

THE CITY OF  
ROME, GEORGIA

WATER AND SEWER DIVISION



PROJECT MANUAL FOR

**HAMLER WATER TREATMENT PLANT  
CHEMICAL FEED SYSTEM IMPROVEMENTS**

OWNER BID #032-17  
PROJECT NUMBER 17021.00

SEPTEMBER 2017

PREPARED BY:



9/22/17

InSite Engineering, LLC  
5800 Feldspar Way  
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## SECTION 001116 - INVITATION TO BID

### 1.1 BID INFORMATION

- A. InSite Project: 17021.00 Hamler Water Treatment Plant Chemical Feed System Improvements
- B. Owner Bid # 032-17 Hamler Water Treatment Plant Chemical Feed System Improvements
- C. Owner: The City of Rome, Georgia
- D. Engineer: InSite Engineering, LLC.
- E. Names of Bidders:
  - 1. All Bidders.

### 1.2 ANNOUNCEMENT

- A. All qualified bidders are invited to submit a Bid under sealed envelope to The City of Rome, Georgia for the installation of a new chemical feed building with bulk storage and chemical feed systems for fluoride, orthophosphate, and sodium hypochlorite, and all other necessary appurtenances at the City of Rome's Bruce Hamler Water Treatment Facility located at 1 Blossom Hill Road, Rome, Georgia 30161. The Owner will receive Bids at the City of Rome – Purchasing Department, Attention: Johnna M. Allen, located at 601 Broad Street, Rome, Georgia, 30161 until 2:00 P.M. local standard time on the 10<sup>th</sup> day of October, 2017. Mailed Bids are to be sent to the City of Rome – Purchasing Department, Attention: Johnna M. Allen, 601 Broad Street, Rome, Georgia, 30161. **Bids not received by 2:00 P.M. local standard time on the 10<sup>th</sup> day of October, 2017 will not be opened.**
- B. The Bids will be publicly opened and read aloud at 2:00 P.M. local standard time on the 10<sup>th</sup> day of October, 2017 at the City of Rome – Water Department Conference Room, located at 100 Vaughn Road, Rome, Georgia, 30161.
- C. Owner requires the Project to be substantially completed within **180** days after the date when the Contract Times commence to run as dated in the Notice to Proceed and completed and ready for final payment within **210** days after the date when the Contract Times commence to run as dated in the Notice to Proceed.
- D. Bid Documents can be obtained only by General Contractors and Bidders at [www.insiteengineering.org](http://www.insiteengineering.org). Others may view the Bid Documents at the office of the Engineer or online at [www.insiteengineering.org](http://www.insiteengineering.org).
- E. Bidders will be required to provide Bid security according to the requirements in Bid Document Instruction to Bidders.
- F. Other Bidding requirements are described in Bid Document Instructions to Bidders.
- G. Submit your Bid on the Bid Form provided. Bidders are required to complete all sections and requirements as stated with the Contract Documents.
- H. Bids will be required to be submitted under a condition of irrevocability for a period of no less than 60 days after submission.

- I. A mandatory Pre-Bid Meeting will not be held. Each bidder can schedule a time to view the site and construction area through the office of the Engineer.
- J. Owner reserves the right to waive irregularities and to accept or reject any or all Bids.

END OF DOCUMENT 001116



## MEMORANDUM

TO: Prospective Bidders

FROM: Johnna M. Allen, Purchasing Director

RE: Request for Bid - #032-17

DATE: September 13, 2017

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Enclosed you will find the necessary information for preparing and submitting your bid for **Hamler Water Treatment Plant Chemical Feed System Improvements** for the City of Rome. The deadline for submitting your bid is **October 10, 2017 at 2:00 p.m.**

All information for this bid is posted on the City of Rome website [www.romefloyd.com](http://www.romefloyd.com). All questions should be submitted via e-mail to Johnna Allen at [jallen@romega.us](mailto:jallen@romega.us). All questions and answers will be posted on the website. It is the responsibility of interested parties to visit the site regularly to insure receipt of any new information that may be provided.

If you have further questions, please do not hesitate to call my office at 706-236-4410.

---

Johnna M. Allen  
Purchasing Director



## INSTRUCTIONS FOR BIDDERS

I. Bids must be received by **October 10, 2017 at 2:00 p.m.**

II. Bids must be delivered to:

City of Rome – Purchasing Department  
Attention: Johnna M. Allen  
601 Broad Street  
P.O. Box 1433  
Rome, Georgia 30162

III. Bids must be sealed and marked:

**“032-17 “Hamler Water Treatment Plant Chemical Feed System Improvements”**

IV. Bids must be complete and include:

- A. Completed Bid Proposal Form
- B. Executed Bidder's Declaration
- C. Executed Certificate of Non-Discrimination
- D. Executed Affidavit of Non-Collusion
- E. Prompt Payment Affidavit
- F. Request for Taxpayer I.D. Number
- G. Drug-Free Workplace Certification
- H. E-Verify Compliance Affidavit
- I. SAVE Compliance Affidavit

All bids submitted shall be subject to acceptance or rejection and the City of Rome specifically reserves the right to accept or reject any or all bids, to waive any technicalities and formalities in the bidding.

Bidder shall submit all required forms and information simultaneously with sealed bids, which forms and information become a part of the property of the City of Rome and will not be returned to bidders unless a written request to withdraw is received prior to **October 10, 2017 @ 2:00 p.m.**

V. Payment:

When contracts are awarded, payment by the City of Rome will be the normal 30-day cycle. However, the City does make every effort to honor all discounts.

## REQUIREMENTS FOR BIDDERS

These items apply to and become a part of the terms and conditions of the bidders bid. Any exceptions must be in writing.

Notice is hereby given that the City of Rome will receive sealed bids from interested parties until **October 10, 2017 at 2:00 p.m.** at its offices located at 601 Broad Street, Rome, Georgia 30162-1433.

Any bids received thereafter will not be considered.

Bids will be publicly opened and read at the City of Rome Purchasing Department located at 601 Broad Street on the day and at the hour specified.

The purchaser may consider as non-responsive, any bid in which there is an alteration of, or departure from the bid form hereto attached.

The bid will be awarded to the lowest reliable bidder complying with the conditions of the invitation for bid. The bidder to whom award is made will be notified at the earliest possible date. The purchaser reserves the right to reject the bid of a bidder who has previously failed to perform properly or complete on time, contracts of a similar nature, or the bid of a bidder who, in the sole opinion and discretion of the purchaser is not in a position to perform the contract, or whose name appears on the United States Comptroller General's list of ineligible contractors.

Bids may be withdrawn by written or faxed request, provided such withdrawals are received prior to bid opening date.

NOTE: Unless stated on the bid form the bid submitted will assume all specifications will be met. Please note on the bid form all exceptions.

## SECTION 002113 – ADDITIONAL INSTRUCTIONS TO BIDDERS

### 1.1 INTENT

- A. Intent of this Bid request is to obtain an offer to perform Work to complete the installation of a new chemical feed building with bulk storage and chemical feed systems for fluoride, orthophosphate, and sodium hypochlorite, and all other necessary appurtenances at the City of Rome's Bruce Hamler Water Treatment Facility located at 1 Blossom Hill Road, Rome, Georgia 30161, for a Stipulated Price contract, according to Contract Documents.

### 1.2 WORK IDENTIFIED IN CONTRACT DOCUMENTS

- A. Work of this proposed Contract comprises general construction of a new chemical feed building with bulk storage and chemical feed systems for fluoride, orthophosphate, and sodium hypochlorite, and all other necessary appurtenances.
- B. Location: 1 Blossom Hill Road, Rome, Georgia, 30161
- C. Land and Access:
  - 1. Contract Documents identify land, rights-of-way, and easements for the Work to be accessed and performed.

### 1.3 CONTRACT TIME

- A. Description:
  - 1. Owner requires the Project to be substantially completed within **180** calendar days after the date when the Contract Times commence to run as dated in the Notice to Proceed and completed and ready for final payment within **210** calendar days after the date when the Contract Times commence to run as dated in the Notice to Proceed.
- B. Time is of Essence:
  - 1. Owner requires Work of this Contract to be completed as soon as possible.

### 1.4 DEFINITIONS

- A. Bidding Documents: Contract Documents supplemented with Advertisement for Bids, Instructions to Bidders, Bid Form, Bid securities, and Technical Specifications.
- B. Contract Documents: As defined in EJCDC C-700 - Standard General Conditions of the Construction Contract, Article 1, including issued Addenda.
- C. Bid: Executed Bid Form and required attachments submitted according to Instructions to Bidders.

- D. Bid Price / Sum: Monetary sum identified by Bidder in Bid Form.

#### 1.5 CONTRACT DOCUMENTS IDENTIFICATION

- A. Contract Documents are identified as Project No. 17021.00 (Owner Bid # 032-17), as prepared by InSite Engineering, LLC located at 5800 Feldspar Way, Hoover, Alabama 35244, and as identified in Project Manual.

#### 1.6 AVAILABILITY OF DOCUMENTS

- A. Bidding Documents may be obtained as indicated in Advertisement for Bids.
- B. Purpose:
  - 1. Bidding Documents are made available only for the purpose of obtaining offers for the Project.
  - 2. Their use does not grant a license for other purposes.

#### 1.7 EXAMINATION OF DOCUMENTS

- A. Bidding Documents may be viewed at the office of InSite Engineering, LLC or Online within the plan library at [www.insiteengineering.org](http://www.insiteengineering.org) and [www.romefloyd.com](http://www.romefloyd.com).
- B. Completeness:
  - 1. Upon receipt of Bidding Documents, verify that documents are complete.
  - 2. Notify Engineer if documents are incomplete.
- C. Immediately notify Engineer upon finding discrepancies or omissions in Bidding Documents.

#### 1.8 INQUIRIES AND ADDENDA

- A. Direct questions in writing to Johnna Allen, at the office of City of Rome – Purchasing Department, at [jallen@romege.us](mailto:jallen@romege.us). It is the bidders responsibility to ensure the email is received.
- B. Verbal answers are not binding on any party.
- C. Submit questions not less than five days before date set for receipt of Bids.
- D. Include resultant costs in Bid Price/Sum.

#### 1.9 PRODUCT SUBSTITUTIONS

- A. Where Bidding Documents stipulate particular products, substitution requests will be considered by Engineer up to 10 days before receipt of Bids.

- B. With each substitution request, provide sufficient information for Engineer to determine acceptability of proposed products.
- C. Comply with substitution request submittal requirements in Section 016000 - Product Requirements including use of Substitution Request Form.
- D. Approvals:
  - 1. When a request to substitute a product is made, Engineer may approve the substitution with Owners direction.
  - 2. Approved substitutions will be identified by Addenda.
- E. Changes in the Work:
  - 1. In submitting substitutions to specified products, Bidders shall include changes required in the Work and changes to Contract Time, Contract Sum, and Contract Price to accommodate such approved substitutions in their Bid.
  - 2. Later claims by the Bidder for an addition to the Contract Time or Contract Price because of changes in Work necessitated by use of substitutions will not be considered.
- F. With each substitution request, provide sufficient information for Engineer to determine acceptability of proposed products.
- G. Comply with substitution request submittal requirements in Section 016000 - Product Requirements including use of Substitution Request Form.
- H. Provide complete information on required revisions to other Work to accommodate each substitution, the value of additions to or reductions from the Bid Price, including revisions to other Work.
- I. Provide products as specified unless substitutions are submitted in this manner and subsequently accepted.
- J. Approval to submit substitution requests prior to submission of Bids is not required.

#### 1.10 SITE EXAMINATION

- A. Examine Project Site before submitting a Bid.
- B. Contact Engineer at following address and phone number to arrange date and time to visit Project Site:
  - 1. Address: 5800 Feldspar Way, Hoover, Alabama 35244.
  - 2. Telephone: 205-733-9696.

#### 1.11 PREBID MEETING

- A. A mandatory Pre-Bid Meeting will not be held. Each bidder can schedule a time to view the site and construction area through the office of the Engineer.

**1.12 BIDDER QUALIFICATIONS**

- A. To demonstrate qualification for performing the Work of this Contract, Bidders may be requested to submit written evidence of previous experience and proper license to perform work in State of Alabama.

**1.13 BIDDER PREQUALIFICATION**

- A. Bidder prequalification for this project is not required.

**1.14 SUBCONTRACTORS**

- A. Owner reserves right to reject a proposed Subcontractor for reasonable cause.

**1.15 SUBMISSION PROCEDURE**

- A. Bidders shall be solely responsible for delivery of Bids in manner and time prescribed.
- B. Submit one copy of executed offer on provided Bid Forms, signed and sealed with required Bid Bond in a closed opaque envelope, and clearly identified with Bidder's name and address, Project name, General Contractors License Number, and Owner's name on outside.
- C. Improperly completed information, including irregularities in Bid bond, will be cause not to open Bid Form envelope and to declare Bid invalid or informal.
- D. An abstract summary of submitted Bids will be made available to all Bidders following Bid opening.

**1.16 BID INELIGIBILITY**

- A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, and obscure, or Bids that contain arithmetical errors, erasures, alterations, or irregularities, may be declared unacceptable at Owner's discretion.
- B. Bid Forms, Appendices, and enclosures that are improperly prepared may be declared unacceptable at Owner's discretion.
- C. Failure to provide security deposit, bonds, or insurance requirements will invalidate Bid at Owner's discretion.

**1.17 BID SECURITY**

- A. Bids shall be accompanied by Bid security as follows:
  1. Bid bond in the amount of a maximum of \$10,000 or of a sum no less than 5 percent of Bid Sum.

- B. Endorse Bid bond in name of The City of Rome, Georgia. Signed and sealed by principal (Contractor) and surety.
- C. Bid securities will be returned after delivery to Owner of required performance and payment bonds by accepted Bidder.
- D. If accepted Bidder fails to execute the Agreement and indicated bonds within 15 days after Notice of Award, Notice of Award may be annulled and Bidder's Bid security will be forfeited.
- E. Include cost of Bid security in Bid Sum/Price
- F. After Bid has been accepted, Bid security will be returned to respective Bidders.
- G. If no contract is awarded, Bid security will be returned.

#### 1.18 PERFORMANCE ASSURANCE

- A. Accepted Bidder: Provide performance and payment bond as described in Document 007314 - Supplementary Conditions - EJCDC
- B. Include cost of performance assurance bonds in Bid Sum/Price. Separate payment will not be made.

#### 1.19 INSURANCE

- A. Provide an executed "Undertaking of Insurance" on Standard form provided by the insurance company, stating insurance company's intention to provide insurance to Bidder according to insurance requirements of Contract Documents.

#### 1.20 BID FORM REQUIREMENTS

- A. Complete requested information in Bid Form and Bid Form Supplements.
- B. Refer to Document 007314 - Supplementary Conditions - EJCDC for inclusion of taxes, and tax-exempt products.

#### 1.21 FEES FOR CHANGES IN THE WORK

- A. Include in Bid Form the overhead and profit fees on Bidder's own Work and Work by Subcontractors, applicable for changes in the Work, whether additions to or deductions from the Work on which Bid Sum/Price is based.
- B. Subcontract Work:
  - 1. Include in Bid Form the fees proposed for subcontract Work for changes, both additions and deductions, in the Work.

## 1.22 BID FORM SIGNATURE

### A. Sign Bid Form as follows:

1. Sole Proprietorship:
  - a. Signature of sole proprietor in presence of a witness who will also sign.
  - b. Include words "Sole Proprietor" under signature.
  - c. **[Affix seal.]**
2. Partnership:
  - a. Signature of each partner in presence of a witness who will also sign.
  - b. Include word "Partner" under each signature.
  - c. **[Affix seal to each signature.]**
3. Corporation:
  - a. Signature of at least one duly authorized signing officer.
  - b. Include officer's capacity under each signature.
  - c. Affix corporate seal.
  - d. If Bid is signed by officials other than president, secretary, or treasurer of company, submit a copy of bylaws or a resolution of board of directors authorizing them to do so, included with Bid Form in Bid envelope.
4. Joint Venture:
  - a. Signature of each party of joint venture under their respective seals in a manner appropriate to such party as described above, similar to requirements for partnerships.

## 1.23 ADDITIONAL BID INFORMATION

### A. Complete and submit with Bid, Document 004300 - Procurement Form Supplements.

1. Appendix A - List of Subcontractors: Include names of all Subcontractors and portions of the Work each Subcontractor will perform.
2. Appendix B - List of Unit Prices: Include list of Unit Prices specifically requested by Contract Documents.
3. Appendix C - List of Alternates: Include cost variation to Bid Sum/Price applicable to Work described in Section 012000 - Price and Payment Procedures.
4. Appendix D - List of Separate Prices: Include list of separate prices as specifically requested in Contract Documents.
5. Appendix E - Cost Breakdown: Includes Bid sum/price segmented into portions as requested.
6. Appendix F - List of Supplementary Mechanical Information.
7. Appendix G - List of Supplementary Electrical Information.
8. Appendix H - List of Equipment.
9. Appendix I - List of Tax Rebate Items.

1.24 SELECTION AND AWARD OF ALTERNATES

A. Evaluation:

1. Bids will be evaluated on base Bid Price or Base Plus any Alternates.

1.25 BID OPENING

A. Description:

1. Bids will be opened publicly immediately after time for receipt of Bids.
2. Bidders may be present.

1.26 DURATION OF OFFER

A. Bids shall remain open to acceptance and shall be irrevocable for a period of **60** days after Bid closing date.

1.27 ACCEPTANCE OF OFFER

- A. Owner reserves right to waive irregularities and to accept or reject any or all offers.
- B. After acceptance by Owner, Engineer, on behalf of Owner, will issue to the accepted Bidder a written Notice of Award.
- C. Notwithstanding delay in the preparation and execution of the Agreement, accepted Bidder shall be prepared, upon written Notice to Proceed, to commence Work within 30 days following receipt of official written order of Owner to proceed, or on date stipulated in such order.
- D. Accepted Bidder shall assist and cooperate with Owner to prepare Agreement, and shall execute Agreement and return it to Owner within 15 days following its presentation.

END OF DOCUMENT 002113

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## SECTION 004100 – BID SECURITY FORMS

### 1.1 BID FORM SUPPLEMENT

- A. A completed bid bond form is required to be attached to the Bid Form.

### 1.2 BID BOND FORM

- A. EJCDC Document C-430, "Bid Bond," is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.
- B. A copy of the form is attached in these documents.

END OF SECTIONS 004100



WWW.INSITEENGINEERING.ORG

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## BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

**BIDDER** (*Name and Address*):

**SURETY** (*Name, and Address of Principal Place of Business*):

**OWNER** (*Name and Address*):

### BID

Bid Due Date:

Description (*Project Name—Include Location*):

### BOND

Bond Number:

Date:

Penal sum

\$

(Words)

(Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

### BIDDER

### SURETY

(Seal)

(Seal)

Bidder's Name and Corporate Seal

Surety's Name and Corporate Seal

By:

Signature

By:

Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest:

Signature

Attest:

Signature

Title

Title

*Note: Addresses are to be used for giving any required notice.*

*Provide execution by any additional parties, such as joint venturers, if necessary.*

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
  - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
  - 3.2 All Bids are rejected by Owner, or
  - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

## BID FORM

TO: City of Rome – Purchasing Department  
ATTN: JOHNNA M. ALLEN  
P.O. Box 1433  
601 Broad Street  
Rome, Georgia 30162-1433

### **“032-17 “Hamler Water Treatment Plant Chemical Feed System Improvements”**

Quantity	Description	Total Cost
1	<b>Chemical Feed System Improvements</b>	\$ _____

All bids submitted shall be subject to acceptance or rejection and the City of Rome specifically reserves the right to accept or reject any or all bids, to waive any technicalities and formalities in the bidding.

The undersigned understands that any conditions stated above, clarifications made to the above or information other than that requested should be under separate cover and to be considered only at the discretion of the Purchasing Department.

---

Name of Individual, Partner  
or Corporation

---

Company

---

Title

---

Address

---

Authorized Signature

---

City, State, Zip Code

---

Company phone number

**Please attach contact's business card:**



## SECTION 004143 - BID FORM - UNIT PRICE (SINGLE-PRIME CONTRACT)

### 1.1 BID INFORMATION

- A. To: City of Rome, Georgia
- B. Project Name: Hamler Water Treatment Plant Chemical Feed System Improvements
- C. InSite Project No.: 17021.00
- D. Owner Bid # 032-17
- E. Date:
- F. Submitted by:

1. Name: \_\_\_\_\_

2. Address: \_\_\_\_\_

### 1.2 OFFER

- A. Having examined the Place of the Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by the InSite Engineering, LLC for the above-referenced Project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Unit Prices listed in this Bid Form in lawful money of the United States of America.
- B. We have included the Bid security as required by the Instructions to Bidders.
- C. All applicable federal taxes are included and State of Georgia, Floyd County, and City of Rome taxes are included in the Unit Prices.
- D. All Allowances described in Section 012000 - Price and Payment Procedures are included in the Unit Prices.

### 1.3 ACCEPTANCE

- A. This offer shall be open to acceptance and is irrevocable for 60 days from the Bid closing date.
- B. If this Bid is accepted by the Owner within the time period stated above, we will:
  - 1. Execute the Agreement within 15 days of receipt of Notice of Award.
  - 2. Furnish the required bonds within 15 days of receipt of Notice of Award.
  - 3. Commence Work within 30 days after written Notice to Proceed.

- C. If this Bid is accepted within the indicated time, and we fail to commence the Work or we fail to provide the required bonds, the Bid security shall be forfeited as damages to the Owner by reason of our failure, limited in amount to the lesser of the face value of the Bid security or the difference between this Bid and the Bid upon which a Contract is signed.
- D. In the event our Bid is not accepted within the time stated above, the required Bid security will be returned to the undersigned, according to the provisions of the Instructions to Bidders, unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

#### 1.4 CONTRACT TIME

- A. If this Bid is accepted, we will:
  - 1. Owner requires the Project to be substantially completed within 180 calendar days after the date when the Contract Times commence to run as dated in the Notice to Proceed and completed and ready for final payment within 210 calendar days after the date when the Contract Times commence to run as dated in the Notice to Proceed.

#### 1.5 UNIT PRICES

- A. Following are Unit Prices for specific portions of the Work as listed:

##### BASE BID

Item	Description	Unit	Units	Unit Price	Total
1	Constructing and providing all items of work as shown in the Contract Documents, except as specifically listed below. Lump Sum	1	LS		
2	Fluoride Feed System, Furnished and Installed, Lump Sum	1	LS		
3	Orthophosphate Feed System, Furnished and Installed, Lump Sum	1	LS		
4	Sodium Hypochlorite Feed System, Furnished and Installed, Lump Sum	1	LS		

Total Base Bid \_\_\_\_\_

##### DEDUCTIVE BID ALTERNATE No. 1

Item	Description	Unit	Units	Unit Price	Total
A1.1	Deduct all work associated with the Sodium Hypochlorite Feed System	1	LS		

Total Deductive Bid Alternate No. 1 \_\_\_\_\_

## 1.6 SCHEDULE OF PAY ITEMS

### A. **Item No. 1 - Constructing and providing all items of work.**

1. This item covers all items of work shown on the plans and/or included in the specifications except for those items specifically listed on the Bid Form as separate items numbers. This Lump Sum Bid shall be full compensation for all items and for all labor, materials, and equipment required to construct the new chemical feed building in accordance with the drawings and specifications including but not limited to the Pre-Engineered Metal Building, Doors, windows, louvers, fans, heaters, emergency shower/safety shower station, tankless water heater, concrete equipment pads, lighting, all necessary electrical components, and all incidentals necessary and appurtenant to the completion of these items.

### B. **Item No. 2 – Fluoride Feed System**

1. This item covers all items of work shown on Sheet CB-1 associated with the Fluoride Feed System. This Lump Sum Bid shall be full compensation for the following items: Fluoride Chemical Feed Skid, Fluoride Storage Tank, Fluoride Day Tank and Scale, all necessary fill pipe, casing pipe, fittings, quick connect fittings, and connection to the tank, all necessary discharge pipe, casing pipe, fittings, valves, and connection to the injection point, ultrasonic level sensors, all necessary electrical components, conduit, and wiring, and for all labor, materials, and equipment required to complete these items in accordance with the drawings and specifications.

### C. **Item No. 3 – Orthophosphate Feed System**

1. This item covers all items of work shown on Sheet CB-1 associated with the Orthophosphate Feed System. This Lump Sum Bid shall be full compensation for the following items: Orthophosphate Chemical Feed Skid, Orthophosphate Storage Tank, Orthophosphate Day Tank and Scale, all necessary fill pipe, casing pipe, fittings, quick connect fittings, and connection to the tank, all necessary discharge pipe, casing pipe, fittings, valves, and connection to the injection point, ultrasonic level sensors, all necessary electrical components, conduit, and wiring, and for all labor, materials, and equipment required to complete these items in accordance with the drawings and specifications.

### D. **Item No. 4 – Sodium Hypochlorite Feed System**

1. This item covers all items of work shown on Sheet CB-1 associated with the Sodium Hypochlorite Feed System. This Lump Sum Bid shall be full compensation for the following items: Sodium Hypochlorite Chemical Feed Skid, Sodium Hypochlorite Storage Tank, all necessary fill pipe, casing pipe, fittings, quick connect fittings, and connection to the tank, all necessary discharge pipe, casing pipe, fittings, valves, and connection to the injection point, ultrasonic level sensors, all necessary electrical components, conduit, and wiring, and for all labor, materials, and equipment required to complete these items in accordance with the drawings and specifications.

**E. Item No. A1.1 – Deductive Bid Alternate: Deduct all work Associated with the Sodium Hypochlorite Feed System**

1. On Sheet CB-1, delete all work associated with the Sodium Hypochlorite Feed System including the following items: Sodium Hypochlorite Chemical Feed Skid, Sodium Hypochlorite Storage Tank, all necessary fill pipe, casing pipe, fittings, quick connect fittings, and connection to the tank, all necessary discharge pipe, casing pipe, fittings, valves, and connection to the injection point, ultrasonic level sensors, all necessary electrical components, conduit, and wiring, and for all labor, materials, and equipment required to complete these items in accordance with the drawings and specifications. The concrete equipment pad shall not be omitted.

**1.7 ADDENDA**

**A. Following Addenda have been received, and the modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum/Price**

1. Addendum No. ...., dated .....
2. Addendum No. ...., dated .....
3. Other: \_\_\_\_\_, dated .....

**1.8 APPENDICES**

**A. Following documents are attached to and made a condition of the Bid:**

1. Bid security in amount of \_\_\_\_\_
2. Bidder's qualifications statement and supporting data.
3. Document 004300 - Procurement Form Supplements, including all items required by Instructions to Bidders:

**1.9 BID FORM SIGNATURES**

- A. Full Name of Bidder: .....
- B. Hereunto affixed in the presence of .....
- C. Authorized Signing Officer and Title: .....
- D. [Seal: .....]
- E. Address for giving Notice: .....

END OF DOCUMENT 004143

## **BIDDERS DECLARATION**

The bidder understands, agrees and warrants:

The bidder has carefully read and fully understands the full scope of the specifications.

The bidder has the capability to successfully undertake and complete the responsibilities and obligations in said specifications.

The bidder has liability insurance and a declaration of insurance form is included in the bid package.

That this bid may be withdrawn by requesting such withdrawal in writing at any time prior to **October 10, 2017 @ 2:00 p.m.** but may not be withdrawn after such date and time.

That the City of Rome reserves the right to reject any or all bids and to accept that bid which will, in its opinion, best serve the public interest. The City of Rome reserves the right to waive any technicalities and formalities in the bidding.

That by submission of this bid the bidder acknowledges that the City of Rome has the right to make any inquiry or investigation it deems appropriate to substantiate or supplement information supplied by the bidder.

If a partnership, a general partner must sign.

If a corporation, the authorized corporate officer(s) must sign and the corporate seal must be affixed to this bid.

**BIDDER:**

---

Name

---

Title

---

Name

---

Title

**AFFIX CORPORATE SEAL (If Applicable)**

## **CERTIFICATE OF NON-DISCRIMINATION**

In connection with the performance of work under this contract, the bidder agrees as follows:

The bidder agrees not to discriminate against any employee or applicant for employment because of race, creed, color, sex, national origin, ancestry or disability. The vendor shall take affirmative action to insure that employees are treated without regard to their race, creed, color, sex, national origin, ancestry or disability. Such action shall include, but not be limited to the following: employment, upgrading, demotion, transfer, recruiting or recruitment, advertising, lay-off or termination, rates of pay or other compensation and selection for training, including apprenticeship.

In the event of the bidder's non-compliance with this non-discrimination clause, the contract may be canceled or terminated by the City of Rome. The bidders may be declared, by the City of Rome, ineligible for further contracts with the City of Rome until satisfactory proof of intent to comply shall be made by the vendor.

The bidder agrees to include this non-discrimination clause in any sub-contracts connected with the performance of this agreement.

---

BIDDER

---

SIGNATURE

---

TITLE

**NON-COLLUSION AFFIDAVIT**

The following affidavit is to accompany the bid:

STATE OF \_\_\_\_\_

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

Owner, Partner or Officer of Firm \_\_\_\_\_

Company Name, Address, City and State \_\_\_\_\_

Being of lawful age, being first duly sworn, on oath says that he/she is the agent authorized by the bidder to submit the attached bid. Affidavit further states as bidder, that they have not been a party to any collusion among bidders in restraint of competition by agreement to bid at a fixed price or to refrain from bidding; or with any office of the City of Rome or any of their employees as to quantity, quality or price in the prospective contract; or any discussion between bidders and any official of the City of Rome or any of their employees concerning exchange of money or other things of value for special consideration in submitting a sealed bid for:

FIRM NAME \_\_\_\_\_

SIGNATURE \_\_\_\_\_

TITLE \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_\_

\_\_\_\_\_  
NOTARY PUBLIC

## STATE OF GEORGIA PROMPT PAY ACT AFFIDAVIT

THIS AFFIDAVIT IS TO ACCOMPANY THE BID

GEORGIA PROMPT PAY ACT: The Georgia Prompt Pay Act was enacted by the General Assembly in 1994 and took effect January 1, 1995. This act requires owners to pay contractors within 15 days of receipt of a pay request by the owner or the owner's representative. If payment is not made the owner shall pay the contractor 1% per month interest on the delayed payment. Additionally, the contractor must pay subcontractors within 15 days of receipt of payment from the owner.

This Act is Code Section 13-11-1 (Georgia Laws of 1994, p. 1398 par. 4)

Firm Name: \_\_\_\_\_

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

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

Subscribed and Sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_

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

**W-9**  
 Form  
 (Rev. December 2014)  
 Department of the Treasury  
 Internal Revenue Service

**Request for Taxpayer  
 Identification Number and Certification**

Give Form to the  
 requester. Do not  
 send to the IRS.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.	
2 Business name/disregarded entity name, if different from above	
3 Check appropriate box for federal tax classification; check only one of the following seven boxes: <input type="checkbox"/> Individual/sole proprietor or <input type="checkbox"/> C Corporation <input type="checkbox"/> S Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Trust/estate <input type="checkbox"/> Single-member LLC <input type="checkbox"/> Limited liability company Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ► Note: For a single-member LLC that is disregarded, do not check LLC; check the appropriate box in the line above for the tax classification of the single-member owner. <input type="checkbox"/> Other (see instructions) ►	
4 Exemptions (codes apply only to certain entities, not individuals, see instructions on page 2): Exempt payee code if any: _____ Exemption from FATCA reporting code (if any) _____ <small>(Applies to accounts maintained in the U.S.)</small>	
5 Address (number, street, and apt. or suite no.)	Requester's name and address (optional)
6 City, state, and ZIP code	
7 List account number(s) here (optional)	

**Part I Taxpayer Identification Number (TIN)**

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I Instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

**Note.** If the account is in more than one name, see the instructions for line 1 and the chart on page 4 for guidelines on whose number to enter.

Social security number			
	-		
	-		

or

Employer identification number			
	-		
	-		

**Part II Certification**

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

**Certification instructions.** You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3.

**Sign  
 Here** **Signature of  
 U.S. person ►**

**Date ►**

**General Instructions**

Section references are to the Internal Revenue Code unless otherwise noted.

**Future developments.** Information about developments affecting Form W-9 (such as legislation enacted after we release it) is at [www.irs.gov/w9](http://www.irs.gov/w9).

**Purpose of Form**

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following:

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)

- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See *What is backup withholding?* on page 2.

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued).
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting is correct. See *What is FATCA reporting?* on page 2 for further information.

**CITY OF ROME**

**DRUG-FREE WORKPLACE CERTIFICATE**

By signature on this certificate, the Bidder certifies that the provisions of O.C.G.A. Section 50-24-1 through 50-24-6 related to the "Drug-Free Workplace Act" will be complied with in full. The Bidder further certifies that:

1. A drug-free workplace will be provided for the Bidder's employees during the performance of the contract; and
2. Each contractor who hires a subcontractor to work in a drug-free workplace shall secure from that subcontractor the following written certification: "As part of the subcontracting agreement with (contractor's name), (subcontractor's name) certifies to the contractor that a drug-free workplace will be provided for the subcontractor's employees during the performance of this contract pursuant to O.C.G.A. Section 50-24-3(b)(7)."

By signature on this certificate, the Bidder further certifies that it will not engage in the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana during the performance of the contract.

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

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

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

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

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

**CITY OF ROME, GEORGIA**  
**E-VERIFY COMPLIANCE AFFIDAVIT**

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of the City of Rome, Georgia has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the contractor with the information required by O.C.G.A. § 13-10-91 (b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization User Identification number  
(Not Required if Less than 10 Employees)

Signature (if less than 10 employees)

Date of Authorization

Name of Contractor

Name of Project

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on \_\_\_\_\_, 20\_\_\_\_ in \_\_\_\_\_ (city) \_\_\_\_\_ (state).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

**SUBSCRIBED AND SWORN BEFORE ME**  
**ON THIS THE \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_\_**

NOTARY PUBLIC  
My Commission Expires:

**CITY OF ROME, GEORGIA**

**SAVE COMPLIANCE AFFIDAVIT**  
**O.C.G.A § 50-36-1(e) (2) Affidavit**

By executing this affidavit under oath, as an applicant for a (n) Contract or Services, as referenced O.C.G.A. C. § 50-36-1, from the City of Rome, Georgia, the undersigned applicant verifies one of the following with respect to my application for a public benefit:

- 1) \_\_\_\_\_ I am a United State citizen.
- 2) \_\_\_\_\_ I am a legal permanent resident of the United States

3) \_\_\_\_\_ I am a qualified alien or non-immigrant under the Federal Immigration and Nationality Act with an alien number issued by the Department of Homeland Security or other federal immigration agency.

My alien number issued by the Department of Homeland Security or other federal immigration agency is: \_\_\_\_\_.

The undersigned applicant also hereby verifies that he or she is 18 years of age or older and has provided at least one secure and verifiable document, as required by O.C.G.A. § 50-36-1(e) (1), with this affidavit.

The secure and verifiable document provided with this affidavit can best be classified as:

---

In making the above representation under oath, I understand that any person who knowingly and willfully makes a false, fictitious, or fraudulent statement or representation in an affidavit shall be guilty of a violation of O.C.G.A. § 16-10-20, and face criminal penalties as allowed by such criminal statute.

Executed in \_\_\_\_\_ (city), \_\_\_\_\_ (state).

---

Signature of Applicant

Printed Name of Applicant

SUBSCRIBED AND SWORN

BEFORE ME ON THIS THE

DAY OF \_\_\_\_\_, 20 \_\_\_\_\_

---

NOTARY PUBLIC  
My Commission Expires:

## SECTION 004300 - PROCUREMENT FORM SUPPLEMENTS

### 1.1 PROJECT INFORMATION

- A. To: The City of Rome, Georgia
- B. Project Name: Hamler Water Treatment Plant Chemical Feed Systems Improvements
- C. InSite Project No.: 17021.00
- D. Owner Bid # 032-17
- E. Date: .....
- F. Submitted by: .....
- G. Full name and address: .....
- H. According to Document 002113 - Instructions to Bidders] and Document 004113 - Bid Form – Stipulated Sum (Single-Prime Contract), we include the Appendices to Bid Form Supplements listed below.
  - 1. The information provided shall be considered an integral part of the Bid Form.
  - 2. Following Appendices are attached to this Document:
    - a. Appendix A - List of Subcontractors: Include names of all Subcontractors and portions of the Work each Subcontractor will perform.
    - b. Appendix B - List of Unit Prices: Include list of Unit Prices specifically requested by Contract Documents.
    - c. Appendix C - List of Alternates: Include cost variation to Bid Sum/Price applicable to the Work as described in Section 012000 - Price and Payment Procedures.
    - d. Appendix D - List of Separate Prices: Include list of separate prices as specifically requested in Contract Documents.
    - e. Appendix E - Cost Breakdown: Includes Bid Sum/Price segmented into portions as requested.
    - f. Appendix F - List of Supplementary Mechanical Information. If Applicable.
    - g. Appendix G - List of Supplementary Electrical Information. If Applicable.
    - h. Appendix H - List of Equipment. If Applicable.
    - i. Appendix I - List of Tax Rebate Items. If Applicable.

### 1.2 BID FORM SUPPLEMENT SIGNATURES

- A. The Corporate Seal of.....
- B. (Bidder - print the full name of your firm) .....
- C. was hereunto affixed in the presence of .....

- D. (Authorized signing officer and title) .....
- E. (Seal) .....
- F. (Authorized signing officer and title): .....
- G. (Seal) .....

### 1.3 APPENDIX A - LIST OF SUBCONTRACTORS

- A. The list of Subcontractors submitted below is an integral part of the Bid Form and is referenced in the Bid submitted by:
  - 1. (Bidder) .....
  - 2. (Sub).....
  - 3. (Sub).....
  - 4. (Sub).....
  - 5. (Sub).....
  - 6. (Sub).....
- B. Following work will be performed (or provided) by Subcontractors and coordinated by us:
  - 1. Work.....By.....
  - 2. Work.....By.....
  - 3. Work.....By.....
  - 4. Work.....By.....

### 1.4 APPENDIX B - LIST OF UNIT PRICES

- A. Following list of Unit Prices is an integral part of the Bid Form and is referenced in the Bid submitted by:
  - 1. (Bidder) .....
  - 2. To: The City of Rome, Georgia
  - 3. Dated .....
- B. Following Unit Prices are for specific portions of the Work as listed and are applicable to authorized variations from the Contract Documents:
  - 1. See Bid Form

### 1.5 APPENDIX C - LIST OF ALTERNATES

- A. Following list of alternates is an integral part of the Bid Form and is referenced in the Bid submitted by:
  - 1. (Bidder) .....
  - 2. To: The City of Rome, Georgia
  - 3. Dated .....
  - 4. Alternate.....

B. Following amounts shall be added to or deducted from the Bid Sum/Price. Refer to Schedule of Alternates in Section 012000 - Price and Payment Procedures for description of alternates.

1. Alternate No.....
2. Add Value. ....

1.6 APPENDIX D - LIST OF SEPARATE PRICES

1. SEE BID FORM

1.7 APPENDIX E - COST BREAKDOWN

1. SEE BID FORM.

1.8 APPENDIX F - LIST OF SUPPLEMENTARY MECHANICAL INFORMATION

1. N/A

1.9 APPENDIX G - LIST OF SUPPLEMENTARY ELECTRICAL INFORMATION

1. N/A

1.10 APPENDIX H - LIST OF EQUIPMENT

1. N/A

1.11 APPENDIX I - LIST OF TAX REBATE ITEMS

1. N/A

END OF DOCUMENT 004300

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SECTION 005213.12 - AGREEMENT FORM - EJCDC STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 AGREEMENT

A. Basis of Agreement between Owner and Contractor: EJCDC C-520 - Agreement between Owner and Contractor for Construction Contract (Stipulated Price).

END OF DOCUMENT 005213.12

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**AGREEMENT  
BETWEEN OWNER AND CONTRACTOR  
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)**

THIS AGREEMENT is by and between The City of Rome, Georgia ("Owner") and ("Contractor").

Owner and Contractor hereby agree as follows:

## ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

## ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows:

**THE INSTALLATION OF A NEW CHEMICAL FEED BUILDING WITH BULK STORAGE  
AND CHEMICAL FEED SYSTEMS FOR FLUORIDE, ORTHOPHOSPHATE, AND SODIUM  
HYPOCHLORITE, AND ALL OTHER NECESSARY APPURTENANCES AT THE CITY OF  
ROME'S BRUCE HAMLER WATER TREATMENT FACILITY.**

### **ARTICLE 3 – ENGINEER**

- 3.01 The part of the Project that pertains to the Work has been designed by InSite Engineering, LLC.
- 3.02 The Owner has retained InSite Engineering, LLC (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

## ARTICLE 4 – CONTRACT TIMES

#### 4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

#### 4.02 *Contract Times: Days*

A. The Work will be substantially completed within 180 days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 210 days after the date when the Contract Times commence to run.

#### 4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the

actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner \$750 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.
2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$750 for each day that expires after such time until the Work is completed and ready for final payment.
3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

#### 4.04 *Special Damages*

- A. In addition to the amount provided for liquidated damages, Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.
- B. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

### ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

- A. For all Work other than Unit Price Work, a lump sum of: \$\_\_\_\_\_.  
All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.
- B. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item):

Unit Price Work					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)					\$

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

- C. Total of Unit Price Work (subject to final Unit Price adjustment) \$ \_\_\_\_\_.
- D. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

## ARTICLE 6 – PAYMENT PROCEDURES

### 6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

### 6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 25 day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.
  - 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract
    - a. 90 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

- b. 90 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

#### 6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

### **ARTICLE 7 – INTEREST**

7.01 All amounts not paid when due shall bear interest at the rate of 1 percent per annum.

### **ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS**

8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:

- A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.
- B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
- E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.
- F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

## ARTICLE 9 – CONTRACT DOCUMENTS

### 9.01 *Contents*

- A. The Contract Documents consist of the following:
  - 1. This Agreement (pages 1 to 8, inclusive).
  - 2. Performance bond (pages        to       , inclusive).
  - 3. Payment bond (pages        to       , inclusive).
  - 4. Other bonds.
    - a.        (pages        to       , inclusive).
  - 5. General Conditions (pages        to       , inclusive).
  - 6. Supplementary Conditions (pages        to       , inclusive).
  - 7. Specifications as listed in the table of contents of the Project Manual.

Drawings (not attached but incorporated by reference) consisting of        sheets with each sheet bearing the following general title: "**Hamler Water Treatment Plant Chemical Feed System Improvements**".

- 8. Addenda (numbers        to       , inclusive).
- 9. Exhibits to this Agreement (enumerated as follows):
  - a. Contractor's Bid (pages        to       , inclusive).
- 10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
  - a. Notice to Proceed.
  - b. Work Change Directives.
  - c. Change Orders.
  - d. Field Orders.

- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

## ARTICLE 10 – MISCELLANEOUS

### 10.01 *Terms*

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

### 10.02 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is 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.

### 10.03 *Successors and Assigns*

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

### 10.04 *Severability*

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

### 10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
  1. “corrupt practice” means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
  2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
  3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
  4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

### 10.06 *Other Provisions*

- A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, published by the Engineers Joint Contract Documents Committee®, and if Owner is the

party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or “track changes” (redline/strikeout), or in the Supplementary Conditions.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on \_\_\_\_\_ (which is the Effective Date of the Contract).

OWNER:

The City of Rome, Georgia

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

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

Attest: \_\_\_\_\_

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

Address for giving notices:

The City of Rome, Georgia

601 Broad Street

Rome, Georgia 30162

CONTRACTOR:

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

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

*(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*

Attest: \_\_\_\_\_

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

Address for giving notices:

\_\_\_\_\_

\_\_\_\_\_

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

*(where applicable)*

*(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*

*NOTE TO USER: Use in those states or other jurisdictions where applicable or required.*

## SECTION 006000.00 – PROJECT FORMS

### 1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:

1. EJCDC Document C-520, "Suggested Form of Agreement between Owner and Contractor for Construction Contract (Stipulated Price)."
  - a. The General Conditions for Project are EJCDC Document C-700, "Standard General Conditions of the Construction Contract."
2. The General Conditions are included in the Project Manual.
3. The Supplementary Conditions for Project are separately prepared and included in the Project Manual.

### 1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of standard forms not included in the Project Manual may be obtained from the respective agencies who produce the forms.

C. Preconstruction Forms:

1. Form of Performance Bond: EJCDC Document C-610, "Performance Bond."
2. Form of Payment Bond: EJCDC Document C-615(A), "Payment Bond."

D. Information and Modification Forms:

1. Form for Requests for Information (RFIs): Engineer's Standard Form issued for the Project.
2. Change Order Form: EJCDC Document C-941, "Change Order."
3. Form of Engineer's Memorandum for Minor Changes in the Work: EJCDC Document C-942, "Field Order."
4. Form of Work Change Directive: EJCDC Document C-940, "Work Change Directive."

E. Payment Forms:

1. Schedule of Values Form: Contractor's Standard Form issued for the Project.
2. Payment Application: EJCDC Document C-620, "Contractor's Application for Payment."

3. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
4. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor's Affidavit of Payment of Release of Liens."
5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF SECTION 006000

## PERFORMANCE BOND

CONTRACTOR (*name and address*):

SURETY (*name and address of principal place of business*):

OWNER (*name and address*):

### CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description (*name and location*):

### BOND

Bond Number:

Date (*not earlier than the Effective Date of the Agreement of the Construction Contract*):

Amount:

Modifications to this Bond Form:  None  See Paragraph 16

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Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

### CONTRACTOR AS PRINCIPAL

\_\_\_\_\_  
Contractor's Name and Corporate Seal

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

Print Name

Title

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

Title

### SURETY

\_\_\_\_\_  
Surety's Name and Corporate Seal

By: \_\_\_\_\_  
Signature (*attach power of attorney*)

Print Name

Title

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

Title

**Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.**

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence,

to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

#### 14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims

for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

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## PAYMENT BOND

CONTRACTOR (*name and address*):

SURETY (*name and address of principal place of business*):

OWNER (*name and address*):

### CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description (*name and location*):

### BOND

Bond Number:

Date (*not earlier than the Effective Date of the Agreement of the Construction Contract*):

Amount:

Modifications to this Bond Form:  None  See Paragraph 18

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Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

### CONTRACTOR AS PRINCIPAL

### SURETY

\_\_\_\_\_  
Contractor's Name and Corporate Seal

(*seal*)

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

\_\_\_\_\_  
Surety's Name and Corporate Seal

(*seal*)

Print Name

Print Name

Title

Title

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

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

Title

Title

**Notes:** (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
  - 5.1 Claimants who do not have a direct contract with the Contractor,
    - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
    - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
  - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall

promptly and at the Surety's expense take the following actions:

- 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
- 7.2 Pay or arrange for payment of any undisputed amounts.
- 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph

are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

## 16. Definitions

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor

of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

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SECTION 007213.12 - GENERAL CONDITIONS - EJCDC STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 GENERAL CONDITIONS

- A. General Conditions of the Contract: EJCDC C-700 - Standard General Conditions of the Construction Contract.

1.2 SUPPLEMENTARY CONDITIONS

- A. Refer to Document 007314 - Supplementary Conditions - EJCDC for amendments and supplements to General Conditions.

END OF DOCUMENT 007213.12

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This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

## STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



Endorsed by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
5. *Bidder*—An individual or entity that submits a Bid to Owner.
6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *Engineer*—The individual or entity named as such in the Agreement.
21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.
35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
  - 1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:*
  - 1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:*
  - 1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
    - a. does not conform to the Contract Documents; or
    - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
    - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. *Furnish, Install, Perform, Provide:*
  - 1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
  - 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

- 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
- 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## ARTICLE 2 – PRELIMINARY MATTERS

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

- A. *Bonds:* When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Contractor's Insurance:* When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner's Insurance:* After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

### 2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

### 2.03 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
  - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
  - 2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

**2.04 *Preconstruction Conference; Designation of Authorized Representatives***

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

**2.05 *Initial Acceptance of Schedules***

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
  1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
  2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
  3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

**2.06 *Electronic Transmittals***

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

## **ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE**

### **3.01 *Intent***

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

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

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

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

- A. *Reporting Discrepancies:*
  1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

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

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

### 3.05 *Reuse of Documents*

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

## **ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK**

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

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

### 4.02 *Starting the Work*

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

### 4.03 *Reference Points*

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

### 4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
  1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
  1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
  2. abnormal weather conditions;
  3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
  4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

## **ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS**

### **5.01 Availability of Lands**

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

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

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

#### 5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
  - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
  - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
  - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
  - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
  - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
  - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

## 5.04 Differing Subsurface or Physical Conditions

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

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
2. is of such a nature as to require a change in the Drawings or Specifications; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments:*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
  - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
  - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
  - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
  - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
  - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

## 5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
  1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
  2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
    - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
    - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
    - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
    - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
  - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
    - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
    - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
    - d. Contractor gave the notice required in Paragraph 5.05.B.
  - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
  - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

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

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
2. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

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

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 6 – BONDS AND INSURANCE

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

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

### 6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

#### 6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
  - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
  - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
  - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
  1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
  2. claims for damages insured by reasonably available personal injury liability coverage.
  3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
  1. Products and completed operations coverage:
    - a. Such insurance shall be maintained for three years after final payment.
    - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
  2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
  3. Broad form property damage coverage.
  4. Severability of interest.
  5. Underground, explosion, and collapse coverage.
  6. Personal injury coverage.
  7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
  8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

- G. *Additional insureds:* The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance:* If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions:* The policies of insurance required by this Paragraph 6.03 shall:
  - 1. include at least the specific coverages provided in this Article.
  - 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
  - 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
  - 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
  - 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

#### 6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

#### 6.05 *Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

- 5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
- 6. extend to cover damage or loss to insured property while in transit.
- 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
- 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
- 10. not include a co-insurance clause.
- 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
- 12. include performance/hot testing and start-up.
- 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

## 6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
  1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
  2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

## 6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

## ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

### 7.01 *Supervision and Superintendence*

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

### 7.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

### 7.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
  - a. in the exercise of reasonable judgment Engineer determines that:
    - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
    - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
    - 3) it has a proven record of performance and availability of responsive service; and
    - 4) it is not objectionable to Owner.
  - b. Contractor certifies that, if approved and incorporated into the Work:
    - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
    - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

#### 7.05 Substitutes

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
  - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
  - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
  - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
    - a. shall certify that the proposed substitute item will:
      - 1) perform adequately the functions and achieve the results called for by the general design,
      - 2) be similar in substance to that specified, and
      - 3) be suited to the same use as that specified.
    - b. will state:
      - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
      - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
      - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
    - c. will identify:
      - 1) all variations of the proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
- d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

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

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

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

7.08 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

#### 7.09 Taxes

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

#### 7.10 Laws and Regulations

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

#### 7.11 Record Documents

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

#### 7.12 Safety and Protection

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
  1. all persons on the Site or who may be affected by the Work;

- 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
- 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

#### 7.13 *Safety Representative*

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

#### 7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### 7.15 *Emergencies*

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

#### 7.16 *Shop Drawings, Samples, and Other Submittals*

##### A. *Shop Drawing and Sample Submittal Requirements:*

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

B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*
  - a. Contractor shall submit the number of copies required in the Specifications.
  - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples:*

- a. Contractor shall submit the number of Samples required in the Specifications.
- b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
  1. observations by Engineer;
  2. recommendation by Engineer or payment by Owner of any progress or final payment;
  3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
  4. use or occupancy of the Work or any part thereof by Owner;
  5. any review and approval of a Shop Drawing or Sample submittal;
  6. the issuance of a notice of acceptability by Engineer;
  7. any inspection, test, or approval by others; or
  8. any correction of defective Work by Owner.

D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

## ARTICLE 8 – OTHER WORK AT THE SITE

### 8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

## 8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
  1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
  2. an itemization of the specific matters to be covered by such authority and responsibility; and
  3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

## 8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

## **ARTICLE 9 – OWNER'S RESPONSIBILITIES**

### **9.01 *Communications to Contractor***

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

### **9.02 *Replacement of Engineer***

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

### **9.03 *Furnish Data***

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

### **9.04 *Pay When Due***

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

### **9.05 *Lands and Easements; Reports, Tests, and Drawings***

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

### **9.06 *Insurance***

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

### **9.07 *Change Orders***

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

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

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

## **ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION**

10.01 *Owner's Representative*

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

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

**10.03 *Project Representative***

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

**10.04 *Rejecting Defective Work***

- A. Engineer has the authority to reject Work in accordance with Article 14.

**10.05 *Shop Drawings, Change Orders and Payments***

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

**10.06 *Determinations for Unit Price Work***

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

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

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

**10.08 *Limitations on Engineer's Authority and Responsibilities***

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

#### 10.09 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

### **ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK**

#### 11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
  - 1. *Change Orders:*
    - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
    - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
  - 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders:* Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

#### 11.02 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

#### 11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

#### 11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
  1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
  2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
  3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
  - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
  - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
  - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
  - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
  - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
  - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

#### 11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

#### 11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

#### 11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
  1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
  2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
  3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
  4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

**11.08 *Notification to Surety***

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

**ARTICLE 12 – CLAIMS**

**12.01 *Claims***

A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation:*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval:* If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim:* If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results:* If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

## **ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK**

### **13.01 Cost of the Work**

- A. *Purposes for Determination of Cost of the Work:* The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
  1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
  2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
  1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
  - c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
  - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
  - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
  - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

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

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

## 13.02 *Allowances*

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

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

#### 13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
  1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
  2. there is no corresponding adjustment with respect to any other item of Work; and
  3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

## ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

### 14.01 Access to Work

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

### 14.02 Tests, Inspections, and Approvals

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
  1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
  2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
  3. by manufacturers of equipment furnished under the Contract Documents;
  4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
  5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

#### 14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

#### 14.04 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

#### 14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
  - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
  - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

#### **14.06 Owner May Stop the Work**

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

#### **14.07 Owner May Correct Defective Work**

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

## ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

### 15.01 *Progress Payments*

A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments:*

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

C. *Review of Applications:*

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

- a. the Work has progressed to the point indicated;
  - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
  - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
  - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
  - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
  - a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
  - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
  - a. the Work is defective, requiring correction or replacement;
  - b. the Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

**D. *Payment Becomes Due:***

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

**E. *Reductions in Payment by Owner:***

- 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
  - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
  - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
  - c. Contractor has failed to provide and maintain required bonds or insurance;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
  - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
  - f. the Work is defective, requiring correction or replacement;
  - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - h. the Contract Price has been reduced by Change Orders;
  - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
  - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
  - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - l. there are other items entitling Owner to a set off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

#### 15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

#### 15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

#### 15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
  1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
  2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
  3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
  4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

#### 15.05 *Final Inspection*

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

#### 15.06 *Final Payment*

- A. *Application for Payment:*
  1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents;
  - b. consent of the surety, if any, to final payment;
  - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
  - d. a list of all disputes that Contractor believes are unsettled; and
  - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

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

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

#### 15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

#### 15.08 *Correction Period*

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

E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

## **ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION**

### **16.01 Owner May Suspend Work**

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

### **16.02 Owner May Terminate for Cause**

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

#### **16.03 Owner May Terminate For Convenience**

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
  - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
  - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

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

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

## **ARTICLE 17 – FINAL RESOLUTION OF DISPUTES**

### **17.01 *Methods and Procedures***

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article:
  1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and
  2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this Article, Owner or Contractor may:
  1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or
  2. agree with the other party to submit the dispute to another dispute resolution process; or
  3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

## **ARTICLE 18 – MISCELLANEOUS**

### **18.01 *Giving Notice***

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

### **18.02 *Computation of Times***

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

### **18.03 *Cumulative Remedies***

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

**18.04 *Limitation of Damages***

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

**18.05 *No Waiver***

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

**18.06 *Survival of Obligations***

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

**18.07 *Controlling Law***

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

**18.08 *Headings***

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

## SECTION 007314 - SUPPLEMENTARY CONDITIONS - EJCDC

### 1.1 SUPPLEMENTARY CONDITIONS

#### A. Amendments:

1. These Supplementary Conditions amend or supplement EJCDC C-700 - Standard General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below.
2. All provisions not amended or supplemented remain in full force.

B. The terms used in these Supplementary Conditions, which are defined in EJCDC C-700, have the meanings assigned to them in the General Conditions.

#### C. (SC-1.01.A): Add following to Paragraph 1.01.A:

1. (Paragraph SC-1.01.A) Products: New material, machinery, components, equipment, fixtures, and systems forming the Work, not including machinery and equipment used for preparation, fabrication, conveying, and erection of the Work. Products may also include existing materials or components required for reuse.

#### D. (SC-3.01.D): Add following Paragraph immediately after Paragraph 3.01.C:

1. (Paragraph 3.01.D): Sections of Division 01 govern the execution of the Work of all Sections of the Specifications.

#### E. (SC-4.01.A): Delete Paragraph 4.01.A in its entirety and insert following in its place:

1. (Paragraph 4.01.A): Contract Times are identified in Document 004143 - Bid Form - Unit Price (Single-Prime Contract)

#### F. (SC-5.03): Delete Paragraphs 5.03.A and 5.03.B and insert following:

1. (Paragraph 5.03.A): No reports or explorations or tests of subsurface conditions at or contiguous to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.

#### G. (SC-5.06): Delete Paragraphs 5.06.A and 5.06.B and insert following:

1. (Paragraph 5.06.A): No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

#### H. (SC-6.01.A): Amend Paragraph 6.01.A and add two Subparagraphs as follows:

1. (Paragraph 6.01.A): Delete the first sentence and substitute the following: Contractor shall furnish a performance bond and a payment bond as security for the faithful performance and payment of all of Contractor's obligations under the Contract.

- a. (Subparagraph 6.01.A.1): Furnish a performance bond in the amount of 100 percent of Contract Price.
- b. (Subparagraph 6.01.A.2): Furnish a payment bond in the amount of 100 percent of Contract Price.

I. (SC-6.01.B): Add following Subparagraphs to Paragraph 6.01.B:

1. (Subparagraph 6.01.B.1): Furnish Performance Bond on EJCDC C-610 standard surety bond form.
2. (Subparagraph 6.01.B.2): Furnish Payment Bond on EJCDC C-615 standard surety bond form.

J. (SC-6.03): Contractor's Insurance.

SC-6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

- C. The limits of liability for the insurance required by Paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:
  - 1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:
 

a. State:	Statutory
b. Applicable Federal (e.g., Longshoreman's):	Statutory
c. Employer's Liability: <u>Occurrence</u>	<u>\$500,000 Ea.</u>
  - 2. Contractor's General Liability under Paragraphs 6.03.A.3 through A.4 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Contractor:
 

a. General Aggregate	<u>\$1,000,000</u>
b. Products - Completed Operations Aggregate	<u>\$1,000,000</u>
c. Personal and Advertising Injury	<u>\$1,000,000</u>
d. Each Occurrence (Bodily Injury and Property Damage)	<u>\$1,000,000</u>
e. Property Damage liability insurance will provide Explosion, Collapse, and Under-ground coverages where applicable.	
f. Excess or Umbrella Liability	

General Aggregate	<u>\$1,000,000</u>
Each Occurrence	<u>\$1,000,000</u>

3. Automobile Liability under Paragraph 6.03.D of the General Conditions:
  - a. Bodily Injury:
 

Each person	<u>\$500,000</u>
Each Accident	<u>\$1,000,000</u>
  - b. Property Damage:
 

Each Accident	<u>\$1,000,000</u>
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4. The Contractual Liability coverage required by Paragraph 6.03.C.2 of the General Conditions shall provide coverage for not less than the following amounts:
  - a. Bodily Injury:
 

Each person	<u>\$500,000</u>
Each Accident	<u>\$1,000,000</u>
  - b. Property Damage:
 

Each Accident	<u>\$1,000,000</u>
Annual Aggregate	<u>\$1,000,000</u>
5. The following other persons or entities shall be included on all policies as additional insureds:
  - a. The City of Rome, Georgia
  - b. InSite Engineering, LLC

K. (SC-6.05): Delete Paragraph 6.05.A in its entirety and insert the following in its place:

L.

- A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof. Contractor shall be responsible for any deductible or self-insured retention. This insurance shall:
  1. include the interests of Owner, Contractor, Subcontractors, Engineer, and Subconsultants and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by these Supplementary Conditions.
3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
5. allow for partial utilization of the Work by Owner;
6. include testing and startup;
7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued; and
8. comply with the requirements of Paragraph 5.06.C of the General Conditions.

M. (SC-11.04.C): Amend Paragraph 11.04.C.1 to read as follows:

1. (Subparagraph 11.04.C.1): The Agreement identifies the following:
  - a. (Subparagraph 11.04.C.1.a): Overhead and profit fees applicable to changes in the Work, whether additions to or deductions from the Work, on which the Contract Price is based.
  - b. (Subparagraph 11.04.C.1.b): Fees for changes in Subcontract work (both additions and deductions).
  - c. (Subparagraph 11.04.C.1.c): Contractor shall apply fees noted above to Subcontractor's gross (net plus fee) costs on additional work.

END OF DOCUMENT 007314

## SECTION 011000 - SUMMARY

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Contract description.
2. Work by Owner or other Work at the Site.
3. Owner-furnished products.
4. Contractor's use of Site and premises.
5. Future work.
6. Work sequence.
7. Owner occupancy.
8. Permits.
9. Specification conventions.

#### 1.2 CONTRACT DESCRIPTION

A. Work of the Project includes construction of a new chemical feed building with bulk storage and chemical feed systems for fluoride, orthophosphate, and sodium hypochlorite, and all other necessary appurtenances at the City of Rome's Bruce Hamler Water Treatment Facility.

B. Perform Work of Contract under stipulated sum/price Contract with Owner according to Conditions of Contract.

#### 1.3 WORK BY OWNER OR OTHERS

A. Owner will not be installing any items or performing in work.

B. No additional contracts for work at the water treatment plant by others will be let during this project.

C. Work under this Contract will include:

1. Installation of a new chemical feed building with bulk storage and chemical feed systems for fluoride, orthophosphate, and sodium hypochlorite, and all other necessary appurtenances at the City of Rome's Bruce Hamler Water Treatment Facility.

#### 1.4 OWNER-FURNISHED PRODUCTS

1. N/A

B. Contractor's Responsibilities:

1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
2. Receive and unload products at Site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install, and finish products.
4. Repair or replace items damaged after receipt.

C. Items furnished by Owner for installation by Contractor:

1. N/A

#### 1.5 CONTRACTOR'S USE OF SITE

A. Access to Site: Construction site is within the existing plant.

B. Construction Operations: Limited to Areas of Work Required

1. Noisy and Disruptive Operations (such as Use of Jack Hammers and Other Noisy Equipment): Not allowed in close proximity to existing structures outside of regular hours of operation.

C. Time Restrictions for Performing Work: The Contractor will be limited to the following working times:

1. Work Days: Monday to Friday.
2. Work Times: 7 A.M. to 4 P.M.
3. No work will be allowed on weekends or holiday or outside the times specified above except in case of emergency, and then only as required to alleviate the immediacy of the emergency.

D. Utility Outages and Shutdown:

1. N/A

E. Construction Plan: Before start of construction, submit three copies of construction plan regarding access to Work, and use of Site for acceptance by Owner. After acceptance of plan, construction operations shall comply with accepted plan unless deviations are accepted by Owner in writing.

#### 1.6 FUTURE WORK

A. N/A

#### 1.7 WORK SEQUENCE

A. Construct Work in stages in order to accommodate Owner's occupancy requirements during construction period. Coordinate construction schedule and operations with Engineer, Operator, and Owner.

#### 1.8 OWNER OCCUPANCY

- A. Schedule and substantially complete designated portions of the Work for occupancy before Substantial Completion of the entire Work.
  - 1. Owner intends to occupy and operate the existing water treatment plant and will coordinate and work with contractor on schedule, etc.
  - 2. Owner's use and occupancy of designated areas before Substantial Completion of the entire Project do not relieve Contractor of responsibility to maintain specified insurance coverages on a 100 percent basis until date of final payment.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

#### 1.9 PERMITS

- A. Furnish necessary permits for construction of Work including the following:
  - 1. Business License for Prime and Subs

#### 1.10 SPECIFICATION CONVENTIONS

- A. These Specifications are written in imperative mood and streamlined form. This imperative language is directed to Contractor unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 011000

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## SECTION 012000 - PRICE AND PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Cash allowances.
- B. Contingency allowances.
- C. Testing and inspection allowances.
- D. Schedule of Values.
- E. Application for Payment.
- F. Change procedures.
- G. Defect assessment.
- H. Unit prices.
- I. Alternates.

#### 1.2 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of product to Contractor or Subcontractor, less applicable trade discounts; delivery to Site and applicable taxes unless stated otherwise in Allowance Schedule.
- B. Costs Not Included in Cash Allowances but Included in Contract Sum/Price: Product handling at Site including unloading, uncrating, and storage; protection of products from elements and from damage; and labor for installation and finishing unless stated otherwise in Allowance Schedule.
- C. Engineer Responsibilities:
  1. Consult with Contractor for consideration and selection of products, suppliers, etc.
  2. Select products in consultation with Owner and transmit decision to Contractor.
  3. Prepare Change Order.
- D. Contractor Responsibilities:
  1. Assist Engineer in selection of products, suppliers. Etc.
  2. Obtain proposals from suppliers and offer recommendations.
  3. Upon notification of selection by Engineer execute purchase agreement with designated supplier.

4. Arrange for and process Shop Drawings, Product Data, and Samples. Arrange for delivery.
5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

E. Differences in costs will be adjusted by Change Order.

#### 1.3 CONTINGENCY ALLOWANCES

A. N/A

#### 1.4 TESTING AND INSPECTION ALLOWANCES

A. N/A

#### 1.5 SCHEDULE OF VALUES

- A. Submit electronic file to Engineer schedule on Contractor's standard form.
- B. Submit Schedule of Values within 15 days after date established in Notice to Proceed.
- C. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major Specification Section. Also identify sub milestones of each category.
- D. Include in each line item amount of allowances as specified in this Section.
- E. Include within each line item, direct proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders with each Application for Payment.

#### 1.6 APPLICATION FOR PAYMENT

- A. Submit three copies, electronically, signed and sealed, of each Application for Payment on the provided application of payment form.
- B. Content and Format: Use Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule, if applicable, with each Application for Payment.
- D. Submit three copies of lien waivers requested by Owner.
- E. Substantiating Data: When Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
  1. Current construction photographs.
  2. Partial release of liens from major Subcontractors and vendors.
  3. Record Documents, for review by Owner, which will be returned to Contractor.

4. Affidavits attesting to off-Site stored products.
5. Construction Progress Schedule, revised and current.

## 1.7 CHANGE PROCEDURES

- A. Submittals: Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Architect/Engineer of any error, inconsistency, omission, or apparent discrepancy.
- C. Requests for Interpretation (RFI) and Clarifications: Allot time in construction scheduling for liaison with Architect/Engineer; establish procedures for handling queries and clarifications.
  1. Use provided forms for requesting interpretations.
  2. Engineer may respond with a direct answer on the Request for Interpretation form or within a letter format.
- D. Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on a work change directive form or within a letter format.
- E. Engineer may issue Notice of Change including a detailed description of proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change with stipulation of overtime work required and with the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within 5 days.
- F. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change and the effect on Contract Sum/Price and Contract Time with full documentation.
- G. Stipulated Sum/Price Change Order: Based on Notice of Change and Contractor's fixed price quotation or Contractor's request for Change Order as approved by Engineer.
- H. Unit Price Change Order: For Contract unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of that which are not predetermined, execute Work under Work Directive Change. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.
- I. Work Directive Change: Engineer may issue directive, on EJCDC C-940 - Work Change Directive signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
- J. Document each quotation for change in Project Cost or Time with sufficient data to allow evaluation of quotation.

K. Change Order Forms: EJCDC C-941 - Change Order

1.8 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of Engineer, it is not practical to remove and replace the Work, Engineer will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price reduced at discretion of Engineer and Owner
- D. Authority of Engineer to assess defects and identify payment adjustments is final.

1.9 UNIT PRICES

- A. Engineer will take measurements and compute quantities accordingly. Provide assistance in taking of measurements.
- B. Unit Quantities: Quantities and measurements indicated on Bid Form are for Contract purposes only.
  - 1. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at contracted unit sum/prices.
- C. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application, or installation of item of the Work; overhead and profit.
- D. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Architect/Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
- E. Unit Price Schedule:
  - 1. See Bid Form

1.10 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement. The Owner-Contractor Agreement may identify certain Alternates to remain an Owner option for a stipulated period of time.
- B. Coordinate related Work and modify surrounding Work. Description for each Alternate is recognized to be abbreviated but requires that each change shall be complete for scope of Work affected.
  - 1. Coordinate related requirements among Specification Sections as required.

2. Include as part of each Alternate: Miscellaneous devices, appurtenances, and similar items incidental to or necessary for complete installation.
3. Coordinate Alternate with adjacent Work and modify or adjust as necessary to ensure integration.

C. Schedule of Alternates:

- a. N/A

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 012000

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**Contractor's Application for Payment No.**

<b>Contractor's Application for Payment No.</b>											
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Application Period:</td> <td style="width: 85%;">Application Date:</td> </tr> <tr> <td>To (Owner):</td> <td>From (Contractor):</td> </tr> <tr> <td>Project:</td> <td>Contract:</td> </tr> <tr> <td>Owner's Contract No.:</td> <td>Contractor's Project No.:</td> </tr> <tr> <td></td> <td>Engineer's Project No.:</td> </tr> </table>		Application Period:	Application Date:	To (Owner):	From (Contractor):	Project:	Contract:	Owner's Contract No.:	Contractor's Project No.:		Engineer's Project No.:
Application Period:	Application Date:										
To (Owner):	From (Contractor):										
Project:	Contract:										
Owner's Contract No.:	Contractor's Project No.:										
	Engineer's Project No.:										

## Application For Payment

## Change Order Summary

### Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:

(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;

covered by prior Applications for Payment;

(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Lien, security interest, or encumbrance); and

against any such Liens, security interest, or encumbrances); and  
(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

**Contractor Signature**

By:

Date:

Payment of: \$ \_\_\_\_\_  
(Line 8 or other - attach explanation of the other amount)

is recommended by: \_\_\_\_\_ (Engineer) \_\_\_\_\_ (Date)

Payment of: \$ \_\_\_\_\_  
(Line 8 or other... attach explanation of the other amount)

is approved by: \_\_\_\_\_

Approved by: \_\_\_\_\_ Funding or Financing Entity (if applicable) \_\_\_\_\_ (Date) \_\_\_\_\_

## Progress Estimate - Lump Sum Work

## Contractor's Application

For (Contract):				Application Number:			
Application Period:				Application Date:			
A		B		Work Completed		E	
Specification Section No.	Description	Scheduled Value (\$)	From Previous Application (C+D)	This Period	Materials Presently Stored (not in C or D)	Total Completed and Stored to Date (C + D + E)	% (F / B)
Totals							

## Progress Estimate - Unit Price Work

## Contractor's Application

For (Contract):							Application Number:						
Application Period:							Application Date:						
A				B	C	D	E	F					
Item		Contract Information					Estimated Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish F)	(B)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value Item (\$)	of							
<b>Totals</b>													

## Stored Material Summary

## Contractor's Application

## Work Change Directive No.

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

Contractor is directed to proceed promptly with the following change(s):

Description:

Attachments: *[List documents supporting change]*

### Purpose for Work Change Directive:

Directive to proceed promptly with the Work described herein, prior to agreeing to changes on Contract Price and Contract Time, is issued due to: *[check one or both of the following]*

- Non-agreement on pricing of proposed change.
- Necessity to proceed for schedule or other Project reasons.

### Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price      \$      [increase] [decrease].  
Contract Time      days      [increase] [decrease].

### Basis of estimated change in Contract Price:

- Lump Sum       Unit Price
- Cost of the Work       Other

RECOMMENDED:

AUTHORIZED BY:

RECEIVED:

By:

By:

By:

Engineer (Authorized Signature)

Owner (Authorized Signature)

Contractor (Authorized Signature)

Title:

Title:

Title:

Date:

Date:

Date:

Approved by Funding Agency (if applicable)

By:

Date:

Title:

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

The Contract is modified as follows upon execution of this Change Order:

Description:

Attachments: *[List documents supporting change]*

<b>CHANGE IN CONTRACT PRICE</b>	<b>CHANGE IN CONTRACT TIMES</b> <i>[note changes in Milestones if applicable]</i>
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: \$ _____	[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: Substantial Completion: _____ Ready for Final Payment: _____ days
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
[Increase] [Decrease] of this Change Order: \$ _____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ days or dates
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ days or dates

RECOMMENDED:	ACCEPTED:	ACCEPTED:
By: _____ Engineer (if required)	By: _____ Owner (Authorized Signature)	By: _____ Contractor (Authorized Signature)
Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____

Approved by Funding Agency (if applicable)

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Title: \_\_\_\_\_

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

---

Contractor is hereby directed to promptly execute this Field Order, issued in accordance with General Conditions Paragraph 11.01, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference: \_\_\_\_\_

Specification(s)	Drawing(s) / Detail(s)
------------------	------------------------

---

Description:

Attachments:

---

ISSUED:

RECEIVED:

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

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

Engineer (Authorized Signature) Contractor (Authorized Signature)

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

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

Copy to: Owner

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# InSite Engineering, LLC

## Request For Information Form

Project Name: Hamler Water Treatment Plant Chemical Feed System Improvements  
Project Number: 17021.00  
Owner Bid Number: 032-17

By responding to the RFI, we do not agree to any additional costs and/or time. Any additional costs and/or time shall be submitted in accordance with the requirements of the Contract Documents.

Date Answered:

Answered By:

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## SECTION 012500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Quality assurance.
- B. Product substitution procedures.

#### 1.2 QUALITY ASSURANCE

- A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.
- B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.
- C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

#### 1.3 PRODUCT SUBSTITUTION PROCEDURES

- A. Document 002113 - Instructions to Bidders specifies time restrictions for submitting requests for substitutions during Bidding period.

### PART 2 - PRODUCTS - Not Used

### PART 3 - EXECUTION - Not Used

END OF SECTION 012500

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## SECTION 012500.1 – SUBSTITUTION REQUEST FORM

GENERAL: Form shall be submitted via General Contractor to Engineer.

PROJECT TITLE AND NO. The City of Rome, Georgia  
Hamler Water Treatment Plant Chemical Feed System Improvements  
Project No. 17021.00 (Owner Bid # 032-17)

TO: INSITE ENGINEERING, LLC  
5800 Feldspar Way  
Hoover, Alabama 35244  
Telephone: 205.733.9696

THIS SUBSTITUTION REQUEST IS FOR:  CAUSE  [ ] CONVENIENCE

ATTN: \_\_\_\_\_

DATE OF REQUEST: \_\_\_\_\_ DATE OF NOTICE TO PROCEED: \_\_\_\_\_

SPECIFIED ITEM: \_\_\_\_\_

Section \_\_\_\_\_ Paragraph \_\_\_\_\_

REASON FOR SUBSTITUTION: \_\_\_\_\_

PROPOSED SUBSTITUTE: (indicate manufacturer and model) \_\_\_\_\_

Attach complete description, catalog, spec data, and laboratory tests.

1. Describe change to Contract Documents proposed substitute will require for its proper installation.

\_\_\_\_\_

2. Will substitution affect electrical requirements, wiring, piping, equipment, systems, ductwork, etc. indicated in Contract Documents?

   No    Yes; Explain: \_\_\_\_\_

3. Proposed substitution affects other trades.  No  Yes; Explain: \_\_\_\_\_

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4. List all differences between proposed substitute and specified product/material: (noise, weight, power, size, gage, finishes, dimensions, etc.). Attach separate sheet if necessary.

---

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5. List (on separate sheet) the availability of maintenance services and replacement materials for proposed substitution.

6. List (on separate sheet) company names, addresses, phone numbers and contact persons of fabricators and suppliers for proposed substitution.

7. Will substitution affect the construction schedule?

No  Yes; Explain \_\_\_\_\_

---

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8. If the substitution request is accepted, it will result in: No cost impact \_\_\_\_\_

Lower cost (How much) \_\_\_\_\_ Added cost (How much) \_\_\_\_\_

9. Are there any additional license fees and/or royalties pending on the proposed substitute.  No  
 Yes; Explain: \_\_\_\_\_

---

---

10. The undersigned certifies/agrees:

- Same warranty/guarantee will be furnished for proposed substitute as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Payment will be made for changes to building design, including Architect/Engineer design, detailing and construction costs caused by the substitution.

SUBMITTED BY: (Supplier or Subcontractor)

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

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

Name and Title of Person Signing: \_\_\_\_\_

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

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

REVIEWED AND APPROVED for Subcontractor or Supplier by (General Contractor):

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

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

Name and Title of Person Signing: \_\_\_\_\_

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

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

**11. ENGINEER'S REVIEW AND ACTION:**

- Accepted - Make submittals in accordance with Specification Section 01330.
- Accepted as Noted - Make submittals in accordance with Specification Section 01330.
- Rejected - Use specified materials.
- Received too late - Use specified materials.

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

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

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## SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Coordination and Project conditions.
- B. Preconstruction meeting.
- C. Site mobilization meeting.
- D. Progress meetings.
- E. Preinstallation meetings.
- F. Closeout meeting.
- G. Alteration procedures.

#### 1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements with provisions for accommodating items installed later.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
  - 1. Coordination Drawings: Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.
- D. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

### 1.3 PRECONSTRUCTION MEETING

- A. Engineer will schedule and preside over meeting after Contracts have been executed.
- B. Attendance Required: Engineer, Owner, and Contractor.
- C. Possible Agenda Items:
  1. Execution of Owner-Contractor Agreement.
  2. Submission of executed bonds and insurance certificates.
  3. Distribution of Contract Documents.
  4. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule.
  5. Designation of personnel representing parties in Contract, and Engineer.
  6. Communication procedures.
  7. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
  8. Scheduling.
  9. Critical Work sequencing.
  10. Scheduling activities
- D. Engineer will Record minutes and distribute to participants within 2 days after meeting to Owner, Contractor, and those affected by decisions made.

### 1.4 SITE MOBILIZATION MEETING

- A. N/A

### 1.5 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.
- C. Attendance Required: Job superintendent, major Subcontractors, Contractors, and suppliers, and Engineer, owner, as appropriate to agenda topics for each meeting.
- D. Probable Agenda Items:
  1. Review minutes of previous meetings.
  2. Review of Work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems impeding planned progress.
  5. Review of submittal schedule and status of submittals.
  6. Review of off-site fabrication and delivery schedules.
  7. Maintenance of Progress Schedule.

8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on Progress Schedule and coordination.
13. Other business relating to Work.

E. Engineer will record minutes and distribute to participants within 2 days after meeting to owner, contractor, and those affected by decisions made.

## 1.6 PREINSTALLATION MEETINGS

- A. When required in individual Specification Sections, convene pre-installation meetings at Project Site one (1) week before starting Work of specific Section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific Section.
- C. Prepare agenda and preside over meeting:
  1. Review conditions of installation, preparation, and installation procedures.
  2. Review coordination with related Work.
- D. Record minutes and distribute copies to participants within two (2) days after meeting, and those affected by decisions made.

## 1.7 CLOSEOUT MEETING

- A. N/A – Final Inspection will be Scheduled by Engineer after completion.

## PART 2 - PRODUCTS - Not Used

## PART 3 - EXECUTION

### 3.1 ALTERATION PROCEDURES

- A. Work area will be within the existing water treatment plant. The Owner will be traversing the work area during progress of construction. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage.
  1. Keep utility and service outages to a minimum and perform only after written approval of Owner.
  2. Clean construction areas daily. Clean spillage, overspray, rock, dirt and any construction debris in work areas daily.
- B. Materials: As specified in product Sections; match existing products with new products for patching and extending Work.

- C. Employ skilled installer to perform alteration and renovation Work.
- D. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- E. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- F. Remove debris and abandoned items from area and from concealed spaces.
- G. Prepare surface and remove surface finishes to permit installation of new Work and finishes.
- H. Close openings in exterior surfaces to protect existing Work from weather and extremes of temperature and humidity.
- I. Remove, cut, and patch Work to minimize damage and to permit restoring products and finishes to new condition.
- J. Refinish existing visible surfaces to remain in renovated rooms and spaces, to renewed condition for each material, with neat transition to adjacent finishes.
- K. Where new Work abuts or aligns with existing Work, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- L. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.
- M. Where change of plane of  $\frac{1}{4}$ " or more occurs submit recommendations to the engineer on process for ensuring smooth transitions.
- N. Trim existing doors to clear new floor finish. Refinish trim to original condition.
- O. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections.
- P. Finish surfaces as specified in individual product Sections.

END OF SECTION 013000

## SECTION 013216 - CONSTRUCTION PROGRESS SCHEDULE

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Submittals.
- B. Format.
- C. Review and evaluation.
- D. Distribution.

#### 1.2 SUBMITTALS

- A. Within seven (7) days after date of Owner-Contractor Agreement, submit draft of proposed complete bar chart schedule for review. Include written certification that Subcontractors have reviewed and accepted proposed schedule.
- B. Within seven (7) days after joint review, submit revised Progress Schedule.
- C. Submit updated schedules at Progress Meetings.
- D. Schedule Updates:
  - 1. Overall percent complete, projected and actual.
  - 2. Completion progress by listed activity and sub activity, to within five working days prior to submittal.
  - 3. Changes in Work scope and activities modified since submittal.
  - 4. Delays in submittals or resubmittals, deliveries, or Work.
  - 5. Adjusted or modified sequences of Work.
  - 6. Other identifiable changes.
  - 7. Revised projections of progress and completion.
- E. Narrative Progress Report:
  - 1. Submit with each submission of Progress Schedule.
  - 2. Summary of Work completed during the past period between reports.
  - 3. Work planned during the next period.
  - 4. Explanation of differences between summary of Work completed and Work planned in previously submitted report.
  - 5. Current and anticipated delaying factors and estimated impact on other activities and completion milestones.
  - 6. Corrective action taken or proposed.

### 1.3 FORMAT

- A. Computer-generated bar chart schedule to include at least:
  - 1. Identification and listing in chronological order of those activities reasonably required to complete the Work, including:
    - a. Subcontract Work.
    - b. Major equipment design, fabrication, factory testing, and delivery dates including required lead times.
    - c. Move-in and other preliminary activities.
    - d. Equipment and equipment system test and startup activities.
    - e. Project closeout and cleanup.
    - f. Work sequences, constraints, and milestones.
  - 2. Listings identified by Specification Section number.
  - 3. Identification of the following:
    - a. Horizontal time frame by year, month, and week.
    - b. Duration, early start, and completion for each activity and sub activity.
    - c. Critical activities and Project float.
    - d. Sub schedules to further define critical portions of Work.

### 1.4 REVIEW AND EVALUATION

- A. Participate in joint review and evaluation of schedules with Architect/Engineer at each submittal.
- B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.
- C. After review, revise schedules incorporating results of review, and resubmit within (7) days.

### 1.5 DISTRIBUTION

- A. Following joint review, distribute copies of updated schedules to Contractor's Project site file, to Subcontractors, suppliers, Architect/Engineer, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 013216

## SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Definitions.
- B. Submittal procedures.
- C. Proposed product list.
- D. Product data.
- E. Use of electronic CAD files of Project Drawings.
- F. Shop Drawings.
- G. Samples.
- H. Design data.
- I. Test reports.
- J. Certificates.
- K. Manufacturer's instructions.
- L. Manufacturer's field reports.
- M. Erection Drawings.
- N. Construction photographs.
- O. Contractor review.
- P. Architect/Engineer review.

#### 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

### 1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer-accepted forms.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project, and deliver to Engineer post electronic submittals as PDF electronic via email. It is the contractor's responsibility to ensure the submittal make it to the Engineer. Coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.
- G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.
- H. Allow space on submittals for Contractor and Architect/Engineer review stamps.
- I. When revised for resubmission, identify changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized nor processed.
- L. Incomplete Submittals: Architect/Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Architect/Engineer.

### 1.4 PROPOSED PRODUCT LIST

- A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

### 1.5 PRODUCT DATA

- A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.

B. Submit number of copies Contractor requires, plus Three copies Engineer will retain. (if submitting hard copies.

or

C. Electronic submittals as PDF electronic files to Engineer.

D. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

E. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

F. After review, produce copies and distribute.

## 1.6 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.

B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:

1. Use of files is solely at receiver's risk. Architect/Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Architect/Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
4. Receiver shall not hold Architect/Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
5. Receiver shall understand that even though Architect/Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
6. Receiver shall not hold Architect/Engineer responsible for such viruses or their consequences, and shall hold Architect/Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

C. Costs: \$100 per file, plus administrative fee of \$50 per request paid in advance by certified check or money order payable to Architect/Engineer.

## 1.7 SHOP DRAWINGS

- A. Shop Drawings: Action Submittal: Submit to Architect/Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
  - 1. Include signed and sealed calculations to support design.
  - 2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
  - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit in form of one reproducible transparency or as an electronic .pdf.
- E. After review, produce copies and distribute.

## 1.8 SAMPLES

- A. Samples: Action Submittal: Submit to Architect/Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Samples for Selection as Specified in Product Sections:
  - 1. Submit to Architect/Engineer for aesthetic, color, and finish selection.
  - 2. Submit Samples of finishes, textures, and patterns for Architect/Engineer selection.
- C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.
- D. Include identification on each Sample, with full Project information.
- E. Submit number of Samples specified in individual Specification Sections; Engineer will retain 2 Sample.
- F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.
- G. After review, produce copies and distribute.

## 1.9 DESIGN DATA

- A. Informational Submittal: Submit data for Engineer's knowledge as Contract administrator or for Owner.

- B. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.10 TEST REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.11 CERTIFICATES

- A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

#### 1.12 MANUFACTURER'S INSTRUCTIONS

- A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.
- C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

#### 1.13 MANUFACTURER'S FIELD REPORTS

- A. Informational Submittal: Submit reports for Architect/Engineer's knowledge as Contract administrator or for Owner.
- B. Submit report within 2 days of observation to Engineer for information.
- C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.14 ERECTION DRAWINGS

- A. N/A

#### 1.15 CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer acceptable to Architect/Engineer.
- B. Monthly submit photographs with Application for Payment.
- C. Photopgraphs may be submitted on a disk.
- D. Take photographs as evidence of existing Project conditions as follows:
  - 1. Interior views:
  - 2. Exterior views:
- E. Digital Images: Deliver complete set of digital image electronic files on CD-ROM to Owner with Project record documents. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as sensor, uncropped.
  - 1. Digital Images: Uncompressed TIFF format, produced by digital camera with minimum sensor size of 4.0 megapixels, and image resolution of not less than 1024 by 768 pixels.
  - 2. Date and Time: Include date and time in filename for each image.

#### 1.16 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer
- B. Contractor: Responsible for:
  - 1. Determination and verification of materials including manufacturer's catalog numbers.
  - 2. Determination and verification of field measurements and field construction criteria.
  - 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
  - 4. Determination of accuracy and completeness of dimensions and quantities.
  - 5. Confirmation and coordination of dimensions and field conditions at Site.
  - 6. Construction means, techniques, sequences, and procedures.
  - 7. Safety precautions.
  - 8. Coordination and performance of Work of all trades.
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.
- D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Architect/Engineer.

#### 1.17 ENGINEER REVIEW

- A. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 20 or more submittals or items in one week. If "mass

"submittals" are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.

- B. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.
- C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.
- D. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order, Field Order, or Work Change Directive.
- E. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

**PART 2 - PRODUCTS - Not Used**

**PART 3 - EXECUTION - Not Used**

**END OF SECTION 013300**

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## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Quality control.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Mockup requirements.
- F. Testing and inspection services.
- G. Manufacturers' field services.

#### 1.2 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Perform Work using persons qualified to produce required and specified quality.
- D. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

#### 1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

#### 1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current as of date of Contract Documents except where specific date is established by code.
- C. Obtain copies of standards and maintain on Site when required by product Specification Sections.
- D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference in reference documents.

#### 1.5 LABELING

- A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
  - 1. Model number.
  - 2. Serial number.
  - 3. Performance characteristics.
- C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

#### 1.6 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this Section and identified in individual product Specification Sections.
- B. Assemble and erect specified or indicated items with specified or indicated attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mockups shall be comparison standard for remaining Work.

#### 1.7 TESTING AND INSPECTION SERVICES

- A. Owner will employ and pay for specified services of an independent firm to perform testing and inspection. (If required)

- B. Independent firm will perform tests, inspections, and other services specified in individual Specification Sections and as required by owner.
  - 1. Laboratory: Authorized to operate in the State of Georgia.
- C. Reports shall be submitted by independent firm to Engineer, Contractor, and authorities having jurisdiction, in Georgia indicating observations and results of tests and compliance or noncompliance with Contract Documents.
- D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
  - 1. Notify Engineer and independent firm 24 hours before expected time for operations requiring services.
  - 2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.
- E. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.
- F. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Engineer. Payment for retesting or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.
- G. Agency Responsibilities:
  - 1. Test Samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at Site. Cooperate with Architect/Engineer and Contractor in performance of services.
  - 3. Perform indicated sampling and testing of products according to specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Architect/Engineer and Contractor of observed irregularities or nonconformance of Work or products.
  - 6. Perform additional tests required by Engineer.
  - 7. Attend preconstruction meetings and progress meetings.
- H. Agency Reports: After each test, promptly submit 2 copies of report to Engineer, Contractor, and authorities having jurisdiction. When requested by Architect/Engineer, provide interpretation of test results.
- I. Limits on Testing Authority:
  - 1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency or laboratory may not approve or accept any portion of the Work.
  - 3. Agency or laboratory may not assume duties of Contractor.
  - 4. Agency or laboratory has no authority to stop the Work.

## 1.8 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment, commissioning and misc. other services as applicable, and to initiate instructions when necessary.
- B. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 014000

## SECTION 014200 - REFERENCES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

#### 1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if

bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### 1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association (The) <a href="http://www.aluminum.org">www.aluminum.org</a>	(703) 358-2960
AABC	Associated Air Balance Council <a href="http://www.aabchq.com">www.aabchq.com</a>	(202) 737-0202
AAMA	American Architectural Manufacturers Association <a href="http://www.aamanet.org">www.aamanet.org</a>	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials <a href="http://www.transportation.org">www.transportation.org</a>	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists <a href="http://www.aatcc.org">www.aatcc.org</a>	(919) 549-8141
ABAA	Air Barrier Association of America <a href="http://www.airbarrier.org">www.airbarrier.org</a>	(866) 956-5888
ABMA	American Bearing Manufacturers Association <a href="http://www.abma-dc.org">www.abma-dc.org</a>	(202) 367-1155
ACI	American Concrete Institute <a href="http://www.concrete.org">www.concrete.org</a>	(248) 848-3700

ACPA	American Concrete Pipe Association <a href="http://www.concrete-pipe.org">www.concrete-pipe.org</a>	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) <a href="http://www.aeic.org">www.aeic.org</a>	(205) 257-2530
AF&PA	American Forest & Paper Association <a href="http://www.afandpa.org">www.afandpa.org</a>	(800) 878-8878 (202) 463-2700
AGA	American Gas Association <a href="http://www.agas.org">www.agas.org</a>	(202) 824-7000
AHAM	Association of Home Appliance Manufacturers <a href="http://www.aham.org">www.aham.org</a>	(202) 872-5955
AHRI	Air-Conditioning, Heating, and Refrigeration Institute, The <a href="http://www.ahrinet.org">www.ahrinet.org</a>	(703) 524-8800
AI	Asphalt Institute <a href="http://www.asphaltinstitute.org">www.asphaltinstitute.org</a>	(859) 288-4960
AIA	American Institute of Architects (The) <a href="http://www.aia.org">www.aia.org</a>	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction <a href="http://www.aisc.org">www.aisc.org</a>	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute <a href="http://www.steel.org">www.steel.org</a>	(202) 452-7100
AITC	American Institute of Timber Construction <a href="http://www.aitc-glulam.org">www.aitc-glulam.org</a>	(303) 792-9559
ALSC	American Lumber Standard Committee, Incorporated <a href="http://www.alsc.org">www.alsc.org</a>	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. <a href="http://www.amca.org">www.amca.org</a>	(847) 394-0150
ANSI	American National Standards Institute <a href="http://www.ansi.org">www.ansi.org</a>	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. <a href="http://www.aosaseed.com">www.aosaseed.com</a>	(405) 780-7372
APA	APA - The Engineered Wood Association <a href="http://www.apawood.org">www.apawood.org</a>	(253) 565-6600
APA	Architectural Precast Association <a href="http://www.archprecast.org">www.archprecast.org</a>	(239) 454-6989

API	American Petroleum Institute <a href="http://www.api.org">www.api.org</a>	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute <a href="http://www.ari.org">www.ari.org</a>	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association <a href="http://www.asphaltroofing.org">www.asphaltroofing.org</a>	(202) 207-0917
ASCE	American Society of Civil Engineers <a href="http://www.asce.org">www.asce.org</a>	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers <a href="http://www.ashrae.org">www.ashrae.org</a>	(800) 527-4723 (404) 636-8400
ASME	ASME International (American Society of Mechanical Engineers International) <a href="http://www.asme.org">www.asme.org</a>	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering <a href="http://www.asse-plumbing.org">www.asse-plumbing.org</a>	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) <a href="http://www.astm.org">www.astm.org</a>	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions <a href="http://wwwatis.org">wwwatis.org</a>	(202) 628-6380
AWCMA	American Window Covering Manufacturers Association (Now WCMA)	
AWCI	Association of the Wall and Ceiling Industry <a href="http://www.awci.org">www.awci.org</a>	(703) 534-8300
AWI	Architectural Woodwork Institute <a href="http://www.awinnet.org">www.awinnet.org</a>	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) <a href="http://www.awpa.com">www.awpa.com</a>	(205) 733-4077
AWS	American Welding Society <a href="http://www.aws.org">www.aws.org</a>	(800) 443-9353 (305) 443-9353

AWWA	American Water Works Association <a href="http://www.awwa.org">www.awwa.org</a>	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association <a href="http://www.buildershardware.com">www.buildershardware.com</a>	(212) 297-2122
BIA	Brick Industry Association (The) <a href="http://www.bia.org">www.bia.org</a>	(703) 620-0010
BICSI	BICSI, Inc. <a href="http://www.bicsi.org">www.bicsi.org</a>	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) <a href="http://www.bifma.com">www.bifma.com</a>	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee <a href="http://www.bissc.org">www.bissc.org</a>	(866) 342-4772
CCC	Carpet Cushion Council <a href="http://www.carpetcushion.org">www.carpetcushion.org</a>	(610) 527-3880
CDA	Copper Development Association <a href="http://www.copper.org">www.copper.org</a>	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association <a href="http://www.canelect.ca">www.canelect.ca</a>	(613) 230-9263
CEA	Consumer Electronics Association <a href="http://www.ce.org">www.ce.org</a>	(866) 858-1555 (703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc. <a href="http://www.chemicalfabricsandfilm.com">www.chemicalfabricsandfilm.com</a>	(216) 241-7333
CGA	Compressed Gas Association <a href="http://www.cganet.com">www.cganet.com</a>	(703) 788-2700
CIMA	Cellulose Insulation Manufacturers Association <a href="http://www.cellulose.org">www.cellulose.org</a>	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association <a href="http://www.cisca.org">www.cisca.org</a>	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute <a href="http://www.cispi.org">www.cispi.org</a>	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute <a href="http://www.chainlinkinfo.org">www.chainlinkinfo.org</a>	(301) 596-2583

CPA	Composite Panel Association www.pbmdf.com	(703) 724-1128
CRI	Carpet and Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200 (800) 328-6306
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CSA	Canadian Standards Association www.csa.ca	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
ECA	Electrical Components Association www.ec-central.org	(703) 907-8024
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee http://content.asce.org/ejcdc/	(703) 295-6000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040

ESD	ESD Association (Electrostatic Discharge Association) <a href="http://www.esda.org">www.esda.org</a>	(315) 339-6937
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA) <a href="http://www.intertek-etlsemko.com">www.intertek-etlsemko.com</a>	(800) 967-5352
FIBA	Federation Internationale de Basketball (The International Basketball Federation) <a href="http://www.fiba.com">www.fiba.com</a>	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) <a href="http://www.fivb.ch">www.fivb.ch</a>	41 21 345 35 35
FM Approvals	FM Approvals LLC <a href="http://www.fmglobal.com">www.fmglobal.com</a>	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) <a href="http://www.fmglobal.com">www.fmglobal.com</a>	(401) 275-3000
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. <a href="http://www.floridaroof.com">www.floridaroof.com</a>	(407) 671-3772
FSA	Fluid Sealing Association <a href="http://www.fluidsealing.com">www.fluidsealing.com</a>	(610) 971-4850
FSC	Forest Stewardship Council <a href="http://www.fsc.org">www.fsc.org</a>	49 228 367 66 0
GA	Gypsum Association <a href="http://www.gypsum.org">www.gypsum.org</a>	(301) 277-8686
GANA	Glass Association of North America <a href="http://www.glasswebsite.com">www.glasswebsite.com</a>	(785) 271-0208
GRI	(Part of GSI)	
GS	Green Seal <a href="http://www.greenseal.org">www.greenseal.org</a>	(202) 872-6400
GSI	Geosynthetic Institute <a href="http://www.geosynthetic-institute.org">www.geosynthetic-institute.org</a>	(610) 522-8440
HI	Hydronics Institute <a href="http://www.gamanet.org">www.gamanet.org</a>	(908) 464-8200

HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association Division of Air-Conditioning, Heating, and Refrigeration Institute (AHRI) <a href="http://www.ahrinet.org">www.ahrinet.org</a>	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association <a href="http://www.hpva.org">www.hpva.org</a>	(703) 435-2900
HPW	H. P. White Laboratory, Inc. <a href="http://www.hpwhite.com">www.hpwhite.com</a>	(410) 838-6550
IAPSC	International Association of Professional Security Consultants <a href="http://www.iapsc.org">www.iapsc.org</a>	(515) 282-8192
ICBO	International Conference of Building Officials <a href="http://www.iccsafe.org">www.iccsafe.org</a>	(888) 422-7233
ICEA	Insulated Cable Engineers Association, Inc. <a href="http://www.icea.net">www.icea.net</a>	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. <a href="http://www.icri.org">www.icri.org</a>	(847) 827-0830
ICPA	International Cast Polymer Association <a href="http://www.icpa-hq.org">www.icpa-hq.org</a>	(703) 525-0320
IEC	International Electrotechnical Commission <a href="http://www.iec.ch">www.iec.ch</a>	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) <a href="http://www.ieee.org">www.ieee.org</a>	(212) 419-7900
IES	Illuminating Engineering Society of North America <a href="http://www.iesna.org">www.iesna.org</a>	(703) 525-0320
IESST	Institute of Environmental Sciences and Technology <a href="http://www.iest.org">www.iest.org</a>	(847) 255-1561
IGMA	Insulating Glass Manufacturers Alliance <a href="http://www.igmaonline.org">www.igmaonline.org</a>	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. <a href="http://www.iliai.com">www.iliai.com</a>	(812) 275-4426
ISA	Instrumentation, Systems, and Automation Society, The	(919) 549-8411

	www.isa.org	
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (801) 341-7360
ITS	Intertek Testing Service NA (Now ETL SEMCO)	
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LGSEA	Light Gauge Steel Engineers Association www.arcat.com	(202) 263-4488
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MCA	Metal Construction Association www.metalconstruction.org	(847) 375-4718
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(888) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578

MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. <a href="http://www.mss-hq.com">www.mss-hq.com</a>	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers <a href="http://www.naamm.org">www.naamm.org</a>	(630) 942-6591
NACE	NACE International (National Association of Corrosion Engineers International) <a href="http://www.nace.org">www.nace.org</a>	(800) 797-6223 (281) 228-6200
NADCA	National Air Duct Cleaners Association <a href="http://www.nadca.com">www.nadca.com</a>	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport <a href="http://www.aahperd.org/nagws/">www.aahperd.org/nagws/</a>	(800) 213-7193, ext. 453
NAIMA	North American Insulation Manufacturers Association <a href="http://www.naima.org">www.naima.org</a>	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. <a href="http://www.nbgqa.com">www.nbgqa.com</a>	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) <a href="http://www.ncaa.org">www.ncaa.org</a>	(317) 917-6222
NCMA	National Concrete Masonry Association <a href="http://www.ncma.org">www.ncma.org</a>	(703) 713-1900
NCTA	National Cable & Telecommunications Association <a href="http://www.ncta.com">www.ncta.com</a>	(202) 222-2300
NEBB	National Environmental Balancing Bureau <a href="http://www.nebb.org">www.nebb.org</a>	(301) 977-3698
NECA	National Electrical Contractors Association <a href="http://www.necanet.org">www.necanet.org</a>	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association <a href="http://www.nelma.org">www.nelma.org</a>	(207) 829-6901
NEMA	National Electrical Manufacturers Association <a href="http://www.nema.org">www.nema.org</a>	(703) 841-3200
NETA	InterNational Electrical Testing Association <a href="http://www.netaworld.org">www.netaworld.org</a>	(888) 300-6382 (269) 488-6382
NFHS	National Federation of State High School Associations <a href="http://www.nfhs.org">www.nfhs.org</a>	(317) 972-6900

NFPA	NFPA (National Fire Protection Association) <a href="http://www.nfpa.org">www.nfpa.org</a>	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council <a href="http://www.nfrc.org">www.nfrc.org</a>	(301) 589-1776
NGA	National Glass Association <a href="http://www.glass.org">www.glass.org</a>	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association <a href="http://www.natlhardwood.org">www.natlhardwood.org</a>	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority <a href="http://www.nlga.org">www.nlga.org</a>	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) <a href="http://www.nofma.org">www.nofma.org</a>	(901) 526-5016
NOMMA	National Ornamental & Miscellaneous Metals Association <a href="http://www.nomma.org">www.nomma.org</a>	(888) 516-8585
NRCA	National Roofing Contractors Association <a href="http://www.nrca.net">www.nrca.net</a>	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association <a href="http://www.nrmca.org">www.nrmca.org</a>	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) <a href="http://www.nsf.org">www.nsf.org</a>	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association <a href="http://www.nssga.org">www.nssga.org</a>	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) <a href="http://www.ntma.com">www.ntma.com</a>	(800) 323-9736 (540) 751-0930
NWFA	National Wood Flooring Association <a href="http://www.nwfa.org">www.nwfa.org</a>	(800) 422-4556 (636) 519-9663
PCI	Precast/Prestressed Concrete Institute <a href="http://www pci.org">www pci.org</a>	(312) 786-0300
PDI	Plumbing & Drainage Institute <a href="http://www.pdionline.org">www.pdionline.org</a>	(800) 589-8956 (978) 557-0720

PGI	PVC Geomembrane Institute <a href="http://pgi-tp.cee.uiuc.edu">http://pgi-tp.cee.uiuc.edu</a>	(217) 333-3929
PTI	Post-Tensioning Institute <a href="http://www.post-tensioning.org">www.post-tensioning.org</a>	(248) 848-3180
RCSC	Research Council on Structural Connections <a href="http://www.boltcouncil.org">www.boltcouncil.org</a>	
RFCI	Resilient Floor Covering Institute <a href="http://www.rfci.com">www.rfci.com</a>	(706) 882-3833
RIS	Redwood Inspection Service <a href="http://www.redwoodinspection.com">www.redwoodinspection.com</a>	(925) 935-1499
SAE	SAE International <a href="http://www.sae.org">www.sae.org</a>	(877) 606-7323 (724) 776-4841
SCAQMD	South Coast Air Quality Management District <a href="http://www.aqmd.com">www.aqmd.com</a>	(909) 396-2000
SCTE	Society of Cable Telecommunications Engineers <a href="http://www.scte.org">www.scte.org</a>	(800) 542-5040 (610) 363-6888
SDI	Steel Deck Institute <a href="http://www.sdi.org">www.sdi.org</a>	(847) 458-4647
SDI	Steel Door Institute <a href="http://www.steeldoor.org">www.steeldoor.org</a>	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association <a href="http://www.sefalabs.com">www.sefalabs.com</a>	(877) 294-5424 (516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SIA	Security Industry Association <a href="http://www.siaonline.org">www.siaonline.org</a>	(866) 817-8888 (703) 683-2075
SJI	Steel Joist Institute <a href="http://www.steeljoist.org">www.steeljoist.org</a>	(843) 626-1995
SMA	Screen Manufacturers Association <a href="http://www.smacentral.org">www.smacentral.org</a>	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association <a href="http://www.smacna.org">www.smacna.org</a>	(703) 803-2980

SMPTE	Society of Motion Picture and Television Engineers <a href="http://www.smpte.org">www.smpte.org</a>	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) <a href="http://www.sprayfoam.org">www.sprayfoam.org</a>	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) <a href="http://www.spib.org">www.spib.org</a>	(850) 434-2611
SPRI	Single Ply Roofing Industry <a href="http://www.spri.org">www.spri.org</a>	(781) 647-7026
SSINA	Specialty Steel Industry of North America <a href="http://www.ssina.com">www.ssina.com</a>	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings <a href="http://www.sspc.org">www.sspc.org</a>	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute <a href="http://www.steltank.com">www.steltank.com</a>	(847) 438-8265
SWI	Steel Window Institute <a href="http://www.steelwindows.com">www.steelwindows.com</a>	(216) 241-7333
SWPA	Submersible Wastewater Pump Association <a href="http://www.swpa.org">www.swpa.org</a>	(847) 681-1868
TCA	Tilt-Up Concrete Association <a href="http://www.tilt-up.org">www.tilt-up.org</a>	(319) 895-6911
TCNA	Tile Council of North America, Inc. <a href="http://www.tileusa.com">www.tileusa.com</a>	(864) 646-8453
TEMA	Tubular Exchanger Manufacturers Association <a href="http://www.tema.org">www.tema.org</a>	(914) 332-0040
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance <a href="http://www.tiaonline.org">www.tiaonline.org</a>	(703) 907-7700
TMS	The Masonry Society <a href="http://www.masonrysociety.org">www.masonrysociety.org</a>	(303) 939-9700
TPI	Truss Plate Institute, Inc. <a href="http://www.tpinst.org">www.tpinst.org</a>	(703) 683-1010
TPI	Turfgrass Producers International <a href="http://www.turfgrasssod.org">www.turfgrasssod.org</a>	(800) 405-8873 (847) 649-5555

TRI	Tile Roofing Institute <a href="http://www.tileroofing.org">www.tileroofing.org</a>	(312) 670-4177
UL	Underwriters Laboratories Inc. <a href="http://www.ul.com">www.ul.com</a>	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association <a href="http://www.uni-bell.org">www.uni-bell.org</a>	(972) 243-3902
USA V	USA Volleyball <a href="http://www.usavolleyball.org">www.usavolleyball.org</a>	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council <a href="http://www.usgbc.org">www.usgbc.org</a>	(800) 795-1747
USITT	United States Institute for Theatre Technology, Inc. <a href="http://www.usitt.org">www.usitt.org</a>	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association <a href="http://www.wastec.org">www.wastec.org</a>	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau <a href="http://www.wclib.org">www.wclib.org</a>	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association <a href="http://www.wcmamanet.org">www.wcmamanet.org</a>	(212) 297-2122
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) <a href="http://www.wdma.com">www.wdma.com</a>	(800) 223-2301 (312) 321-6802
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) <a href="http://www.wicnet.org">www.wicnet.org</a>	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association <a href="http://www.wmmmpa.com">www.wmmmpa.com</a>	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association <a href="http://www.wsrca.com">www.wsrca.com</a>	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association <a href="http://www.wwpa.org">www.wwpa.org</a>	(503) 224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DIN	Deutsches Institut fur Normung e.V. www.din.de	49 30 2601-0
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development	(202) 708-1112

www.hud.gov

LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Buildings Service (See GSA)	
PHS	Office of Public Health and Science http://www.hhs.gov/ophs/	(202) 690-7694
RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USP	U.S. Pharmacopeia www.usp.org	(800) 227-8772
USPS	Postal Service www.usps.com	(202) 268-2000

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA)	(800) 872-2253
	Architectural Barriers Act (ABA)	(202) 272-0080
	Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	

CFR	Code of Federal Regulations	(866) 512-1800
	Available from Government Printing Office	(202) 512-1800
	<a href="http://www.gpoaccess.gov/cfr/index.html">www.gpoaccess.gov/cfr/index.html</a>	
DOD	Department of Defense Military Specifications and Standards	(215) 697-2664
	Available from Department of Defense Single Stock Point	
	<a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a>	
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification	(215) 697-2664
	Available from Department of Defense Single Stock Point	
	<a href="http://dodssp.daps.dla.mil/">http://dodssp.daps.dla.mil/</a>	
	Available from Defense Standardization Program	
	<a href="http://www.dsp.dla.mil">www.dsp.dla.mil</a>	
	Available from General Services Administration	(202) 619-8925
	<a href="http://www.gsa.gov">www.gsa.gov</a>	
	Available from National Institute of Building Sciences	(202) 289-7800
	<a href="http://www.wbdg.org/ccb">www.wbdg.org/ccb</a>	
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards	(215) 697-2664
	Available from Department of Defense Single Stock Point	
	<a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a>	
UFAS	Uniform Federal Accessibility Standards	(800) 872-2253
	Available from Access Board	(202) 272-0080

[www.access-board.gov](http://www.access-board.gov)

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation (800) 952-5210  
[www.dca.ca.gov/bhfti](http://www.dca.ca.gov/bhfti) (916) 574-2041

CCR California Code of Regulations (916) 323-6815  
[www.calregs.com](http://www.calregs.com)

CDHS California Department of Health Services (916) 445-4171  
[www.dhcs.ca.gov](http://www.dhcs.ca.gov)

CDPH California Department of Public Health, Indoor Air Quality Section  
[www.cal-iaq.org](http://www.cal-iaq.org)

CPUC California Public Utilities Commission (415) 703-2782  
[www.cpuc.ca.gov](http://www.cpuc.ca.gov)

TFS Texas Forest Service (979) 458-6606  
 Forest Resource Development  
<http://txforestservice.tamu.edu>

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

## SECTION 014500 - UNCOVERING AND CORRECTION OF WORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This section specifies the requirements for uncovering and correction of work.

#### 1.3 UNCOVERING OF WORK

- A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any Public Authority having jurisdiction require any portion of the Work to be inspected, the Contractor shall give the Engineer timely notice of its readiness so that the Engineer may observe such inspections.
- B. If a portion of the Work is covered contrary to the Engineer's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Engineer, be uncovered for the Engineer's observation and be replaced at the Contractor's expense without change in the Contract Time.
- C. If a portion of the Work has been covered which the Engineer has not specifically requested to observe prior to its being covered, the Engineer may request to see such Work and it shall be uncovered by the Contractor.
  1. If such Work is in accordance with Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner.
  2. If such Work is not in accordance with Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

#### 1.4 CORRECTION OF WORK

- A. The Contractor shall promptly correct the Work rejected by the Engineer or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed.
- B.
  1. Costs of correcting such rejected Work, including additional testing, inspections, and compensation for the Engineer's services and expenses made necessary thereby, shall be at the Contractor's expense.
- C. The quality of materials and workmanship used in restoring this work shall be in full compliance with the requirements of the Contract Documents.

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

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

END OF SECTION 014500

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Temporary facilities under Construction Management Agreement.
- B. Temporary Utilities:
  - 1. Temporary electricity.
  - 2. Temporary lighting for construction purposes.
  - 3. Temporary heating.
  - 4. Temporary cooling.
  - 5. Temporary ventilation.
  - 6. Communication services.
  - 7. Temporary water service.
  - 8. Temporary sanitary facilities.
- C. Construction Facilities:
  - 1. Field offices and sheds.
  - 2. Vehicular access.
  - 3. Parking.
  - 4. Progress cleaning and waste removal.
  - 5. Project identification.
  - 6. Traffic regulation.
  - 7. Fire-prevention facilities.
- D. Temporary Controls:
  - 1. Barriers.
  - 2. Enclosures and fencing.
  - 3. Security.
  - 4. Water control.
  - 5. Dust control.
  - 6. Erosion and sediment control.
  - 7. Noise control.
  - 8. Pest and rodent control.
  - 9. Pollution control.
- E. Removal of utilities, facilities, and controls.

#### 1.2 TEMPORARY FACILITIES UNDER CONSTRUCTION MANAGEMENT AGREEMENT

- A. Temporary Provisions Provided by Construction Manager:

1. Temporary barriers, barricades, covered walkways, fencing, exterior closures, and interior closures.
2. Temporary field offices.
3. Cleaning during construction.
4. Access roads and approaches.
5. Temporary elevator.
6. Temporary sanitary facilities.
7. Temporary heating and ventilating after enclosure.
8. Temporary electrical service and distribution system for power and lighting.
9. Temporary telephone and internet service.

B. Each Contractor: Coordinate provisions with Construction Manager and provide the following items as necessary for execution of the Work including associated costs:

1. Construction aids.
2. Temporary fire protection, dust control, erosion and sediment control, water control, noise control, and other necessary temporary controls.
3. Temporary barriers, barricades, and similar devices as necessary for safety and protection of construction personnel and public.
4. On Construction Manager's approval, may provide temporary field office including electrical service and temporary telephone.
5. Temporary tree and plant protection.
6. Temporary heating before building enclosure.
7. Electrical service required in addition to temporary service and distribution provided by Construction Manager.
8. Temporary provisions for protection of installed Work.

### 1.3 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required from source as needed for construction operation.
- B. Do not disrupt Owner's use of service.
- C. Permanent convenience receptacles may be used during construction.

### 1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting for construction operations.

### 1.5 TEMPORARY HEATING

- A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

**1.6 TEMPORARY COOLING**

- A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.

**1.7 COMMUNICATION SERVICES**

- A. Telephone Service: Provide, maintain, and pay for telephone service to field office at time of Project mobilization and until completion of Work.
- B. Facsimile Service: Provide, maintain, and pay for facsimile service including dedicated telephone line to field office at time of Project mobilization and until completion of Work.
- C. Internet Service: Provide, maintain, and pay for broadband Internet service to field office at time of Project mobilization. Provide desktop computer with Microsoft operating system and appropriate office function software, modem, and printer.

**1.8 TEMPORARY WATER SERVICE**

- A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations.

**1.9 TEMPORARY SANITARY FACILITIES**

- A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization.

**1.10 FIELD OFFICES AND SHEDS**

Resident Project Representative (RPR) Field Office: 12' x 40' Weathertight, with two offices, bathroom, lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture including conference table, [drawing rack,] filing cabinets, two (2) 8' tables and drawing display table.

- A. Provide space for Project meetings in RPR Field Office, with table and chairs to accommodate ten (10) persons.

**1.11 VEHICULAR ACCESS**

- A. Locate as indicated on Drawings approved by Engineer and approved by Owner.

**1.12 PARKING**

- A. Provide temporary gravel surface parking areas to accommodate construction personnel.

- B. Locate as indicated on Drawings approved by Engineer and approved by Owner.
- C. Maintenance:
  - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.
  - 2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.
- D. Removal, Repair:
  - 1. Remove temporary materials and construction before Substantial Completion.
  - 2. Repair existing facilities damaged by use, to original condition.

#### 1.13 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, before enclosing spaces.
- C. Broom and vacuum clean interior areas before starting surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and rubbish from Site weekly and dispose of off-Site.

#### 1.14 PROJECT IDENTIFICATION

- A. Project Identification Sign:
  - 1. One painted sign of construction, design, and content shown on Drawings, location designated.
  - 2. Content:
    - a. Project [number,] title, [logo,] and name of Owner.
    - b. Names and titles of authorities.
    - c. Names and titles of Engineer.
    - d. Name of Prime Contractor.
  - 3. Graphic Design, Colors, and Style of Lettering: Designated by Engineer.
- B. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

## 1.15 TRAFFIC REGULATION

- A. Signs, Signals, and Devices:
  - 1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
  - 2. Traffic Control Signals: As approved by local jurisdictions.
  - 3. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
  - 4. Flag Person Equipment: As required by authorities having jurisdiction.
- B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
- C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- D. Haul Routes:
  - 1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.
  - 2. Confine construction traffic to designated haul routes.
  - 3. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.
- E. Traffic Signs and Signals:
  - 1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
  - 2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.
  - 3. Relocate signs and signals as Work progresses, to maintain effective traffic control.
- F. Removal:
  - 1. Remove equipment and devices at Substantial Completion.
  - 2. Repair damage caused by installation.
  - 3. Remove post settings to depth of (2) feet.

## 1.16 FIRE-PREVENTION FACILITIES

- A. Prohibit smoking within buildings. Designate area on Site where smoking is permitted. Provide approved ashtrays in designated smoking areas.
- B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.
- C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.

1. Provide one fire extinguisher at each stairway on each floor of buildings under construction.
2. Provide minimum of one fire extinguisher in every construction trailer and storage shed.
3. Provide minimum of one fire extinguisher on roof during roofing operations using heat-producing equipment.

**1.17 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of Site, and to protect existing facilities and adjacent properties from damage from construction operations.

**1.18 ENCLOSURES AND FENCING**

- A. Construction: Commercial-grade chain-link fence
- B. Provide 6 foot high fence around construction Site; equip with vehicular and pedestrian gates with locks.

**1.19 SECURITY**

- A. Security Program:
  1. Protect Work on existing premises from theft, vandalism, and unauthorized entry.

**1.20 WATER CONTROL**

- A. Grade Site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.
- B. Protect Site from puddles or running water. Provide water barriers as required to protect Site from soil erosion.

**1.21 DUST CONTROL**

- A. Execute Work by methods that minimize raising dust from construction operations.
- B. Provide positive means to prevent airborne dust from dispersing into atmosphere.

**1.22 EROSION AND SEDIMENT CONTROL**

- A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.

- B. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.

**1.23 NOISE CONTROL**

- A. Provide methods, means, and facilities to minimize noise from and noise produced by construction operations.

**1.24 PEST AND RODENT CONTROL**

- A. N/A

**1.25 POLLUTION CONTROL**

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.
- B. Comply with pollution and environmental control requirements of EPA and ADEM

**1.26 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. Remove temporary utilities, equipment, facilities, and materials before final inspection.
- B. Clean and repair damage caused by installation or use of temporary Work.
- C. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

**PART 2 - PRODUCTS - Not Used**

**PART 3 - EXECUTION - Not Used**

**END OF SECTION 015000**

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## SECTION 016000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.

#### 1.2 PRODUCTS

- A. At minimum, comply with specified requirements and reference standards.
- B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.
- C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.
- D. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.
- E. Furnish interchangeable components from same manufacturer for components being replaced.

#### 1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Comply with delivery requirements in Section 017419 - Construction Waste Management and Disposal.
- B. Transport and handle products according to manufacturer's instructions.
- C. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- D. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

#### 1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products according to manufacturer's instructions.
- B. Store products with seals and labels intact and legible.
- C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.
- D. For exterior storage of fabricated products, place products on sloped supports aboveground.
- E. Provide off-Site storage and protection when Site does not permit on-Site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.

#### 1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 012500 - Substitution Procedures.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 016000

## SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Field engineering.
- B. Closeout procedures.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Testing, adjusting, and balancing.
- F. Project record documents.
- G. Operation and maintenance data.
- H. Manual for materials and finishes.
- I. Manual for equipment and systems.
- J. Spare parts and maintenance products.
- K. Product warranties and product bonds.
- L. Examination.
- M. Preparation.
- N. Execution.
- O. Cutting and patching.
- P. Protecting installed construction.
- Q. Final cleaning.

#### 1.2 FIELD ENGINEERING

- A. Employ land surveyor registered in State of Georgia and acceptable to Engineer.
- B. Locate all and protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.
- C. Control datum for survey is established on the drawings.

- D. Prior to beginning Work, verify and establish floor elevations of existing facilities to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.
- E. Verify setbacks and easements; confirm Drawing dimensions and elevations.
- F. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.
- G. Submit copy of certificate signed by land surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- H. On completion of foundation walls and major Site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction.
- I. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.
- J. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.
- K. Final Property Survey: Prior to Substantial Completion, prepare final property survey illustrating locations, dimensions, angles, and elevations of buildings and Site Work that have resulted from construction indicating their relationship to permanent bench marks and property lines.
  - 1. Show significant features (real property) for Project.
  - 2. Include certification on survey, signed by surveyor, that principal metes, bounds, lines, levels, and elevations of Project are accurately shown.

### 1.3 CLOSEOUT PROCEDURES

- A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
  - 1. Submit maintenance manuals, Project record documents, digital images of construction photographs, and other similar final record data in compliance with this Section.
  - 2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
  - 3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
  - 4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
  - 5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.

6. Make final change-over of locks and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
8. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:

1. When Contractor considers Work to be substantially complete, submit to Engineer:
  - a. Written certificate that Work, or designated portion, is substantially complete.
  - b. List of items to be completed or corrected (initial punch list).
2. Within 7 days after receipt of request for Substantial Completion, Engineer and Owner will make inspection to determine whether Work or designated portion is substantially complete.
3. Should Engineer determine that Work is not substantially complete:
  - a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
  - b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
  - c. Engineer will reinspect Work.
  - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer / Owners inspection.
4. When Engineer and Owner finds that Work is substantially complete, Engineer will:
  - a. Prepare Certificate of Substantial Completion accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
  - b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
5. After Work is substantially complete, Contractor shall:
  - a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
  - b. Complete Work listed for completion or correction within time period stipulated.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.

1. When Contractor considers Work to be complete, submit written certification that:
  - a. Contract Documents have been reviewed.
  - b. Work has been examined for compliance with Contract Documents.
  - c. Work has been completed according to Contract Documents.
  - d. Work is completed and ready for final inspection.
2. Submittals: Submit following:

- a. Final punch list indicating all items have been completed or corrected.
- b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
- c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
- d. Accounting statement for final changes to Contract Sum.
- e. Contractor's affidavit of payment of debts and claims.
- f. Contractor affidavit of release of liens.
- g. Consent of surety to final payment.

3. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:

- 1. Within 7 days after receipt of request for final inspection, Engineer and Owner will make inspection to determine whether Work or designated portion is complete.
- 2. Should Engineer consider Work to be incomplete or defective:
  - a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
  - b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.
  - c. Engineer will reinspect Work.
  - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer and Owner inspection.

#### 1.4 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of various equipment and systems.
- B. Notify Engineer 7 days prior to startup of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.
- G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

## 1.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel 14 Days prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instructed by manufacturer's representative who is knowledgeable about the Project.
- C. Video Recordings: Provide high-quality color video recordings of demonstration and instructional sessions. Engage commercial videographer to record sessions. Include classroom instructions, demonstrations, board diagrams, and other visual aids. Include menu navigation.
- D. For equipment or systems requiring seasonal operation, perform demonstration for other season within 6 months.
- E. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time at equipment location.
- G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

## 1.6 TESTING, ADJUSTING, AND BALANCING

- A. Owner will appoint, employ, and pay for services of independent firm to perform testing, adjusting, and balancing after initial contractor start up and adjustments.

## 1.7 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
  1. Drawings.
  2. Specifications.
  3. Addenda.
  4. Change Orders and other modifications to the Contract.
  5. Reviewed Shop Drawings, product data, and Samples.
  6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates used.
3. Changes made by Addenda and modifications.

F. Record Drawings Legibly mark each item to record actual construction as follows:

1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
2. Include locations of concealed elements of the Work.
3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
5. Identify and locate existing buried or concealed items encountered during Project.
6. Measured depths of foundations in relation to finish main floor datum.
7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
9. Field changes of dimension and detail.
10. Details not on original Drawings.

G. Submit marked-up paper copy documents to Engineer before Substantial Completion.

H. Submit PDF electronic files of marked-up documents to Architect/Engineer before Substantial Completion.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit in PDF composite electronic indexed file.

B. Submit 3 data bound in 8-1/2 x 11-inch (A4) text pages, three D side ring binders with durable plastic covers.

C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.

D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
  - a. Significant design criteria.
  - b. List of equipment.
  - c. Parts list for each component.
  - d. Operating instructions.
  - e. Maintenance instructions for equipment and systems.
  - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  - g. Safety precautions to be taken when operating and maintaining or working near equipment.
3. Part 3: Project documents and certificates, including the following:
  - a. Shop Drawings and product data.
  - b. Air and water balance reports.
  - c. Certificates.
  - d. Originals of warranties.

## 1.9 MANUAL FOR MATERIALS AND FINISHES

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes before Substantial Completion. Draft copy be reviewed and returned, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit 2 sets of revised final volumes within 10 days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual within 10 days after final inspection.
- F. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom-manufactured products.
- G. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- H. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

- I. Additional Requirements: As specified in individual product Specification Sections.
- J. Include listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

#### 1.10 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes before Substantial Completion. Draft copy will be reviewed and returned, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit 2 sets of revised final volumes within 10 days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual within 10 days after final inspection.
- F. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- G. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed by label machine.
- H. Include color-coded wiring diagrams as installed.
- I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.
- J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- K. Include servicing and lubrication schedule and list of lubricants required.
- L. Include manufacturer's printed operation and maintenance instructions.
- M. Include sequence of operation by controls manufacturer.
- N. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- O. Include control diagrams by controls manufacturer as installed.

- P. Include Contractor's coordination drawings with color-coded piping diagrams as installed.
- Q. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- R. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- S. Include test and balancing reports.
- T. Additional Requirements: As specified in individual product Specification Sections.
- U. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.

#### 1.11 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.
- B. Deliver to Project Site; obtain receipt prior to final payment.

#### 1.12 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within 10 days after completion of applicable item of Work.
- B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include table of contents and assemble in three D side ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time of Submittals:
  1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  2. Make other submittals within 10 days after date of Substantial Completion, prior to final Application for Payment.
  3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within 10 days after acceptance, listing date of acceptance as beginning of warranty or bond period.

## PART 2 - PRODUCTS - Not Used

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.
- D. Verify that utility services are available with correct characteristics and in correct locations.

### 3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

### 3.3 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
  1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
  2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
  3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Architect/Engineer for final decision.

- E. Allow for expansion of materials and building movement.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
  - 1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
  - 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.
  - 1. Refer questionable mounting heights choices to Architect/Engineer for final decision.
  - 2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.
- H. Adjust operating products and equipment to ensure smooth and unhindered operation.
- I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

#### 3.4 CUTTING AND PATCHING

- A. Employ skilled installers to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting:
  - 1. Structural integrity of element.
  - 2. Integrity of weather-exposed or moisture-resistant elements.
  - 3. Efficiency, maintenance, or safety of element.
  - 4. Visual qualities of sight-exposed elements.
  - 5. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching to complete Work and to:
  - 1. Fit the several parts together, to integrate with other Work.
  - 2. Uncover Work to install or correct ill-timed Work.
  - 3. Remove and replace defective and nonconforming Work.
  - 4. Remove samples of installed Work for testing.
  - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products according to requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. At penetrations of fire-rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material to full thickness of penetrated element.
- J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- K. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

### 3.5 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

### 3.6 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment. Employ
  - 1. Employ experienced personnel or professional cleaning firm.
- B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces; and vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.
- D. Replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean Site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION 017000

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## SECTION 017310 – CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
  - 1. Division 1 Section "Selective Demolition" for demolition of selected portions of the alterations.
  - 2. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

#### 1.3 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

#### 1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete or Asphalt: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as

possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Exterior Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 017310

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## SECTION 017320 – SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

- B. Related Requirements:

1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017000 "Execution and Closeout Requirements" for cutting and patching procedures.
3. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

## 1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

## 1.6 INFORMATIONAL SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

B. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

C. Predemolition Photographs or Video: Submit before Work begins.

D. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

## 1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

## 1.8 FIELD CONDITIONS

- A. Owner may occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## PART 2 - PRODUCTS

### 2.1 PEFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Perform an engineering survey of condition of existing structures to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
  - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
  - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
  - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
  - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. Arrange to shut off indicated utilities with utility companies.
  - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

- f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

### 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Comply with requirements for access and protection specified in Section 01500 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
  - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of selective demolition.

### 3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

### 3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RCFI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.
  - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
  - 2. Remove existing roofing system down to substrate.

### 3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Burning of demolished materials will be permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.
- C. Disposal: Transport demolished inert concrete materials and dispose of at designated spoil areas on Owner's property. Transport all other demolished materials off Owner's property and legally dispose of them.

### 3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 017320

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## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Construction waste management plan.
2. Construction waste recycling.
3. Construction waste adaptive reuse.

#### 1.2 PLAN REQUIREMENTS

A. Develop and implement construction waste management plan as approved by Engineer.

B. Intent:

1. Divert construction, demolition, and land-clearing debris from landfill disposal.
2. Redirect recyclable material back to manufacturing process.
3. Generate cost savings or increase minimal additional cost to Project for waste disposal.

#### 1.3 SUBMITTALS

A. Construction Waste Management Plan: Submit construction waste management plan describing methods and procedures for implementation and monitoring compliance including the following:

1. Transportation company hauling construction waste to waste processing facilities.
2. Recycling and adaptive reuse processing facilities and waste type each facility will accept.
3. Construction waste materials anticipated for recycling and adaptive reuse.
4. On-Site sorting and Site storage methods.

B. Submit documentation with each application for payment substantiating construction waste management plan was maintained and goals are being achieved.

1. Trash: Quantity by weight deposited in landfills. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal.
2. Salvaged Material: Quantity by weight with destination for each type of material salvaged for resale, recycling, or adaptive reuse. Include associated fees, transportation costs, container rentals, taxes for total cost of disposal, and reimbursements due to salvage resale.
3. Total Cost: Indicate total cost or savings for implementation of construction waste management plan.

#### 1.4 CONSTRUCTION WASTE MANAGEMENT PLAN

- A. Construction Waste Landfill Diversion: Minimum 75 percent by weight of construction waste materials for duration of Project through resale, recycling, or adaptive reuse.
- B. Implement construction waste management plan at start of construction.
- C. Review construction waste management plan at preconstruction meeting and progress meetings.
- D. Distribute approved construction waste management plan to Subcontractors and others affected by plan requirements.
- E. Oversee plan implementation, instruct construction personnel for plan compliance, and document plan results.
- F. Purchase products to prevent waste by:
  - 1. Ensuring correct quantity of each material is delivered to Site.
  - 2. Choosing products with minimal or no packaging.
  - 3. Requiring suppliers to use returnable pallets or containers.
  - 4. Requiring suppliers to take or buy back rejected or unused items.

#### 1.5 CONSTRUCTION WASTE RECYCLING

- A. Use source separation method or comingling method suitable to sorting and processing method of selected recycling center. Dispose nonrecyclable trash separately into landfill.
- B. Source Separation Method: Recyclable materials separated from trash and sorted into separate bins or containers, identified by waste type, prior to transportation to recycling center.
- C. Comingling Method: Recyclable materials separated from trash and placed in unsorted bins or container for sorting at recycling center.

#### 1.6 CONSTRUCTION WASTE ADAPTIVE REUSE

- A. Arrange with processing facility for salvage of construction material and processing for reuse. Do not reuse construction materials on-Site except as allowed by Engineer.

### PART 2 - PRODUCTS - Not Used

### PART 3 - EXECUTION

#### 3.1 CONSTRUCTION WASTE COLLECTION

- A. Collect construction waste materials in marked bins or containers and arrange for transportation to recycling centers or adaptive salvage and reuse processing facilities.

- B. Maintain recycling and adaptive reuse storage and collection area in orderly arrangement with materials separated to eliminate co-mingling of materials required to be delivered separately to waste processing facility.

### 3.2 CONSTRUCTION WASTE DISPOSAL

- A. Deliver construction waste to waste processing facilities. Obtain receipt for deliveries.
- B. Dispose of construction waste not capable of being recycled or adaptively reused by delivery to landfill, incinerator, or other legal disposal facility. Obtain receipt for deliveries.

END OF SECTION 017419

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## SECTION 017810 – PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 017000 "Execution and Closeout Requirements" for final property survey.

#### 1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.

B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

E. Reports: Submit written report indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

## PART 2 - PRODUCTS

### 2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
  - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
  - b. Accurately record information in an acceptable drawing technique.
  - c. Record data as soon as possible after obtaining it.
  - d. Record and check the markup before enclosing concealed installations.
  - e. Cross-reference record prints to corresponding archive photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
  - a. Dimensional changes to Drawings.
  - b. Revisions to details shown on Drawings.
  - c. Depths of foundations below first floor.
  - d. Locations and depths of underground utilities.
  - e. Revisions to routing of piping and conduits.
  - f. Revisions to electrical circuitry.
  - g. Actual equipment locations.
  - h. Duct size and routing.
  - i. Locations of concealed internal utilities.
  - j. Changes made by Change Order or Work Change Directive.
  - k. Changes made following Engineer's written orders.
  - l. Details not on the original Contract Drawings.
  - m. Field records for variable and concealed conditions.
  - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Engineer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Engineer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "PROJECT RECORD DRAWINGS."
  - d. Name of Engineer.
  - e. Name of Contractor.

## 2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

## 2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.

- B. Format: Submit record Product Data as paper copy.
  - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

## 2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as paper copy.
  - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer's reference during normal working hours.

END OF SECTION 017810

## SECTION 033000 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.
5. Concrete toppings.

B. Related Sections include the following:

1. Division 03 Section "Concrete Topping" for emery- and iron-aggregate concrete floor toppings.
2. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
3. Division 32 Section "Concrete Paving" for concrete pavement and walks.
4. Division 32 Section "Decorative Concrete Paving" for decorative concrete pavement and walks.

#### 1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

#### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Samples: For waterstops, vapor retarder.
- E. Qualification Data: For testing agency.
- F. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Form materials and form-release agents.
  - 4. Steel reinforcement and accessories.
  - 5. Waterstops.
  - 6. Curing compounds.
  - 7. Floor and slab treatments.
  - 8. Bonding agents.
  - 9. Adhesives.
  - 10. Vapor retarders.
  - 11. Semirigid joint filler.
  - 12. Joint-filler strips.
  - 13. Repair materials.
- G. Field quality-control test and inspection reports.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- C. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete,"
  - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
  - 1. Plywood, metal, or other approved panel materials.
  - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-oreded plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
  - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.

## 2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Deformed-Steel Wire: ASTM A 496.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.4 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

## 2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I/II, gray
    - a. Fly Ash: ASTM C 618, Class C.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

## 2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

- 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
- 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
- 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
- 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
- 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

- 1. Available Products:
  - a. Boral Material Technologies, Inc.; Boral BCN.
  - b. Euclid Chemical Company (The); Eucon CIA.
  - c. Grace Construction Products, W. R. Grace & Co.; DCI.
  - d. Master Builders, Inc.; Rheocrete CNI.
  - e. Sika Corporation; Sika CNI.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

- 1. Available Products:
  - a. Axim Concrete Technologies; Catekol 1000CI.
  - b. Boral Material Technologies, Inc.; Boral BCN2.
  - c. Cortec Corporation; MCI [2000] [2005NS].
  - d. Grace Construction Products, W. R. Grace & Co.; DCI-S.
  - e. Master Builders, Inc.; Rheocrete 222+.
  - f. Sika Corporation; FerroGard-901.

## 2.7 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

- 1. Available Manufacturers:
  - a. Bometals, Inc.
  - b. Greenstreak.
  - c. Meadows, W. R., Inc.
  - d. Murphy, Paul Plastics Co.
  - e. Progress Unlimited, Inc.
  - f. Tamms Industries, Inc.
  - g. Vinylex Corp.
- 2. Profile: As indicated.

3. Dimensions: 6 inches by 3/8 inch thick (150 mm by 10 mm thick; nontapered).
- B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).
  1. Available Products:
    - a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
    - b. Concrete Sealants Inc.; Conseal CS-231.
    - c. Greenstreak; Swellstop.
    - d. Henry Company, Sealants Division; Hydro-Flex.
    - e. JP Specialties, Inc.; Earthshield Type 20.
    - f. Progress Unlimited, Inc.; Superstop.
    - g. TCMiraDRI; Mirastop.

## 2.8 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
  1. Available Products:
    - a. Fortifiber Corporation; Moistop Plus.
    - b. Stego Industries, LLC; Stego Wrap, 10 mils.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

## 2.9 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
  1. Available Products:
    - a. Axim Concrete Technologies; Cimfilm.
    - b. Burke by Edoco; BurkeFilm.
    - c. ChemMasters; Spray-Film.
    - d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
    - e. Dayton Superior Corporation; Sure Film.
    - f. Euclid Chemical Company (The); Eucobar.
    - g. Kaufman Products, Inc.; Vapor Aid.
    - h. Lambert Corporation; Lambco Skin.
    - i. L&M Construction Chemicals, Inc.; E-Con.
    - j. MBT Protection and Repair, Div. of ChemRex; Confilm.

- k. Meadows, W. R., Inc.; Sealtight Evapre.
- l. Metalcrete Industries; Waterhold.
- m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
- n. Sika Corporation, Inc.; SikaFilm.
- o. Symons Corporation, a Dayton Superior Company; Finishing Aid.
- p. Unitex; Pro-Film.
- q. US Mix Products Company; US Spec Monofilm ER.
- r. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Available Products:

- a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
- b. Burke by Edoco; Aqua Resin Cure.
- c. ChemMasters; Safe-Cure Clear.
- d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
- e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
- f. Euclid Chemical Company (The); Kurez DR VOX.
- g. Kaufman Products, Inc.; Thinfilm 420.
- h. Lambert Corporation; Aqua Kure-Clear.
- i. L&M Construction Chemicals, Inc.; L&M Cure R.
- j. Meadows, W. R., Inc.; 1100 Clear.
- k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.
- l. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
- m. Tamms Industries, Inc.; Horncure WB 30.
- n. Unitex; Hydro Cure 309.
- o. US Mix Products Company; US Spec Maxcure Resin Clear.
- p. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

## 2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlay: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

## 2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials

1. Fly Ash: 20 percent max.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
2. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

## 2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 5 inches (125 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

B. Slabs-on-Grade, Building Walls, and Suspended Slab: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Minimum Cementitious Materials Content: 470 lb/cu. yd. (279 kg/cu. m).
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
4. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

## 2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
  - 2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
  - 1.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.4 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
  1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair vapor retarders according to manufacturer's written instructions.
- C. Granular Course: Cover vapor retarder with [granular fill] [fine-graded granular material], moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).
  1. Place and compact a 1/2-inch- (13-mm-) thick layer of fine-graded granular material over granular fill.

### 3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
  - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
  - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
  - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
  - 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

### 3.7 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

### 3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screeb slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

### 3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching  $0.2 \text{ lb/sq. ft.} \times \text{h}$  ( $1 \text{ kg/sq. m} \times \text{h}$ ) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
  2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
- b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
- c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  1. Defer joint filling until concrete has aged at least [one] [six] month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching

mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
  - 1. Steel reinforcement placement.
  - 2. Steel reinforcement welding.
  - 3. Headed bolts and studs.
  - 4. Verification of use of required design mixture.
  - 5. Concrete placement, including conveying and depositing.
  - 6. Curing procedures and maintenance of curing temperature.
  - 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
  - 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
  - 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 7. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
  - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
  - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 033000

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## SECTION 081113 – HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

#### 1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Flush Wood Doors".
3. Division 08 Section "Fiberglass Reinforced Polyester (FRP) Doors".
4. Division 08 Section "Integrated Door Opening Assemblies".
5. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
6. Division 08 Section "Door Hardware".
7. Division 08 Section "Access Control Hardware".
8. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.

10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies

### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
  1. Elevations of each door design.
  2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of anchorages, joints, field splices, and connections.
  6. Details of accessories.
  7. Details of moldings, removable stops, and glazing.
  8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
  1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.
  - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inchhigh wood blocking. Do not store in a manner that traps excess humidity.
  1. Provide minimum 1/4-inchspace between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

#### 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

#### 1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. CECO Door Products (C).
  - 2. Curries Company (CU).
  - 3. Steelcraft (S).

### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

### 2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.
  - 1. Design: Flush panel.
  - 2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".
    - a. Provide 22 gauge steel stiffeners at 6 inches on-center internally welded at 5" on center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
    - b. Thermal properties to rate at a fully operable minimum U-Factor 0.29 and R-Value3.4, including insulated door, thermal-break frame and threshold.

- 1) Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.36 and R-Value 2.7, including insulated door, kerf type frame, and threshold.
- 3. Level/Model: Level 2 and Physical Performance Level A (Heavy Duty), Minimum 18 gauge (0.042 inch - 1.1-mm) thick steel, Model 2.
- 4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
- 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
- 6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
- 7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets

C. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

- 1. Design: Flush panel.
- 2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
- 3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
- 4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
- 5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Interior Doors (Energy Efficient): Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A366 or 620. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

- 1. Design: Flush panel.
- 2. Core Construction: Steel stiffened laminated core with fiberglass filler with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".
  - a. Provide 22 gauge steel-stiffeners at 6 inches on-center internally welded at 5" oncenter to integral core assembly, No stiffener face welding is permitted.
  - b. Acoustical sound transmission rating shall be no less than STC 38 complying with ASTM E 90 and must be visible on factory applied labels.
- 3. Level/Model: Level 2 and Physical Performance Level A (Heavy Duty), Minimum 18 gauge (0.042 inch - 1.1-mm) thick steel, Model 2.
- 4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).

- 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
- 6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
- 7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

- 1. Design: Flush panel. a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
- 2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
- 3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
- 4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
- 5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

F. Manufacturers Basis of Design:

- 1. CECO Door Products (C) Energy Efficient - Trio-E Series.
- 2. Curries Company (CU) - Energy Efficient - 777 Trio-E Series..

## 2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
  - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
  - 2. Manufacturers Basis of Design:
    - a. Curries Company (CU) – M Series.
- C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
  - 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
  - 2. Manufacturers Basis of Design:
    - a. Curries Company (CU) - M Series.
- D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  - 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
  - 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

## 2.6 HOLLOW METAL PANELS

- A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal components.

## 2.7 LOUVERS

- A. Metal Louvers: Door manufacturer's standard metal louvers unless otherwise indicated.
  - 1. Blade Type: Vision proof inverted V or inverted Y.
  - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
  - 1. Manufacturers: Subject to compliance with requirements, provide door manufacturers standard louver to meet rating indicated.
  - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable

## 2.8 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable

## 2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick

## 2.10 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
  - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
  - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
  - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
  - 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- D. Hollow Metal Frames:
  - 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
    - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
  - 3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

- 4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
- 5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- 6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
- 7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
- 8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
- 9. Jamb Anchors: Provide number and spacing of anchors as follows:
  - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
    - 1) Two anchors per jamb up to 60 inches high.
    - 2) Three anchors per jamb from 60 to 90 inches high.
    - 3) Four anchors per jamb from 90 to 120 inches high.
    - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
  - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
    - 1) Three anchors per jamb up to 60 inches high.
    - 2) Four anchors per jamb from 60 to 90 inches high.
    - 3) Five anchors per jamb from 90 to 96 inches high.
    - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
    - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
- 10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

- 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
- 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
- 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
- 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

## 2.11 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
  1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
  2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
  3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.

4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
  1. Non-Fire-Rated Standard Steel Doors:
    - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint

END OF SECTION 081113

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## SECTION 083310 – OVERHEAD COILING DOORS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section specifies:
  - 1. Insulated service doors
- B. Related Sections include the following:
  - 1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind load, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.
  - 1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.

#### 1.3 SUBMITTALS

- A. Product Data: For each type and size of overhead coiling door and accessory.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Maintenance Data

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

## PART 2 - PRODUCTS

**2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION**

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
  1. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.
  2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
- B. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from metal to match curtain slats and finish.
- C. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent over travel of curtain.

**2.2 HOOD**

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
  1. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

**2.3 LOCK DEVICES**

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.
- B. Chain Lock Keeper: Suitable for padlock.

**2.4 CURTAIN ACCESSORIES**

- A. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.

## 2.5 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.6 MANUAL DOOR OPERATORS

- A. Equip door with manufacturer's recommended manual door operator unless another type of door operator is indicated.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25 lbf force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear reduction unit, of type indicated. Size gears to require not more than 25 lbf force to turn crank. Fabricate gearbox to be oil tight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device..

## 2.7 DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Model 625, Overhead Door Corp., or comparable product by one of the following:
    - a. Cookson Company.
    - b. Mahon Door Corporation.
    - c. McKeon Rolling Steel Door Company, Inc.
    - d. Wayne-Dalton Corp.
    - e. Kinnear
    - f. North American
    - g. Atlas Door Corporation.
- B. Operation Cycles: Not less than 20,000.
- C. Curtain R-Value: 5.0 deg F x h x sq. ft./Btu.
- D. Door Curtain Material: Galvanized steel.
- E. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
  - 1. Insulated-Slat Interior Facing: Metal.
- F. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

- G. Hood: Match curtain material and finish.
  - 1. Shape: As shown on Drawings.
  - 2. Mounting: As shown on Drawings.
- H. Locking Devices: Equip door with slide bolt for padlock and chain lock keeper.
  - 1. Locking Device Assembly: Single-jamb side locking bars, operable from.
- I. Manual Door Operator: Chain-hoist operator.
- J. Door Finish:
  - 1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.
  - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer. Adjust seals to provide weathertight fit around entire perimeter.

#### 3.2 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling door.

END OF SECTION 083310

## SECTION 112220 – CHEMICAL FEED TANKS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. This section includes the following equipment:

1. One chemical bulk storage tank located in the Chemical Feed building for storage of Fluoride.
2. One chemical day tank located in the Chemical Feed building for storage of Fluoride.
3. One chemical bulk storage tank located in the Chemical Feed building for storage of Orthophosphate (Bulk Storage Tank to also be rated for Blended Zinc Orthophosphate.).
4. One chemical day tank located in the Chemical Feed building for storage of Orthophosphate.
5. One chemical bulk storage tank located outside of the Chemical Feed building for storage of Sodium Hypochlorite.

B. Related Sections include the following:

1. Division 3 Section “Cast-In-Place Concrete”
2. Division 5 Section “Metal Fabrications”

#### 1.3 GENERAL

A. This Specification, together with the purchaser's design sketches, covers the requirements for design, submittals, materials, fabrication, inspection, testing and shipping of reinforced thermoset plastic vessels.

B. All vessels shall be made by a combination of contact molding for the inner corrosion barrier followed by a filament wound, or contact molded structural layer using a room temperature cure

C. All conflicts between the requirements of this specification, design sketches, specified codes, local or federal regulations and/or insurance requirements shall be called to the purchaser's and the engineer's attention without delay. Where requirements on design sketches conflict with this specification, the drawings will take precedence.

#### 1.4 SUBMITTALS

A. Submit the following in accordance with Section 013300- Submittals.

1. Shop and field testing procedures and equipment to be used.
2. Special Tools.
3. Fabricator shall include detail drawings of tank shell attachment to top and bottom heads.
4. Fabricator shall give complete details of knuckle radius and lay-up sequences; minimum knuckle radius is 1-1/2".

5. Fabricator shall certify whether the method of fabrication is contact molded or filament wound.
6. Fabricator shall specify on the drawings what resins and cure systems are to be used.

## 1.5 APPLICABLE CODES

- A. Unless otherwise indicated in this specification, the design and fabrication of the vessel shall conform to the latest addition of the following codes and specifications:
  1. For Basic Design and Fabrication
    - a. All Fiberglass vessels shall be manufactured by a fabricator certified to ASME RTP-1 and shall furnish their certification number with bid proposal.
    - b. ASTM D3299 - Standard Specification for Filament-Wound Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Vessels.
    - c. ASTM D4097 - Standard Specification for Contact-Molded Glass-Fiber-Reinforced Thermoset Resin Corrosion-Resistant Vessels
    - d. NBS Voluntary Product Standard PS 15-69 - Custom Contact Molded Reinforced Polyester Chemical Resistant Process Equipment.
    - e. Manufacture shall be ISO 9001 approved
  2. Laminate Quality
    - a. ASTM D2563 - Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts.
  3. Determination of Laminate Properties
    - a. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.
    - b. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.
    - c. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

## 1.6 INSPECTION AND TESTING

- A. Fabricator shall have a written quality control program demonstrating the capability to design and supply equipment conforming to customer specifications with periodic internal auditing and semi-annual external audits, such as ISO 9001 or equal.

## 1.7 QUALITY CONTROL PROGRAM

- A. Program shall include the following:
  1. A written quality policy that defines and documents the objectives for and commitment to its program;
  2. The assignment of responsibility and authority to all personnel who manage, perform, and verify work effecting quality
  3. Appointment of a management representative to ensure the policy is implemented and maintained
  4. A written quality manual outlining the major areas affecting product quality, identifying the controls in place to monitor each.
  5. Operating procedures which detail the specific steps necessary to comply with customer requirements
  6. Recording and analysis of quality records with resulting corrective action at appropriate inspection/review points in the contract negotiations, design, fabrication, shipping, installation or servicing of equipment supplied.

B. All equipment shall be visually inspected to ASTM 2563, Standard Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts and shall meet 90% of resin manufacturer's minimum barcol hardness level in accordance with ASTM 2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

#### 1.8 WARRANTY

A. The manufacturer shall provide a full warranty for a period of 12 months after successful completion of equipment installation. If the equipment should fail during the warranty period due to a defect in the workmanship design or material, the manufacturer shall replace the affected part(s), and restore the equipment to service.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with section 16000.

B. Shipping.

1. Fabricator shall specify method of transportation.
2. Fabricator shall support vessel using proper shipping techniques.
3. Protection shall be provided by openings being sealed and flanged protected by covers of an approved, inexpensive material.
4. It shall be the responsibility of the fabricator to protect vessel from damage during shipment.
5. Chains shall not be used as a means of holding vessel in position during transportation.

C. Receiving

1. CONTRACTOR to inspect and inventory items upon delivery to site. The supplier must be notified of any damaged or missing items within 24 hours of delivery. Any damages not noted within 24 hours of delivery shall be assumed to be the responsibility of the contractor.
2. CONTRACTOR to store and safeguard equipment, material and spare parts in accordance with manufacturer's recommendation.
3. CONTRACTOR to unload, haul, and store items.
4. CONTRACTOR to pay all demurrage charges for failure to promptly unload items.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. Approved Manufacturers are as follows:

1. Plas-Tanks Industries, Inc., Hamilton, Ohio.
2. Augusta Fiberglass, Blackville, South Carolina.
3. Pre-approved Equivalent.

#### 2.2 MATERIALS OF CONSTRUCTION

A. Glass Reinforcement Materials

1. Chemical surfacing shall normally be type "C" glass veil 10 to 20 mils thick, with a silane finish and a styrene soluble binder compatible with the resin used. Synthetic, or other veils shall be used when required by the service conditions, or when recommended by the resin manufacturer.
2. Woven roving shall be type "E" glass of 24-oz./sq. yd
3. Undirectional, biaxial, triaxial or other directional reinforcements shall be identified as to purpose, quantity, mechanical properties and placement within the laminate.
4. Chopped strand mat shall be type "E" glass, 3/4 oz/sq. ft or 1-1/2 oz./sq. ft. with a silane-type finish and a styrene soluble binder compatible with the resin used.
5. Continuous filament shall be type "E" glass with a minimum yield of 450 yds/lb. with polyester compatible finish.

**B. Resins and Resin Additives**

1. The type of resin used shall be suitable for the service conditions specified on the individual vessel requisition form. Resin suitability shall be verified by the resin manufacturer and acknowledged by the fabricator.
2. Curing systems, catalysts, and promoters shall be as specified or recommended by the resin manufacturer. This information shall be included in the drawing notes for the engineer's review and record.
3. Cumene hydroperoxide, benzyl peroxide, or methyl ethyl ketone peroxide are acceptable curing systems and are to be selected by the fabricator for workability and degree of cure.
4. Dyes, pigments, fire retardant agents, or any other additives that interfere with the visual inspection of the vessel shall not be used unless specified on the engineer's drawings.
5. Thixotropic Agents may be added to the resin system to control viscosity, if recommended by the resin manufacturer. A maximum of 5% by weight of a thixotropic agent may be added. Thixotropic agent shall be Cab-O-Sil or approved equal. Thixotropes will not be used in laminates that will come in contact with any bleaching agent.
6. Ultra-Violet Light Inhibitors such as UV-9 shall be used in the exterior layer of all vessels. Two to four percent by weight shall be added to the exterior resin to protect fiberglass reinforced plastic laminates from ultra-violet light degradation.
7. Paraffin Wax shall be added to resin where air inhibition of cure could be a problem. Paraffin wax shall not be more than 8% by weight of a 5% dispersion in styrene. Wax shall be a commercial grade of paraffin having a melting point of 52°-55° C.

**C. Laminate Construction**

1. Filament-Wound Laminate Construction
2. Inner Surface shall be 0.010" to 0.020" thick reinforced with type "C" glass, or synthetic surfacing veil, depending on the tank service conditions and the recommendations of the resin manufacturer. The amount of reinforcement required to prevent cracking in the resin-rich surface shall be between 10% to 20% as determined by the fabricator.
3. Interior Layer shall be fabricated from a minimum of two layers of type "E" glass chopped strand mat 1-1/2 oz. to 2 oz./sq. ft. per layer or four layers of 3/4 oz./sq. ft. mat
4. Structural Layer shall be made in accordance with ASTM D3299, Standard Specification for Filament-Wound Glass-Fiber-Reinforced or ASMT D40977 Standard Specification for Contact Molded Thermoset Resin Corrosion-Resistant Vessels. Before applying filament structural layer to corrosion barrier, apply resin and chopped strand glass to the exterior of the corrosion barrier to insure filament adhesion, and intersperse between subsequent cycles.

5. Structural laminate shall consist of continuous filament applied in a controlled uniform pattern at a specified helix angle. Winding pattern shall produce a dense laminate with minimum air entrapment and no bridging of filament during tank winding. Equal and constant pressure shall be applied to each glass filament during tank winding. Glass content of structural portion shall be 60% - 65% by weight.
6. Final Resin Gel Coat shall be applied to the exterior surface of structural filament winding. Gel coat shall contain 8% by weight of a 5% dispersion of paraffin wax in styrene to prevent air inhibition of the resin cure. This wax shall be a commercial grade having a melting point of 52° - 55° C.
7. Deviations from this specification complete with detailed design data and calculations must be submitted to the engineer for approval prior to fabrication.

## 2.3 MATERIALS OF CONSTRUCTION FOR SODIUM HYPOCHLORITE VESSEL

- A. Glass shall be constructed of filament-wound reinforced thermoset plastic composite materials in accordance with ASME RTP-1 and be manufactured from a certified RTP-1 manufacturer.
- B. Tank construction shall consist of:
  1. An interior surface or corrosion barrier, which is exposed to the chemical environment, and is made up of two ply 'C' glass surface veil, saturated with **brominated vinylester** resin, and **cured with a BPO/DMA** cure system containing a minimum 55% active benzoyl peroxide. This surface shall be 0.02" to 0.03" thick and shall contain a minimum 80% resin by weight.
  2. An interior layer consisting of 0.10" thick layer of mechanically applied chopped strands, saturated with the same brominated vinylester resin as above and cured with the same BPO/DMA cure system. Minimum resin content of this layer shall be 65% by weight.
  3. A structural layer consisting of continuous filament windings made of 'E' grade fiberglass, saturated with the same brominated vinylester resin as above, cured with any system approved by the resin manufacturer. Minimum glass content of this layer shall be 60% by weight. Thickness of this layer shall be designed for operating conditions as specified below.
  4. The exterior surface shall be pigmented white. This surface treatment is provided to prevent ultraviolet degradation of the NaOCl solution stored within the vessels.
  5. Continuous filament shall be type "E" glass with a minimum yield of 450 yds/lb. with polyester compatible finish.
- C. Resins and Resin Additives
  1. The type of resin used shall be suitable for the service conditions specified on the individual vessel requisition form. Resin suitability shall be verified by the resin manufacturer and acknowledged by the fabricator.
  2. Resin to be used in the fabrication of sodium hypochlorite vessels shall be Hetron® 992 FR brominated vinylester resin, or approved equal.
  3. Curing systems, catalysts, and promoters shall be as specified or recommended by the resin manufacturer. This information shall be included in the drawing notes for the engineer's review and record.

## 2.4 FABRICATOR DESIGN

- A. The fabricator shall perform all calculations necessary to ensure the integrity of the vessel, and proper functioning of the associated components at the stated design temperature, concentrations, and pressure. These calculations shall be in sufficient order and detail to facilitate review by the engineer. No fabrication will start on vessels without the engineer's approval of all calculations.
- B. Design calculations shall be based on the laminate physical properties listed as follows (latest edition): ASTM-D-638 Standard Test Method for Tensile Properties of Plastics;
  - 1. ASTM-D-695 Standard Test Method for Compressive Properties of Rigid Plastics;
  - 2. ASTM-D-790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials;
  - 3. Or test data furnished by the fabricator
- C. Vessels shall be designed using a safety factor of 10:1 for pressure conditions, 5:1 for vacuum and periodic loads and 2:1 for tie down, lifting devices or one-time test loads.
- D. Design calculations shall take into account the following:
  - 1. External pressure loading
  - 2. Internal pressure loading
  - 3. Wind loads per Uniform Building Code, latest edition
  - 4. Seismic loads per Uniform Building Code, latest edition
  - 5. Snow loads
  - 6. Personnel loading on vessel tops
  - 7. Local stresses at tie downs and at the horn of saddle supports on horizontal vessels
  - 8. Live loads, such as those induced by agitation.

## 2.5 FABRICATION

- A. Vessel shell shall be fabricated in accordance with ASTM D3299 or ASTM D4097.
- B. Vessels shall be fabricated with bottom and side shell integrally molded with no joint within 4 ft. of the vessel bottom.
- C. Bottom head corner or knuckle radius shall have a minimum radius of 1-1/2". The bottom radius area shall be reinforced to meet increased stress. Reinforcement thickness shall be the combined thickness of the vessel wall and bottom, and shall extend at least 4" up the side wall of vessels 2' AFF to 4' AFF and 12" up the side wall for vessels 4'- 6" AFF or greater.
- D. The vessel top head, regardless of shape, shall be designed to support a 250 lb. load on a 4" x 4" area. The maximum deflection shall be 0.5% of the shell diameter.
- E. Vessels located outside shall be UV resistant.

## 2.6 FABRICATION FOR SODIUM HYPOCHLORITE VESSEL

- A. Vessel shell shall be fabricated in accordance with ASME RTP-1.
- B. Vessels shall be fabricated with bottom and side shell integrally molded with no joint within 4 ft. of the vessel bottom.

- C. Vessels shall be vertical, cylindrical, flat-bottomed, with the bottom integrally molded with the sidewall, all in one piece and at the same time. In other words, there shall be no attachment seam in the bottom sidewall whatsoever.
- D. There shall be no structural sidewall seam within 20 feet of the bottom elevation.
- E. Vessels shall be ASME dome top with knuckle radius equal to 6% of the dome radius. Dome radius shall equal the vessel diameter.
- F. Bottom head corner or knuckle radius shall have a minimum radius of 2". The bottom radius area shall be reinforced to meet increased stress. Reinforcement thickness shall be the combined thickness of the vessel wall and bottom, and shall extend at least 4" up the side wall of vessels 2' AFF to 4' AFF and 12" up the side wall for vessels 4'- 6" AFF or greater.
- G. The vessel top head, regardless of shape, shall be designed to support a 250 lb. load on a 4" x 4" area. The maximum deflection shall be 0.5% of the shell diameter.
- H. Vessels located outside shall be UV resistant

## 2.7 NOZZLES

- A. Flanges shall be full and flat-faced fiberglass. The flange face shall be perpendicular to the axis of the nozzle within 1/2° and shall be flat to .06" for nozzles up to 6", .09" for nozzles 8" - 16", .12" for nozzles 18" and over and .25" for manways.
- B. Flange face and bolting shall correspond to ANSI Standard B 16.5 for 150#, steel flanges. All flange thickness shall be specified by fabricator for approval by the engineer. All bolt holes shall straddle vessel natural centerlines. All flanges shall be fabricated using the same chemical resistant resins throughout as used to fabricate shell and heads.
- C. Fittings, nozzles, or internal equipment shall not be fabricated using filament wound construction.
- D. All nozzles up to 4" shall be conically or plate gussetted.
- E. All gussets shall be attached to the flange of flanged fittings, not merely to the neck.
- F. Nozzle cutouts shall be saved and given to the engineer upon inspection of the vessel for verification of thickness. Failure to comply with this will be sufficient cause for rejection of the equipment. After inspection by the engineer, cutouts will be labeled and saved for one (1) year from date of manufacture.

## 2.8 MANWAY REINFORCEMENT

- A. As required by ASTM standards, areas surrounding manways and fittings shall be reinforced.

## 2.9 WELDS

- A. Fabricator's shop drawings shall locate all longitudinal and circumferential welds.

- B. Shell welds shall be reinforced with an overlay of fiberglass with the same resin as the shell. Weld shall extend on both sides of the joint. The exterior weld shall start with two layers of mat and the remaining build-up shall consist of alternate layers of 1-1/2 oz. mat and 24 oz. woven roving. Thickness shall be equal to the contact molded structural thickness required for that portion of the vessel wall where the weld is being made.
- C. Minimum ply width shall be 3". Each successive layer shall extend 1/2" on each side of the preceding layer. The internal overlay shall be equal to the corrosion barrier.
- D. All cut edges shall be resin coated.

2.10 Hold Down Lugs / Lifting Channels

- A. Vessels shall have suitable lifting channels and tie down lugs for handling and anchoring the vessel in place. Tie down lugs and channels shall be fabricated from 304 stainless steel

2.11 Top Flanges

- A. Vessels shall include a flange at the top of the tank for attachment of an ultrasonic level detector.

2.12 TANK SCHEDULE

- A. Bulk Storage Tank Schedule:

Tank Number	1	2	3
Tank Size (Gallons)	12,000	3,000	8,000
Orientation	Vertical	Vertical	Vertical
Top	Dished	Dished	Dished
Bottom	Flat	Flat	Flat
Location	Outside	Inside	Inside
Tank Diameter	12'	6'-6"	10'-0"
Tank Height	14'-6"	13'-6"	14'-0"
Chemicals Contained	Sodium Hypochlorite	Orthophosphate (Blended Zinc Orthophosphate)	Fluoride

- B. Day Storage Tank Schedule:

Tank Number	4	5
Tank Size (Gallons)	60	150
Orientation	Vertical	Vertical
Top	Dished	Dished
Bottom	Flat	Flat
Location	Inside	Inside
Tank Diameter	26"	34"
Tank Height	41"	62"
Chemicals Contained	Orthophosphate	Fluoride

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install tanks per manufacturer's printed instructions and templates.

### 3.2 FIELD SERVICE

- A. Per manufacturer's instructions.

### 3.3 ACCEPTANCE TESTS

- A. Make all adjustments necessary to provide for proper operation and full functionality.

END OF SECTION 112220

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## SECTION 112230 – CHEMICAL FEED PUMPS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This section includes the following equipment:
  - 1. Two (2) separate dualplex chemical feed pump skids. Each designed specifically for the intended chemical application: One (1) for Fluoride, and One (1) for Orthophosphate.
  - 2. One (1) separate triplex chemical feed skid. Designed specifically for the intended chemical application: Sodium Hypochlorite.
- B. Related Sections include the following:
  - 1. Division 3 Section “Cast-In-Place Concrete”
  - 2. Division 5 Section “Metal Fabrications”

#### 1.3 GENERAL

- A. Pumps shall be positive displacement peristaltic type complete with spring-loaded pumphead, self-contained variable speed drive, and flexible extruded tube as specified.
- B. Peristaltic pumping action is created by the compression of the flexible tube between the pump head rollers and track, induced forward fluid displacement within the tube by the rotation of the pump rotor, and subsequent vacuum-creating restitution of the tube.
- C. Pumps shall be dry self-priming, capable of being run dry without damaging effects to pump or tube, and shall have a maximum suction lift capability of up to 30' vertical water column. Maximum pressure rating: 100 psi.
- D. Pump shall not require the use of check valves or diaphragms and shall not require dynamic seals in contact with the pumped fluid. Process fluid shall be contained within pump tubing and shall not directly contact any rotary or metallic components.
- E. Flow shall be in the direction of the rotor rotation, which can be reversed and shall be proportional to rotor speed.

#### 1.4 QUALITY ASSURANCE

- A. This specification is the basis for design of peristaltic metering pumps. All pumps, whether named as an acceptable supplier or submitted, as an equal must, at a minimum, meet the following critical design requirements.
- B. To maximize pump efficiency and minimize tube fatigue that will impact life, performance, and accuracy, pumps must be designed not to exceed the specified P/10 ratio (Theoretical maximum

number of occlusions per 10 gallons pumped). Pumps exceeding the specified P/10 ratio, will not be considered suitable for the duty condition. The following criteria is set to maintain the P/10 ratio for the tube size specified for this application:

1. Maximum two compressing rollers for two compressions per revolution.
2. Tube wall thickness of 2.4 mm and material specified
3. Large diameter spring-loaded roller set for 2.4mm wall thickness tubing
4. Max base drive speed of 220 RPM for 2.4mm wall thickness tubing.

5. Track geometry of no less than 180 degrees and rotor geometry with roller degrees apart.

180

C. P/10 ratio shall not exceed the following per tube size:

<u>Tube Size</u>	<u>P/10 ratio</u>
3.2mm x 2.4mm (520REH Element)	37,038
3.2mm x 2.4mm (520REL & 520REM Elements)	45,456
6.4mm x 2.4mm (520REL & 520REM Elements)	11,112
9.6mm x 2.4mm (520REL Element)	5,000

D. For quality assurance, all pump elements must be manufactured by the pump manufacturer in accordance with their specifications. Elements not manufactured by the pump manufacturer will not be acceptable.

E. Drive and pumpheads shall be 24 hr continuous duty rated and have a five-year manufacturer's warranty from date of shipment.

F. Pumps to be manufacturer's standard product. Manufacturer of tubing pumps must have at least 20 operating installations in domestic water or wastewater treatment plants located in the United States over a period of at least seven years pumping the same fluid as specified.

G. Pumps must be manufactured under ISO 9001-2000.

H. Pumps shall be meet all applicable CE and C ETL US standards per UL610101A.

## 1.5 SUBMITTALS

A. Submit the Following:

1. Certified shop drawings
2. Characteristic performance curve showing flow rate as a function of RPM and pressure.
3. Dimensional drawings
4. Operating and maintenance instructions
5. P/10 ratio calculation

## 1.6 DELIVERY STORAGE AND HANDLING

A. Shipping

1. Ship pump and drive assembled complete. Ship tubing separately for field installation and process line connection by contractor.
2. Pack all additional spare parts in containers bearing labels clearly designating contents and pieces of equipment for which intended.
3. Deliver spare parts at the same time as pertaining equipment.

B. Receiving

1. Contractor to inspect and inventory items upon delivery to site.
2. Contractor to store and safeguard equipment, material, instructions, and spare parts in accordance with manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

- A. Watson Marlow, Inc.
- B. Pre-Approved Equivalent

### 2.2 PUMP PROCESS SCHEDULE

Quantity	<b>2</b>			
Tag Number(s)	<b>CP-1, CP-2</b>			
Fluid	<b>Fluoride, and Orthophosphate</b>			
Tubing Material	<b>Marprene II</b>			
Max – Min Capacity (GPH)	<b>0.10 GPH to 48.0 GPH</b>			
Max Pump RPM for Application				
Tubing ID * <b>9.6mm</b>	3.2mm (520REH Element)	3.2mm (520REL & 520REM Element)	6.4mm (520REL & 520REM Element)	9.6mm (520REL Element)
Displacement /Revolution (Gallons)	0.0005	0.0004	0.0018	0.004
Displacement /Revolution (Milliliters)	2.05	1.68	6.82	15.0
P10 Ratio (Theoretical Maximum Number of Occlusions/10 Gallons Pumped)	37,038	45,456	11,112	5,000
Min Flow Rate (GPH)	0.003	0.002	0.011	0.024
Max Flow Rate (GPH)	6.6	5.28	23.76	52.8
Min Flow Rate (MI/Min)	0.2	0.17	0.7	1.50
Max Flow Rate (MI/Min)	450	370	1500	3300
Max Discharge Pressure (PSI)	100	60	60	30
Suction Head				
Power (VAC, Frequency, Phase)	<b>115VAC, 60 Hz, 1 Phase</b>			

Quantity	<b>3</b>			
Tag Number(s)	<b>CP-3</b>			
Fluid	<b>Commercial Bleach</b>			
Tubing Material	<b>Marprene II</b>			
Max – Min Capacity (GPH)	<b>0.10 GPH to 48.0 GPH</b>			
Max Pump RPM for Application				
Tubing ID * <b>9.6mm</b>	3.2mm (520REH Element)	3.2mm (520REL & 520REM Element)	6.4mm (520REL & 520REM Element)	9.6mm (520REL Element)
Displacement /Revolution (Gallons)	0.0005	0.0004	0.0018	0.004
Displacement /Revolution (Milliliters)	2.05	1.68	6.82	15.0
P10 Ratio (Theoretical Maximum Number of Occlusions/10 Gallons Pumped)	37,038	45,456	11,112	5,000
Min Flow Rate (GPH)	0.003	0.002	0.011	0.024
Max Flow Rate (GPH)	6.6	5.28	23.76	52.8
Min Flow Rate (MI/Min)	0.2	0.17	0.7	1.50
Max Flow Rate (MI/Min)	450	370	1500	3300
Max Discharge Pressure (PSI)	100	60	60	30
Suction Head				
Power (VAC, Frequency, Phase)	<b>115VAC, 60 Hz, 1 Phase</b>			

## 2.3 PUMP CONSTRUCTION

### A. Pumphead

1. Pumphead shall consist of a fixed track, a hinged guard door, and spring-loaded roller rotor assembly. Pump tubing shall be in contact with the inside diameter of the track through an angle of 180 degrees. At all times, one roller shall be fully engaged with the tubing providing complete compression and preventing back flow or siphoning. Tube occlusion and spring tension shall be factory set to accommodate 2.4mm wall thickness tubing and shall not require adjustment.
2. Pumphead guard shall be transparent for the purpose of viewing direction of rotation. When closed, the pump head guard shall seal against the pump track for leak containment and controlled waste through the pump head waste port in the event of a tube failure. For operator and environmental safety, pumps in which the direction of rotation cannot be visually verified and/or do not have a controlled waste port are not acceptable.
  - a. Pumphead Assembly
    - 1) Pump Track Geometry must have a minimum 96.6mm swept diameter through a minimum track angle of 180 degrees
    - 2) Provide high corrosion/impact materials as specified
      - a) Track Construction: polyphenylene sulfide (PPS)
      - b) Guard Construction: hinged impact-resistant polycarbonate breakaway guard, tool un-lockable for operator safety.

- c) Rotor Construction: polyphenylene sulfide (PPS)
- b. Rotor Assembly
  - 1) Provide rotor assembly that ensures gradual tube occlusion and compensates for tube tolerance:
    - a) Twin spring-loaded roller arms located 180 degrees apart, each fitted with stainless steel helical springs and compressing roller for occlusion of the tube twice per rotor revolution
      - 1) Compressing Rollers: 316SS with low friction stainless steel bearings and PTFE seals, minimum diameter of 18mm
    - b) Provide non-compressing guide rollers constructed of corrosion resistant Nylatron
    - c) Clutch: Equip rotor with a central handgrip hub and manually activated clutch to disengage the rotor from the drive for manual rotor rotation during tube loading. Clutch shall automatically reengage rotor to gear box upon one complete revolution.
    - d) Mounting: To prevent slip, the rotor assembly shall be axially secured to the dogged output shaft of the gearmotor via a slotted collet and central retaining screw.
    - e) Pumpheads requiring disassembly or special tools for tube changing are not acceptable.

#### B. Tubing

1. Pump shall be supplied with a Load Sure tubing element with molded fittings, which shall be self-locating when fitted into the pump head. Tube element shall be in contact with the inside diameter of the track (housing) through an angle of 180 degrees and be held in place on the suction and discharge by the element fittings. The tubing shall be replaceable without the use of tools and with no disassembly of the pump head. To achieve maximum service life, pump heads with a track angle of less than 180 degrees and/or without tube elements are not acceptable.
2. Load Sure Element shall be constructed with either Marprene or Sta-Pure tubing with male PVDF Quick Release Connectors.
3. Supply One (1) tube element of the specified size per pump.
4. Supply Two (2) one-meter long flexible reinforced PVC hoses for connection of pump to suction and discharge process lines. Flexible hose shall have a PVDF female Quick Release fitting for connection to the Loadsure Element and male Quick Release fitting for connection to NPT adaptor with built in shut off valve for ease of maintenance and connection to process lines.
5. Supply Two (2) Quick Release to  $\frac{1}{2}$ " NPT Adaptors..

#### C. Drive

1. Rating: Continuous 24 hour operation, 40° C ambient.
2. Supply: 110-120V 50/60 Hz and 220-240V 50/60 Hz, 1-Phase field switchable. Supply nine-foot length mains power cord with standard 115V three-prong plug.
3. Max drive power consumption: 135VA.
4. Enclosure: NEMA 4X
5. Housing: Pressure cast aluminum with Alocrom pre-treatment and exterior grade corrosion resistant polyester powder coat. By nature of the environmental conditions, unpainted housings, including 316SS, are not acceptable.
6. Pumps must meet the following minimum requirements for operator interface functionality. Pumps not meeting this minimum functionality will not be accepted.

- a. Backlit graphical LCD capable of up to four lines of text with up to 16 characters per line to display pump speed, running status, flow rate, and programming instructions
- b. Keypad for start, stop, speed increment, speed decrement, forward/reverse direction, rapid prime, and programming.
- c. Menu driven on screen programming of manual or auto control, flow and remote signal calibration, and general programming.
- d. Programmable “Auto Restart” feature to resume pump status in the event of power outage interruption.
- e. Programmable “Keypad Lock” to allow operator lockout of all keys except emergency start/stop.
- f. Programmable “Maximum Speed” to allow operator to set the maximum speed of the pump within 0.1-220 rpm.
- 7. Supply auto control features to meet the following minimum functionality requirements for use with the SCADA system. All control signal features must be located internally to the pump. Pumps not meeting this minimum functionality or that require additional external control boxes are not acceptable.

a. Remote Control Inputs

- 1. Speed Control:
  - a) Primary Analog 4-20mA or 0-10VDC speed input, with input signal trimmable and speed scaleable over any part of the drive speed range.
  - b) Secondary Analog 4-20mA or 0-10VDC scaling input, with input signal trimmable and programmable scaling factor.
  - c) Provisions for alternative remote accessory potentiometer (if supplied by others) for primary speed control or secondary speed scaling.
- 2. Start/Stop Control: via 120 VAC input- Configurable command sense allowing open to equal run or open to equal stopped.
- 3. Forward/Reverse Control: via 120 VAC input
- 4. Auto/Man Mode Control: via 120 VAC input
  - 5. Leak Detector Run/Stop Control: via 5V TTL, 24V industrial logic, or dry contact

b. Status Outputs

- 1. Four relay contacts rated for a max. current of 2A at 120V, NO or NC software configurable to indicate the following:
  - a) Running/Stopped status
  - b) Forward/Reverse status
  - c) Auto/Manual status
  - d) General Alarm status
  - e) Leak Detected status
- 2. Speed output – Analog 4-20mA or 0-10 VDC

c. Accepts RS485 data protocol

d. Termination: supply screw down terminals suitable for up to 18 AWG field wire and accessible through four glanded cable entry points on the pump

- 8. Drive motor- brushless DC motor with integral gearbox and tachometer feedback.
- a. Speed Control Range of 2200:1 from 0.1 to 220 rpm +/- 0.1 rpm throughout the range.
- b. Closed loop microprocessor controlled drive with pulse width modulation at speeds above 35 rpm and synchronous mode with magnetic field rotation control below 35 rpm
- c. Circuitry complete with temperature and load compensation and protection.
- 9. Mounting: Drive shall be self-supporting and shall not require anchoring.

10. **Leak Detection**- Pump manufacturer shall supply float-type leak sensor mounted to the drain port of the pump head for leak detection and pump shut down in the event of a tubing failure.

**D. Spares**

1. Supply one spare pumphead assembly with rotor.
2. Supply (4) tube elements of the specified size per pump

## 2.4 METERING PUMP SKID ASSEMBLY

A. Each pump shall have the ability to function as an isolated pump (i.e., independent of piping and operation of the other pump mounted on the skid assembly) and shall be able to pump to all chemical feed points as shown on the drawings.

B. Pumps shall be provided as skid mounted chemical metering pump systems complete with the skid assembly containing chemical metering pumps, all necessary piping, valves, fittings, supports, and accessories as specified herein. The metering pump skid shall contain the following items:

1. Skid
2. Metering pumps
3. Pump motors
4. Calibration columns
5. Pressure gauges with diaphragm seals
6. Isolation valves
7. Pressure relief valves
8. Controls
9. All piping, valves, gaskets, supports, hardware, and accessories necessary for a fully functioning skid. Piping shall be terminated within 2 inches from the edge of skid.

C. Each chemical feed system shall be completely assembled by skid manufacturer, mounted, calibrated, tested, and delivered to the site on a single skid. Components to be mounted on the skid shall include, but not be limited to, the metering pumps, calibration column, piping, valves, and piping accessories integral to the skid. The chemical feed system supplier shall be responsible for providing all equipment, valves and piping within the skid boundary.

D. Chemical feed skids shall be Co-Polymer Polypropylene as specified below. All components of the chemical metering system shall be contained within the skid.

1. Co-Polymer Polypropylene Skids shall be fabricated out of euro-grey colored polypropylene sheet stock. Skids shall consist of a 3/4" thick back plate and a 1/2" thick base, shelves, and side braces. The skid shall be assembled using thermal welding technology with triangular welding rod. The skid shall be constructed to maintain a 2" containment lip completely around the surface in which the pump(s) sits. The skid shall be constructed with forklift slots. Metallic skids including those that are painted or coated are not acceptable.

E. The wetted end of each pump shall be oriented at the open end of the framework for easy access. All pumps shall be arranged with the pump wet end facing the open end of the feed

system. Where local control panels will be located on the skid, all panels shall be mounted so that the control interface faces the top or front end of the skid.

- F. All components of the skid mounted system (pumps, piping and controls) shall be factory pressure tested with air prior to shipment. Certification of factory testing shall be submitted to the Engineer and included in the Operations and Maintenance Manuals.
- G. All metering pump accessories shall have pressure ratings equal to or greater than the discharge pressure of the associated metering pumps.
- H. Unless otherwise specified herein, all accessories shall be manufactured of the same materials as the piping for each chemical as specified in Section 40 06 20, Schedules.
- I. All wiring within the skid boundaries shall be performed by the contractor.

**J. Calibration Chamber:** Provide one clear PVC calibration chamber with vent for use in calibrating the metering pumps with each skid. The chamber shall be sized to give adequate capacity for a minimum 30 second draw down test at maximum pump capacity. The scale shall give direct readings in GPH without the need for calculations. The top of the chamber shall be piped to a common vent on the skid.

**K. Pressure Gauges -** Gauges shall be provided on the discharge of metering pumps as shown in the Drawings. Gauges shall be as specified in Section 40 91 19.29. Each gauge shall have a range of zero to 30 psi. Each gauge shall be provided with a diaphragm seal as specified in Section 40 91 19.29 constructed of materials which are completely resistant to corrosion by the chemicals referred to in this section. Each pressure gauge shall also be provided with an isolation valve. Isolation valves shall be constructed of materials and seals that are resistant to the chemical applications.

1. Gauge assemblies shall incorporate a  $\frac{1}{2}$ " threaded connection on the liquid side of the gauge isolator.

**L. Pressure Relief Valves –** Pressure relief valves shall be provided in the discharge piping of each metering pump, prior to any valves, to eliminate the buildup of excess pressure in the system. Valves shall be completely resistant to the chemicals for which they are provided. The pressure relief valves shall be fully adjustable from 10-150 psi. Relief vents shall be piped back to suction header. Pressure relief valves to be by Griffco or approved equal.

**M. Piping, Valves and Appurtenances:**

1. Furnish hard piping on the suction and discharge of each metering pump as specified in the Piping System Schedule at the end of Section 40 06 20, Schedules and as shown on the Drawings.
2. Seals shall be compatible with the chemical being pumped.
3. Valves shall be of the type shown on Drawings and in accordance with Division 15 of these specifications.
4. Feed system piping shall include an air bleed/flush connection on the suction and discharge of each pump. The bleed/flush connections should be located on the interior of the pump isolation valves to allow for all lines to be purged of air after the day tank is filled and allow the pump to be flushed prior to maintenance being performed.

5. Provide flexible piping connection and quick connects between fixed piping and suction and discharge of the pump in order to allow removal of the pump without disturbing the suction or discharge piping.
6. All piping and accessory support shall be from the skid base or rear panel. Piping and accessory support from above is not acceptable.
7. All piping and accessories shall be securely fastened to the frame or supported with stand-offs. The use of steel bands or strapping shall not be acceptable.
8. Provide transition fittings for connection of dissimilar materials or provide metering pump accessories manufactured of the same material as the piping.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install pumps per manufacturer's printed instructions and templates.
- B. Supply shielded signal wiring for wiring of the required remote input and output to the connectors.
- C. Supply fittings for connection of pump to process.
- D. Per manufacturer's instructions.

### 3.2 ACCEPTANCE TESTS

- A. Make all adjustments necessary to provide for proper operation and full functionality.

### 3.3 WARRANTY

- A. Provide 12 months of warranty from the date of substantial completion.

END OF SECTION 112230

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## SECTION 114000 – MISCELLANEOUS EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes miscellaneous equipment not covered in other portions of the specifications.

#### 1.2 SUBMITTALS

- A. Make submittals in accordance with Section 013300.

#### 1.3 DELIVERY, STORAGE AND HANDLING

- A. Handle, store and protect all materials in accordance with the manufacturer's recommendations.

### PART 2 - PRODUCTS (Not Used)

#### 2.1 CHEMICAL DAY TANK SCALES

- A. Chemical Day Tank Scales shall be provided at Fluoride and Orthophosphate day tanks.
  - 1. Each scale shall have a minimum 2,000 pound capacity with platform sized to accept a tank of the size as specified above.
  - 2. Four (4) adjustable hold down lugs shall be furnished on the platform to allow securing the vessel to the platform.
  - 3. Platform scale coating system shall be a minimum dry thickness of 80 mils and be resistant to moisture, chemicals, abrasion, impact and UV light.
  - 4. Flexible cable shall connect load cell to indicator to allow easy remote installation of the readout.
  - 5. Cable length shall be minimum 20 feet.
- B. INSTRUMENT ENCLOSURE, OUTPUTS & ALARMS
  - 1. Indicator shall carry CE marking and shall be housed in a NEMA 4X, UL approved enclosure.
  - 2. Indicator shall have a 20 key digital keypad & ability to display 2 scales at a time on a backlit alphanumeric display.
  - 3. Indicator shall have adjustable 4-20mA signals that output net weight and chemical feed rate for each scale to the existing SCADA system.
  - 4. Indicator shall display an alarm in any of the following conditions: Low level, high level, low feed rate, high feed rate, max daily use, min daily use, supply exhausted and load cell failure.
  - 5. An alarm log shall store the most recent 10 alarm conditions with time and date of occurrence.
  - 6. Up to 12 relays shall be provided for remote alarm indication or transfer pump control.
  - 7. Indicator shall be enabled with MODBUS protocol for remote RS-485 serial communications.

8. Due to their locations in the room, each scale shall be furnished with its own local indicator.

C. DISPLAY & INVENTORY CONTROL SOFTWARE

1. Keypad and Menu items shall have independent password protection to prevent unauthorized operation.
2. Both a numerical and a bar graph display shall give operator the ability to monitor chemical by weight, volume or percent full.
3. Each channel shall have a user selectable, two digit scale ID number and shall display net remaining, pure chemical remaining, feed rate, daily usage, total amount used, days until empty, gross weight and tare weight.
4. A TANK LOAD key shall pause & project usage accumulation during chemical resupply to maintain accurate usage data over multiple tank loads.
5. A data log shall store the DAILY USAGE for each of the previous 31 days.
6. Indicator re-calibration in the field shall be accomplished through the keypad and shall not require the use of dead weights.

D. WARRANTY

1. Scale shall carry a Full Five (5) Year Factory Warranty. Full scale accuracy shall be better than  $\frac{1}{4}$  of 1%. Scale shall be similar to the CHEM-SCALE® with TUF-COAT™ Environmental Armor and WIZARD 4000® digital display.

## 2.2 EMERGENCY SHOWER/SAFETY STATION

- A. Combination wide area eye/face wash and shower safety station.
- B. Four eye/face wash spray heads for complete rinsing of eyes and face in 11  $\frac{1}{2}$ " diameter stainless steel eye/face washbowl.
- C. 10" diameter ABS plastic showerhead, orange.
- D. 1" IPS chrome-plated brass stay-open ball valve with stainless steel actuating arm and 29" min. stainless steel pull rod.
- E. Schedule 40 galvanized steel pipe and fittings furnished with orange polyethylene covers for all vertical piping.
- F. ANSI-compliant identification signage included.
- G. Include hand and foot control.
- H. Manufacturers:
  1. Guardian G-1909-HFC Safety Station with Wide Area Eye/Face Wash.
  2. Or Equivalent.

## 2.3 TEPID WATER HEATER

- A. Packaged type instantaneous electric tankless water heater, complete and ready for plumbing and electrical connections.

- B. Heating Chamber – 316L Stainless Steel, maximum allowable working pressure of 150 psi. Plastic is not acceptable.
- C. Heating chamber and all electrical controls completely enclosed in a NEMA 4 enclosure suitable for wet/outdoor applications.
- D. Tankless heater shall have an Integral Factory Prewired Disconnect Switch.
- E. Tankless heater rated at 24KW which will heat 5.5 GPM at 30° temperature rise.
- F. Tankless heater designed to operate at 480 volts, three phase, 50/60 Hz balanced power, drawing a maximum of 29 amps at full power.
- G. Manufacturers:
  - 1. Hubbell ETX Tankless Heater, Model No. ETX 24 – 3 T4
  - 2. Approved Equivalent

## 2.4 LEVEL TRANSMITTERS AND ULTRASONIC TRANSDUCERS

- A. General:
  - 1. Scope -This section describes the requirements for a 4-wire, multi-functional ultrasonic level/open channel flow transmitter system.
  - 2. Basic System Description
    - a. The multi-functional level control system (level system) shall employ acoustic echo-ranging technology to determine the distance between the transducer(s) and monitored surface(s), as a basis for display, output, and digital communication.
    - b. The level/flow monitoring system shall consist of a microprocessor based level transmitter and one or two ultrasonic transducers.
    - c. The level/flow transmitter shall be operator configurable to meet specific application requirements by implementation of available signal processing and process control functions, in any allowable combination.
- B. Technical Specifications:
  - 1. Signal Processing – The level transmitter shall:
    - a. Employ ultrasonic transceiver(s) suitable for providing excitation to, and processing resultant signals from the attached ultrasonic transducer(s).
    - b. Create a digitized echo profile, and apply patented Sonic Intelligence echo processing techniques to select and verify the echo representing the reflective surface monitored.
    - c. Calculate the distance between the transducer face and reflective surface based on the echo selected. The calculated distance may be converted to represent: material level, differential level, average level, space, material volume, vessel ullage, pumped volume, or head, open channel flow rate, and/or total flow volume.
    - d. Compensate temperature-induced variation in the acoustic wave propagation velocity in air. This compensation shall be based on signals received from the ultrasonic transducer(s) and/or a TS-3 temperature sensor.
    - e. Include a calibration method and/or enable manual operator value entry, to set a fixed acoustic wave propagation velocity for transmission mediums other than air.
    - f. Include configuration and calibration ability via integral keypad with non-volatile EEPROM memory to store user-programmed configuration.

- g. Display measured variable (level/flow) on the main backlit LCD display along with associated units.
- 2. Process Control Functions - The level transmitter shall provide an assortment of process control functions that may be user implemented in any allowable combination.
  - a. Standard Process Control Functions
    - 1) 0/4–20 mA output directly / inversely proportional to level, space, flow or distance
    - 2) Level alarm(s) based on on/off setpoints
    - 3) Loss of Echo or Cable Fault alarm
    - 4) Duty assist pump operation based on fixed or alternating level setpoints
    - 5) Remote relay state control via communications
    - 6) Basic failsafe operation on measurement loss
    - 7) Discrete inputs configurable to override level transmitter I/O operations
- 3. User Interface – The level transmitter shall enable user access to read only and read/write enabled data, using any of the following methods:
  - a. Direct or scroll access to data stored in numerical parameters, using the hand programmer and graphic LCD display.
  - b. IBM PC compatible computer access to data and digital echo profiles, using the Dolphin Plus instrument configuration package.
  - c. HMI, SCADA, PLC, or DCS system access to data stored in Modbus registers via digital communications.
- 4. Detailed Specifications:
  - a. Power
    - 1) 100-230 VAC  $\pm$  15%, 50/60 Hz, 50VA or less
  - b. Enclosures
    - 1) Polycarbonate/Polyester, Indoor/Outdoor
    - 2) NEMA 4X / IP 65
  - c. Ambient Temperature
    - 1) -20 to 50°C (-5 to 122°F)
  - d. Display
    - 1) Back lit LCD, multi-line display
  - e. Process Control I/O – The level transmitter shall provide:
    - 1) One (1) 4-20mA HART analog signal output, directly or inversely proportional and scalable to the configured process variables, (dependent upon the transmitter model), capable of driving a 750 ohm load.
    - 2) A minimum of three (3) form C relays with contact outputs based on the level conversion or other process variable as set by the Relay Function and other user configurable relay parameters.
    - 3) Two discrete inputs that may be configured to override normal Process Control Functions.
    - 4) One (1) 4-20mA input (model dependant) that may be scaled to a monitored process variable, to be used
  - f. Ranges: As directed by Civil Engineer.
- 5. Accessories:
  - a. Stainless steel mounting bracket/hardware as recommended by manufacturer.
- 6. Spare Parts:
  - a. Provide one (1) spare transducer of each type furnished with manufacturers cable length to match longest length furnished within project.
- 7. Execution:

- a. Maintain minimum separation between transducer and maximum process material level as recommended by manufacturer.
- b. Mount transducer to ensure a clear path from the transducer to the process material surface.
- c. Where required by the application, provide submergence shield for the transducer(s).

C. Manufacturer / Model

- 1. Siemens Milltronics – HydroRanger 200

## 2.5 SIGNAGE AND FIRST AID KITS

- 1. Signage and First Aid Kits will be located and selected by the Owner near the end of construction.
- 2. Contractor shall furnish all stainless steel hardware and shall wall-mount or post-mount all signs/kits as required.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install all equipment in accordance with manufacturer's written directions.

### 3.2 WARRANTY

- A. All Equipment shall be warrantied for one year from the date of substantial completion or 18 months from the date of installation, whichever occurs first.

END OF SECTION 114000

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## SECTION 131250 - METAL BUILDING SYSTEMS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Structural-steel framing.
2. Metal roof panels.
3. Metal wall panels.
4. Metal soffit panels.
5. Thermal insulation.
6. Doors and frames.
7. Windows.
8. Accessories.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.

B. Shop Drawings: For metal building system components. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Metal Building System Certificates: For each type of metal building system, from manufacturer.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
  - a. Name and location of Project.
  - b. Order number.
  - c. Name of manufacturer.
  - d. Name of Contractor.
  - e. Building dimensions including width, length, height, and roof slope.

- f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
- g. Governing building code and year of edition.
- h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
- i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
- j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
- k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

- C. Material test reports.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Warranties: Sample of special warranties.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer **and member of MBMA**.
  - 1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.
  - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.

- E. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- F. Preinstallation Conference: Conduct conference at **Project site**.

## 1.6 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Finish Warranty Period: **20** years from date of Substantial Completion.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
  - 1. Warranty Period: **20** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, **available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** or comparable product by one of the following:
  - 1. A&S Building Systems, Inc.; Division of NCI Building Systems, L.P.
  - 2. Alliance Steel, Inc.
  - 3. American Buildings Company; Division of Magnatrax Corp.
  - 4. American Steel Building Co., Inc.
  - 5. BC Steel Buildings, Inc.
  - 6. Behlen Mfg. Co.
  - 7. Bigbee Steel Buildings, Inc.
  - 8. Butler Manufacturing Company; a BlueScope Steel company.
  - 9. CBC Steel Buildings; Division of Magnatrax Corp.
  - 10. Ceco Building Systems; Division of NCI Building Systems, L.P.
  - 11. Chief Buildings; Division of Chief Industries, Inc.
  - 12. Elite Structures, Inc.
  - 13. Garco Building Systems; Division of NCI Building Systems, L.P.
  - 14. Gulf States Manufacturers, Inc.; Division of Magnatrax Corp.
  - 15. Inland Buildings; Subsidiary of Behlen Mfg. Co.
  - 16. Kirby Building Systems; Division of Magnatrax Corp.
  - 17. Mesco Building Solutions; Division of NCI Building Systems, L.P.

18. Metallic Building Company; Division of NCI Building Systems, L.P.
19. Metco Metal Supply.
20. Mid-West Steel Building Company; Division of NCI Building Systems, L.P.
21. Nucor Building Systems.
22. Pinnacle Structures, Inc.
23. Robertson Building Systems; an NCI company.
24. Ruffin Building Systems, Inc.
25. Schulte Building Systems, LLP.
26. Spirco Manufacturing.
27. Star Building Systems; an NCI company.
28. Tyler Building Systems, L.P.
29. USA, Inc.
30. VP Buildings; a United Dominion company.
31. Vulcan Steel Structures, Inc.
32. Whirlwind Building Systems.
33. <Insert manufacturer's name>.

## 2.2 METAL BUILDING SYSTEM PERFORMANCE

- A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Metal building systems shall be designed according to procedures in MBMA's "Metal Building Systems Manual."
  1. Design Loads: As indicated on Drawings.
  2. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:
    - a. Purlins and Rafters: Vertical deflection of **1/180** of the span.
    - b. Girts: Horizontal deflection of **1/240** of the span.
    - c. Metal Roof Panels: Vertical deflection of **1/180** of the span.
    - d. Metal Wall Panels: Horizontal deflection of **1/240** of the span.
    - e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
  3. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:
    - a. Lateral Drift: Maximum of **1/200** of the building height.
  4. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.
- C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7>**.

D. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): **120 deg F (67 deg C), ambient; 180 deg F (100 deg C)** material surfaces.

E. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** of roof area when tested according to ASTM E 1680 at negative test-pressure difference of **1.57 lbf/sq. ft. (75 Pa)**.

F. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** of wall area when tested according to ASTM E 283 at static-air-pressure difference of **1.57 lbf/sq. ft. (75 Pa)**.

G. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of **2.86 lbf/sq. ft. (137 Pa)**.

H. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a wind-load design pressure of not less than **2.86 lbf/sq. ft. (137 Pa)**.

I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for **Class 60**.

J. Solar Reflectance Index: Not less than **78** when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

K. Energy Performance: Provide roof panels that are listed on the DOE's ENERGY STAR Roof Products Qualified Product List for **steep-slope** roof products.

L. Energy Performance: Provide roof panels with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC.

## 2.3 STRUCTURAL-STEEL FRAMING

A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly.
2. Frame Configuration: **Single gable**.
3. Exterior Column Type: **Tapered**.
4. Rafter Type: **Tapered**.

- B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly.
- C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating.
- D. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide zinc-plated or hot-dip galvanized bolts for structural-framing components that are galvanized.
- E. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.

## 2.4 METAL ROOF PANELS

- A. **Vertical-Rib, Trapezoidal-Rib, Standing-Seam Metal Roof Panels:** Formed with ribs at panel edges and **flat pan** between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
  - 1. Material: **Aluminum-zinc alloy-coated** steel sheet, [0.022-inch (0.56-mm)] [0.028-inch (0.71-mm)] [0.034-inch (0.86-mm)] nominal thickness.
    - a. Exterior Finish: [Two-coat fluoropolymer] [Three-coat fluoropolymer] [Siliconized polyester].
    - b. Color: [As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>.
  - 2. Clips: Manufacturer's standard, [fixed type] [floating type to accommodate thermal movement]; fabricated from [zinc-coated (galvanized) steel] [aluminum-zinc alloy-coated steel] [stainless-steel] [zinc-coated (galvanized) steel, aluminum-zinc alloy-coated steel, or stainless-steel] sheet.
  - 3. Joint Type: Panels snapped together.
  - 4. Joint Type: Mechanically seamed, [single folded] [double folded] [folded according to manufacturer's standard].
  - 5. Panel Coverage: [16 inches (406 mm)] <Insert dimension>.
  - 6. Panel Height: 2 inches (51 mm).
  - 7. Uplift Rating: [UL 30] [UL 60] [UL 90].
- B. Tapered-Rib-Profile, Lap-Seam Metal Roof Panels <Insert drawing designation>: Formed with raised, trapezoidal major ribs and [intermediate stiffening ribs symmetrically spaced] [**flat pan**] between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
  - 1. Material: [Zinc-coated (galvanized)] [Aluminum-zinc alloy-coated] steel sheet, [0.022-inch (0.56-mm)] [0.028-inch (0.71-mm)] [0.034-inch (0.86-mm)] nominal thickness.

- a. Exterior Finish: [Two-coat fluoropolymer] [Three-coat fluoropolymer] [Siliconized polyester].
- b. Color: [As indicated by manufacturer's designations] [As selected by Architect from manufacturer's full range] <Insert color>.

2. Major-Rib Spacing: [6 inches (152 mm)] [12 inches (305 mm)] <Insert dimension> o.c.
3. Panel Coverage: [36 inches (914 mm)] <Insert dimension>.
4. Panel Height: [0.75 inch (19 mm)] [1.125 inches (29 mm)] [1.188 inches (30 mm)] [1.25 inches (32 mm)] [1.5 inches (38 mm)] <Insert dimension>.

## 2.5 METAL WALL PANELS

A. [Tapered-Rib-Profile,] [Reverse-Rib-Profile,] Exposed-Fastener Metal Wall Panels <Insert drawing designation>: Formed with raised, trapezoidal major ribs and [intermediate stiffening ribs symmetrically spaced] [flat pan] between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: [Zinc-coated (galvanized)] [Aluminum-zinc alloy-coated] steel sheet, [0.022-inch (0.56-mm)] [0.028-inch (0.71-mm)] [0.034-inch (0.86-mm)] nominal thickness.
  - a. Exterior Finish: **Three-coat fluoropolymer**.
  - b. Color: **As indicated by manufacturer's designations**.
2. Major-Rib Spacing: **12 inches (305 mm)** o.c.
3. Panel Coverage: **36 inches (914 mm)**.
4. Panel Height: **1.25 inches (32 mm)**.

## 2.6 METAL SOFFIT PANELS

A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners **and factory-applied sealant** in side laps. Include accessories required for weathertight installation.

B. Metal Soffit Panels: Match profile and material of metal **roof** panels.

1. Finish: **Match finish and color of metal roof panels**.

## 2.7 THERMAL INSULATION

A. Faced Metal Building Insulation: ASTM C 991, Type II, glass-fiber-blanket insulation; **0.5-lb/cu. ft. (8-kg/cu. m)** density; **2-inch- (51-mm-)** wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

B. Unfaced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation; **0.5-lb/cu. ft. (8-kg/cu. m)** density; **2-inch- (51-mm-)** wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

1. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than **0.02 perm (1.15 ng/Pa x s x sq. m)** when tested according to ASTM E 96/E 96M, Desiccant Method.

## 2.8 DOORS AND FRAMES

A. Swinging Personnel Doors and Frames: Metal building system manufacturer's standard doors and frames; prepared and reinforced at strike and at hinges to receive factory- and field-applied hardware according to BHMA A156 Series.

1. Hardware:
  - a. Provide hardware for each door leaf, as follows:
    - 1) Hinges: BHMA A156.1. Three **[plain] [antifriction]**-bearing, standard-weight, full-mortise, stainless-steel or bronze, template-type hinges; **4-1/2 by 4-1/2 inches (114 by 114 mm)**, with nonremovable pin.
    - 2) Lockset: BHMA A156.2. **Key-in-lever cylindrical** type.
    - 3) Exit Device: BHMA A156.3. Touch- or push-bar type.
    - 4) Threshold: BHMA A156.21. Extruded aluminum.
    - 5) Silencers: Pneumatic rubber; three silencers on strike jambs of single door frames and two silencers on heads of double door frames.
    - 6) Closer: BHMA A156.4. Surface-applied, standard-duty hydraulic type.
    - 7) Weather Stripping: Vinyl applied to head and jambs, with vinyl sweep at sill.

B. Finishes for Personnel Doors and Frames:

1. Prime Finish: Factory-apply manufacturer's standard primer immediately after cleaning and pretreating.
2. Factory-Applied Paint Finish: Manufacturer's standard, complying with SDI A250.3 for performance and acceptance criteria.
  - a. Color and Gloss: **As selected by Owner's representative from manufacturer's full range** of colors.

## 2.9 WINDOWS

A. Aluminum Windows: Metal building system manufacturer's standard, with self-flashing mounting fins, and as follows:

1. Type, Performance Class, and Performance Grade: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 and as follows:
  - a. Horizontal-Sliding Units: **HS-LC25**.

- b. Single-Hung Units: **H-LC25**.
- c. Fixed Units: **F-LC25**.

2. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:

- a. Cam-action sweep sash lock and keeper at meeting rails.
- b. Spring-loaded, snap-type lock at jambs.
- c. Pole-operated, cam-action locking device on meeting rail where rail is more than **72 inches (1830 mm)** above floor.
- d. Lift handles for single-hung units.
- e. Nylon sash rollers for horizontal-sliding units.
- f. Steel or bronze operating arms.

3. Sliding-Type Weather Stripping: Woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric; complying with AAMA 701/702.

4. Insect Screens: Provide removable insect screen on each operable exterior sash, with screen frame finished to match window unit.

B. Glazing: Comply with requirements specified in Division 8 Section "Glazing."

C. Finish:

- 1. Mill finish.
- 2. Baked-Enamel Finish: Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of **0.7 mil (0.02 mm)**, medium gloss.
  - a. Color: **As selected by Owner's representative from manufacturer's full range** of colors.

## 2.10 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers,

closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

- D. Flashing and Trim: Formed from **0.022-inch (0.56-mm)** nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.
- E. Gutters: Formed from **0.022-inch (0.56-mm)** nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum **96-inch- (2438-mm-)** long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
  - 1. Gutter Supports: Fabricated from same material and finish as gutters.
  - 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Formed from **0.022-inch (0.56-mm)** nominal-thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum **10-foot- (3-m-)** long sections, complete with formed elbows and offsets.
  - 1. Mounting Straps: Fabricated from same material and finish as gutters.
- G. Roof Ventilators: Gravity type, complete with hardware, flashing, closures, and fittings.
  - 1. Circular-Revolving Type: Minimum **20-inch- (508-mm-)** diameter throat opening; finished to match metal roof panels; with matching base and rain cap.
    - a. Type: **Stationary** revolving.
    - b. Bird Screening: Galvanized steel or aluminum.
    - c. Dampers: Spring-loaded, butterfly type; pull-chain operation; with pull chain of length required to reach within **36 inches (914 mm)** of floor.
  - 2. Continuous or Sectional-Ridge Type: Factory-engineered and -fabricated, continuous unit; fabricated from **0.022-inch (0.56-mm)** nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal roof panels. Fabricated in minimum **10-foot- (3-m-)** long sections. Provide throat size and total length indicated, complete with side baffles, ventilator assembly, end caps, splice plates, and reinforcing diaphragms.
    - a. Bird Screening: Galvanized steel or aluminum.
    - b. Dampers: Manually operated, spring-loaded, vertically rising type; chain and worm gear operator; with pull chain of length required to reach within **36 inches (914 mm)** of floor.
    - c. Throat Size: **9 or 12 inches (229 or 305 mm)**, as standard with manufacturer, and as required to comply with ventilation requirements.
- H. Roof Curbs: Fabricated from minimum **0.052-inch (1.32-mm)** nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal roof panels; capable of withstanding loads of size and height indicated.

- I. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

## 2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: **Engage** a qualified testing agency to evaluate product.
- B. Special Inspector: Owner will engage a qualified special inspector to perform the following tests and inspections and to submit reports. Special inspector will verify that manufacturer maintains detailed fabrication and quality-control procedures and will review the completeness and adequacy of those procedures to perform the Work.
  - 1. Special inspections will not be required if fabrication is performed by manufacturer registered and approved by authorities having jurisdiction to perform such Work without special inspection.
    - a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.
- C. Testing: Test and inspect shop connections for metal buildings according to the following:
  - 1. Bolted Connections: Shop-bolted connections shall be **tested and** inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  - 2. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
- D. Product will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

## 2.12 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
  - 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
  - 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
- D. Secondary Framing: Shop fabricate framing components to size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

## PART 3 - EXECUTION

### 3.1 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  1. Set plates for structural members on wedges, shims, or setting nuts as required.
  2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  1. Level and plumb individual members of structure.
  2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.
  - a. Joint Type: Snug tightened or pretensioned.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Locate canopy framing as indicated.
4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Steel Joists: Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Bolt joists to supporting steel framework using carbon-steel bolts unless high-strength structural bolts are required by the manufacturer.
5. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
6. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

### 3.2 METAL PANEL INSTALLATION, GENERAL

- A. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
    - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
  - 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
  - 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
  - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
  - 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- B. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
  - 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants recommended by metal panel manufacturer.
  - 1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
  - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

### 3.3 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
  - 1. Install ridge **and hip** caps as metal roof panel work proceeds.

2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.

1. Install clips to supports with self-drilling or self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels for fasteners.
6. Provide metal closures at **peaks, rake edges, rake walls, and** each side of ridge **and hip caps.**

C. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.

1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
4. At metal panel splices, nest panels with minimum **6-inch (152-mm)** end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

D. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

### 3.4 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels **4 inches (102 mm)** minimum.

4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
7. Install screw fasteners in predrilled holes.
8. Install flashing and trim as metal wall panel work proceeds.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

### 3.5 METAL SOFFIT PANEL INSTALLATION

- A. Provide metal soffit panels the full width of soffits. Install panels perpendicular to support framing.
- B. Flash and seal metal soffit panels with weather closures where panels meet walls and at perimeter of all openings.

### 3.6 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
  1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
  2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
  3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Roof Insulation: Comply with the following installation method:
  1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal roof panels fastened to secondary framing.
  2. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.
  3. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Install layer of filler insulation

over first layer to fill space formed by metal roof panel standoffs. Hold in place by panels fastened to standoffs.

- a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
4. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
  - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
5. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.

1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.
2. Sound-Absorption Insulation: Where sound-absorption requirement is indicated for metal liner panels, cover insulation with polyethylene film and provide inserts of wire mesh to form acoustical spacer grid.

### 3.7 DOOR AND FRAME INSTALLATION

- A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.
- B. Personnel Doors and Frames: Install doors and frames according to SDI A250.8.
- C. Field Glazing: Comply with installation requirements in Division 8 Section "Glazing."
- D. Door Hardware: Mount units at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  1. Install surface-mounted items after finishes have been completed on substrates involved.
  2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
  4. Set thresholds for exterior doors in full bed of butyl-rubber sealant complying with requirements specified in Division 7 Section "Joint Sealants."

### 3.8 WINDOW INSTALLATION

- A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.
  - 1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.
- B. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Mount screens directly to frames with tapped screw clips.
- E. Field Glazing: Comply with installation requirements in Division 8 Section "Glazing."

### 3.9 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  - 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
  - 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10 feet (3 m)** with no joints allowed within **24 inches (600 mm)** of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof,

form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with mastic sealant (concealed within joints).

- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than **36 inches (914 mm)** o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with **1-1/2-inch (38-mm)** telescoping joints. Provide fasteners designed to hold downspouts securely **1 inch (25 mm)** away from walls; locate fasteners at top and bottom and at approximately **60 inches (1524 mm)** o.c. in between.
  - 1. Provide elbows at base of downspouts to direct water away from building.
  - 2. Tie downspouts to underground drainage system indicated.
- E. Circular Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Mount ventilators on flat level base. Install preformed filler strips at base to seal ventilator to metal roof panels.
- F. Continuous Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Join sections with splice plates and end-cap skirt assemblies where required to achieve indicated length. Install preformed filler strips at base to seal ventilator to metal roof panels.
- G. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- H. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

### 3.10 FIELD QUALITY CONTROL

- A. Special Inspections: **Engage** a qualified special inspector to perform special inspections.
- B. Testing Agency: **Engage** a qualified testing agency to perform tests and inspections.
- C. Tests and Inspections:
  - 1. High-Strength, Field-Bolted Connections: Connections shall be **tested and** inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
  - 2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

- c. Ultrasonic Inspection: ASTM E 164.
- d. Radiographic Inspection: ASTM E 94.

D. Product will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 13125

JRA PROJECT NO. 217140  
HAMLER WTP IMPROVEMENTS  
CHEMICAL FEED SYSTEMS  
CITY OF ROME, GEORGIA  
WATER AND SEWER DIVISION  
CLIENT JOB NO. 17021.00  
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#### **ELECTRICAL SPECIFICATION INDEX:**

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<u>26 05 33</u> .....	RACEWAYS
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<u>26 05 53</u> .....	ELECTRICAL IDENTIFICATION
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# DIVISION 26/27/28 ELECTRICAL



9/8/2017



## SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.1. DESCRIPTION

##### A. General Conditions:

1. The accompanying General Conditions (front-end specifications) shall apply to and form a part of this section.

##### B. General Requirements:

1. Carefully examine General Conditions, other specification sections, and other drawings (in addition to Electrical) in order to be fully acquainted with their effect on electrical work.
2. Do all work in compliance with all applicable codes, laws, and ordinances, the National Electrical Safety Code, the National Electrical Code (hereinafter referred to as "Code"), applicable energy codes, and the regulations of the local utility companies. Obtain and pay for any and all required permits, inspections, certificates of inspections and approval, and the like.
3. Cooperate with other trades and contractors at job. Perform work in such manner and at such times as not to delay work of other trades. Complete all work as soon as the structure and installations of equipment will permit. Patch, in a satisfactory manner and by the proper craft, any work damaged by electrical workmen.
4. The Owner shall be provided access to all software to include copies of software for all systems provided under this division of the specifications. Software shall be password protected where applicable.
5. Only qualified electrical sub-contractors will be allowed to submit proposals for this project. In order to be considered qualified, contractor shall have completed a minimum of five (5) projects of similar type/scope and equal or greater magnitude and complexity within the last ten (10) years. Sub-contractors without qualifications will be rejected. If desired, potential electrical sub-contractors may submit qualification evidence for review and pre-bid approval a minimum of ten (10) days prior to bid. Previous projects used to meet this experience requirement must have included similar (or greater) scopes of work for each of the following areas:
  - a. Power Systems.
  - b. Control Systems.
  - c. Instrumentation Systems.
6. Electrical contracting firm shall be licensed as an electrical contractor in the state where work will be performed

#### 1.2. GENERAL SCOPE OF ELECTRICAL WORK (REFER TO DRAWINGS FOR OTHER SPECIFIC SCOPE ITEMS)

- A. Furnish all labor and materials to complete electrical work as shown on drawings and/or herein specified.

- B. Remove all existing electrical equipment and wiring made obsolete by this project and remove or relocate all electrical services located on or crossing through the project property, either above or below grade, which would obstruct the construction of the project or conflict in any manner with the completed project or any code pertaining thereto. Dispose of salvageable materials as directed by the Engineer. Contractor shall schedule meeting to review scope of electrical demolition and to confirm scope and phasing of proposed demolition with the owner in the presence of the prime consultant prior to start of any electrical demolition.
- C. Furnish and install complete power distribution system as shown on drawings and/or specified herein.
- D. Furnish and install complete electrical grounding systems as shown on drawings and/or specified herein.
- E. Install and connect electrical equipment mentioned in Division 26/27/28 Specifications or noted in drawings, whether furnished by electrical contractor or by others.
  - 1. Where shown or specified, equipment furnished by others shall be installed and connected under this Contract.
  - 2. Where shown or specified, Contractor shall receive, unpack, check and assume custody of equipment furnished by Others. Contractor shall assume responsibility for care and safekeeping of this equipment, when delivered into his custody. He shall protect it from moisture, dust and damage during construction and until Owner acceptance of project.
- F. Furnish and install complete electrical lighting systems as shown on drawings and/or specified herein.
- G. Furnish and install all electrical items shown on drawings and/or herein specified, unless shown or specified otherwise.
- H. Furnish and install complete controls, instrumentation & auxiliary systems as shown on drawings and/or specified herein.
- I. Procure and pay for permits and certificates as required by local and state ordinances and fire underwriter's certificate of inspection.
- J. Balance loads as equally as practicable on services, distribution feeders, circuits and buses. Provide typewritten directory for each panel.
- K. Unless specifically indicated or required otherwise, terminate all circuitry/cabling provided within this contract at associated equipment/devices/etc. in accordance with all applicable codes, standards and supplier requirements, whether associated equipment/device/etc. is furnished within this contract or by others.
- L. Complete field testing, adjustment & startup of all systems listed above as shown on drawings and/or specified herein.

## PART 2 - PRODUCTS

### 2.1. APPROVED MATERIALS AND DEVICES

- A. Where not otherwise specified, provide only new, standard, first-grade materials/systems throughout, conforming to standards established by Underwriter's Laboratories, Inc., and so marked or labeled, together with manufacturer's brand or trademark. All equipment/systems subject to approval of Engineer before installation. All like items and associated equipment/systems shall be of one manufacturer.
- B. To insure proper coordination, it is intended that all electrical equipment and materials specified in Division 26/27/28 of these specifications and shown on the electrical drawings be furnished and installed by the electrical sub-contractor. It will not be permissible for any of these items to be furnished directly by the general contractor without the electrical contractor's coordination.
- C. To insure commonality of spare parts, it is required that the electrical contractor provide the same brand for all circuit breakers, starters, power equipment, etc. provided under the following divisions of these specifications:
  - 1. SECTION 26 22 00: DRY TYPE TRANSFORMERS
  - 2. SECTION 26 24 17: LIGHTING PANELBOARDS

## 2.2. SUBMITTALS

- A. All submittals to the design team shall be accompanied by a letter summarizing all proposed deviations from specified products or pre-approved substitutions. The absence of such a letter shall be understood to indicate that the contractor intends to meet all contract requirements, regardless of cut-sheets/data-sheets provided within the submittal.
- B. Submit to Engineer ten (10) days prior to bid date three (3) copies of any items and/or manufacturers which are proposed as substitutes for those specified.
- C. Submit to Engineer promptly after award of Contract and prior to purchasing, the number of copies required by the contract. All drawings of a specific item or system shall be made in one submittal, and within thirty (30) days after award of Contract. Shop drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each major piece of equipment. Shop drawings shall be submitted on the following:
  - 1. SECTION 26 22 00: DRY TYPE TRANSFORMERS
  - 2. SECTION 26 24 17: LIGHTING PANELBOARDS
  - 3. SECTION 26 44 00: ELECTRICAL HEAT TRACING SYSTEMS
  - 4. SECTION 26 50 00: LIGHTING MATERIALS AND METHODS
  - 5. SECTION 27 10 00: STRUCTURED CABLING SYSTEM
  - 6. ALL MISCELLANEOUS POWER DISTRIBUTION EQUIPMENT
  - 7. ALL ELECTRICAL AND TELECOMMUNICATION ROOM LAYOUTS - Submittals shall include  $\frac{1}{4}$ " = 1'-0" CAD drawings (hand drawn sketches will not be accepted) of each electrical and IT room indicating all panelboards, transformers, switchboards, equipment racks, control panels, HVAC equipment, etc. that are located in each room. Layouts shall show that each piece of electrical equipment has the clearances, working space and dedicated equipment space required by applicable codes. No conduits to equipment within these rooms shall be installed until submittals have been provided and returned without exception by the design team.

## 8. ALL CONTROL ITEMS & SYSTEMS

- D. The contractor shall fully review, comment upon and correct all shop drawings as required to assure compliance with contract documents prior to submittal to Engineer. The failure of the contractor to properly review and correct shop drawings prior to submittal will result in rejection of shop drawings by the engineer. Review by the Engineer will be for general conformance with contract documents. The contractor shall be fully responsible for correctness of all submitted dimensions, details, quantities and locations.
- E. None of the above items shall be installed until shop drawings or catalog data have been reviewed by Engineer without rejection or required resubmittal. Any listed item not submitted, even if specified, shall be considered not acceptable and shall be removed if directed.
- F. Any required resubmittal will be reviewed by the Engineer for conformance with previously issued comments only. The contractor shall be responsible for verifying that all items not specifically requiring resubmittal have not been altered from the previously reviewed submittal.
- G. Material proposed for substitution shall be of the same quality, perform the same functions, conform to such physical dimensions and appearance as are required by the Engineer. All material proposed for substitution is subject to the approval of the Engineer and his authority for approval is final. No material proposed for substitution will be considered unless all submittal data complies with the drawings and specifications of Section 16 as to time of submission, number of copies of submittal, and detail requirements.
- H. Samples of material shall be furnished where required by drawings or Division 26/27/28 Specification, or as requested by the Engineer on items proposed as substitutes.
- I. Submit to Engineer a certificate of final inspection from local inspection department.

## PART 3 - EXECUTION

### 3.1. SITE VISIT

- A. The Contractor shall visit the site to determine existing dimensions and conditions affecting electrical work. Failure to do so in no way relieves Contractor of his responsibility under Contract.

### 3.2. CLEARANCE WITH UTILITIES

- A. It shall be the responsibility of this Contractor, prior to bid, to reaffirm with the utility companies involved, that the locations, arrangement (and with power company voltage, phase, and metering required) and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, the Contract price shall include any additional cost necessary to meet those requirements without extra cost to Owner after a contract is entered into.
- B. On many projects the utility company may levy charges due to locations, size or type service involved. The Contractor shall be responsible for these charges (including permanent meter

deposit), unless such charges are not available prior to bid and Contractor so documents as described below. The meter deposit will be refunded to the contractor at time of Owner's acceptance.

- C. Should above cost not be available, prior to bid, Contractor must submit a letter signed by a responsible utility company person so stating with his bid and in turn must be submitted by Prime Contractor with his bid to Owner. The cost will then be deleted from the Contract and become responsibility of the Owner.
- D. Arrange with utility companies for such services as shown or herein specified and installation of meter where shown. Furnish with shop drawings a signed document from utility companies describing the location and type of services to be furnished and any requirements they may have. This document shall be signed for each utility company by a person responsible for granting such service.

### 3.3. WORKMANSHIP

- A. All work shall be in accordance with the latest editions of NFPA 70 (National Electrical Code), NFPA 101 (Life Safety Code), National Electric Safety Code, International Building Code, applicable NECA standards and the rules and regulations of State and Local Authorities Having Jurisdiction.
- B. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance upon completion.
- C. All equipment, devices, etc. shall be installed in accordance with manufacturer's recommendations.
- D. All items shall be installed straight and plumb in a workmanlike manner and care shall be exercised so that like items are mounted the same position, heights and general location.
- E. Keep site clean of accumulation of cartons, trash and debris.

### 3.4. SAFETY

- A. The contractor is solely responsible for all job safety. Engineer assumes no responsibility for job safety. Maximum consideration shall be given to job safety and only such methods as will reasonably insure the safety of all persons shall be employed. The codes and regulations of OSHA shall be given strict compliance as well as such other codes, laws, and regulations as may be applicable.

### 3.5. CONTRACT DOCUMENTS

- A. Contract documents indicate diagrammatically, extent, general character and approximate location of work. Where work is indicated but minor details omitted, furnish and install it complete so as to perform its intended functions. For details and mechanical equipment, follow drawings provided by other disciplines (Architectural, Mechanical, Structural, Civil, etc.) and fit electrical work thereto.

- B. Contract documents consist only of the hardcopy documents issued by the Prime Engineer. Electronic documents issued directly by the electrical engineer to the contractor and/or its subcontractors/vendors are issued for convenience only (electronic documents are not formal contract documents).
- C. If the contractor and/or one of its suppliers require a one-time transfer of electronic files of the current electrical construction documents to prepare shop drawings (or for another similar purpose), it shall:
  - 1. Sign a waiver prepared by the electrical engineer prior to the transmittal of these files.
  - 2. Agree to pay the electrical engineer a fee of \$50.00 per drawing, up to a maximum of \$400 per transfer, payable upon receipt of the files.
  - 3. To the fullest extent permitted by law, indemnify, hold harmless, and defend JRA from all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the use of the CAD files.
- D. Take finish dimensions at job in preference to scaled dimensions.
- E. Except as above noted, make no changes in or deviations from work as shown or specified except on written order of Engineer.

### 3.6. UNDERGROUND UTILITY/EQUIPMENT COORDINATION

- A. Prior to commencement of work, verify exact locations of all existing or proposed underground utilities and/or underground equipment and verify that proposed electrical installation does not conflict with these items. Notify Engineer immediately if any conflict is found.

### 3.7. EQUIPMENT STORAGE

- A. Store all electrical equipment in dry, covered locations as directed by equipment manufacturers. Contractor shall be responsible for replacing or repairing improperly-storied equipment as directed by Engineer.

### 3.8. EXCAVATION, CUTTING AND PATCHING

- A. Perform all cutting and excavating as necessary for installation of electrical systems, unless specifically covered under another section. After Engineer's observation, complete all excavation, filling and backfilling as directed under specifications for preparation of site and earthwork. Foundations for equipment shall be as specified under concrete section. Concrete pads shall be minimum of 6" thick; unless greater thickness required by equipment manufacturer. Obtain specific approval of Engineer before cutting into any structural members.
- B. For all such work employ competent workmen, and finish up in neat and workmanlike manner, equal to quality and appearance to adjacent work.

### 3.9. PENETRATIONS

- A. Furnish roof flashing for all equipment installed under Division 26/27/28 that penetrates through the roof. Appropriate flashing is specified under roofing and sheet metal section.

Supply these flashings for installation under roofing and sheet metal section.

- B. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly to maintain the fire/smoke rating of the associated membrane.

**3.10. INSTALLATION OF EQUIPMENT - GENERAL**

- A. Care shall be exercised in exact routing and location of all items so as not to obstruct access to equipment, personnel walkways, or expose it to potential mechanical damage.
- B. Items shall be securely anchored and/or fastened. All construction shall meet the seismic design requirements of the building code. Items (especially transformers, light fixtures, equipment racks, freestanding gear, etc.) installed in seismic zones C, D, E or F shall be supported and braced per applicable codes and standards.
- C. All wall, pole or frame-mounted electrical equipment shall be mounted to metal unistrut (or similar) frames of same material as electrical equipment. For example, pole-mounted stainless steel disconnect switches shall be mounted to stainless steel unistrut frames.
- D. All electrical equipment, furnished by Contractor or by others shall be covered and protected during construction.
- E. All control cabinets, panels, motor control centers and other electrical cabinets and enclosures shall have all trash removed and be vacuumed clean. All foreign paint, etc., shall be removed from exterior and all scratches in finish touched up with same color and material as original. Any rusted areas shall be sanded, primed and repainted.
- F. All relays, starters, push-button and other control devices shall be cleaned and if necessary, lubricated with CRC 2-26 to assure free operation.

**3.11. MOTORS, STARTERS AND CONTROLS**

- A. Unless otherwise specified or shown, all motors will be furnished and installed under other sections of this specification.
- B. Electrical Contractor shall install all starters and all electrical power wiring and connections to motors and starters.
- C. Unless otherwise specified or shown, all control items for motors shall be furnished, installed and wired in conduit by the electrician.

**3.12. CIRCUITS AND BRANCH CIRCUITS**

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit numbers. No more outlets than are indicated shall be connected to a circuit.
- B. Branch circuit homeruns shall be installed as shown on drawings. Multiple homerun conduits shall not be combined by contractor into larger, single homerun conduits unless specific permission is granted by the Engineer.

**3.13. LUG/TERMINAL RATINGS**

- A. All lug/terminal ratings, sizes, locations, types, etc. shall be coordinated with the associated conductor sizes, types, routings, etc. by the contractor.
- B. All lugs/terminals/etc. shall be rated for 75 degree C terminations (minimum, unless specified otherwise).

**3.14. EQUIPMENT FAULT CURRENT RATINGS**

- A. All equipment and breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated distribution equipment. All interrupting ratings shall be full ratings. Where new devices or breakers are added to existing distribution equipment, the new devices/breakers shall have interrupting ratings matching or exceeding that of the existing distribution equipment.

**3.15. OUTLET LOCATION**

- A. Symbols shown on drawings and mounting heights indicated on drawings and in specifications are approximate only. The exact locations and mounting height must be determined on the job and it shall be the Contractor's responsibility to coordinate with other trades to insure correct installation.

**3.16. IDENTIFICATION**

- A. Each panel shall have each circuit identified. Panels without branch circuit nameplates shall have typewritten directories.
- B. Each individually mounted switch, circuit breaker, starter and/or any other control or protective device shall identify equipment fed and fuse size, if any, by engraved plastic nameplate, white with black letters, screw attached.
- C. See Specification Section 26 05 53 for additional requirements.

**3.17. GROUNDING**

- A. All equipment shall be grounded and bonded in accordance with all state/local regulations, The National Electrical Code and as specified herein.

**3.18. PAINTING**

- A. Refer to Painting/Finishing specifications for requirements regarding field painting of exposed conduit. Any scratches, dents or rust spots in conduit electrical enclosures, panels, motor control or any other electrical items shall have the dents removed, and they, along with any rust spots or scratches, sanded and touched up with the same exact color paint as original finish.

**3.19. ACCEPTANCE TESTING**

- A. Upon completion of work, the entire electrical system installed within this project shall be

tested and shall be shown to be in perfect working condition, in accordance with the intent of the specifications and drawings. It shall be the responsibility of the Electrical Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of the observation representative(s) of the Engineer. The Electrician shall be available to assist in removal of panel fronts, etc., to permit inspection as required.

- B. The electrical sub-contractor shall include in bid price start-up assistance and training from a certified representative of the manufacturer for the following systems:
  1. SECTION 26 44 00: ELECTRICAL HEAT TRACING SYSTEMS
  2. SECTION 27 10 00: STRUCTURED CABLING SYSTEM

### 3.20. OPERATION AND MAINTENANCE DATA

- A. One set of marked "AS BUILT" drawings, three (3) sets of all equipment catalog and maintenance data and three (3) sets of all final shop drawings, on all equipment requiring same shall be turned over to owner. These items shall be bound in hard back book. Contractor shall explain and demonstrate all systems to Owner's representative.

### 3.21. GUARANTY-WARRANTY

- A. Furnish a written Guarantee-Warranty, countersigned and guaranteed by General Contractor, stating:
  1. That all work executed under this section will be free from defects of workmanship and materials for a period of one (1) year from date of final acceptance of this work.
  2. Above parties further agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the Guaranty-Warranty.

END OF SECTION 26 05 00



## SECTION 26 05 19 - POWER CONDUCTORS AND CABLES 51V-600V

### PART 1 - GENERAL

#### 1.1. DESCRIPTION

- A. Power Wires and Cables
- B. Low Voltage Wires and Cables

### PART 2 - PRODUCTS

#### 2.1. POWER WIRES AND CABLES - 600 VOLT

- A. General: Conductors shall have current carrying capacities as per N.E.C. and with 600 volt insulation, #12 minimum except for controls and fixture wire. Conductors shall be copper.
- B. General Application (see below for exceptions):
  - 1. At or Below Grade (including within slab-on-grade):
    - a. #8 or larger conductors:
      - 1) XHHW or RHH/RHW/USE stranded (in conduit).
      - b. #10 or smaller conductors for circuits terminating at motors:
        - 1) THHN/THWN or XHHW stranded (in conduit).
        - c. #10 or smaller conductors (excluding circuits terminating at motors):
          - 1) THHN/THWN or XHHW solid (in conduit).
    - 2. Above Grade:
      - a. #8 or larger conductors:
        - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
        - b. #10 or smaller conductors for circuits terminating at motors:
          - 1) THHN/THWN, XHHW or RHH/RHW/USE stranded (in conduit).
          - c. #10 or smaller conductors (excluding circuits terminating at motors):
            - 1) THHN/THWN, XHHW or RHH/RHW/USE solid (in conduit).
      - 3. Power Wire and cable shall be as manufactured by Southwire, Rome, American Insulated Wire, Okonite, Phelps-Dodge, Amercable, Aetna or approved equal.
    - C. VFD Cabling
      - 1. Wiring/Cabling installed between each VFD (Variable Frequency Drive) and the associated motor shall be multi-conductor shielded VFD power cable with the following characteristics:
        - a. Multi-conductor cable with three (3) power conductors and three (3) ground conductors
        - b. Soft annealed flexible stranded copper conductors.
        - c. 1kV cross-linked polyolefin insulation (to resist the potential reflected voltages experienced in 600VAC VFD applications).
        - d. Metallic shielded providing 100% shield coverage
        - e. Oil, abrasion, chemical & sunlight resistant thermosetting compound outer jacket.
        - f. Flexible TC-ER rated, UL listed for use in cable trays.

- g. Equal to AmerCable #37-108VFD cable.

D. Emergency Feeder Wiring

- 1. Where specifically required by NEC articles 700, 701, or other similar sections, feeder-circuit wiring for emergency systems and legally-required standby systems shall be a listed electrical circuit protective system consisting of 2-hour fire-rated, mineral insulated, copper-sheathed wiring cable (Pyrotenax System 1850 or equal).

E. Class 1 Control Cabling (120VAC Control Circuits, Etc.)

- 1. Unless specified otherwise, Class 1 control cabling shall:
  - a. Be rated for exposed cable tray installation.
  - b. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
  - c. Be UL-rated for the proposed application.
  - d. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation.
  - e. Utilize copper conductors.
  - f. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
  - g. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
  - h. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.
  - i. Be rated for 600V.
  - j. Be industrial grade.
  - k. Have stranded conductors.
  - l. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
- 2. Control cabling shall be as manufactured by Belden, AlphaWire or General Cable.

F. Fixture Wiring

- 1. Conductor Types:
  - a. Type TFFN or XFF.
- 2. Minimum Sizes:
  - a. For fixtures up to 300 watts: #16.
  - b. For fixtures over 300 watts up to 1500 watts: #14.
  - c. For fixtures over 1500 watts: as required.
  - d. Conductors to concrete pour fixtures: #12.
- 3. Fixture wire shall extend only from fixture to first junction, and not over 6 feet, except for concrete pour units.

2.2. WIRE CONNECTIONS:

A. All connector types:

- 1. Shall be properly rated for the proposed application by UL and per the manufacturer.

- B. At Motor Connections (within motor terminal boxes):
  - 1. On Unshielded Wire:
    - a. Single conductor per phase: shall be made with insulated set screw connectors or 3M 5300 Series 1kV Motor Lead Connections kits with mechanical lugs as required.
    - b. Multiple conductors per phase: shall be made with insulated mechanical lugs, rated for the associated motor cable types, by Polaris or Ilsco.
  - 2. On Shielded Power Wire:
    - a. The braided shields and internal grounding conductors of shielded power (not instrumentation) cables shall be grounded at BOTH ends (at VFD/starter and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.
- C. Other Dry locations:
  - 1. On Wire larger than #10: shall be made with solderless, non-insulated compression-type connectors meeting requirements of Federal Specification WS-610e for Type II, Class 2 and shall be covered with Scotch #33 electrical tape so that insulation is equal to 150% of conductor insulation.
  - 2. On Wire #10 and smaller: shall be made with one of the following:
    - a. Ideal Wing Nuts or equal by 3M .
    - b. Ideal Push-In Wire Connectors (for #12 and smaller only).
- D. Other Wet/Damp locations:
  - 1. On Wire larger than #10: shall be made with underground/direct-burial, waterproof rated EPDM or TPE-insulated connectors by Ilsco, Burndy or T&B.
  - 2. On Wire #10 and smaller: shall be made with one of the following:
    - a. Ideal Weatherproof or Underground Wire Connectors pre-filled with 100% silicone sealant as required by the application.

### PART 3 - EXECUTION

- 3.1. GENERAL INSTALLATION
  - A. All wires and cables shall be installed in conduit unless specifically noted otherwise.
  - B. All joints and splices on wire shall be made with solderless connectors, and covered so that insulation is equal to conductor insulation.
  - C. No splices shall be pulled into conduit.
  - D. No conductor shall be pulled until conduit is cleaned of all foreign matter.
  - E. Wire and cable shall be neatly formed, bundled and tied in all panelboards, wireways, disconnect switches, pullboxes, junction boxes, cabinets and other similar electrical enclosures.
  - F. All wires and cables installed in underground or other wet locations shall be rated by the manufacturer for wet locations.

G. Network cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

### 3.2. POWER WIRE AND CABLE INSTALLATION:

- A. No power conductor shall be smaller than #12 except where so designated on the drawings or hereinafter specified.
- B. Multi-wire lighting branches shall be used as indicated.
- C. Where more than three current-carrying conductors are installed in a single raceway or cable, conductors shall be derated as indicated in NEC Table 310.15(B)(3)(a).
- D. Raceways/cables shall generally not be installed exposed to sunlight on roofs unless specifically required. Where raceways or cables are installed exposed to sunlight on roofs, conductors shall be derated with ampacities adjusted per NEC Table 310.15(B)(3)(c).
- E. In installing parallel power conductors, it is mandatory that all conductors making up the feeder be exactly the same length, the same size, the same type of conductor with the same insulation. Each group of conductors making up a phase or neutral must be bonded at both ends in an approved manner.
- F. In installing overhead main power services, a minimum of 5'-0" of cable per run shall be extended beyond the weatherhead(s) for connection to service drop. Confirm exact requirements with local utility company.

### 3.3. WIRE CONNECTIONS

- A. See Part 2 above for material types.
- B. Aluminum Wire Connections:
  1. Where aluminum wiring is allowed, connections shall utilize compression fittings, no exceptions (Anderson Versa Crimp or equal).
- C. Any stranded wire connection to wiring devices shall be made with crimp type terminals.
- D. All electrical connections and terminals shall be tightened according to manufacturer's published torque-tightening values with calibrated torque wrenches as required to clearly indicate final torque value to the contractor. Where manufacturer's torque values are not provided, those specified in UL 486A & 486B shall be used.
- E. All connections and connector types shall be installed in strict compliance with all requirements of the connector manufacturer.
- F. Under no condition shall the specified conductors be connected to terminals rated less than 75°C. Where conductors sized #1 or smaller are shown to be terminated at equipment and the terminals of that equipment are rated for less than 75°C, contractor shall install junction box near equipment to capture the specified conductors, splice with compression connections (rated for a least 75°C) and extend conductors with ampacity rating as required by NEC (based on

terminal temperature rating) to equipment terminals. The length of the conductors to be terminated shall be as directed by the AHJ but not less than 48 inches.

### 3.4. SHIELDED CABLE INSTALLATION

- A. Shielded VFD (power) cables:
  - 1. The braided shields and internal grounding conductors of shielded VFD (power) cables shall be grounded at BOTH ends (at VFD and at motor) with a termination kit provided by the cable supplier. This termination kit shall include a connection ring that makes contact around the full circumference of the braided shield, and connects all internal grounds to a common external ground point.
  - 2. Contractor shall coordinate the necessary size of conduit with the outer diameter of the proposed cable type to verify that the raceway loading does not exceed NEC requirements prior to rough-in of the conduit system.
- B. Shielded instrumentation (low voltage) cables:
  - 1. The outer foil of shielded instrumentation cables shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.

### 3.5. LOW VOLTAGE (LESS THAN 50V) CONTROL AND NETWORK CABLE INSTALLATION:

- A. All wires and cables shall be installed in conduit unless specifically noted otherwise. Low voltage control and/or network cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
  - 1. Cabling shall be plenum-rated, multi-conductor.
  - 2. Cabling shall be supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
  - 3. Cabling shall be properly bundled with plenum-rated Velcro straps on intervals not to exceed 30" on center.
  - 4. Properly-sized conduit(s) shall be provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings or through walls). End bushings shall be provided on both ends of all raceway terminations. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.

### 3.6. CIRCUITS AND BRANCH CIRCUITS

- A. Outlets shall be connected to branch circuits as indicated on drawings by circuit number adjacent to outlet symbols, and no more outlets than are indicated shall be connected to a circuit.

### 3.7. LABELING AND COLOR CODING OF WIRE AND CABLE

- A. Refer to Specification Section 26 05 53 for all labeling requirements.

B. A color coding system as listed below shall be followed throughout the network of branch power circuits as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
A	BLACK	BLACK	BROWN
B	RED	ORANGE (FOR HI- LEG)	ORANGE
C	BLUE	BLUE	YELLOW
NEUTRAL	WHITE	WHITE	GRAY
GROUND	GREEN	GREEN	GREEN

C. Where dedicated neutrals are installed for multi-wire branch circuits, the neutral conductors shall be color coded as follows:

PHASE	120/208/240/ COLOR	120/240 HIGH LEG DELTA COLOR	277/480 VOLT COLOR
NEUTRAL A	WHITE W/ BLACK TRACER	WHITE W/ BLACK TRACER	GRAY W/ BROWN TRACER
NEUTRAL B	WHITE W/ RED TRACER	WHITE W/ ORANGE TRACER (FOR HI-LEG NEUTRAL)	GRAY W/ ORANGE TRACER
NEUTRAL C	WHITE W/ BLUE TRACER	WHITE W/ BLUE TRACER	GRAY W/ YELLOW TRACER

D. Control Conductors: Shall be color coded by use of colored "tracers". No control circuit shall contain two identical conductors. For example, a set of five (5) control conductors for a pushbutton station represents one (1) control circuit which would require five (5) uniquely-colored control conductors.

### 3.8. TESTING

A. The insulation resistance of all feeder conductors (feeding electrical distribution equipment such as switchboards, panelboards, transfer switches, transformers, etc.) shall be tested at the load side of the feeder breaker with a 500-volt DC Megger Tester. Any feeder conductor with an insulation resistance less than 1 Mega ohm to ground shall be replaced by the contractor at the contractor's expense. All final test results shall be clearly documented (with date, time, feeder, results, test equipment, etc.), and the final test results shall be submitted to the design team for review.

END OF SECTION 26 05 19

## SECTION 26 05 26 - GROUNDING

### PART 1 - GENERAL

#### 1.1. GENERAL

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO GROUNDING OF THE FOLLOWING:

1. Service Equipment.
2. Transformers.
3. Non-current carrying conductive surfaces of equipment.
4. Metal Buildings.
5. Structures.
6. Other Equipment.

#### 1.2. GENERAL REQUIREMENTS

A. All equipment, building steel, and main service shall be effectively and permanently grounded with a conductor cross section as required by the National Electrical Code and of capacity sufficient to insure continued effectiveness of the ground connections for fault current. Ground conductors shall be as short and straight as possible, protected from mechanical injury and, if practicable, without splice or joint.

B. All grounding connections shall be installed in accordance with the National Electrical Code and all local codes and requirements. Such codes shall be considered minimum requirements and the installation of the grounding system shall insure freedom from dangerous shock voltage exposure and provide a low impedance ground fault path to permit proper operation of overcurrent and ground fault protective devices.

### PART 2 - PRODUCTS

#### 2.1. CONDUCTORS

A. All grounding conductors shall be insulated with green colored, 600 volt insulation unless noted otherwise.

B. Motors having power supplied by single conductor wire in conduit shall be grounded through the conduit system. Flexible conduit shall be "jumpered" by an appropriate bonding conductor.

C. Supplemental grounding system conductors shall be bare, softdrawn, stranded, single conductor copper wire, and generally sized as follows (unless shown otherwise on plans):

1. Switchgear, motor control centers, and power transformer #4/0 minimum or as shown on plans.
2. Power panels, #2/0.
3. Control panels and consoles, #4.
4. Process Motors, #1/0.

5. Building Columns, #4/0.
6. Light Poles, #2.
7. Telephone Backboard & Cabinet ground busses, #2.

## 2.2. GROUNDING ELECTRODES

- A. Grounding electrodes shall be copper-clad steel rods 3/4 inch in diameter and ten feet long. Where longer electrodes are necessary to reduce the ground resistance, Contractor shall provide sectional rods, connectors, drive heads, etc.

## 2.3. CONNECTIONS

- A. All conductor-to-conductor, conductor-to-ground rod, conductor-to-structure, conductor-to-fence connections of #6 and larger sized conductors and underground ground connections shall be permanent exothermic welded connections (Cadweld or equal) unless otherwise noted on applicable drawings.
- B. Connections to equipment shall be by bolted compression type lugs (except for motors). When the conductor is #6 and larger, the lug shall be joined to the conductor by an exothermic weld (Cadweld or equal).
- C. Motors to be grounded by the grounding conductors run with the power conductors shall have a split-post grounding stud installed in the connection box.
- D. Each cast pull box or junction box shall have a ground lug, connected to largest ground conductor to enter box.
- E. Ground connections at conduit terminations shall be made by approved grounding bushings (see Raceways Specification Section for additional requirements).

## 2.4. MANUFACTURERS

- A. Conduit clamps and connectors shall be manufactured by Raco, OZ., or Ercon.
- B. Lugs shall be as manufactured by Square "D", Burndy, or T and B.
- C. Exothermic weld connections shall be as manufactured by Cadweld, or approved equal.
- D. Ground rods shall be as manufactured by Joslyn or McGraw Edison.
- E. Split post grounding shall be as manufactured by Burndy or T and B.

## PART 3 - EXECUTION

### 3.1. MAIN SERVICE GROUND

- A. The main service grounding electrode system shall consist of the following items bonded together by the grounding electrode conductor:
  1. The main underground cold water pipe (metal).

2. The metal frame of the building.
3. Driven ground rods. Ground rods shall be embedded at the lowest point in the building and below the permanent moisture level. Ground rods shall be spaced a minimum of ten (10) feet apart and connected in parallel until resistance to ground does not exceed five (5) ohms.

B. The grounding electrode system shall be connected to the grounded conductor (neutral) on the supply side of the service disconnecting means by a grounding electrode conductor not smaller than that shown in Table 250.66 of the N.E.C. The main service equipment grounding conductor shall be connected to the grounding conductor on the supply side of the service disconnecting means in accordance with Table 250.122 of the N.E.C. for the ampere rating of the service entrance equipment. Where in a service entrance switchboard, the equipment grounding conductor shall not be less than 25% of the main bus rating. These connections shall be made inside the service entrance equipment enclosure.

### 3.2. TRANSFORMER GROUNDS

A. Dry type insulation transformers with a grounded conductor in the secondary shall be grounded in accordance with N.E.C. Section 250-26.

### 3.3. EXPOSED NON-CURRENT-CARRYING METAL PARTS

A. General: Ground connections to equipment or devices shall be made as close to the current carrying parts as possible, that is, to the main frame rather than supporting structures, bases or shields. Grounding connections shall be made only to dry surfaces that are clean and dry. Steel surfaces shall be ground or filed to remove all scales, rust, grease, and dirt. Copper and galvanized steel shall be cleaned to remove oxide before making welds or connections. Code size ground conductors shall be run in all power conduits and properly terminated at each end.

B. Motors: Exposed non-current-carrying metal parts, shall be grounded by a grounding conductor either run with power conductors, and/or separate grounding conductors. Drawings will show method(s) to be used. The ground conductors with all motor conductors shall be connected to the ground buss in the motor connection box. Jumper connections shall be installed between frames and rigid conduit for equipment having flexible conduit connections (sealtight). All AC motor grounds shall provide a low impedance path to ground. Connections from the supplemental grounding system (when specified) shall be made directly to the motor frame. Additionally, utilization equipment connected to the motor (pump, fan, mixer, etc.) shall be bonded to the motor with flexible braid-type bonding strap to ensure equalization of ground potentials.

C. Raceways & boxes: All raceways, conduits, armored or shielded cable and all exposed non-current carrying metal parts shall be grounded. Such items shall be bonded together and permanently grounded to the equipment ground buss. Metallic conduits shall be connected by grounding or clamps to ground buss. Flexible "jumpers" shall be provided around all raceway expansion joints. Bonding straps for steel conduit shall be copper. Jumper connections shall be provided to effectively ground all sections of rigid conduit connected into plastic pipe. No metallic conduit shall be left ungrounded. In conduit systems interrupted by junction or switch boxes where locknuts and bushings are used to secure the conduit in the box, the sections of

conduit and box must be bonded together. If conduit, couplings or fittings have a protective coating or non-conductive material, such as enamel, such coating must be thoroughly removed from threads of both couplings and conduit and the surface of conduit or fitting where the ground clamp is secured.

- D. Enclosures: Metal conduits entering free standing motor control centers, switchboards or other free standing equipment shall be grounded by bare conductors and approved clamp. Any conduits entering low voltage (480 volts or below) equipment through sheet metal enclosure and effectively grounded to enclosure by double locknut or hub need not be otherwise bonded.
- E. Equipment: In addition to equipment grounding provisions mandated by code requirements, additional equipment grounding provisions (including local ground rods, connections, etc.) shall be provided by the contractor as directed by equipment suppliers.
- F. Both ends of ground busses in motor control centers, switchboards, etc., shall be separately connected to the main ground buss to form two separate paths to ground.
- G. Fences and Grills: Fences and metal grills around equipment carrying voltage above 500 volts between phases shall be bonded together and to ground. Fences and grill work shall be grounded at every post, column, or support, and on each side of every gate.

### 3.4. ACCEPTANCE DOCUMENTATION AND TESTING

- A. Contractor shall take and store photographs of all underground grounding system connections prior to burial of connections, for review by Engineer.
- B. Upon completion of work, the entire ground system shall be shown to be in perfect working condition, in accordance with the intent of the Specifications.
- C. Contractor shall measure the resistance between the main ground bonding jumper to true earth ground using the Fall of Potential method as described by ANSI/IEEE Standard 81 ("Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of an Earth System"). If the measured value is greater than five ohms, additional grounding electrodes shall be installed as described in Part 3.1 above. The final ground resistance value shall be submitted in writing, and documented via picture of the meter reading from the Fall of Potential test, to the Engineer prior to the final observation, and shall be included in final O&M documentation.

END OF SECTION 26 05 26

## SECTION 26 05 33 - RACEWAYS

### PART 1 - GENERAL

#### 1.1. DESCRIPTION

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1. Conduits
2. Conduit Fittings
3. Couplings & Connectors
4. Bushings
5. Raceway Hardware, Conduit Clamps & Supports
6. Watertight Entrance Seal Devices

### PART 2 - PRODUCTS

#### 2.1. CONDUITS

A. PVC-Coated Rigid Steel:

1. The PVC coated rigid metal conduit must be UL Listed. Hazardous location fittings, prior to plastic coating must be UL listed. All conduit and fittings must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
2. The PVC-coated rigid metal conduit shall be ETL PVC-001 listed.
3. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.
4. Form 8 Condulets®, 3/4" through 2" diameters, shall have a tongue-in-groove "V-Seal" gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.
5. A PVC sleeve extending one pipe diameter or two inches, whichever is less, shall be formed at every female fitting opening except unions. The inside sleeve diameter shall be matched to the outside diameter of the conduit.
6. The PVC coating on the outside of conduit couplings shall have a series of longitudinal ribs 40 mils in thickness to protect the coating from tool damage during installation.
7. Form 8 Condulets® shall be supplied with plastic encapsulated stainless steel cover screws.
8. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. Conduit or fittings having areas with thin or no coating shall be unacceptable.
9. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30deg.F (-1deg.C).
10. All male threads on conduit, elbows and nipples shall be protected by application of a urethane coating.

11. All female threads on fittings or conduit couplings shall be protected by application of a urethane coating.
12. Independent certified test results shall be available to confirm coating adhesion per ETL PVC-001 standards under the following conditions:
  - a. Conduit immersed in boiling water with a minimum mean time to adhesion failure of 200 hours. (ASTM D870)
  - b. Conduit and conductel exposure to 150deg F (65deg C) and 95% relative humidity with a minimum mean time to failure of 30 days. (ASTM D11513).
  - c. The interior coating bond shall be confirmed using the Standard Method of Adhesion by Tape Test (ASTM D3359).
  - d. No trace of the internal coating shall be visible on a white cloth following six wipes over the coating which has been wetted with acetone (ASTM D1308).
  - e. The exterior coating bond shall be confirmed using the methods described in Section 3.8, NEMA RN1.
  - f. After these tests the physical properties of the exterior coating shall exceed the minimum requirements specified in Table 3.1, NEMA RN1.
13. Water tight flex connectors used in areas where PVC coated metal conduit is utilized shall be PVC coated also.
14. Shall be as manufactured by Perma-Cote, Plastibond, Korkap, Ocal or Okote.

B. Rigid Galvanized Steel and I.M.C.:

1. Shall be galvanized outside and inside by hot dipping.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

C. E.M.T.:

1. Shall be Electro-Galvanized.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

D. Rigid Aluminum:

1. Shall be manufactured of 6063 Alloy, T-1 temper.
2. Shall be as manufactured by Republic, Wheatland, Triangle, Pittsburg Standard, Youngstown, Allied or equal.

E. Schedule 40 and 80 PVC:

1. Shall be composed of polyvinyl chloride and shall be U.L. rated type 40 or 80 for use with 90 degree rated conductors. Conduit shall conform to NEMA Standards and applicable sections of N.E.C.
2. The conduit manufacturer shall have had a minimum of 5 years experience in the manufacture of the products. Non-metallic raceways shall be as manufactured by Carlon, Triangle, Can-Tex, Allied or equal.

F. HDPE Innerduct

1. Shall be composed high density polyethylene and shall be orange in color, unless noted otherwise.
2. Shall be corrugated unless noted otherwise.
3. Shall be manufactured by Carlon, Iplex or equal.

- G. Flexible Metallic Conduit:
  - 1. Shall be continuous spiral wound and interlocked galvanized material, code approved for grounding.
- H. Liquidtight Flexible Metallic Conduit:
  - 1. Shall be galvanized steel-core sealite, code approved for grounding.
  - 2. Shall have an outer liquidtight, nonmetallic, sunlight-resistant jacket over an inner flexible metal core.
  - 3. Shall be as manufactured by Electric-Flex, Anaconda or equal.

## 2.2. FITTINGS, COUPLINGS & CONNECTORS

- A. Rigid Galvanized Steel and I.M.C. couplings and connectors shall be standard threaded type, galvanized outside and inside by hot dipping. Threadless and clamp type are not acceptable. Couplings/connectors shall be as manufactured by Raco, Efcor, or Appleton or equal.
- B. All fittings, couplings and connectors (**including conduit seals, Meyers hubs, sealite connectors, etc.**) used in areas where PVC-Coated Rigid Steel conduit is used shall also be PVC-coated.
- C. All rain tight connectors shall be threaded Myers or approved equal, rated for outdoor application.
- D. E.M.T. couplings and connectors shall be set screw, or steel compression type. All couplings and connectors shall be 720B, 730, 750B, or 760 series of Efcor or equal series of Raco. Pressure indented type connectors or cast metal will not be approved for any location. E.M.T. couplings and connectors shall be as manufactured by O-Z/Gedney, T&B, Efcor, Raco, Midwest or equal. E.M.T. fittings, couplings and connectors located within concrete (where allowed) shall be compression type and shall be adequately sealed with tape to ensure a concrete-tight seal.
- E. Rigid Aluminum couplings and connectors shall be standard threaded type, of the same alloy as the associated conduit. Threadless and clamp type are not acceptable. Fittings shall be as manufactured by Thomas & Betts, Crouse-Hinds, Appleton, Pyle-National or equal.
- F. All PVC couplings, adapters, end bells, reducers, etc., shall be of same material as conduit.
- G. Liquidtight Flexible Metallic Conduit connectors shall be steel-core liquidtight with insulating throat or end bushing, designed for application with Liquidtight Flexible Metallic Conduit. Fittings shall be as manufactured by Efcor, Raco, Midwest or equal.
- H. All LB unilets shall have rollers.
- I. Miscellaneous conduit fittings shall be as manufactured by Appleton, Crouse-Hinds, Pyle-National, Russell & Stoll or equal.

## 2.3. BUSHINGS

- A. All non-grounding rigid bushings 1-1/4" and larger shall be the insulating type (O-Z/Gedney

type "BB" or equal by T&B, Midwest Electric or Penn Union).

- B. All non-grounding rigid bushings 1" and smaller shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. Non-grounding rigid conduit bushings shall be O-Z/Gedney type "B" or equal by T&B, Midwest Electric or Penn Union.
- C. All grounding rigid bushings shall be threaded malleable iron with integral noncombustible insulator rated for 150°C. All grounding rigid conduit bushings shall be O-Z/Gedney type "BLG" or equal by T&B, Midwest Electric or Penn Union.

**2.4. HARDWARE, CONDUIT CLAMPS AND SUPPORTS**

- A. All hardware such as expansion shields, machine screws, toggle bolts, "U" or "J" bolts, machine bolts, conduit clamps and supports shall be of corrosion resistant materials (stainless steel, aluminum, galvanized or plated steel, or other approved materials).
- B. Hardware in contact with aluminum handrails, plates or structural members and all hardware in exterior, wet or corrosive areas shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- C. Supports in exterior, process, wet or corrosive locations shall be type 316 stainless steel or aluminum (with bitumastic paint coating to isolate aluminum from contact with concrete where necessary) unless specifically noted otherwise.
- D. Supports in extremely corrosive environments (such as chlorine or fluoride storage rooms) shall be PVC-Coated steel unless specifically noted otherwise.
- E. Hardware and conduit clamps shall be as manufactured by Efcor, Steel City, G.A., Tinnerman or equal.

**2.5. WATERTIGHT ENTRANCE SEAL DEVICES**

- A. For new construction, seal devices shall consist of oversized sleeve and malleable iron body with sealing rings, pressure rings, sealing grommets and pressure clamps as required (O-Z/Gedney type FSK/WSK or equal).
- B. For cored-hole applications, seal devices shall consist of assembled dual pressure disks with neoprene sealing rings and membrane clamps as required (O-Z/Gedney type CSM or equal).

**PART 3 - EXECUTION**

**3.1. RACEWAY APPLICATION**

- A. Minimum Diameter: 3/4-inch.
- B. Raceway Type: Raceway types shall be as specified below, unless indicated otherwise on drawings:
  1. Exterior, Exposed: Rigid Aluminum unless otherwise noted.

2. Exterior, Used for Instrumentation Circuits: See Below.
3. Other Exterior (Concrete-Encased or Direct Earth Buried): Schedule 40 PVC. PVC conduit shall convert to metallic conduit prior to exiting concrete-encasement or direct earth burial. See "transition" items below for additional requirements. Conduits shall be left exposed until after Engineer's observation.
4. Interior, Exposed:
  - a. Extremely Corrosive Locations (Chemical Feed Rooms, etc.): Schedule 80 PVC.
  - b. Other Locations: Rigid Aluminum.
5. Interior, Concealed:
  - a. Embedded inside Poured Concrete Walls, Ceilings or Floors, with a minimum of 2" of concrete between finished surface and outer wall of conduit on all sides, where no anchor bolts, screws or other similar items will be installed: Schedule 40 PVC. PVC conduit shall convert to metallic conduit (exact type as specified elsewhere within this section) prior to exiting poured concrete-encasement of wall, ceiling, floor or ductbank. See "transition" items below for additional requirements.
  - b. Other Raceways Embedded inside Poured Concrete Walls, Ceilings or Floors (not meeting requirements above): PVC-Coated Rigid Steel
  - c. Other Raceways: Rigid Aluminum.
6. Raceways used for Instrumentation Circuits:
  - a. Underground or Locations Embedded inside Poured Concrete: PVC-Coated Rigid Steel.
  - b. Extremely Corrosive Locations (Chemical Feed Rooms, etc.): PVC-Coated Rigid Steel.
  - c. Other Locations (exposed exterior or non-corrosive interior): Rigid Aluminum.
7. Terminations at motors, transformers and other equipment which has moving or vibrating parts:
  - a. Liquidtight Flexible Nonmetallic Conduit (shall generally not exceed 24 inches in length) with watertight fittings.
8. Terminations at instruments:
  - a. Liquidtight Flexible Nonmetallic Conduit (shall generally not exceed 12 inches in length) with watertight fittings.
9. Transition from underground or concrete-encased to exposed:
  - a. Convert PVC to PVC-Coated Rigid Steel utilizing PVC-Coated Rigid Steel 90 degree bends (and vertical conduits as required by application) prior to exiting concrete/grade (except at outdoor pull boxes and under freestanding electrical equipment, where terminations shall be by PVC end bells installed flush with top of slab). Exposed portions of these coated conduits shall extend a minimum of 6" above floor level, and shall be installed at uniform heights.

### 3.2. RACEWAY INSTALLATION

A. General:

1. Follow methods which are appropriate and approved for the location and conditions involved. Where not otherwise shown, specified, or approved in a particular case, run all wiring concealed.
2. Where conduit crosses a structural expansion joint an approved conduit expansion fitting shall be installed.

3. Where any run of rigid aluminum conduit (including bends) exceeds 50' in length, an approved conduit expansion fitting shall be installed (beginning at center of run) at intervals not to exceed 50' on center.
4. A non-conductive polypropylene pull string, properly tied/secured at either end, shall be installed in all empty conduits.
5. Metal conduit field-cuts shall be cut square with a hacksaw and the ends reamed after threading.
6. PVC conduit field-cuts shall be made with hacksaw, and ends shall be deburred.
7. All PVC joints shall be made as follows:
  - a. Clean the outside of the conduit to depth of the socket, and the inside of socket with an approved cleaner.
  - b. Apply solvent cement as recommended by the conduit manufacturer to the interior of the socket and exterior of conduit, making sure to coat all surfaces to be joined.
  - c. Insert conduit into the socket and rotate 1/4 to 1/2 turn and allow to dry.
8. All metallic conduit installed below grade or within concrete shall be painted with two (2) coats of asphaltum paint prior to installation.
9. Install ground wire sized per N.E.C. Table 250.122 in all conduits.
10. Use of running threads is absolutely prohibited. Conduit shall be jointed with approved threaded conduit couplings. Threadless and clamp type not acceptable.
11. Conduits shall be sized in accordance with latest National Electrical Code except when size shown on drawings.
12. Exposed, field-cut threads on all metal conduits shall be painted with zinc primer (for Galvanized Rigid or I.M.C.) or urethane paint (for PVC-Coated Rigid Steel) as recommended by conduit manufacturer .
13. Installation of PVC coated conduit systems shall be performed in strict accordance with the manufacturer's installation instructions. Damage to PVC coated conduit coating shall be touched up with patching compound as directed by manufacturer. To assure correct installation, the installer shall be certified by the manufacturer to install coated conduit.

**B. Routing/Locating:**

1. Exposed conduit runs shall be run level and plumb and shall, on interior of buildings, be run parallel and/or at right angles to building walls and/or partitions.
2. Conduit with an external diameter larger than 1/3 the thickness of a concrete slab shall not be placed in the slab. Conduits in slab shall not be spaced closer than 3 diameters on center.
3. Conduit run in ceiling spaces shall be run as high as possible, all at same level, and shall be supported from building structure. Do not support conduit from any other installation.
4. Conduit run within exterior CMU, concrete or other similar walls shall be run within the CMU cells / concrete structure / etc. Conduits shall not be run on the outside surface of CMU cells / concrete structure / etc. underneath exterior veneers / etc., which could cause a thermal break in the wall insulation or a future water intrusion problem.
5. Install conduit runs to avoid proximity to steam or hot water pipes. In no place shall a conduit be run within 6" of such pipes except where crossing is unavoidable, then conduit shall be kept at least 3" from the covering of the pipe crossed.
6. Before installing raceways for motors, HVAC equipment and other fixed equipment, check location of all equipment connections/terminal boxes with equipment supplier and locate and arrange raceways appropriately.

7. No conduit for instrumentation shall be run closer than 12 inches to parallel power conduits.
8. A minimum of 12" of clearance (or more as required by associated utility companies) shall be provided between the finished lines of exterior, underground conduit runs and exterior, underground utilities (gas, water, sewer, etc.).

C. Bends:

1. Do not make bends (in any raceway, including flexible conduits) that exceed allowable conductor bending radius of cable to be installed or that significantly restrict conductor flexibility.
2. All bends within concrete-encased ductbanks installed in exterior locations shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
3. All bends in raceways containing multi-conductor power cables (such as shielded VFD cables) shall be long radius bends (24" minimum bending radius – varies with conduit diameter).
4. Where numerous exposed bends or grouped together, all bends shall be parallel, with same center and shall be similar in appearance
5. All PVC elbows, bends, etc., shall be either factory bends or made with an approved heat bender.

D. Support:

1. Anchor conduit securely in place by means of approved conduit clamps, hangers, supports and fastenings. Arrangement and methods of fastening all conduits shall be subject to Engineer's direction and approval. All conduits shall be rigidly supported (wire supports may not be used in any location). Use only approved clamps on exposed conduit.
2. Rigid Aluminum Conduits shall be supported at intervals not to exceed 5' on center.
3. Conduit in riser shafts shall be supported at each floor level by approved clamp hangers.
4. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameters of conduits.
5. Where installed in seismic zones, suspended raceways shall be braced in two (2) directions as required to prevent swaying and excessive movement.
6. Raceways installed on top of flat roofing shall be supported a minimum of 3 ½" above roof with rubber block supports (Cooper B-Line Dura-Blok or equal). Installation shall be in strict accordance with support manufacturer's instructions and recommendations.

E. Terminations:

1. All conduit connections to sheet metal cabinets or enclosures located in exterior or wet locations shall terminate by use of rain tight hubs.
2. Where rigid or I.M.C. conduits enter sheet metal boxes, they shall be secured by approved lock nuts and bushings.
3. Where metal conduits enter outdoor pull boxes, manholes, under freestanding electrical equipment or other locations where direct metal-to-metal contact does not exist between enclosure and conduit, grounding bushings shall be installed. Each grounding bushing shall be connected to the enclosure ground and all other grounding bushings with properly sized grounding conductors.
4. Where E.M.T. enters sheet metal boxes they shall be secured in place with approved insulating fittings.

5. Where PVC enters outdoor pull boxes, manholes or under freestanding electrical equipment, PVC end bells shall be installed.
6. Where conduit terminates in free air such that associated cabling/circuitry becomes exposed (such as at cable trays, etc.), conduit shall generally terminate in a horizontal orientation (to prevent dust/debris/etc. from entering conduit system). Where vertical conduit termination is necessary, the termination shall be provided with cord-grip conduit terminations to seal the conduit system.
7. Conduit ends shall be carefully plugged during construction.
8. Permanent, removable caps or plugs shall be installed on each end of all empty raceways with fittings listed to prevent water and other foreign matter from entering the conduit system.

**F. Penetrations:**

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly. Refer to drawings and other specifications for additional requirements.
2. All penetrations shall be at right angles unless shown otherwise.
3. Structural members (including footings and beams) shall not be notched or penetrated for the installation of electrical raceways unless noted otherwise without specific approval of the structural engineer.
4. Dry-packed non-shrink grout or watertight seal devices shall be used to seal openings around conduits at all penetrations through concrete walls, ceilings or aboveground floors.
5. All raceways entering structures shall be sealed (at the first box or outlet) with polyurethane grout compound that expands to form a flexible foam seal that prevents the entrance of gases or liquids from one area to another (Prime Resins Prime-Flex or equal).
6. All raceways passing through concrete roofs or membrane-waterproofed walls or floors shall be provided with watertight seals as follows:
  - a. Where ducts are concrete encased on one side: Install watertight entrance seal device on the accessible side of roof/wall/floor as directed by equipment manufacturer.
  - b. Where ducts are accessible on both sides: Install watertight entrance seal device on each side of roof/wall/floor as directed by equipment manufacturer.
7. All raceways passing through walls of rooms containing/storing noxious chemicals (chlorine, ammonia, etc.) or through hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS or equal).
8. All raceways terminating into electrical enclosures/devices/panels/etc. located in hazardous locations shall be sealed with conduit seals (Crouse-Hinds type EYS, EZS or equal) within 18" of the termination.

**G. Exterior Electrical Ductbanks:**

1. Where exterior electrical concrete-encased ductbanks are indicated on drawings, conduit runs between buildings or structures shall be grouped in concrete-encased ductbanks as follows:
  - a. A minimum of 3" of concrete shall encase each side of all ductbanks.
  - b. A minimum of 1 1/2" of separation shall be provided between each conduit within ductbanks. PVC spacers shall be installed at the necessary intervals prior to placement of concrete to maintain the required spacing and to prevent bending or displacement of the conduits.

- c. Top of concrete shall be a minimum of 30" below grade. A continuous magnetic marking tape shall be buried directly above each ductbank, 12" below grade.
- d. Exact routing of ductbanks shall be field verified and shall be modified as necessary to avoid obstruction or conflicts.
- e. Underground electrical raceways shall be installed to meet the minimum cover requirements listed in NEC Table 300.5. Refer to drawings for more stringent requirements.

END OF SECTION 26 05 33



## SECTION 26 05 34 - OUTLET BOXES, JUNCTION BOXES, WIREWAYS

### PART 1 - GENERAL

- 1.1. **DESCRIPTION**
  - A. Outlet and Junction Boxes
  - B. Pull Boxes
  - C. Wireways

### PART 2 - PRODUCTS

- 2.1. **OUTLET BOXES & JUNCTION BOXES (THROUGH 4-11/16")**
  - A. Sheet Metal: Shall be standard type with knockouts made of hot dipped galvanized steel as manufactured by Steel City, Raco, Appleton, Bowers or equal.
  - B. Cast: Shall be type FS, FD, JB, GS, or SEH as required for application as manufactured by O-Z/Gedney, Appleton, or equal.
  - C. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.
- 2.2. **JUNCTION AND PULL BOXES (LARGER THAN 4-11/16")**
  - A. Oil-Tight JIC: Shall be Hoffman Type CH box or approved equal.
  - B. Galvanized Cast Iron or Cast Aluminum: Shall be O-Z/Gedney or approved equal.
  - C. Stainless Steel: Shall be as manufactured by O-Z/Gedney, Hoffman or approved equal. Boxes shall have continuous hinges, seamless foam-in-place gaskets and screw-down clamps.
  - D. Nonmetallic: Shall be type Polycarbonate/ABS construction as required for application with non-metallic quick-release latches as manufactured by Hoffman, O-Z/Gedney, Appleton, or equal.
  - E. Wireways: Shall be standard manufacturer's item as manufactured by Hoffman, Square "D", Burns, B & C or equal.
  - F. Pre-cast Polymer Concrete Below-Grade Hand Holes & Pull Boxes:
    1. Enclosures, boxes and cover are required to be UL Listed and conform to all test provisions of ANSI/SCTE 77 "Specifications For Underground Enclosure Integrity" for Tier 15 applications (15,000lb design load and 22,500lb test load) unless noted otherwise.

2. All covers shall have a minimum coefficient of friction of 0.05 in accordance with ASTM C1028 and the corresponding Tier level shall be embossed on the top surface.
3. Cover shall be bolt-down include factory-labeling to read "Electric", "Communications" or other as directed.
4. Hardware shall be stainless steel.
5. Shall be Quazite PG/LG Style or approved equal.

## PART 3 - EXECUTION

### 3.1. APPLICATION

- A. General
  1. All boxes and wireways shall be of sufficient size to provide free space for all enclosed conductors per NEC requirements. Fill calculations shall be performed by contractor per NEC requirements.
- B. Outlet Boxes & Junction Boxes (through 4-11/16")
  1. Sheet metal boxes shall be used on concealed work in ceiling or walls.
  2. Cast boxes shall be used wherever Rigid or I.M.C. conduits are installed.
  3. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
  4. Except when located in exposed concrete block, switch and receptacle boxes shall be 4" square for single gang installation. Appropriate gang boxes shall be used for mounting ganged switches.
  5. When installed in exposed concrete block, switch and receptacle boxes shall be square type designed for exposed block installation.
  6. Ceiling outlet boxes shall be 4" octagon 1-1/2" deep or larger required due to number of wires.
  7. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.
- C. Junction & Pull Boxes (larger than 4-11/16")
  1. For all below grade exterior use and elsewhere as shown:
    - a. In areas subject to future vehicular traffic: shall be galvanized cast iron (rated AASHTO H-20 Loading unless noted otherwise).
    - b. In areas not subject to vehicular traffic: shall be galvanized cast iron or pre-cast polymer concrete (rated for Tier 15 Loading unless noted otherwise).
  2. All boxes installed exposed in exterior or wet areas shall be stainless steel (NEMA 4X).
  3. All boxes installed exposed in corrosive areas shall be stainless steel (NEMA 4X).
  4. All boxes installed in extremely corrosive areas (such as chlorine and fluoride storage rooms) where non-metallic raceways are used shall be non-metallic.
  5. Boxes installed in hazardous locations shall be explosion-proof rated for the associated application, constructed of copper-free cast aluminum.
  6. All others shall be oil tight JIC box not less than 16 gauge.

### 3.2. INSTALLATION

- A. General

1. All boxes and wireways shall be securely anchored.
2. All boxes shall be properly sealed and protected during construction and shall be cleaned of all foreign matter before conductors are installed.
3. All boxes and wireways shall be readily accessible. Contractor shall be responsible for furnishing and installing access panels as directed by the architect as required to make boxes and wireways accessible where above gypsum board ceilings or in other similar locations.
4. All metallic boxes and wireways shall be properly grounded.
5. Refer to Specification Section 26 05 53 for identification requirements.

**B. Outlet Boxes & Junction Boxes (through 4-11/16")**

1. Boxes shall be provided with approved 3/8" fixture studs were required.
2. Recessed boxes for wiring devices, surface fixtures, or connections, shall be set so that the edge of cover comes flush with finished surface.
3. There shall be no more knockouts opened in any sheet metal box than actually used.
4. Any unused opening in cast boxes shall be plugged.
5. Back to back boxes to be staggered at least 3 inches.
6. Under no circumstances shall through-the-wall boxes be used.

**C. Junction & Pull Boxes (larger than 4-11/16")**

1. Pull boxes shall be installed as indicated on plans and/or as required due to number of bends, distance or pulling conditions.
2. Boxes to be imbedded in concrete shall be properly leveled and anchored in place before the concrete is poured.
3. All pull boxes and/or junction boxes installed exterior below grade, shall have their tops a minimum of 1-1/2 inches above surrounding grade and sloped so that water will not stand on lid. A positive drain shall be installed, to prevent water accumulation inside.
4. Above grade pull boxes shall be installed on concrete anchor bases as shown on Plans.

**D. Wireways and/or wall-mounted equipment**

1. Mount each wireway to channels of the same metal type as the wireway.
2. Conductors serving a wireway shall be extended without reduction in size, for the entire length of the wireway. Tap-offs to switches and other items served by the wireway shall be made with ILSCO type GTA with GTC cap.

END OF SECTION 26 05 34



## SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

### PART 1 - GENERAL

- 1.1. **DESCRIPTION**
  - A. Wire and cable identification.
  - B. Pullbox & Junction Box Identification
  - C. Electrical distribution & utilization equipment identification.
  - D. Emergency and Standby Power receptacle identification.
  - E. Instrument and control device identification.
  - F. Raceway identification.

### PART 2 - PRODUCTS

#### 2.1. WIRE AND CABLE IDENTIFICATION

- A. Intermediate Locations:
  1. Wires and cable labels shall be white, thermal transfer, halogen-free, flame-retardant marker plates (sized to accommodate three lines of text) permanently affixed to the associated cable with UV-resistant plastic wire ties. Labels shall be Panduit #M200X/300X series or equal.
- B. Circuit/Cable Termination Locations:
  1. Wires and cable labels shall be non-ferrous identifying tags or pressure sensitive labels unless noted otherwise.

#### 2.2. ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

- A. Labels on electrical distribution & utilization equipment shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment with rivets or silicone adhesive unless noted otherwise.

#### 2.3. EMERGENCY AND STANDBY POWER RECEPTACLE IDENTIFICATION

- A. Receptacles fed from emergency or standby power sources (such as emergency generators) shall be provided with factory-marked engraved coverplates as follows:
  1. Emergency System source: Red engraved lettering to read "EMERGENCY".
  2. Legally-Required or Optional Standby Generator source:
    - a. If only part of facility is fed with generator backup: Black engraved lettering to read "FED FROM GENERATOR".

- b. If entire facility is fed with generator backup: No “....GENERATOR...” label required.

#### 2.4. INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

- A. Instruments and control device labels shall be black-on-white engraved Bakelite nameplates permanently affixed to the equipment or the adjacent, visible mounting surface with silicone adhesive or stainless steel wire ties.

#### 2.5. RACEWAY IDENTIFICATION

- A. Raceway labels shall be white thermal transfer marker plates permanently affixed to the associated raceway with stainless steel wire ties, with two wire ties (one on either end of marker plate to provide a flush installation) where possible. Labels shall be Panduit #M300X series or equal.

### PART 3 - EXECUTION

#### 3.1. GENERAL

- A. Any proposed deviation in identification methods and materials from those described herein shall be submitted to Engineer for review and comment prior to installation.
- B. Contractor shall provide all labeling or identification required by applicable local, state and national codes. These specifications do not intend to itemize all code-required labeling or identification requirements.
- C. All labels/identification shall be positioned such as to be readable from the normal perspective without adjusting wiring/cables/labels. For example, labels/identification of wires/cables within cable trays shall be positioned to point towards the viewer (typically downward for overhead cable trays, or upward for cable trays within trenches).
- D. All labels/identification (except for handwritten labels on concealed pullbox/junction box covers as noted below) shall be typewritten/printed/engraved in a neat, workmanlike, permanent, legible, consistent and meaningful manner. Labels shall not be handwritten unless specific approval is granted by engineer.

#### 3.2. WIRE AND CABLE IDENTIFICATION

- A. General:
  1. Where cabling is exposed (such as within cable trays), provide two wire ties per cable (one on either end of marker plate to provide a flush installation). Where cabling is concealed (such as within pullboxes/wireways), one wire tie per cable will be acceptable.
- B. Intermediate Locations:
  1. Thermal transfer labels shall be securely fastened to all wiring and cabling in the following locations:
    - a. Wireways
    - b. Pullboxes/Junction boxes larger than 4-11/16”

- c. Pullboxes/Junction boxes through 4-11/16" where wires and cables are not easily identifiable via the color coding and box labeling
- d. Vaults & Manholes
- e. Approximately every 50 feet within cable trays (especially at locations where cables exit or diverge). Labels within cable trays shall be grouped (rather than being pre-labeled on cables and pulled into cable trays).
- f. Other similar intermediate locations.

2. Labels shall be stamped or printed with the following data so that the feeder or cable can be readily identified and traced:

- a. From where the circuit originates (including panel designation and circuit number):
  - 1) Ex: "FROM: PP-A CIR. 3 (IN MAIN ELEC ROOM)"
- b. To where the circuit extends (using the common name of the equipment):
  - 1) Ex: "TO: RTU-6 (ON ROOF)"
- c. The purpose of the circuit:
  - 1) Ex: "POWER"
- d. The set number (If parallel power feeds are used).
  - 1) Ex: "SET NO. 3 OF 4"

C. Circuit/Cable Termination Locations:

- 1. Where multiple termination points exist within a circuit origination point (panelboard, switchboard, MCC, starter, etc.) or other similar circuit endpoint (control panel, etc.), labels shall be securely fastened to all ungrounded and neutral conductors to clearly identify the terminal and/or circuit number associated with each conductor. For example, within lighting panels, each phase and neutral conductor shall be labeled near the terminals at a clearly visible location with the associated circuit number(s), so that if all conductors were unterminated, the labels would clearly indicate which conductor was associated with each circuit.

D. Refer to Specification Section 26 05 19 for all color-coding requirements of wires and cables.

**3.3. PULLBOX & JUNCTION BOX IDENTIFICATION**

A. Concealed pullboxes/junction boxes:

- 1. Front surface of all pullbox/junction box covers in concealed areas (such as above lay-in ceilings) or within mechanical/electrical rooms (and other similar areas where appearance of boxes is not an issue) shall be neatly marked with the ID of circuits/cables contained with permanent black marker on cover of box (Ex: "RP-1A Cir. 1, 2 & 3"). Additionally, front surface of box shall be painted red where box contains fire alarm system cabling.

B. Exposed pullboxes/junction boxes:

- 1. Interior surface of all pullbox/junction box covers in exposed areas shall be labeled "Power", "Telecommunications", "Fire Alarm" or with other similar general text neatly with permanent black marker to indicate function of box. Circuit/cable labeling within box (see above) shall identify specific cables contained. Additionally, interior surface of cover shall be painted red where box contains fire alarm system cabling.

C. Where pullboxes/junction boxes are named on contract documents (Ex: "PULLBOX #3"), an engraved nameplate shall be installed on the front surface of the box to identify the name.

### 3.4. ELECTRICAL DISTRIBUTION & UTILIZATION EQUIPMENT IDENTIFICATION

#### A. General:

1. All new and existing equipment modified by this project shall include arc-flash warning labels in accordance with NEC article 110.16.

#### B. All Panels, Motor Control Centers, Switchboards, Switchgear, Transformers, Etc.:

1. Engraved nameplates identifying name of equipment, nominal voltage and phase of the equipment and where the equipment is fed from shall be installed on front surface of all panels, motor control centers, switchboards, switchgear, transformers, etc.:
  - a. Ex: First Line: "NAME: RP-A", Second Line: "120/208V-3Ø-4W", Third Line: "FED FROM: PP-A CIR. 4 (IN MAIN ELEC ROOM)"
2. Refer to Panelboard Specification Sections for additional labeling requirements (circuit directory cards, permanent circuit labels, permanent circuit numbers, etc.) required inside panelboards.

#### C. Safety/Disconnect Switches and Utilization Equipment (HVAC Equipment, Pumps, Powered Valves, Control Panels, Starters, Etc.):

1. Engraved nameplates identifying equipment being fed and where the equipment is fed from shall be installed on front surface of all disconnect switches (including both visible blade type switches and toggle-type switches) and on utilization equipment (where not clearly identified by immediately adjacent local disconnect switch):
  - a. Ex: First Line: "RTU-6", Second Line: "FED FROM: PP-A CIR. 5"
2. Where safety/disconnect switches are installed on the load side of variable frequency drives, the safety/disconnect switch shall be furnished with an additional engraved nameplate to read: "WARNING: TURN OFF VFD PRIOR TO OPENING THIS SWITCH".
3. Safety/Disconnect switches feeding equipment that is fed from multiple sources (such as motors with integral overtemperature contacts that are monitored via a control system) and Utilization Equipment fed from multiple sources shall be furnished with an additional BLACK-ON-YELLOW engraved nameplate to read: "WARNING: ASSOCIATED EQUIPMENT FED FROM MULTIPLE SOURCES – DISCONNECT ALL SOURCES PRIOR TO OPENING COVER".

#### D. Emergency Systems:

1. A sign shall be placed at the service entrance equipment indicating the type and location of on-site emergency power sources (such as generators, central battery systems, etc.) per NEC requirements.
2. All boxes and enclosures (including transfer switches, generators, power panels, junction boxes, pullboxes, etc.) dedicated for emergency circuits shall be permanently marked with white-on-red engraved nameplates so they will be readily identified as a component of an emergency circuit or system.

#### E. Services:

1. All Service Equipment:

- a. Engraved nameplates identifying maximum available fault current, including date the fault current calculation was performed, in accordance with NEC article 110.24.
  - 1) Ex: First Line: "AVAILABLE FAULT CURRENT: 16,154 AMPS", Second Line: "DATE CALCULATED: JULY 8, 2013"
- b. All service entrance equipment shall be clearly labeled as being service entrance rated.
- 2. Where a building or structure is supplied by more than one service (or any combination of branch circuits, feeders and services), a permanent plaque or directory shall be installed at each service disconnect location denoting all other services, feeders & branch circuits supplying that building or structure and the area served by each, per NEC requirements.

F. Generators:

- 1. Generators shall be labeled with engraved nameplates identifying name of equipment.

3.5. EMERGENCY AND STANDBY POWER RECEPTACLE IDENTIFICATION

A. Receptacles fed from emergency or standby power sources (such as emergency generators) shall be provided with factory-marked engraved coverplates as described above.

3.6. INSTRUMENT AND CONTROL DEVICE IDENTIFICATION

A. New Instruments and control devices (whether furnished by contractor or not) shall be labeled with black-on-white engraved nameplates permanently affixed to the equipment or to the adjacent, readily-visible mounting surface with silicone adhesive or stainless steel wire ties.

- 1. Instruments and process control devices (float switches, etc.) shall be labeled with instrument name and, where available, instrument ID number.
- 2. Pushbutton stations shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all pushbutton stations.
- 3. Thermostats and other similar HVAC control devices installed in process areas shall be labeled with equipment being controlled. Labels shall be installed on front surface (or adjacent mounting surface) of all thermostats and other similar HVAC control devices.

3.7. RACEWAY IDENTIFICATION

A. Each exposed raceway shall be labeled at the point where it becomes concealed, such as where it enters a concrete floor slab, a concrete wall, the ground, etc.

B. Each raceway entering in-grade or on-grade pullboxes/junction boxes, where the conduits are only visible inside the box, shall be labeled within the box at the point where the raceway becomes concealed.

C. Raceway nameplates shall identify:

- 1. The location of the other end of the raceway ("TO MCC-1" or similar). If the other end of the raceway is at an intermediate, named pullbox ("INSTRUMENTATION PULLBOX #4" or similar), that pullbox name shall be labeled rather than the endpoint of the circuitry.

3.8. OTHER IDENTIFICATION

A. Factory-engraved coverplates identifying functions of light switches and other similar devices shall be installed where so required by plans/specifications.

END OF SECTION 26 05 53

## SECTION 26 22 00 - DRY TYPE TRANSFORMERS

### PART 1 - GENERAL

1.1. GENERAL

A. THE WORK UNDER THIS SECTION INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING:

1. Dry Type Transformers

1.2. GENERAL REQUIREMENTS

A. Voltage for 3 phase units shall be 480V to 120/208V, three phase, four wire unless shown otherwise. Voltage of single phase units shall be 480V to 120/240V single phase, three wire unless shown otherwise.

### PART 2 - PRODUCTS

2.1. INSULATION

A. Transformers shall be ventilated with insulation to withstand a minimum of 150 degree Celsius temperature rise (Class 220 insulation) unless specifically shown otherwise on the drawings.

2.2. ENERGY EFFICIENCY

A. Transformers shall comply with the latest applicable DOE energy efficiency requirements and latest edition of NEMA standard TP-1 and shall be labeled for the EPA Energy Star Program.

2.3. SOUND RATING

A. Sound level design may not exceed the following:

KVA	DESIGN SOUND LEVEL
0-45	40 db
46-112.5	44 db
113-150	47 db
151-300	49 db
301-750	58 db

B. Sound levels shall be determined in accordance with NEMA and ASA Standards. Core and coils shall be mounted on vibration isolator pads.

2.4. ENCLOSURES

A. Transformers mounted in dry, interior, non-corrosive locations shall be furnished with NEMA 1 enclosures unless shown otherwise.

B. Transformers mounted outdoors or in wet locations shall be furnished with NEMA 3R or 4X

stainless steel enclosures with drip shields unless shown otherwise.

C. Transformers installed inside motor control centers or other similarly enclosed equipment may be "open" units not requiring additional enclosures.

#### 2.5. CLEARANCE REQUIREMENTS

A. Transformer construction/efficiency/ventilation shall allow 3" (or less) clearance from rear and sides.

#### 2.6. TAPS

A. All units shall be equipped with a minimum of two (2) 2 1/2% taps above nominal (FCAN) and a minimum of four (4) 2 1/2% taps below nominal (FCBN) as required to allow adjustment of the turns ratio of the transformer to account for site voltage adjustments.

#### 2.7. LUGS

A. Lugs shall be AL/CU compression type suitable for the quantities and sizes of conductors required.

#### 2.8. MANUFACTURER

A. Transformers shall be Square 'D' or Cutler Hammer.

### PART 3 - EXECUTION

#### 3.1. GENERAL

A. Minimum clearances shall be provided on all sides of transformers per manufacturer's and code requirements.

B. Where site voltages so require, transformer taps shall be adjusted to maintain nominal voltage on secondary side of transformer. Adjustment of dry-type transformer taps shall not be made until all upstream voltage adjustments (such as voltage tap adjustments at service transformers) are finalized.

C. Refer to Specification Section 26 05 26 for transformer grounding requirements.

D. Refer to Specification Section 26 05 53 for transformer identification requirements.

#### 3.2. MOUNTING

A. Transformers shall be mounted as indicated on plans. No units shall be wall mounted unless shown or directed otherwise.

B. Floor mounted transformers:

1. Shall be installed on a minimum of four (4) double-deflection neoprene vibration isolators (Amber/Booth type RVD or equal by Korfund Dynamics or Mason Industries - size as required).
2. Shall be installed on four inch thick concrete pads unless specifically shown otherwise. Pad shall have beveled edges.

C. Suspended transformers:

1. Shall be trapeze-mounted on unistrut frame supported by a minimum of four steel rods and shall be mounted as high as possible or at height directed (transformers shall not be mounted above lay-in ceilings or in areas with restricted ventilation). Each rod shall be provided with a double-deflection neoprene vibration isolation hanger (Amber/Booth type BRD or equal by Korfund Dynamics or Mason Industries - size as required).
2. Contractor shall supply extra supports as may be required due to size and weight.
3. Additional seismic bracing shall be provided for suspended transformers in seismic zones as required to provide a fully code-compliant installation.

END OF SECTION 26 22 00



## SECTION 26 24 17 - LIGHTING PANELBOARDS

### PART 1 - GENERAL

#### 1.1. GENERAL

- A. The work under this section includes but is not limited to the following:
  - 1. Lighting Panelboards
  - 2. Circuit Breakers

### PART 2 - PRODUCT

#### 2.1. PANELBOARDS

##### A. Enclosure:

- 1. Panelboards shall be dead front type and shall be in accordance with Underwriter's Laboratories, Inc., standard of panelboards and enclosing cabinets and so labeled.
- 2. Panelboards installed in dry locations shall have enclosures fabricated from sheet steel and shall be finished in ASA #49. Panelboards installed in corrosive, exterior or wet locations shall have NEMA 4 stainless steel enclosures.
- 3. The door shall have a cylinder type lock. Lock shall be held in place by concealed screw to a captive nut, welded to inside of door. All locks shall be keyed alike.
- 4. A metal framed circuit directory card holder with clear plastic covering shall be factory-mounted on the inside of door.
- 5. Panels for 20 or more circuits, including spares and spaces, shall be 20 inches wide.
- 6. Panelboards enclosures shall be as shown on panel schedule on plans for surface, flush or motor control center mounting.
- 7. Provide hinged trim with piano-hinge down full length of one side to allow access to wiring without complete removal of outer trim.
- 8. Each section of multi-section panelboards shall be of matching heights and depths.

##### B. Bussing/Lugs:

- 1. Ampacity and service voltage of main buss, lugs or main breakers and branch circuit breakers shall be as shown on drawings.
- 2. All bussing and associated connectors shall be tin-plated copper.
- 3. All panelboards shall contain ground buss.
- 4. Entire panelboard shall be capable of withstanding a short circuit not less than the interrupting capacity of any breaker in the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. Interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
- 5. Buss connectors shall be for distributed phase arrangement.
- 6. Main and sub-feed lugs shall be provided with AL/CU compression lugs suitable for the quantities and sizes of conductors required.

- 7. Top/bottom feed arrangement and lug sizes/quantities shall be coordinated by the contractor.
- 8. Entire panelboard assembly, including all bussing, shall have SCCR ratings meeting or exceeding the minimum AIC ratings listed on the plans for the panel. When a power distribution system electrical study (including short circuit stud, etc.) is a part of the project, contractor shall further verify that all proposed equipment is properly rated (per the results of the study) prior to submitting shop drawings. All ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.

C. Breaker arrangement and numbering:

- 1. Panelboards shall be factory assembled with branch breakers arranged exactly as indicated on plans.
- 2. Breakers shall be numbered vertically beginning top left. Multi-section panelboards shall be numbered consecutively through all sections.
- 3. Breaker numbers shall be permanently attached to trim.
- 4. Main breakers shall be vertically-mounted (branch-mounted or back-fed main breakers will not be acceptable unless specifically so shown on plans).

2.2. CIRCUIT BREAKERS

- A. Circuit breakers shall be quick break, quick make, thermal magnetic type, for alternating current. Breakers shall trip free for the handle and tripping shall be indicated by the handle assuming a position between OFF and ON.
- B. Circuit breakers shall be of the bolt-on type.
- C. Multi-pole breakers shall be internal common trip with single operating handle; external handle ties are not acceptable, unless specifically noted otherwise (such as for multi-wire branch circuits described below).
- D. Circuit breakers feeding multiwire branch circuits (as defined by NEC) consisting of separate single phase loads sharing a common neutral shall be provided with multi-pole breakers or handle ties to simultaneously disconnect all ungrounded conductors per NEC Article 210.4(B). The necessary locations of these multi-pole breakers or handle ties shall be coordinated by the contractor. Where necessary, the contractor may rearrange circuit breakers (as minimally as possible) as required to meet this requirement.
- E. All breakers shall meet the minimum RMS symmetrical interrupting capacity ratings shown on plans for the associated panel. All interrupting ratings shall be full ratings. Series ratings will not be allowed unless shown otherwise on drawings.
- F. All branch circuit breakers shall be listed to UL489 or shall be specially-tested to be HACR listed.

2.3. SPECIAL REQUIREMENTS

- A. Any special requirements on the drawings, such as for increased interrupting rating, ground fault protection, etc., shall supersede these specifications, but only insofar as that particular requirement is concerned.

- B. Lighting panels larger than 400A shall conform to the requirements for power panels.

#### 2.4. MANUFACTURER

- A. Panelboards shall be as manufactured by Square 'D' or Cutler Hammer.

### PART 3 - EXECUTION

#### 3.1. INSTALLATION

- A. All panelboard dimensions and clearances shall be carefully checked and coordinated with the proper trades to insure proper mounting space and support prior to roughing in equipment. In no case shall any circuit breaker be located above 6'-7" A.F.F.
- B. Wiring in panelboard wireways shall be done in a neat and workmanlike manner. Wiring shall be grouped into neat bundles and secured with approved tie wraps.
- C. For all flush-mounted panelboards, a minimum of three (3) one-inch empty conduits shall be stubbed out above the nearest accessible ceiling space for future use.

#### 3.2. PANEL IDENTIFICATION

- A. Refer to Specification Section 26 05 53.

END OF SECTION 26 24 17



## SECTION 26 27 26 - WIRING DEVICES

### PART 1 - GENERAL

#### 1.1. DESCRIPTION

- A. Wiring Devices
- B. Plates
- C. Finishes

### PART 2 - PRODUCTS

#### 2.1. WIRING DEVICES AND PLATES

- A. Switches shall be AC type, extra-heavy duty industrial grade (unless otherwise shown) of ratings shown on drawings. Switches shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- B. Receptacles shall have blade configuration and shall be extra-heavy duty industrial grade (unless otherwise shown) of current and voltage rating as shown on drawings. Receptacles shall be as manufactured by Hubbell, P & S, Sierra, Bryant, GE, Arrow Hart or equal.
- C. All GFCI-type receptacles shall continuously self-test and shall trip/deny power if the receptacle does not provide proper GFCI protection or if the line/load terminations are miswired and shall provide visual indication of power status, trip conditions, ground fault conditions and end-of-life status.
- D. Each wiring device shall have a plate (see "Finishes" section below for specific requirements).

#### 2.2. FINISHES

- A. All wiring devices (switches, receptacles, etc.) shall be colored to match the coverplates described below. For instance, all items covered by stainless steel, aluminum or malleable iron plates shall be gray in color.
  - 1. Exceptions:
    - a. Emergency wiring devices shall be red.
    - b. Isolated ground wiring devices shall be orange.
- B. Coverplates for recessed, wall-mounted electrical items (switches, receptacles, telephone outlets, etc.) shall be stainless steel unless shown otherwise.
- C. Coverplates, trim rings, etc. for recessed, floor-mounted electrical items (floor outlets, underfloor duct junctions, etc.) shall match finish of building hardware (302/304 stainless steel, brass, etc.) in area installed.

- D. Coverplates for exposed electrical items (switches, receptacles, telephone outlets, etc.) shall be of same material as exposed boxes (see Outlet Box Specification for required material type) and shall have beveled edges.
- E. Coverplates for receptacles in wet locations shall be metallic, in-use type, rated for wet locations per NEC requirements unless noted otherwise.
- F. See "Electrical Identification" specification section for coverplate labeling requirements.

### PART 3 - EXECUTION

#### 3.1. GENERAL MOUNTING

- A. Symbols on drawings and mounting heights are approximate. The exact locations and mounting heights shall be determined on the job, and it shall be the Contractor's responsibility to coordinate with all trades to secure correct installation. For example, Contractor shall coordinate exact mounting heights over counters, in or above backsplashes, in block walls, and at other specific construction features.
- B. Verify all door swings with Architectural. Locate boxes for light switches within four inches of door trim on swing side (not hinge side) of door.
- C. Devices and associates plates shall not be used as support; outlet boxes shall be rigidly supported from structural members.
- D. Mount all straight-blade receptacles vertically with ground pole up, unless specifically noted otherwise.
- E. Unless otherwise shown or required by local handicap codes, centerline of outlet boxes shall be the following distances above the finished floor unless otherwise noted.
  1. Receptacles and telephone outlets in offices and other finished areas: 1'-6"
  2. Receptacles and telephone outlets in equipment rooms and other unfinished areas: 4'-0"
  3. Receptacles over counters: As Noted
  4. Clock outlet, general: 7'-6"
  5. Switches, general: 4'-0"
  6. Bell outlets, interior, general: 7'-6"
  7. Bell outlets, exterior, general: 10'-0" or 1'-0" below roof line, whichever is lower.
  8. Fire Alarm Pull Stations: 4'-0"
  9. Fire Alarm Audio/Visual Devices: 6'-8"
  10. Push-button, etc., general: 4'-0"

END OF SECTION 26 27 26

## SECTION 26 44 00 - ELECTRICAL HEAT TRACING SYSTEMS

### PART 1 - GENERAL

#### 1.1. SCOPE

A. This specification covers the requirements of materials and support services for heat-tracing systems. Heat tracing systems (including insulation and all accessories) shall be provided on all piping installed exposed in exterior locations or where otherwise indicated on plans unless noted otherwise.

#### 1.2. CODES, APPROVALS, AND STANDARDS

A. The electric heat-tracing system shall conform to this specification. It shall be designed, manufactured, and tested in accordance with the applicable requirements of the latest edition of the following codes and standards.

1. ANSI American National Standards Institute
2. CEC Canadian Electrical Code
3. CSA CSA International
4. FM FM Approvals
5. IEC International Electro-Mechanical Commission
6. IEEE Institute Of Electrical and Electronics Engineers
7. ITS Intertek Testing Services (Intertek ETL SEMKO)
8. NEC U.S. National Electrical Code (NFPA 70)
9. NEMA National Electrical Manufacturers Association
10. NESC National Electrical Safety Code
11. UL Underwriters' Laboratories, Inc.

### PART 2 - PRODUCTS

#### 2.1. ACCEPTABLE MANUFACTURERS

A. Heat Tracing:

1. Raychem/Tyco Thermal Controls.
2. Thermon.
3. Nelson Heat Tracing.
4. Chromalox.

B. Insulation:

1. Armstrong World Industries, Inc.
2. Babcock & Wilcox; Insulationg Products Division
3. CertainTeed Corporation
4. Knauf Fiber Glass GmbH
5. Manville Products Corp.
6. Owens-Corning Fiber Glass Corp.
7. Pittsburg Corning Corp.
8. Rubatex Corp.

## 2.2. SELF-REGULATING HEATING CABLES

- A. All heat-tracing applications with continuous exposure (maintain) temperatures from 150°F (65°C) to 250°F (121°C) or intermittent exposure temperatures from 185°F (85°C) to 420°F (215°C) shall use self-regulating cables.
  - 1. Self-regulating heating cable shall vary its power output relative to the temperature of the surface of the pipe or the vessel. The cable shall be designed such that it can be crossed over itself and cut to length in the field.
  - 2. Self-regulating heating cable shall be designed for a useful life of 20 years or more with “power on” continuously, based on the following useful life criteria:
    - a. Retention of at least 75 percent of nominal rated power after 20 years of operation at the maximum published continuous exposure (maintain) temperature.
    - b. Retention of at least 90 percent of nominal rated power after 1000 hours of operation at the maximum published intermittent exposure temperature. The testing shall conform to UL 746B, IEC 216-1 Part 1.
  - 3. A warranty against manufacturing defects for a period of 10 years shall be available.
  - 4. All cables shall be capable of passing a 2.5 kV dielectric test for one minute (ASTM 2633) after undergoing a 0.5 kg-m impact (BS 6351, Part 1, 8.1.10).

## 2.3. FREEZE-PROTECTION SYSTEMS

- A. The heating cable shall consist of two 16 AWG or larger nickel-plated copper bus wires, embedded in a self-regulating polymeric core that controls power output so that the cable can be used directly on plastic or metallic pipes. Cables shall have a temperature identification number (T-rating) of T6 (185°F or 85°C) without use of thermostats.
- B. The heating cable shall have a tinned copper braid with a resistance less than the heating cable bus wire resistance as determined in type test (ASTM, B193, Sec. 5). The braid shall be protected from chemical attack and mechanical abuse by a modified polyolefin or fluoropolymer outer jacket.
- C. In order to provide rapid heat-up, to conserve energy, and to prevent overheating of fluids and plastic pipe, the heating cable shall have the following minimum self-regulating indices:
  - 1. Table K.1 Minimum Self-Regulating Indices

Heating cable	S.R. index (W°F)	S.R. Index (W°C)
3 W/ft	0.038	0.068
5 W/ft	0.060	0.108
8 W/ft	0.074	0.133
10 W/ft	0.100	0.180

- D. The self-regulating index is the rate of change of power output in watts per degree Fahrenheit or watts per degree Celsius, as measured between the temperatures of 50°F (10°C) and 100°F (38°C) and confirmed by the type test and published data sheets.
  - 1. In order to ensure that the self-regulating heating cable does not increase power output when accidentally exposed to high temperatures, resulting in thermal runaway and self-ignition, the cable shall produce less than 0.5 watts per foot (1.64 watts per meter) when energized and heated to 350°F (177°C) for 30 minutes. After this test, if the cable is reenergized, it must not have an increasing power output leading to thermal runaway.

2. In order to confirm 3.1B, the self-regulating heating cable shall retain at least 90 percent of its original power output after having been cycled 300 times between 50°F (10°C) and 210°F (99°C), allowing at least six minutes of dwell time at each temperature.
3. The heating cable shall be Raychem® BTV-CT or BTV-CR self-regulating heater, with continuous exposure (maintain) capability up to 150°F (65°C) and intermittent exposure capability up to 185°F (85°C), as manufactured by Tyco Thermal Controls.

#### 2.4. SYSTEMS FOR DIVISION 1 HAZARDOUS LOCATIONS

- A. The following requirements shall apply in addition to the criteria specified above:
  1. The self-regulating heating cable shall be specifically FM Approved or CSA Certified for use in Division 1 locations.
  2. A ground-fault protection device set at 30 mA, with a nominal 100 ms response time, shall be used to protect each circuit.
  3. The temperature identification number (T-rating) of the cable used shall comply with FM and CSA requirements as applicable.
  4. Connection methods used with the cable shall be compatible and approved as a part of the system manufactured and supplied by the heating cable vendor for use in the Division 1 location.
  5. For plastic pipe and vessel applications, the heating cable shall be Raychem HBT-CT or Raychem BTV-CT self-regulating heaters, with continuous exposure capability up to 150°F (65°C) and intermittent exposure capability up to 185°F (85°C), as manufactured by Tyco Thermal Controls.
  6. The heating cable shall be Raychem HQTV-CT or Raychem QT-CT self-regulating heaters, for continuous and intermittent exposure capability up to 225°F (110°C), as manufactured by Tyco Thermal Controls.
- B. Terminations for nonhazardous And hazardous class 1, div 2 locations
  1. All connection components used to terminate heating cables, including power connectors, splices, tees, and connectors shall be approved for the respective area classification and approved as a system with the particular type of heating cable in use. Under no circumstances shall terminations be used which are manufactured by a vendor other than the cable manufacturer.
  2. In order to keep connections dry and corrosion resistant, components shall be constructed of nonmetallic, electrostatic, charge-resistant, glass-filled, engineered polymer enclosure rated NEMA 4X. The component stand shall allow for up to four inches (100 mm) of thermal insulation.
  3. Terminals shall be spring clamp wire connection type to provide reliable connection, maintenance-free operation, and ease of reentry.
  4. Heating cable terminations shall use cold-applied materials and shall not require the use of a heat gun, torch, or hot work permit for installation.
  5. Components shall be rated to a minimum installation temperature of -40°F (-40°C), minimum usage temperature of -75°F (-60°C), and maximum pipe temperature of 500°F (260°C).
  6. The component system shall be Raychem JBM-100-L-A connection kit complete with integral LED power indicating light to serve as complete power, splice, or tee connection for up to three Raychem BTV, QT-CT, or XTV industrial parallel heating cables as manufactured by Tyco Thermal Controls.

## 2.5. THERMOSTATS AND CONTACTORS

- A. Freeze protection systems shall operate using self-regulating control or with the DigiTrace AMC-1A or DigiTrace AMC-F5 thermostat and the DigiTrace E104-100A or DigiTrace E304-40A contactor in nonhazardous locations, and DigiTrace AMC-1H thermostat with Digitrace E307-40A contactor in hazardous locations, as supplied by Tyco Thermal Controls.

## 2.6. END SEAL

- A. An above-insulation, lighted end seal kit shall be provided for each heat trace circuit termination as per the manufacturer's installation details. The kit shall be E-100-LBTv2 as supplied by Tyco Thermal Controls.

## 2.7. INSULATION

- A. All components of the insulation, including covering, mastics and adhesives shall have a flame-spread rating of not over 25, and a smoke development rating of not over 50. Ratings shall be as established by tests in accordance with ASTM E 84 and Federal Specification standards. The integrated insulation assemblies shall also conform to the above specifications. Insulation shall be applied in strict accordance with the manufacturer's instructions.
- B. Standard Insulation: This type of insulation shall be employed for process, cold-and hot water, steam, and condensate piping and equipment with surface temperatures up to 850 degrees F. Pipe insulation and jacketing shall be applied to piping where shown, and shall include fittings, flanges, and valves. Pipe insulation shall be molded-type pipe covering, made of fibrous glass with a minimum k-factor of 0.23 at 75 degrees F mean temperature. Unless otherwise specified the insulation thickness shall be 1" minimum.
- C. The insulation shall be oversized for installation over electric heating cable. Insulation shall have a factory-applied white fire-retardant vapor-barrier jacket of kraft paper and aluminum foil laminated together and reinforced with fiberglass yarn. Fittings and valves shall be covered with the same material as the pipe, cut in segments to fit snugly without open spaces, held in place with copper wire or cement, and then covered with the same jacketing material as the pipe. Insulated fittings adjacent to vapor-barrier insulation shall be sealed with an acceptable vapor-barrier cement before installation of the finish jacket. Pipe insulation and vapor-barrier shall be continuous through hangers and supports. Insulation shall be coordinated with the pipe hangers and supports and where insulation protection shields are provided the top half section of pipe insulation at support locations shall be of the same specified density, and the bottom half insulation segments provided between the pipe and the insulation protection shields shall have a density of not less than 6 lb/cu ft. All insulation shall be covered with smooth aluminum weatherproof metal or plastic preformed jacketing with a factory attached moisture barrier. The jacket for the fittings shall consist of precision-formed smooth-sided sections and shall be sized to cover and protect the insulated fitting. Each section shall be manufactured from aluminum or PVC, and all joints shall be sealed with silicon mastic or solvent welding, to provide a continuous, air and weathertight joint. Strapping shall be 1/2-inch wide, Type 3003 aluminum or stainless steel.

## PART 3 - EXECUTION

### 3.1. GENERAL

- A. Heat tracing shall be provided along full length of all exposed piping or vessels located outside of buildings or in other areas designated on plans (such as by insulated piping in areas subject to cold temperature). Insulation shall be provided over all heat traced pipes.
- B. The vendor shall provide a detailed design utilizing standard heat-tracing design software, such as Tyco Thermal Controls TraceCalc® Pro design software or equal. At minimum, the design must provide the following:
  1. Circuit identification number
  2. Maintain temperature
  3. Line size and insulation
  4. Heat loss for pipe, valves, and supports
  5. Amount and type of heating cable required
  6. Spiral requirements
  7. Heating cable service voltage
  8. Heating cable power output at the maintain temperature
  9. Minimum and maximum maintain temperature vs. minimum and maximum ambient temperatures
  10. Circuit breaker and transformer sizing
- C. A ground-fault protection device set at 30 mA, with a nominal 100-ms response time, shall be used to protect each circuit.
- D. The entire system shall be installed in compliance with the manufacturer's recommendations for a fully-functional, code-compliant system.
- E. All insulation shall be installed by a qualified insulation contractor in strict accordance with the manufacturer's recommendations and the requirements of these specifications.
- F. All piping insulation shall be installed following required testing and approval of piping.

### 3.2. IDENTIFICATION

- A. Heat tracing systems shall be labeled at the field connection of power to the heat tracing equipment per the requirements for Utilization Equipment within Specification Section 26 05 53.
- B. Heat traced piping, vessels, etc. shall be identified with appropriate caution signs or markings at intervals not exceeding 20 feet on center per NEC requirements.

### 3.3. TESTING

- A. Factory inspections and tests for self-regulating, power limiting, series constant wattage and constant wattage (MI) heater cables shall include but are not limited to the following:
  1. Testing shall be done per the latest IEEE Std. 515 test section and applicable manufacturer's standards.
  2. In the field, all heater cables shall be meggered. The following separate field megger readings shall be taken on each self-regulating and each M.I. heater cable:

- a. Heater cable shall be meggered when received at jobsite before installation.
- b. Heater cable shall be meggered after installation, but before insulation is applied.
- c. Heater cable shall be meggered after insulation has been installed.
3. All three of the above field megger readings shall be greater than 20 megohms. Otherwise, the heater cable is not acceptable and shall be replaced.
4. Field megger tests shall be recorded for each heater cable, and certified reports shall be submitted to the user.

END OF SECTION 26 44 00

## SECTION 26 50 00 - LIGHTING MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.1. DESCRIPTION

- A. Lighting
- B. Ballasts/Drivers
- C. Lamps

#### 1.2. SUBMITTALS

- A. Complete submittals shall be provided identifying all lighting fixture types and options, all lamp types (where applicable) and compliance with all contract requirements. The absence of clear submittal information specifically listing exceptions/ deviations from detailed contract requirements will be understood to indicate that the contractor/ supplier intends to meet all contract requirements. Refer to specification section 26 05 00 for additional requirements.

B.

### PART 2 - PRODUCTS

#### 2.1. GENERAL

- A. Lighting fixtures shall be furnished as shown on plans and specified herein. It shall specifically be the responsibility of Contractor to verify exact types ceilings, walls, etc. and recessing depth of all recessed fixtures and furnish the specific mounting trims and accessories of the specified and/or accepted fixture specifically for the ceiling, wall etc. in which each fixture is to be installed.
- B. Base bid manufacturers are listed on the lighting fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards, efficiency, maximum wattages and photometric distributions set by the specified product.
- C. All lighting fixtures shall be so designed and shall have ballasts, drivers and other similar items so installed as to function without interruptions or failures when operating in the environment in which they are proposed to be installed. Special attention shall be given to environments with potentially high ambient temperatures such as attic spaces, exterior soffits, confined interior soffits, coves, unconditioned spaces, etc. and shall be addressed by providing fixtures with suitable high ambient temperature ratings, remote mounting of drivers/ballasts, providing approved ventilation, etc. as directed by fixture manufacturer and approved by engineer, at contractor's expense.
- D. All fixtures installed such as to create penetrations through fire rated ceiling or wall assemblies shall be labeled as suitable for that purpose or installed with covers, tenting or other means as

required to maintain the fire rating of the assembly.

## 2.2. LED LUMINAIRES

- A. For the purpose of these specifications, LED Luminaires shall be defined as the entire LED fixture assembly including LED array, drivers, housing, electronics, etc. that compose the lighting fixture.
- B. Furnish and install LED Luminaire of proper size, type, efficacy, delivered lumen output, color temperature, distribution pattern, operational life, and CRI as shown on drawings.
- C. LED Luminaires shall be tested in accordance with LM-79 and LM-80 standards.
- D. LED drivers shall comply with NEMA 410 standards for inrush current, etc.
- E. Exterior, pole mounted LED Luminaires shall be provided with an easily-serviceable, UL recognized surge protection device that meets a minimum 10kA Category C Low operation (IECC C62.41.2-2002). Device shall be wired in front of light engine(s) and driver(s) and shall fail “open” such as to prevent fixture operation after a surge protection failure.
- F. LED Luminaires shall have a guarantee-warranty of at least five years unless specifically noted otherwise on contract documents.
- G. LED Luminaire assembly shall comply with ambient temperature requirements specified in General section above.

## 2.3. BALLASTS

- A. Unless shown otherwise on plans, all fluorescent ballasts shall be electronic type with 10% maximum harmonic distortion and shall be approved by E.T.L. and have U.L. and C.B.M. label, be high power factor and have a noise level rating in accordance with I.E.S. recommendations. Fluorescent ballasts shall conform to temperature requirement noted under fixture above.
- B. All T8 and T5HO ballasts shall be programmed-start type with parallel wiring (Philips/Advance Optanium #PSP or equal by GE).
- C. All HID ballasts shall be of the pulse-start super constant wattage autotransformer type (SCWA) or electronic type. Reactor-type HID ballasts are unacceptable.
- D. Each ballast shall be properly protected by fusing, internal or external to the ballast assembly. Where required by the authority having jurisdiction, provide HLR/GMF fusing of proper size and rating external to each individual ballast. All fuses for fixtures mounted on steel or aluminum poles shall be mounted in handhole near fixture base. Contractor shall verify requirement with authority having jurisdiction prior to submitting shop drawings.
- E. Ballasts shall comply with NEMA 410 standards for inrush current, etc.
- F. See General paragraph above for ballast temperature requirements.

## 2.4. STEMS/PENDANTS

- A. Hangers shall be approved ball aligner type swivel, 30 degrees from vertical with swivel below canopy.
- B. Stems/Pendants shall be rigid conduit unless specified otherwise on plans. Proposed stem/pendant types shall be submitted for review prior to shipment of light fixtures from factory.
- C. Stems/Pendants shall be provided as required to prevent swaying of fixtures due to HVAC system airflow or other similar occurrences.
- D. Shall be painted the same color as the fixture trim unless noted otherwise.

## 2.5. LAMPS

- A. Furnish and install lamps of proper size and type as shown on drawings.
- B. All lamps shall be installed new, immediately prior to final inspection and shall not be used for construction purposes.
- C. The guarantee-warranty shall apply to lamps as follows:
  1. Screw-in LED Lamps shall be guaranteed for one (1) full year (see LED Luminaires section above for LED luminaire warranty requirements).
  2. Fluorescent and HID Lamps shall be guaranteed for one (1) full year.
  3. Incandescent lamps shall be guaranteed for one (1) month.
  4. All Quartz Lamps shall be guaranteed for six (6) months.
  5. Guarantee shall begin from date of final acceptance.

## 2.6. MANUFACTURER

- A. Fixtures and stems shall be manufactured as shown in fixture schedule or approved equals.
- B. Ballasts/drivers shall be as manufactured by Philips/Advance, GE, Lutron, Magnatec, Motorola, EldoLED or approved equal.
- C. Lamps shall be as manufactured by General Electric, Sylvania, Philips or approved equal.

## PART 3 - EXECUTION

### 3.1. INSTALLATION OF LIGHTING FIXTURES

- A. Support:
  1. Support of all lighting fixtures shall be responsibility of electrical contractor. All lighting fixture supports shall be installed in accordance with lighting fixture supplier's recommendations.
  2. Contractor shall coordinate installation requirements for all wall-mounted fixtures (especially for wall-mounted fixtures on uneven wall surfaces, etc.) as required to assure a level/flat mounting surface and level/plumb/secure finished installation. Contractor

shall provide flat mounting plates or other mounting provisions where necessary. Any proposed mounting plates, etc. shall be submitted to and approved by project architect prior to ordering materials.

3. Fixtures shall be supported independent of ceiling from structural members of building.
4. Lay-in fixtures shall be supported by four (4) taut 12 gauge hanger wires connected from each corner of the fixture to the structure above so that fixture is supported independent of the ceiling.
5. Other recessed light fixtures (including recessed downlights) shall be supported with two (2) taut 12 gauge hanger wires connected from opposing corners of the light fixture to the structure above so that fixture is supported independent of the ceiling.
6. Pendant mounted fixtures shall be directly supported from the structure above using a 9 gauge hanger wire or an approved alternate support without using the ceiling suspension system for direct support.
7. Tandem fixtures may utilize common hanger wires.
8. All lay-in fixtures shall be attached to ceiling grid by means of approved clips and in accordance with the N.E.C.
9. Contractor shall submit typical hanging detail to Engineer before installing any fixtures.

**B. Connections:**

1. All grid fixtures shall be wired by flex individually to junction and not wired fixture to fixture.
2. All flex shall contain 3 conductors (3<sup>rd</sup> wire ground). Ground wire shall be securely grounded at each end. Other conductors shall be connected by approved connectors.

**C. Row-Mounted fixtures:**

1. All stems on row-mounted fluorescent fixtures shall be installed as follows (except fixtures with slide grip hangers):
  - a. One stem shall be installed in the first fixture knockout from end of row (on the first and last fixture of the row).
  - b. One stem shall be installed between each two fixtures. Stem shall center joint where fixtures join and shall attach by use of "joining plates".
2. All fixtures in continuous rows other than recessed grid type shall be connected by nipples with locknuts bushings.

**D. Coordination:**

1. Contractor shall coordinate all dimensions & locations of light fixtures prior to rough-in to insure proper fit and coordination with other trades.
2. Contractor shall verify exact ceiling types being installed and shall adjust fixture trim types accordingly (prior to submitting light fixture shop drawings).

**3.2. SPARE LAMPS**

**A.** Turn over to Owner a minimum of one of each type lamp used. In addition, turn over to Owner one spare lamp for each ten (10) or major factors thereof used, up to a maximum of 20 for any one type and size.

END OF SECTION 26 50 00

## SECTION 27 05 00 - AUXILIARY SYSTEM CABLES, 0-50V

### PART 1 - GENERAL

#### 1.1. DESCRIPTION

- A. Cables rated for 0V-50V application

### PART 2 - PRODUCTS

#### 2.1. GENERAL

- A. Unless specified otherwise, all cables within the scope of this specification section shall:
  - 1. Be rated for exposed cable tray installation.
  - 2. Be plenum rated (Class 1 Control cabling and Instrumentation cabling installed in conduit or exposed in cable tray in non-plenum areas is not required to be plenum-rated).
  - 3. Be UL-rated for the proposed application.
  - 4. Be multi-conductor with overall outer sheath as required by the application. The insulation of each conductor within the overall multi-conductor cable shall be uniquely color-coded. Ground conductors (when provided) within the multi-conductor cable shall have green insulation.
  - 5. Utilize copper conductors.
  - 6. Have wire gauge as required to limit voltage drop to acceptable limits determined by the system supplier and to meet all applicable code requirements.
  - 7. Where installed underground, within slab-on-grade or in exterior locations, be rated for wet locations.
  - 8. Where required for specific systems, meet the specific requirements (conductor quantity, wire gauge, insulation type, shielding, etc.) of the system supplier.

#### 2.2. INSTRUMENTATION CABLING

- A. In addition to above requirements, and unless specified otherwise, Instrumentation cabling shall:
  - 1. Be #16awg minimum.
  - 2. Be rated for 300V.
  - 3. Have aluminum foil shielding.
  - 4. Have stranded, twisted conductors.
  - 5. Have PVC insulation/jacket with ripcord.
  - 6. Be manufactured by Belden, AlphaWire or General Cable.

#### 2.3. CLASS 1 CONTROL CABLING (120VAC CONTROL CIRCUITS, ETC.)

- A. In addition to above requirements, and unless specified otherwise, Class 1 control cabling shall:
  - 1. Be rated for 600V.
  - 2. Be industrial grade.
  - 3. Have stranded conductors.

4. Have sunlight/oil-resistant PVC/Nylon insulation and jacket with ripcord.
5. Be manufactured by Belden, AlphaWire or General Cable.

#### 2.4. CLASS 2 & 3 CONTROL CABLING (FED FROM CLASS 2 OR 3 POWER SUPPLIES)

A. In addition to above requirements, and unless specified otherwise, Class 2 & 3 control cabling shall:

1. Be rated for 300V.
2. Be shielded if so recommended by the system supplier/integrator.
3. Have twisted conductors.
4. Have plenum-rated insulation/jacket with ripcord.
5. Be manufactured by AlphaWire, Belden, General Cable, Superior Essex or West Penn.

#### 2.5. NETWORK CABLING

A. Furnish and install all Ethernet, Fiber Optic and Backbone Copper Telephone cabling in accordance with all BICSI requirements and in accordance with other applicable specification sections.

### PART 3 - EXECUTION

#### 3.1. GENERAL INSTALLATION

A. Routing:

1. All wires and cables shall be installed in conduit unless specifically noted otherwise. Where conduit is not otherwise required by contract documents, 0-50V Cabling located within concealed, accessible ceiling spaces (such as above lay-in ceilings) may be run without conduit if the following requirements are met:
  - a. Cabling is plenum-rated, multi-conductor.
  - b. Cabling is supported by cable tray or with J-hook supports on intervals not to exceed 5'-0" on center. Cabling shall be supported solely from the cable tray or j-hooks supported from the building structure, without using piping, ductwork, conduit or other items as supports.
  - c. Cabling is neatly formed, bundled and tied with plenum-rated Velcro straps on intervals not to exceed 30" on center.
  - d. Properly-sized conduit(s) are provided wherever cabling enters an inaccessible or exposed area (such as above gyp board ceilings, within walls or through walls).
  - e. Cabling is not a part of a Fire Alarm System, Smoke Control System, Emergency Generator Control System or other life-safety related system.
2. End bushings shall be provided on both ends of all raceway terminations.
3. No splices shall be pulled into conduit.
4. No cabling shall be pulled until conduit is cleaned of all foreign matter.

B. Penetrations:

1. All fire/smoke barrier penetrations shall be made in accordance with a U.L. listed assembly.
2. For cabling not installed in conduit:

- a. Fire/smoke barrier penetrations shall be sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.
- 3. For cabling installed within conduit from endpoint to endpoint:
  - a. Fire/smoke barrier penetrations shall be sealed utilizing fire caulk or other equivalent firestop systems around perimeters of conduits per UL requirements.
- 4. For cabling installed within cable trays:
  - a. Fire/smoke barrier penetrations shall be sealed with one of the following methods:
    - 1) Continuous cable tray through the penetration, with a combination of large firestop pillows and small firestop pillows contained, supported and secured (to prevent unauthorized removal) on both sides by aluminum wire mesh and firestop putty. Firestop pillows shall be STI Series SSB or equal and Firestop putty shall be STI Spec Seal or equal.
    - 2) Cable tray broken at the penetration, with fire/smoke barrier penetrations sealed utilizing an enclosed fire-rated pathway device (STI EZ Path or equal) containing a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and tested to the requirements of applicable ASTM/UL1479 standards.

C. Excess Cabling:

- 1. Excess cabling shall be neatly coiled within all junction boxes, pullboxes, wireways, etc. and at all terminations as required to allow future re-termination of cabling.

D. Terminations:

- 1. Cabling shall be neatly formed, bundled and tied at all terminations.

**3.2. SPLICES/CONNECTIONS/TERMINATIONS:**

A. Network Cabling:

- 1. Network and fiber optic cabling shall be continuous from endpoint to endpoint and shall not be spliced unless specifically noted otherwise.

B. Control Cabling:

- 1. Connections shall be made with T & B Sta-Kon wire joints EPT66M, complete with insulating caps. To be installed with WT161 Tool or C nest of WT11M Tool, Ideal Super - Nuts (not wire nuts), Ideal Wing Nuts, or Buchanan Elec. Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators to be installed with C24 pressure tool.

C. Shielded cabling:

1. Unless directed otherwise by the system supplier, 0-50V cable shielding shall be grounded at the PLC/control panel end only (not at the field device end) with a termination kit as directed by the PLC/control panel supplier.
2. Shielded cabling shall be continuous from endpoint to endpoint and shall not be spliced without prior written approval from the Engineer.

3.3. LABELING

A. Refer to Specification Section 26 05 53 for all labeling requirements.

END OF SECTION 27 05 00

## SECTION 27 10 00 - STRUCTURED CABLING FIBER OPTIC SYSTEM

### PART 1 - GENERAL

#### 1.1. SCOPE:

- A. This document describes the products and execution requirements relating to furnishing and installing fiber cabling, and support systems are covered under this document.
- B. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the structured cabling contractor as detailed in this document.
- C. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types are indicated on the plans. If the bid documents are in conflict, this specification shall take precedence.
- D. Refer to Specification Section 26 05 53 (Electrical Identification) for additional identification requirements.
- E. Refer to Specification Section 27 05 00 (Auxiliary System Cables, 0-50V) for additional material and installation requirements.

#### 1.2. REGULATORY REFERENCES:

- A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the National Electrical Code, local ordinances and present manufacturing standards.
- B. All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
- C. The cabling system described in this specification is derived from the recommendations made in recognized telecommunications industry standards. The following documents are incorporated by reference:
  1. ANSI/TIA/EIA - 568-B.1, Commercial Building Telecommunications Cabling Standard Part 1: General Requirements, April, 2001
  2. ANSI/TIA/EIA - 568-B.3, Commercial Building Telecommunications Cabling Standard Part 3: Optical Fiber Cabling Components, March, 2000
  3. ANSI/TIA/EIA – 569-A, Commercial Building Standard for Telecommunications Pathways and Spaces, February, 1998
  4. ANSI/TIA/EIA – 606-A, Administration Standard for Telecommunications Infrastructure of Commercial Buildings, February, 2002

5. ANSI/ TIA/EIA – 758, Customer-Owned Outside Plant Telecommunications Cabling Standard, April 1999
6. BICSI - TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM) 10<sup>TH</sup> edition.
7. National Fire Protection Agency (NFPA – 70), National Electrical Code (NEC) –2002
8. ANSI/TIA/EIA – 45-B, Test Procedures for Fiber Optic Connections.
9. ANSI/TIA/EIA – 526-14, Power Test for Fiber Runs.
10. FCC 47 CFR 68
11. NEMA 250
12. NEC Articles 770 and 800
13. ADA, Americans with Disabilities Act

D. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release.

E. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project. All local State and federal codes are to be followed.

1.3. APPROVED CONTRACTOR:

A. The Structured Cabling Contractor must meet the following requirements:

1. Contractor must have a certified RCDD on staff. The project manager for this project shall have an RCDD certification, and RCDD shall be responsible for reviewing all aspects of the design, submittals and installation of all products.
2. All required submittal information shall be stamped by the RCDD.
3. Contractor must have a minimum of 3 years experience with projects of similar size and scope to this project.
4. The company performing the work must have been in business for a minimum of 3 years.
5. The company must have an office within 75 miles of the job site.

B. The Structured cabling contractor is responsible for workmanship and installation practices in accordance with the requirements of the standards described in these specifications and manufacturer's requirements.

1.4. WORK INCLUDED:

A. The work included under this specification consists of furnishing all labor, equipment, materials, and supplies and performing all operations necessary to complete the installation of this structured cabling system in compliance with the specifications and drawings. The structured cabling contractor will provide and install all of the required material to form a complete system whether specifically addressed in the technical specifications or not.

B. The work shall include, but not be limited to the following:

1. Furnish, install, and terminate all Optical Fiber cable

2. Furnish and install all patch panels and patch cords at panels/racks (unless shown otherwise on plans).
3. Furnish any other material required to form a complete system.
4. Perform channel testing (100% of backbone links/channels) and certification of all components.
5. Furnish test results of all cabling to the owner on electronic and paper format.

**1.5. SUBMITTALS:**

- A. Within thirty (30) days of notice to proceed the structured cabling contractor shall submit the following items:
  1. Submit copies of the certification of the company and names of staff that will be performing the installation and termination of the installation to provide proof of compliance of this spec.
  2. Submit proof from manufacturer of contractor's good standing in manufacturer's certification program.
  3. Submit copy of contractor's RCDD certification.
  4. Submit listing of five (5) projects of similar size and scope to this project that have been completed within the last five years. Include in this submittal owner's contact information for each project.
  5. Submit letter from the manufacturer stating that the manufacturer will provide a twenty-five year (25) warranty in accordance with the requirements paragraph 1.03 (B) of these specifications.
  6. Submit appropriate cut sheets and samples for all products, hardware and cabling.
- B. Work shall not proceed without the engineer's approval of the submitted items.
- C. The structured cabling contractor shall receive approval from the engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the engineer.

**1.6. DRAWINGS:**

- A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the structured cabling contractor in bidding the job. The structured cabling contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.
- B. The structured cabling contractor shall verify all dimensions at the site and be responsible for their accuracy.

**PART 2 - PRODUCTS**

**2.1. EQUIVALENT PRODUCTS:**

- A. Due to the nature and type of communications all products, including but not limited to patch panels, racks, and patch cords, for the purpose of this document, shall be manufactured by Hubbell, Ortronix, Panduit, Amp or Systimax. See below for acceptable cable manufacturers.

**2.2. BACKBONE - FIBER:**

A. Backbone Fiber Optic Cabling shall meet the following requirements:

1. All optical fiber shall be Indoor/Outdoor, Tight-Buffered, All-Dielectric, Plenum rated (unless specified otherwise on plans) with Enhanced Multimode OM4-rated 50/125 Optical Fibers.
2. Each Multimode Fiber shall:
  - a. Be graded-index optical fiber wave-guide with nominal 50/125 $\mu$ m-core/cladding diameter.
  - b. Comply with ANSI/EIA/TIA-492AAAC-A
  - c. Have attenuation measured in accordance with ANSI/EIA/TIA-455-46, 53 or 61.
  - d. Have information transmission capacity measured in accordance with ANSI/EIA/TIA-455-51 or 30.
  - e. Have measurements performed at 23 degrees C +/- 5 degrees.
  - f. Have Maximum attenuation dB/Km @ 850/1300 nm: 3.5/1.0
  - g. Have bandwidth  $\geq$  4700 MHz-km @ 850nm. (EMB)
  - h. Have bandwidth  $\geq$  500 MHz-km @ 1300nm.
  - i. Be laser optimized and guarantee a 1 Gb/s distance of 1000 meters @ 850nm and 10 Gb/s at 600 meters @ 850nm.
  - j. Terminate on fiber patch panel using SC Type fiber connectors.
3. Each indoor/outdoor fiber optic cable shall:
  - a. Be suitable for use in both outdoor and indoor applications without the use of a transition at the building entrance.
  - b. Be suitable for use in risers, plenums and horizontal applications.
  - c. Have a dry water blocking system for cable.
  - d. Have a fiber strand count as indicated on plans.
  - e. Have a nominal 2.21 mm sub-unit diameter.
  - f. Have and be marked with an UL-OFNP Flame Rating (unless engineer specified otherwise on plans).
  - g. Comply with Bellcore GR-409 and GR20
  - h. Be independently verified to comply with ICEA S-104-696
  - i. Have strength members of FGE/Aramid yarn.
  - j. Be suitable for underground or above ground conduits.
  - k. (Where applicable) Have Tight Buffered fibers color coded in accordance with EIA / TIA 598 with an overall black jacket.
  - l. Be suitable for operation between -40° to +70° C
  - m. Be UV resistant
  - n. Be of an all dielectric design
4. Shall be manufactured by Berk-Tek, Corning, General Cable or Superior Essex.

**2.3. PATCH CORDS:**

A. The structured cabling contractor shall provide factory terminated and tested optical fiber patch cords and equipment cords for the complete cabling system. Patch cords shall be provided by the structured cabling contractor to connect patch panels to owner furnished electronics. Provide one set of optical fiber patch cables per fiber run that terminates on fiber patch panel.

B. Fiber Optic patch cords shall:

1. Be manufactured by Panduit, Amp or Systimax.
2. Be multimode OM4 type.
3. Have connector type as directed by owner.
4. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
5. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
6. Be available in three standard colors
7. Be available in 3 foot, 5 foot, 7 foot, 10 foot, and 14 foot standard lengths

### PART 3 - EXECUTION

#### 3.1. PRE-INSTALLATION SITE SURVEY:

- A. Prior to start of work, meet at the project site with the owner's representative and representatives of trades performing related work to coordinate efforts. Review areas of potential interference and resolve conflicts before proceeding with the work. Facilitation with the General Contractor will be necessary to plan the crucial schedule completions of the equipment rooms and telecommunication closets.
- B. Examine areas and conditions under which the system is to be installed. Do not proceed with work until satisfactory conditions have been achieved.

#### 3.2. OPTICAL FIBER TERMINATION HARDWARE:

- A. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.
- B. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.
- C. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
- D. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.
- E. A maximum of 12 strands of fiber shall be spliced in each tray
- F. All spare strands shall be installed into spare splice trays.

#### 3.3. BACKBONE CABLE INSTALLATION:

- A. Raceways:
  1. All backbone cables shall be installed inside innerducts (see specification above) within conduits meeting specification requirements unless specifically noted otherwise.
  2. Backbone cables shall be installed separately (in separate innerducts/conduits) from horizontal distribution cables.

3. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
4. Where backbone cables and distribution cables are specifically specified to be installed in a cable tray or wireway, backbone cables shall be installed first, within innerducts meeting specifications above, bundled separately from the horizontal distribution cables.

3.4. ENCLOSURES:

A. PLC enclosures are to be provided by the owner's SCADA vendor. Structured Cabling contractor shall coordinate with owner's SCADA vendor to ensure that adequate space is provided within each PLC enclosure as required to accommodate the necessary fiber optic patch panels and other necessary equipment.

3.5. IDENTIFICATION AND LABELING:

A. Refer to Specification Section 26 05 53 ("Electrical Identification").

3.6. TESTING AND ACCEPTANCE:

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Panduit Certification Program Information Manual and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end to end system. There shall be no splices unless clearly defined in an RFP. Testing shall consist of an end to end power meter test performed per EIA/TIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.
2. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.
3. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, Method B.
4. Where links are combined to complete a circuit between devices, the structured cabling contractor shall test each link from end to end to ensure the performance of the system. **ONLY LINK TEST IS REQUIRED.** The structured cabling contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test

method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.

5. Attenuation testing shall be performed with an approved hand held tester from an industry recognized test equipment manufacturer.

### 3.7. SYSTEM DOCUMENTATION:

- A. Upon completion of the installation, the structured cabling contractor shall provide three (3) full documentation sets to the owners for approval. Documentation shall include the items detailed in the sub-sections below.
- B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the structured cabling contractor shall provide copies of the original test results.
- C. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the structured cabling contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

### 3.8. TEST RESULTS:

- A. Test documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.
- B. Test results generated for each cable by the fiber test instrument shall be submitted as part of the documentation package. The structured cabling contractor must furnish this information in electronic form (CD-ROM).
- C. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

### 3.9. WARRANTY:

- A. The manufacturer shall provide a 25 year extended product warranty with a 25 year applications assurance warranty. Manufacturer shall provide the warranty directly to the end

user.

- B. An Extended Product Warranty shall be provided which warrants functionality of all components used in the system for 25 years from the date of registration. The Extended Product Warranty shall warrant the installed horizontal copper and the backbone optical fiber portions of the cabling system.
- C. The Application Assurance Warranty shall cover the failure of the wiring system to support current or future applications that are designed for the link/channel specifications of ANSI/TIA/EIA-568-B.1. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, and 155 Mb/s ATM.
- D. The contractor shall provide a warranty on the physical installation.

**3.10. FINAL ACCEPTANCE & SYSTEM CERTIFICATION:**

- A. Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation, and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from the manufacturer, registering the installation.

END OF SECTION 27 10 00

## SECTION 311000 - SITE CLEARING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Removing surface debris.
2. Removing designated paving, curbs, and etc..
3. Removing designated trees, shrubs, and other plant life.
4. Removing abandoned utilities.
5. Excavating topsoil.

#### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Site Clearing:

1. Site Clearing is not a pay item. It shall be considered an integral part of the construction, and unit prices bid for items with which Site Clearing is connected shall be full compensation for this item and for all labor, materials, and equipment required to complete the item in accordance with the drawing and specifications.
2. Includes clearing Site, loading and removing waste materials from Site, applying herbicide to designated plant life.

#### 1.3 SUBMITTALS

A. Product Data: Herbicide; indicate compliance with applicable codes for environmental protection.

#### 1.4 SUSTAINABLE DESIGN SUBMITTALS

A. Manufacturer's Certificate: Products meet or exceed specified sustainable design requirements.

1. Materials Resources Certificates:

a. Source for regional materials and distance from Project Site.

B. Product Cost Data: Verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products. Provide cost data for following products:

1. Regional products.

## 1.5 QUALITY ASSURANCE

- A. Conform to applicable local, state, and federal codes for environmental requirements, disposal of debris, burning debris on Site, and use of herbicide.
- B. Perform Work according to all local, state, and federal standards.

## PART 2 - PRODUCTS

### 2.1 SUSTAINABILITY CHARACTERISTICS

- A. Materials and Resources Characteristics:
  - 1. Regional Materials: Extracted, processed, and manufactured within 100 miles of Project Site.

### 2.2 MATERIALS

- A. Herbicide: Approved by authority having jurisdiction.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify existing plant life designated to remain is tagged or identified.
- B. Identify salvage area for placing removed materials.

### 3.2 PREPARATION

- A. Call local utility line information service at not less than three (3) working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.

### 3.3 PROTECTION

- A. Locate, identify, and protect utilities indicated to remain from damage.
- B. Protect benchmarks, survey control points, and existing structures from damage or displacement.

### 3.4 CLEARING

- A. Clear areas required for access to Site and execution of Work to minimum depth as required by drawings and specifications.
- B. Remove trees and shrubs as indicated. Remove stumps, main root ball, root system to a completely, surface rock, and all necessary debris.
- C. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Apply herbicide to remaining stumps to inhibit growth.

### 3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from Site.
- B. Partially remove paving, curbs, etc. as indicated. Neatly saw cut edges at right angle to surface.
- C. Remove abandoned utilities. Indicated removal termination point for underground utilities on record documents.
- D. Continuously clean-up and remove waste materials from Site. Do not allow materials to accumulate on Site.
- E. Do not burn or bury materials on Site. Leave Site in clean condition.

### 3.6 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, marked areas without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.
- C. Stockpile in area designated on Site to depth not exceeding 8 feet and protect from erosion. Stockpile material and cover over with same material until disposal.
- D. Remove excess topsoil not intended for reuse from Site.

END OF SECTION 311000

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## SECTION 312316 - EXCAVATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Soil densification.
2. Excavating for building foundations.
3. Excavating for paving, roads, and parking areas.
4. Excavating for slabs-on-grade.
5. Excavating for Site structures.
6. Excavating for landscaping.

#### 1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Excavating Soil Materials:

1. Excavation is not a pay item. It shall be considered an integral part of the construction, and unit prices bid for items with which Excavation is connected shall be full compensation for this item and for all labor, materials, and equipment required to complete the item in accordance with the drawing and specifications.
2. Includes general excavating to required elevations, loading and placing materials in stockpile, removing from Site. Over-Excavating: Payment will not be made for over-excavated Work nor for replacement materials.

#### 1.3 SUBMITTALS

A. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

B. Shop Drawings: Indicate soil densification grid for each size and configuration footing requiring soils densification.

#### 1.4 QUALITY ASSURANCE

A. Perform Work according to governing standards.

B. Prepare excavation protection plan under direct supervision of professional engineer experienced in design of this Work and licensed in State of Georgia.

## PART 2 - PRODUCTS

2.1 Not Used.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Call local utility line information service not less than three working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum.
- C. Notify utility company to remove and relocate utilities.
- D. Protect utilities indicated to remain from damage.
- E. Protect plant life, lawns, rock outcroppings, and other features remaining as portion of final landscaping.
- F. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

### 3.2 SOIL DENSIFICATION - VIBRO-COMPACTIION

- A. Vibro-compact substrates below footing bearing surfaces for footings as indicated, before excavating Site.
- B. Densify existing subsoils with relative density rating of compact to dense to attain relative density rating of very dense.
  - 1. Densify subsoils to depth as required by design reports
- C. Densification Equipment:
  - 1. Depth Vibrator: Poker type with follower tubes with visible marking every 12 inches to enable insertion depth measurement.
  - 2. Motion: radial in horizontal plane.
  - 3. Eccentric Force: As required
  - 4. Data Acquisition System: Record amps or pressure of vibrator motor over time and depth.
- D. Perform densification in presence of Geotechnical Engineer directly under each footing with vibrator inserted in grid pattern at maximum 6 feet o.c.

1. Arrange compaction grid for each footing for maximum number of insertion points and with outermost insertion points within bearing area of footings.
2. Adjust compaction grid arrangement and spacing as directed by Geotechnical Engineer to achieve required densification.

E. Insert vibrator to maximum specified depth. Densify soils for 30 seconds or other time as directed by Geotechnical Engineer. Withdraw vibrator every 12 inches (300 mm) increments and repeat densification at each increment.

1. When subsurface obstruction prevents vibrator insertion to specified depth, request instructions from Geotechnical Engineer to compensate for obstruction.

F. Tolerances:

1. Maximum Deviation from Center of Completed Compaction: 8 inches from indicated position.
2. Maximum Deviation from Vertical: 4 degrees during vibrator insertion.

### 3.3 EXCAVATION

- A. Underpin adjacent structures which may be damaged by excavation Work.
- B. Excavate subsoil to accommodate building foundations, and construction operations.
- C. Excavate to working elevation for piling Work.
- D. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction.
- E. Slope banks with machine to angle of repose or less until shored.
- F. Do not interfere with 45 degree bearing splay of foundations.
- G. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- H. Trim excavation. Remove loose matter.
- I. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd measured by volume. Remove larger material.
- J. Notify Architect/Engineer of unexpected subsurface conditions.
- K. Correct areas over excavated with as directed by Architect/Engineer.
- L. Remove excess and unsuitable material from Site.
- M. Repair or replace items indicated to remain damaged by excavation.

**3.4 FIELD QUALITY CONTROL**

- A. Request inspection of excavation and controlled fill operations according to governing code.
- B. Request visual inspection of bearing surfaces by inspection agency before installing subsequent Work.

**3.5 PROTECTION**

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION 312316

## SECTION 312316.01 – UNCLASSIFIED EXCAVATION FOR UTILITIES

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. The work called for by this section shall consist of clearing and grubbing, loosening, loading, removing, and disposing of, in the specified manner, all wet and dry materials (including rock) encountered that must be removed for construction purposes; furnishing, placing, and maintaining all sheeting, shoring, bracing, and timbering necessary for the proper protection and safety of the work, the workmen, the public, and adjacent property and improvements; the dewatering of trenches and other excavations; the preparation of fills and embankments; the removal of unsuitable material from outside the normal limits of excavation and, where ordered by the Engineer, their replacement with suitable materials; and all other grading or excavation work incidental to or necessary for the work. This work shall be performed as specified below.

#### 1.2 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

#### 1.3 JOB CONDITIONS

- A. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
- B. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
- C. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
  - 1. Provide minimum of 48-hour notice to Engineer, and receive written notice to proceed before interrupting any utility.
- D. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.
- E. Use of Explosives: Do not bring explosives onto site or use in work.
- F. Preserve from damage surveying monuments, property pins, and similar items. If disturbed or damaged by construction operations, pay the cost of restoration by a registered surveyor.
- G. Costs for locating, maintaining, and protecting existing facilities shall be merged in the unit price of the pipeline.

H. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

#### 1.4 PROTECTION

- A. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- C. Notify Engineer of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
- D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
- E. Grade excavation top perimeter to prevent surface water run-off into excavation.
- F. Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.
- G. Protect trees, shrubbery, fences, poles, and all other property and surface structures during construction operations unless their removal for purposes of construction is authorized by Engineer. Fences, poles, or other man made surface improvements which are moved or disturbed shall be restored to the original conditions after construction is completed. Trees, shrubbery, or other vegetation which are approved for removal in order to facilitate construction operations shall be removed completely, including stumps and main roots. Responsibility for damage or claims for damage caused by construction operations to shrubbery or other landscape improvements which were not authorized for removal by Engineer shall be assumed by Contractor.

#### 1.5 SAFETY

- A. Barricades, Guards, and Safety Provisions: Place and maintain barricades, fences, construction signs, torches, flashing lights, lanterns, guards, and flagmen as required during the progress of the construction work and until it is safe for traffic to use the roads and streets. Material piles, equipment, and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. The rules and regulations of OSHA and appropriate authorities respecting safety provisions shall be observed.
- B. Structure Protection: Provide temporary support, protection, and maintenance of underground and surface structures, drains, sewers, and other obstructions encountered during the progress of the work. Structures which may have been disturbed shall be restored upon completion of the work.

#### 1.6 DEVIATIONS OCCASIONED BY STRUCTURES OR UTILITIES

- A. Wherever obstructions are encountered during the progress of the work which occupy the space required for the pipeline, Engineer shall have the authority to change the drawings and order a deviation from the line and grade or arrange with the Owners of the structures for the removal, relocation, or reconstruction of the obstructions.

B. Where gas, water, telephone, electrical, or other existing utilities directly interfere with the vertical or horizontal alignment of the pipeline, Engineer will order a change in grade or alignment or will arrange with the Owners of the utilities for their removal.

#### 1.7 DUST CONTROL

A. When ordered by Engineer, furnish and distribute over traveled road surfaces which have not been fully restored an application of regular flake calcium chloride having a minimum calcium chloride content of 77 percent, or a brine solution consisting of 1.5 pound of calcium chloride and one pound of sodium chloride per 100 gallons of water applied by a pressure distributor. Rate of application shall be 3 pounds/square yard for the flake calcium chloride, and 0.48 gallon/square yard for brine solution.

B. Whenever dust control is necessary, it shall be considered an integral part of the work, and no separate payment shall be made for it.

#### 1.8 MAINTENANCE OF TRAFFIC AND CLOSING OF STREETS

A. Carry on the work in a manner which will cause a minimum of interruption to traffic, and do not close to through travel more than two consecutive blocks, including the cross street intersected. Where traffic must cross open trenches, provide bridges at street intersections and driveways. Post signs indicating that a street is closed and necessary detour signs for the proper maintenance of traffic. Before closing any streets notify responsible municipal authorities.

### PART 2 - PRODUCTS

#### 2.1 SOIL MATERIALS

A. Satisfactory soil materials are defined as those complying with ASTM D2487 unified soil classification system groups GW, GP, GM, SM, SW and SP.

B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 unified soil classification system groups GC, SC, ML, MH, CL, CH, OL, OH and PT.

C. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100% passing a 1-1/2" sieve and not more than 5% passing a No. 4 sieve.

D. Backfill and Fill Materials: Satisfactory soil materials of clay, rock or gravel not larger than 2" in any dimension, free of debris, waste, frozen materials, vegetable and other deleterious matter.

### PART 3 - EXECUTION

#### 3.1 PREPARATION OF THE SITE

- A. Before starting construction, remove from the work site all vegetable growth (except as hereinafter excluded), debris, and/or other objectionable matter as well as any buildings and/or other structures that the drawings and/or the Engineer specifically indicate are to be removed. Dispose of this refuse material in a manner acceptable to the Engineer.
- B. In certain areas it may be desirable for existing trees, shrubs, or other vegetation on the site to be preserved for the permanent landscape. Such vegetation may be shown on the drawings, specifically listed in the specifications, marked on the site, or identified by the Engineer. In no case damage or remove such growth without written permission from the Owner.
- C. If the area to be excavated is occupied by trees, brush, or other vegetable growth, clear such growth and grub the excavated area, and remove all large roots to a depth of not less than 2' below the bottom of the proposed construction. Dispose of the growth removed in a manner satisfactory to the Engineer. Fill all holes or cavities created during this work that extend below the subgrade elevation with suitable material, and compact to the same density as the surrounding material.
- D. Trees, cultivated shrubs, etc., that are situated within public rights-of-way and/or construction easements through private property but not directly within the excavation area shall remain undisturbed unless it is necessary to remove them so that the work can be performed safely and unless their removal is specifically ordered by the Engineer. Take special precautions to protect and preserve such growth throughout all stages of the construction.
- E. Preparation of the site shall be considered an integral part of the excavation and one for which no separate payment shall be allowed.

### 3.2 EXCAVATION

- A. Excavation is Unclassified, and includes excavation to subgrade elevations regardless of character of materials and obstructions encountered. It shall be understood that any reference to rock, earth, or any other material on the drawings is not to be taken as an indication of classified excavation or the quantity of either rock, earth, or any other material involved.
- B. The bidder shall draw his own conclusions as to the conditions to be encountered.

### 3.3 UNSUITABLE MATERIALS

- A. Wherever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, subgrade, or backfilling is encountered, remove it and continue excavation until suitable material is encountered. The material removed shall be disposed of in the manner described below. Then refill the areas excavated for this reason with 1" to 2" crushed stone up to the level of the lines, grades, and/or cross sections shown on the drawings. The top 6" of this refill shall be ALDOT No. 67 crushed stone for bedding.

### 3.4 ROCKS AND BOULDERS

- A. Any material that is encountered within the limits of the required excavation that cannot be removed by traditional excavation methods, including rock, boulders, masonry, hard pan, chert, shale, street and sidewalk pavements, and/or similar materials, shall be considered as unclassified excavation, and no separate payment will be made therefor.

- B. Should rock be encountered in the excavation, remove it by hammering, chipping or otherwise. Blasting will not be allowed.
- C. Excavate rock to a minimum horizontal distance of 12" outside the pipe in each direction and to a depth of not less than 12" below the bottom of the pipe if rock extends to such depth. Then backfill the space below the pipe with ALDOT No. 67 crushed stone, tamp to the proper grade, and make ready for construction.

### 3.5 DISPOSAL OF MATERIALS

- A. Whenever practicable, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the drawings or directed by the Engineer shall be used for these purposes. Any materials not so used shall be considered waste materials and disposed of by the Contractor as specified below.
- B. Waste materials may be deposited in spoil areas at locations approved by the Engineer. Waste materials shall be properly disposed of off-site if no spoil area is approved by the Engineer. Provide a copy of executed property owner agreements to Engineer. Do not leave in unsightly piles but instead spread in uniform layers, neatly level, and shape to drain. Seed as specified in Section 02920, Lawns and Grasses.
- C. Once any part of the work is completed, properly dispose of all surplus or unused materials (including waste materials) left within the construction limits of that work. Leave the surface of the work in a neat and workmanlike condition, as described below.
- D. The disposal of waste materials shall be considered an integral part of the excavation work and one for which no separate payment shall be allowed.

### 3.6 EXCAVATION FOR MANHOLES AND STRUCTURES

- A. Excavation for manholes, inlets, and other incidental structures shall not be greater in horizontal area than that required to allow a 2' clearance between the outer surface of the structure and the walls of the adjacent excavation or of the sheeting used to protect it. The bottom of the excavation shall be true to the required shape and elevation shown on the drawings. No earth backfilling will be permitted under manholes, inlets, headwalls, or similar structures. Should the Contractor excavate below the elevations shown or specified, he shall at his own expense, fill the void with either concrete or granular material approved by the Engineer.

### 3.7 SHEETING, SHORING AND BRACING

- A. Take special care to avoid damage wherever excavation is being done. Sufficiently sheet, shore, and brace the sides of all excavations to prevent slides, cave-ins, settlement, or movement of the banks and to maintain the specified trench widths. Use solid sheets in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have enough strength and rigidity to withstand the pressures exerted, to keep the walls of the excavation properly in place, and to protect all persons and property from injury or damage. Separate payment will not be made for sheeting, shoring, and bracing, which are considered an incidental part of the excavation work.
- B. Wherever employees may be exposed to moving ground or cave-ins, shore and lay back exposed earth excavation surfaces more than 5' high to a stable slope, or else provide some equivalent means of protection. Effectively protect trenches less than 5' deep when examination

of the ground indicates hazardous ground movement may be expected. Guard the walls and faces of all excavations in which employees are exposed to danger from moving ground by a shoring system, sloping of the ground, or some equivalent protection.

- C. Comply with all OSHA standards in determining where and in what manner sheeting, shoring, and bracing are to be done. The sheeting, shoring, and bracing system shall be designed by a professional engineer licensed in the State of Alabama and shall be subject to approval by the Engineer. However, such approval does not relieve the Contractor of the sole responsibility for the safety of all employees, the effectiveness of the system, and any damages or injuries resulting from the lack or inadequacy of sheeting, shoring, and bracing.
- D. Where excavations are made adjacent to existing buildings or structures or in paved streets or alleys, take particular care to sheet, shore, and brace the sides of the excavation so as to prevent any undermining of or settlement beneath such structures or pavement. Underpin adjacent structures wherever necessary, with the approval of the Engineer.
- E. Do not leave sheeting, shoring, or bracing materials in place unless this is called for by the drawings, ordered by the Engineer, or deemed necessary or advisable for the safety or protection of the new or existing work or features. Remove these materials in such a manner that the new structure or any existing structures or property, whether public or private, will not be endangered or damaged and that cave-ins and slides are avoided.
- F. Fill and compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing as specified herein.
- G. The Contractor may use a trench box, which is a prefabricated movable trench shield composed of steel plates welded to a heavy steel frame. The trench box shall be designed to provide protection equal to or greater than that of an appropriate shoring system.
- H. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
- I. Do not allow water to accumulate in excavations. Remove water to prevent softening of subgrade foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
- J. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

### 3.8 BORROW EXCAVATION

- A. Whenever the backfill of excavated areas or the placement of embankments requires more material than is available from authorized excavations, or whenever the backfill material from such excavations is unsuitable, then obtain additional material from other sources. This may require the opening of borrow pits at points accessible to the work. In such cases, make suitable arrangements with the property owner and pay all incidental costs, including any royalties, for

the use of the borrowed material. Before a borrow pit is opened, the quality and suitability of its material shall be approved by the Engineer.

- B. Excavate borrow pits in such a way that the remaining surfaces and slopes are reasonably smooth and that adequate drainage is provided over the entire area. Construct drainage ditches wherever necessary to provide outlets for water to the nearest natural channel, thus preventing the formation of pools in the pit area. Leave the sides of borrow pit cuts at a maximum slope of 2:1 unless otherwise directed by the Engineer.
- C. Properly clear and grub borrow pits, and remove all objectionable matter from the borrow pit material before placing it in the backfill.
- D. The taking of materials from borrow pits for use in the construction of backfill, fills, or embankments shall be considered an incidental part of the work; no separate payment shall be made for this.

### 3.9 BACKFILLING

- A. Conduct backfilling around manholes, inlets, outfalls, and/or structures in the same manner as specified for water lines, gravity sewers and/or force mains except that even greater care is necessary to prevent damage to the utility structure.
- B. Perform backfilling so as not to disturb or injure any pipe and/or structure against which the backfill is being placed. If any pipe or structure is damaged and/or displaced during backfilling, open up the backfill and make whatever repairs are necessary.

### 3.10 MAINTENANCE

- A. Seed and maintain in good condition all excavated areas, trenches, fills, embankments, and channels until final acceptance by the Owner.
- B. Maintain trench backfill at the approximate level of the original ground surface by periodically adding backfill material wherever necessary and whenever directed to do so by the Engineer. Continue such maintenance until final acceptance of the project, or until the Engineer issues a written release.

### 3.11 SLOPES

- A. Neatly trim all open cut slopes, and finish to conform either with the slope lines shown on the drawings or the directions of the Engineer. Leave the finished surfaces of bottom and sides in reasonably smooth and uniform planes like those normally obtainable with hand tools, though the Contractor will not be required to use hand methods if he is able to obtain the required degree of evenness with mechanical equipment. Conduct grading operations so that material is not removed or loosened beyond the required slope.

END OF SECTION 312316.01

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## SECTION 312319 - DEWATERING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Dewatering system.
2. Surface water control system.
3. Monitoring wells.
4. System operation and maintenance.
5. Water disposal.

#### 1.2 DEFINITIONS

A. Dewatering includes the following:

1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations and trenches.
2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations and trenches.
3. Disposing of removed water.

B. Surface Water Control: Removal of surface water within open excavations.

#### 1.3 SYSTEM DESCRIPTION

A. Provide dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.

B. Furnish standby equipment stored at Project site and ready for immediate use upon failure of dewatering equipment.

C. Design dewatering systems to:

1. Lower water table within areas of excavation to permit Work to be completed on dry and stable subgrade.
2. Relieve hydrostatic pressures in confined water bearing strata below excavation to eliminate risk of uplift or other instability of excavation.
3. Prevent damage to adjacent properties, buildings, structures, utilities, and facilities from construction operations.
4. Prevent loss of fines, quick condition, or softening of foundation subgrade.
5. Maintain stability of sides and bottoms of excavations and trenches.

D. Design surface water control systems to:

1. Collect and remove surface water and seepage entering excavation.

#### 1.4 SUBMITTALS

- A. N/A

#### 1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations and depths of capped wells and piping abandoned in place.

#### 1.6 QUALITY ASSURANCE

- A. Comply with authorities having jurisdiction for the following:
  1. Drilling and abandoning of wells used for dewatering systems.
  2. Water discharge and disposal from pumping operations.
- B. Obtain permit from EPA under National Pollutant Discharge Elimination System (NPDES), for storm water discharge from construction sites.
- C. Assume sole responsibility for dewatering and surface water control systems and for loss or damage resulting from partial or complete failure of protective measures and settlement or resultant damage caused by ground water control operations.
- D. Perform Work in accordance with governing standards.
- E. Maintain one copy of each document on site.

### PART 2 - PRODUCTS

#### 2.1 DEWATERING EQUIPMENT

- A. Furnish materials in accordance with governing standards.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Call Local Utility Line Information service not less than (3) working days before performing Work.
  1. Request underground utilities to be located and marked within and surrounding construction areas.

- B. Employ licensed land surveyor to provide following documentation:
  - 1. Survey existing adjacent buildings, structures, and improvements for position and elevation of principal elements before and after completion of dewatering operations.

### 3.2 PREPARATION

- A. Protect existing adjacent buildings, structures, and improvements from damage caused by dewatering operations.

### 3.3 MONITORING WELLS

- A. Install monitoring wells
- B. Test each monitoring well point to verify installation is performing properly.
- C. Install piezometers, calibrate, and test for proper operation.
- D. Protect monitoring well standpipes from damage by construction operations.
- E. Maintain accessibility to monitoring wells continuously during construction operations.
- F. Maintain monitoring wells until groundwater is allowed to return to normal level.

### 3.4 DEWATERING SYSTEM

- A. Install Work in accordance with governing standards.

### 3.5 SURFACE WATER CONTROL SYSTEM

- A. Provide ditches, berms, and other devices to divert and drain surface water from excavation area.
- B. Divert surface water and seepage water within excavation areas into sumps and pump water in accordance with requirements of agencies having jurisdiction.
- C. Control and remove unanticipated water seepage into excavation.

### 3.6 SYSTEM OPERATION AND MAINTENANCE

- A. Operate dewatering system continuously until backfilling is complete.
- B. Provide 24-hour supervision of dewatering system by personnel skilled in operation, maintenance, and replacement of system components.

- C. When dewatering system cannot control water within excavation, notify Architect/Engineer and stop excavation work.
- D. Modify dewatering and surface water control systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.
- E. Do not discontinue dewatering operations without Architect/Engineer's approval.

### 3.7 SYSTEM REMOVAL

- A. Remove dewatering and surface water control systems after dewatering operations are discontinued.
- B. Remove piezometers and monitoring wells.
- C. Repair damage caused by dewatering and surface water control systems or resulting from failure of systems to protect property.

### 3.8 FIELD QUALITY CONTROL

- A. After dewatering system is installed, perform pumping test to determine when selected pumping rate lowers water level in well below pump intake. Adjust pump speed, discharge volume, or both to ensure proper operation of each pump.

END OF SECTION 312319

## SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. The work shall include erosion and sediment control on all cut and fill operations, excavation, backfill, or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period. During dry weather, sprinkle the sites with water or use other means as necessary to provide dust control.

#### 1.2 QUALITY ASSURANCE

- A. All erosion and sediment control work shall comply with applicable requirements of governing authorities having jurisdiction. The specifications and drawings are not represented as being comprehensive, but rather convey the intent to provide complete slope protection and erosion control for both the Owner's and adjacent property.
- B. Erosion control measures shall be established at the beginning of construction and maintained during the entire period of construction. On-site areas, which are subject to severe erosion, and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation, are to be identified and receive special attention.
- C. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time, and the length of time of exposure.
- D. Surface water runoff originating from exposed areas should be controlled to reduce erosion and sediment loss during the period of exposure.
- E. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving stream, provide measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream.
- F. All land-disturbing activities shall be planned and conducted so as to minimize off-site sedimentation discharge and damage.
- G. The Contractor is responsible for cleaning out and disposing of all sediment once the storage capacity of the sediment facility is reduced by one-half.
- H. Frequent inspections of erosion and sediment control measures by the Contractor are required. Repair or replacement shall be made promptly.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Temporarily stabilize areas from which topsoil has been removed and topsoil stockpiles by seeding fast growing annuals such as cereal, rye, annual ryegrass, Sudan grass, and millet that provide quick protection. These annual grasses shall be seed certified by the State Department of Agriculture and shall be worked into the soil when the site is prepared for final seeding of more permanent species. To promote temporary vegetation establishment, use commercial lime and fertilizer on exposed areas subject to severe erosion.
- B. Strawbales: Bales shall be either wire bound or string tied with bindings orientated around sides rather than over and under.
- C. Crushed stone for stabilized construction entrance shall conform to ASTM Designation C-33, size No. 2 (1-1/2" to 2-1/2").
- D. Silt fence shall be "Envirofence" preassembled silt fence by Mirafi, Inc., or its equivalent.
- E. Sandbags anchored with steel rods or brush obtained from clearing operations may also be used to control sediment loss.

## PART 3 - EXECUTION

### 3.1 PROTECTION

- A. Conduct construction so as to provide the site with maximum protection from erosion at all times.
- B. Conduct excavation activities to provide erosion and sediment control as follows:
  - 1. Do not start clearing and excavation until a firm construction schedule is submitted to and approved by the Engineer. Continuously coordinate the schedule with the clearing and excavation activity.
  - 2. Place the excavated material so as not to block any drainage area. Replace this excavated material in the trench immediately after repairs or installations have been completed and are approved by the Engineer.
  - 3. Retain natural vegetation whenever feasible.
  - 4. Restore and cover exposed areas subject to erosion as quickly as possible by means of seeding and mulching. Use diversion ditches or other methods as appropriate to prevent storm water from running over the exposed area until seeding is established as specified.
  - 5. Take particular care along streams and drainage ditches so that fallen trees, debris, and excavated material will not adversely affect the streamflow. Exercise care to minimize the destruction of streambanks. Wherever the streambanks are affected by construction, reduce the slope of the streambanks to provide a suitable condition for vegetative protection. Minimize land exposure in terms of area and time.
  - 6. Cover exposed excavated areas with mulch or vegetation.
  - 7. Mechanically retard the rate of runoff water.
  - 8. Trap the sediment contained in the runoff water.

- 9. Divert water from erosive areas.
- 10. Take care during the hauling of materials, etc., to keep vehicles from creating a severe erosion problem. Proper scheduling of operations and prompt repair of ruts created during this operation is necessary from this source.
- 11. Control dust by sprinkling or other means as necessary to keep it to a minimum.
- 12. Stabilize roadways and driveways as soon as feasible.

C. Regrade and reseed surfaces eroded or otherwise damaged during any and all construction operations.

**3.2 STRAW BALE BARRIERS**

- A. Excavation shall be to the width of the bale and the length of the proposed barrier to a minimum depth of 4 inches.
- B. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale.
- C. Staking shall be accomplished to securely anchor bales by driving at least two stakes or rebars through each bale and a minimum of 8 inches into the ground.
- D. The gaps between bales shall be filled by wedging straw.
- E. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4 inches on the uphill side. Loose straw shall then be scattered over the area immediately uphill from a straw barrier.

**3.3 STABILIZED CONSTRUCTION ENTRANCE**

- A. Stone size: Use ASTM designation C-33, size No. 2 (1-1/2" to 2-1/2"). Use crushed stone.
- B. Length: As effective, but not less than 150 feet.
- C. Thickness: Not less than eight (8) inches.
- D. Width: The full width of all points of ingress or egress, but not less than 20 feet.
- E. Washing: When necessary, wheels shall be cleaned to remove sediment prior to entrance onto public right-of-way. When washing is required, it shall be done on an area stabilized with crushed stone, which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch, or watercourse through use of sand bags, gravel, boards or other approved methods.
- F. Maintenance: The entrance shall be maintained in a condition, which will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. It is recommended that a layer of medium grade filter fabric be placed on the ground prior to placing stone. This would help prevent infiltration of fines into the stone. All sediment spilled, dropped, washed or tracked onto public rights-of-way shall be removed immediately.

### 3.4 SILT FENCING

- A. Excavate a 6-inch by 6-inch trench along the lower perimeter of the site, when using premanufactured silt fencing.
- B. Install the silt fence in accordance with the manufacturer's recommendations and the details shown on the plans.
- C. Pile brush in a row along the perimeter of the land disturbing activities. Windrow brush along contour as close as possible. Brush may require compaction.

### 3.5 INLET PROTECTION

- A. Excavation around the drop inlet shall be performed to accommodate the width of the bale and to a minimum depth of 4 inches.
- B. Placement of bales shall be lengthwise in a single row surrounding the drop inlet. Adjacent bales shall be pressed together and loose straw then wedged between them to prevent water entering between bales.
- C. Staking shall be accomplished to securely anchor bales by driving at least two stakes or rebars through each bale and a minimum of 8 inches into the soil.
- D. Backfill shall consist of the excavated soil and be compacted against the straw barrier.

### 3.6 DUST CONTROL

- A. Dust generated from the contractor's performance of the work, either inside or outside the right-of-way shall be controlled by the contractor by applying either water or calcium chloride.
- B. Water and calcium chloride shall be provided in the amounts and locations in accordance with general local practice.

### 3.7 NPDES PERMIT

- A. As designed, the total disturbed acreage of this project is less than one (1) acre, therefore an NPDES permit is not required. The Contractor shall be responsible for applying for, obtaining, and complying with an NPDES permit for the project if the Contractor desires to acquire an NPDES permit.

END OF SECTION 312500

## SECTION 321216 - ASPHALT PAVING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  1. Hot-mix asphalt paving.
  2. Hot-mix asphalt patching.
  3. Hot-mix asphalt paving overlay.
  4. Pavement-marking paint.
  5. Cold milling of existing hot-mix asphalt pavement.
- B. Related Sections include the following:
  1. Division 2 Section "Earthwork" for aggregate subbase and base courses and for aggregate pavement shoulders.

#### 1.3 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. DOT: Department of Transportation.

#### 1.4 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of standard specifications of state or local DOT.
  1. Standard Specification: City of Rome Standard Specifications / DOT.
  2. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
  1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.

- B. Regulatory Requirements: Comply with Standards of local regulatory authority for asphalt paving work.
- C. Asphalt-Paving Publication: Comply with AIMS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
  1. Prime and Tack Coats: Minimum surface temperature of **60 deg F**.
  2. Asphalt Base Course: Minimum surface temperature of **40 deg F** and rising at time of placement.
  3. Asphalt Surface Course: Minimum surface temperature of **60 deg F** at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of **40 deg F** for oil-based materials, **50 deg F** for water-based materials, and not exceeding **95 deg F**.

# PART 2 - PRODUCTS

## 2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.
  1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

## 2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO MP 1.
- B. Asphalt Cement: ASTM D 946 for penetration-graded material.

- C. Prime Coat: ASTM D 2027, medium-curing cutback asphalt.
- D. Prime Coat: Asphalt emulsion prime complying with local regulatory requirements.
- E. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- F. Water: Potable.
- G. Undersealing Asphalt: ASTM D 3141, pumping consistency.

## 2.3 AUXILIARY MATERIALS

- A. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- B. Joint Sealant: ASTM D 3405, hot-applied, single-component, polymer-modified bituminous sealant.
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 3 minutes.
- D. Glass Beads: AASHTO M 247, Type 1.

## 2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and designed according to procedures in AIMS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types."
  - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
  - 2. Provide mixes complying with composition, grading, and tolerance requirements in ASTM D 3515 for the following nominal, maximum aggregate sizes:
    - a. Base Course: **1 inch**.
    - b. Surface Course: **1/2 inch**.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

## 3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending **12 inches** into

adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

- B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
  - 1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
  - 2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of **0.05 to 0.15 gal./sq. yd.**
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

### 3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
  - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of **0.15 to 0.50 gal./sq. yd.** Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of **0.05 to 0.15 gal./sq. yd.**
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.4 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
  - 2. Place hot-mix asphalt surface course in single lift.
  - 3. Spread mix at minimum temperature of **250 deg F.**

4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than **10 feet** wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.5 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of **6 inches**.
3. Offset transverse joints, in successive courses, a minimum of **24 inches**.
4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.6 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to **185 deg F**.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.7 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus or minus **1/2 inch**.
  - 2. Surface Course: Plus **1/4 inch**, no minus.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a **10-foot** straightedge applied transversely or longitudinally to paved areas:
  - 1. Base Course: **1/4 inch**.
  - 2. Surface Course: **1/8 inch**.
  - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is **1/4 inch**.

### 3.8 SURFACE TREATMENTS

- A. Fog Seals: Apply fog seal at a rate of **0.10 to 0.15 gal./sq. yd.** to existing asphalt pavement and allow to cure. With a fine sand, lightly dust areas receiving excess fog seal.

### 3.9 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of **15 mils**.
  - 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of **6 lb/gal.**.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
  - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses shall be determined according to ASTM D 3549.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course shall be tested for compliance with smoothness tolerances.
- E. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

### 3.11 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow excavated materials to accumulate on-site.

END OF SECTION 321216

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## SECTION 321313 - CONCRETE PAVING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
  1. Driveways and roadways.
  2. Parking lots.
  3. Curbs and gutters.
  4. Walkways.
- B. Related Sections include the following:
  1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
  2. Division 2 Section "Pavement Joint Sealants" for joint sealants within concrete pavement and at isolation joints of concrete pavement with adjacent construction.
  3. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

#### 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

#### 1.4 SUBMITTALS

- A. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

- D. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.
- E. Concrete Testing Service: The Owner will engage a qualified independent testing agency to perform material evaluation tests.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

## 1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for neighborhood access construction activities.

## PART 2 - PRODUCTS

### 2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
  - 1. Use flexible or curved forms for curves of a radius **100 feet** or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

### 2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- C. Reinforcement Bars: ASTM A 615/A 615M, **Grade 60**, deformed.
- D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, **Grade 60**, deformed bars; assembled with clips.
- E. Plain Steel Wire: ASTM A 82, as drawn.
- F. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, **Grade 60**. Cut bars true to length with ends square and free of burrs.
- G. Tie Bars: ASTM A 615/A 615M, **Grade 60**, deformed.
- H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

## 2.3 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, Type I or II.
  1. Fly Ash: ASTM C 618, Class F or C.
  2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
  1. Maximum Aggregate Size: **1-1/2 inches** nominal.
  2. Do not use fine or coarse aggregates containing substances that cause spalling.
- D. Exposed Aggregate: Selected, hard, and durable; washed; free of material that reacts with cementitious material or causes staining; from a single source, with gap graded coarse aggregate as follows:
  1. Aggregate Sizes: **3/4 to 1 inch** nominal.
- E. Water: ASTM C 94.

## 2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C 260.

## 2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, **1/2 to 1-1/2 inches** long.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Fibrillated Fibers:
    - a. Fibrasol F; Axim Concrete Technologies.
    - b. Fibermesh; Fibermesh, Div. of Synthetic Technologies.
    - c. Forta; Forta Corporation.
    - d. Grace Fibers; W. R. Grace & Co., Construction Products Div.
  2. Monofilament Fibers:
    - a. Fibrasol IIP; Axim Concrete Technologies.
    - b. Fiberstrand 100; Euclid Chemical Co.
    - c. Fibermix Stealth; Fibermesh, Div. of Synthetic Industries.
    - d. Forta Mono; Forta Corporation.
    - e. Grace MicroFiber; W. R. Grace & Co., Construction Products Div.
    - f. Polystrand 1000; Metalcrete Industries.

## 2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately **9 oz./sq. yd.** dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- E. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Clear Waterborne Membrane-Forming Curing Compound:
    - a. AH Curing Compound #2 DR WB; Anti-Hydro International, Inc.
    - b. Aqua Resin Cure; Burke Group, LLC (The).
    - c. Safe-Cure Clear; ChemMasters.
    - d. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
    - e. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.
    - f. Nitocure S; Fosroc.
    - g. Aqua Kure-Clear; Lambert Corporation.
    - h. L&M Cure R; L&M Construction Chemicals, Inc.
    - i. 1100 Clear; W. R. Meadows, Inc.
    - j. Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
    - k. Rich Cure E; Richmond Screw Anchor Co.
    - l. Resi-Chem Clear Cure; Symons Corporation.
    - m. Horncure 100; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
    - n. Hydro Cure; Unitex.
    - o. Certi-Vex Enviocure; Vexcon Chemicals, Inc.

## 2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork, or ASTM D 1752-84, recycled rubber.
- B. Pavement-Marking Paint: Latex, water-base emulsion; ready mixed; complying with FS TT-P-1952.
  - 1. Color: Blue for handicapped requirements, yellow for fire lanes, white elsewhere.
- C. Glass Beads: AASHTO M 247.
- D. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- F. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.8 CONCRETE MIXES

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- B. Proportion mixes to provide concrete with the following properties:
  1. Compressive Strength (28 Days): **3000 psi**.
  2. Maximum Water-Cementitious Materials Ratio: 0.45.
  3. Slump Limit: **3 inches**.
    - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than **8 inches** after adding admixture to plant- or site-verified, **2- to 3-inch** slump.
- C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  1. Fly Ash: 25 percent.
  2. Combined Fly Ash and Pozzolan: 25 percent.
  3. Ground Granulated Blast-Furnace Slag: 50 percent.
  4. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- D. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2.5 to 4.5 percent.
- E. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than **1.0 lb/cu. yd.**

## 2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
  1. When air temperature is between **85 deg F** and **90 deg F**, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above **90 deg F**, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

### 3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum **2-inch** overlap to adjacent mats.

### 3.4 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
  - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
  - 1. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
  - 2. Provide tie bars at sides of pavement strips where indicated.
  - 3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
  - 1. Locate expansion joints at intervals of **50 feet**, unless otherwise indicated. Locate expansion joints at maximum 30 feet o.c. for sidewalks. Locate expansion joints at all curb returns.
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Terminate joint filler less than **1/2 inch** or more than **1 inch** below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as follows: In vehicular pavements, place contraction joints to form squares and to not exceed 12 feet on any side. In sidewalks, place contraction joints to form squares and to not exceed 6 feet on any side. In curbs, place contraction joints at 10 feet on center. See drawings for additional information.

F. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
  - a. Radius: **1/4 inch**.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut **1/8-inch**- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

G. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: **1/4 inch**.

### 3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

- E. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- F. Screeed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- G. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- H. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
  - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- I. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.
- J. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When air temperature has fallen to or is expected to fall below **40 deg F**, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than **50 deg F** and not more than **80 deg F** at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- K. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
  - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below **90 deg F**. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  - 3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### 3.6 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Finish of all replaced concrete shall match the finish of existing adjacent concrete.
- C. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
  - 2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface **1/16 to 1/8 inch** deep with a stiff-bristled broom, perpendicular to line of traffic.

### 3.7 SPECIAL FINISHES

- A. Monolithic Exposed Aggregate Finish: Expose coarse aggregate to pavement surfaces as follows:
  - 1. Immediately after floating, spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
  - 2. Cover with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
  - 3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon bristle broom.
  - 4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.
- B. Slip-Resistant Aggregate Finish: Before final floating, apply slip-resistant aggregate finish to pavement surfaces according to manufacturer's written instructions and as follows:
  - 1. Uniformly spread **25 lb/100 sq. ft.** of dampened nonslip aggregate over the surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
  - 2. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose nonslip aggregate.

### 3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- C. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.

- c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with **12-inch** lap over adjacent absorptive covers.
- 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least **12 inches**, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### 3.9 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
  - 1. Elevation: **1/4 inch**.
  - 2. Thickness: Plus **3/8 inch**, minus **1/4 inch**.
  - 3. Surface: Gap below **10-foot-** long, unleveled straightedge not to exceed **1/4 inch**.
  - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: **1 inch**.
  - 5. Vertical Alignment of Tie Bars and Dowels: **1/4 inch**.
  - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: **1/2 inch**.
  - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel **1/4 inch per 12 inches**.
  - 8. Joint Spacing: **3 inches**.
  - 9. Contraction Joint Depth: Plus **1/4 inch**, no minus.
  - 10. Joint Width: Plus **1/8 inch**, no minus.

### 3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer.
- B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of **15 mils**.
  - 1. Broadcast glass spheres uniformly into wet pavement markings at a rate of **6 lb/gal**.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: The Owner will engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing shall be performed according to the following requirements:
  - 1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.

2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is **40 deg F** and below and when **80 deg F** and above, and one test for each set of compressive-strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding **5 cu. yd.**, but less than **25 cu. yd.**, plus one set for each additional **50 cu. yd.**. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
8. When total quantity of a given class of concrete is less than **50 cu. yd.**, Architect may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than **500 psi**.

C. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as the sole basis for approval or rejection.

E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Cost of all additional testing and re-testing will be borne by the Contractor.

**3.12 REPAIRS AND PROTECTION**

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

- B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

## SECTION 329221 – LAWNS AND GRASSES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes seeding, sodding, and landscape replacement.
- B. Landscape replacement work shall be performed in all disturbed areas and shall include, but not necessarily be limited to, all seed bed preparation; the supplying and placing of soil additives, seed, sod, and mulch wherever required by the drawings or directed by the Engineer.

#### 1.2 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil. Refer to Division 1 Section "Earthwork" and "Excavation Support and Protection".

#### 1.3 SUBMITTALS

- A. Product Data: Refer to Division 1 Section "Submittal Procedures". For each type of product indicated.
- B. Product certificates/certificates of inspection.
- C. Planting Schedule: Indicating anticipated planting dates.

#### 1.4 QUALITY ASSURANCE

- A. No Substitutions: Do not make substitutions. Replace disturbed landscape materials with identical materials. If identical landscape material is not obtainable, submit proof of non-availability from a minimum of 6 suppliers to the Engineer for review by a Landscape Architect, together with proposal for use of equivalent material.
- B. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Sod: Harvest, deliver, store, and handle sod according to requirements in TPI's "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding."

## 1.6 JOB CONDITIONS

A. Proceed with the complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of turf areas required.

B. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand cultivate as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

C. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required.

## PART 2 - PRODUCTS

### 2.1 SEED

A. Seed Species: State-certified seed of grass species to match adjacent areas. In unplanted areas, as follows:

1. Warm Season (April 30-August 15): 100% hulled common bermuda, 2#/1000 sf.
2. Cool Season (March 1-April 30): or August 15-November 30): 100% Kentucky 31 tall fescue, 5#/1000 sf.
3. When seeding March 1 to April 1 or October 1 to November 30, add an additional 3 pounds per 1000 square feet of annual ryegrass.

### 2.2 TURFGRASS SOD

A. Turfgrass Sod: Approved, complying with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

B. Turfgrass Species: To match disturbed area and/or adjacent yards.

### 2.3 PLANTING MATERIALS

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones **1 inch** or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil.

B. Inorganic Soil Amendments:

1. Lime: ASTM C 602, Class T or O, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

2. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through **No. 6** sieve and a maximum 10 percent passing through **No. 40** sieve.
3. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
4. Aluminum Sulfate: Commercial grade, unadulterated.
5. Sand: Sharp, clean, washed sand, free of toxic materials.

C. Fertilizer:

1. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
2. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
3. Commercial Fertilizer: Complete fertilizer of neutral character furnished in standard containers that are clearly marked with the name, weight, and guaranteed analysis of the contents and that ensure proper protection in transportation and handling; and in compliance with all local, state, and federal fertilizer laws, with some elements derived from organic sources and containing recommended percentages of available plant nutrients.
4. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
  - a. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

D. Mulches:

1. Straw Mulch for Seeding Operations: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
2. Filtration/Separation Fabric: Water permeable filtration fabric of fiberglass or polypropylene fabric.
3. Mulch and Erosion Control Matting and Blankets for Slopes:
  - a. Curlex blanket excelsior blanket.
  - b. Hi-Velocity curlex blanket excelsior blanket by American Excelsior Company, P.O. Box 5067, Arlington, Texas 76011.
4. Erosion Control Matting and Blankets for Ditches and Drainage Channels:
  - a. Enkamat Matting #7020 by AZKO Industrial Systems, Ridgefield Business Center, Suite 18, Asheville, North Carolina 28802.
  - b. Miramat 1000 by Mirafi, Inc., P.O. Box 240967, Charlotte, North Carolina 28224.
5. Straw Mulch for Landscaping Restoration: Provide air-dry, clean, mildew- and seed-free, pine straw.
6. Bark Mulch for Landscaping Restoration: Provide bark mulch as required to match adjacent areas.

## 2.4 PLANTING SOIL MIX

A. Planting Soil Mix: Submit proposed topsoil test results for approval.

## PART 3 - EXECUTION

### 3.1 LAWN PREPARATION

- A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of **4 inches**. Remove stones larger than **2 inches** in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- B. Surface Preparation:
  1. Loosen surface soil to a depth of at least of 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
  2. Remove stones larger than **2 inches** in any dimension and sticks, roots, trash, and other extraneous matter.
  3. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus **1/2 inch** of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted within 2 days.
- D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

### 3.2 SEEDING

- A. Rake seed lightly into top **1/8 inch** of topsoil, roll lightly, and water with fine spray.
- B. Protect all seeded areas by spreading straw mulch. Spread uniformly at a minimum rate of **2 tons/acre** to form a continuous blanket **1-1/2 inches** in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
- C. Hydroseeding New Lawns:
  1. Mix specified seed, fertilizer and pulverized mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
  2. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified seed sowing rate above.

### 3.3 SODDING

- A. Sodding New Lawns:
  1. Lay sod within 72 hours from time of stripping. Do not plant dormant sod or if ground is frozen.
  2. Lay sod between March 1 and October 15 only unless soil conditions are favorable and written permission is obtained from the Engineer.
  3. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; to not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade.

Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass. Lay sod on slopes with short dimension running up and down.

4. Anchor sod on slopes, 3:1 or greater and in drainage swales to prevent slippage, with 1 by 2 wood pegs driven flush with sod.
5. Saturate sod with fine water spray within two hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of **1-1/2 inches** below sod.
6. Two weeks after the sod is installed, top dress and thoroughly water it. Top dressing shall consist of the following:
  - a. 1/2 to 1 pound: 38 percent urea formaldehyde per 1,000 square feet
  - b. 20 pounds: 6-12-12 per 1,000 square feet
7. No equipment, material storage, construction traffic, etc., will be permitted on newly sodded areas.
8. Dispose of all surplus material off site.

#### 3.4 CLEANUP AND PROTECTION

- A. During landscape work, keep pavements clean and work area in an orderly condition.
- B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

END OF SECTION 329221

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## SECTION 331413 - PUBLIC WATER UTILITY DISTRIBUTION PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes water-distribution piping and related components.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
  - 1. Wiring Diagrams: Power, signal, and control wiring for alarms.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- B. Manufacturer's Certificate: Products meet or exceed specified requirements.
- C. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- D. Preconstruction Photographs: Digital files of photographs of Work areas and material storage areas.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and **invert** elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- C. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

#### 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- F. Valves: Mark valve body with manufacturer's name and pressure rating.
- G. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.
- H. Perform Work according to AWWA C600 standards.
- I. Manufacturer: Company specializing in manufacturing products specified in this Section with **three** years' experience.
- J. Installer: Company specializing in performing Work of this Section with **three** years' experience in installation of liner materials.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
  1. Ensure that valves are dry and internally protected against rust and corrosion.
  2. Protect valves against damage to threaded ends and flange faces.
  3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. Storage: Use precautions for valves, including fire hydrants, according to the following:
  1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
  2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
  3. Store materials according to manufacturer instructions.
  4. Block individual and stockpiled pipe lengths to prevent moving.
  5. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
  6. Store PE and PVC materials out of sunlight.
- C. Protection:
  1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  2. Provide additional protection according to manufacturer instructions.

## 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
  - 1. Notify Engineer no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of water-distribution service without Engineer's written permission.

## 1.8 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
  - 2. Indicate field measurements on Shop Drawings.

## 1.9 COORDINATION

- A. Coordinate connection to water main with utility company.
- B. **DO NOT OPERATE ANY EXISTING VALVES.** Notify owner of the need to have a valve operated and Owner's personnel will operate the necessary valves.

# PART 2 - PRODUCTS

## 2.1 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
  - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- B. Hard Copper Tube: ASTM B 88, Type K, water tube, drawn temper.
  - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- D. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

## 2.2 DUCTILE-IRON PIPE AND FITTINGS

- A. Manufacturers:
  - 1. American Cast Iron Pipe Company
  - 2. United States Pipe and Foundry
  - 3. McWane Cast Iron Pipe Co. (project-specific addition to the Standard Specifications of the Oneonta Utilities Board)
  - 4. Griffin Pipe Products Co. (project-specific addition to the Standard Specifications of the Oneonta Utilities Board)
- B. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, CL250 minimum, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- C. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, CL250 minimum, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
  - 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - 2. Gaskets: AWWA C111, rubber.
- D. Restrained Joint, Ductile-Iron Pipe: AWWA C151, CL250 minimum, with restrained joint bell and spigot ends.
  - 1. Restrained Joints:
    - a. Flex-Ring
    - b. Lok-Ring
    - c. TR Flex
    - d. Thrust Lock
  - 2. Field Adaptable Joint Restraints:
    - a. Fast Grip
    - b. Field Flex-Ring
    - c. Field Lok
    - d. Sure Stop
  - 3. Factory Welding: When restrained joints require factory welding, the MANUFACTURER shall qualify all welding procedures and welders used to produce the product per the requirements of a documented quality assurance system based on ANSI/AWS D11.2.
  - 4. Gaskets: Standard styrene butadiene copolymer (SBR), unless noted otherwise.
  - 5. Torque-activated restrained joint devices that rely on threaded bolts or set-screws for joint restraint are not allowed.
- E. Flanges: ASME 16.1, Class 125, cast iron.
- F. Interior Lining: Cement-mortar lining in accordance with ANSI/AWWA C104/A21.4, unless specifically noted otherwise.

## 2.3 PE PIPE AND FITTINGS

- A. PE, AWWA Pipe: AWWA C906, DR No. 7.3, 9, or 9.3; with PE compound number required to give pressure rating not less than 200 psig.
  - 1. PE, AWWA Fittings: AWWA C906, socket- or butt-fusion type, with DR number matching pipe and PE compound number required to give pressure rating not less than 200 psig.

## 2.4 PVC PIPE AND FITTINGS

- A. PVC, Schedule 40 Pipe: ASTM D 1785.
  - 1. PVC, Schedule 40 Socket Fittings: ASTM D 2466.
  - 2. Where glued joints are used, glue must be specifically intended for use with the chemical for which it will be used.
- B. PVC, Schedule 80 Pipe: ASTM D 1785.
  - 1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.
  - 2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.
  - 3. Where glued joints are used, glue must be specifically intended for use with the chemical for which it will be used.
- C. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.
  - 1. PVC Fabricated Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
  - 2. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
  - 3. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
    - a. Gaskets: AWWA C111, rubber.
  - 4. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
    - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

## 2.5 PVDF PIPE AND FITTINGS

- A. PVDF, Schedule 80 Pipe SDR21: ASTM E84.
  - 1. PVC, Schedule 40 Socket Fittings: ASTM E84.

2. Where glued joints are used, glue must be specifically intended for use with the chemical for which it will be used.

## 2.6 SPECIAL PIPE FITTINGS

### A. Ductile-Iron Rigid Expansion Joints:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [EBAА Iron, Inc.](#)
  - b. [U.S. Pipe and Foundry Company.](#)
2. Description: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
  - a. Pressure Rating: **250 psig** minimum.

### B. Ductile-Iron Flexible Expansion Joints:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [EBAА Iron, Inc.](#)
  - b. [Hays Fluid Controls; a division of ROMAC Industries Inc.](#)
  - c. [Star Pipe Products.](#)
2. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
  - a. Pressure Rating: **250 psig** minimum.

### C. Ductile-Iron Deflection Fittings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [EBAА Iron, Inc.](#)

2. Description: Compound, ductile-iron coupling fitting with sleeve and 1 or 2 flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
  - a. Pressure Rating: **250 psig** minimum.

## 2.7 JOINING MATERIALS

- A. Refer to Section 02080 "Piped Utilities - Basic Materials and Methods" for commonly used joining materials.
- B. Brazing Filler Metals: AWS A5.8, BCuP Series.
- C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

## 2.8 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Tubular-Sleeve Pipe Couplings:
  1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Cascade Waterworks Manufacturing](#).
    - b. [Dresser, Inc.; Dresser Piping Specialties](#).
    - c. [Ford Meter Box Company, Inc. \(The\); Pipe Products Div.](#)
    - d. [Hays Fluid Controls; a division of ROMAC Industries Inc.](#)
    - e. [JCM Industries](#).
    - f. [Smith-Blair, Inc.](#)
    - g. [Viking Johnson](#).
  2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
    - a. Standard: AWWA C219.
    - b. Center-Sleeve Material: Ductile iron.
    - c. Gasket Material: Natural or synthetic rubber.
    - d. Pressure Rating: **200 psig** minimum.
    - e. Metal Component Finish: Corrosion-resistant coating or material.
- C. Flexible Connectors:

1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
2. Ferrous-Metal Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

D. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

2. Dielectric Unions:

a. Description:

- 1) Standard: ASSE 1079.
- 2) Pressure Rating: **150 psig**.
- 3) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

a. Description:

- 1) Standard: ASSE 1079.
- 2) Factory-fabricated, bolted, companion-flange assembly.
- 3) Pressure Rating: **150 psig**.
- 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Description:

- 1) Nonconducting materials for field assembly of companion flanges.
- 2) Pressure Rating: **150 psig**.
- 3) Gasket: Neoprene or phenolic.
- 4) Bolt Sleeves: Phenolic or polyethylene.
- 5) Washers: Phenolic with steel backing washers.

5. Dielectric Nipples:

a. Description:

- 1) Standard: IAPMO PS 66
- 2) Electroplated steel nipple, complying with ASTM F 1545.
- 3) Pressure Rating: **300 psig at 225 deg F**.
- 4) End Connections: Male threaded or grooved.

b. Lining: Inert and noncorrosive, propylene.

## 2.9 CORROSION-PROTECTION PIPING ENCASEMENT

### A. Encasement for Underground Metal Piping:

1. Standards: ANSI/AWWA C105/A21.5.
2. Form: Tube.
3. Material: LLDPE film of 0.008-inch minimum thickness.
4. Color: Black.

## 2.10 GATE VALVES

### A. AWWA, Ductile-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Mueller
  - b. M&H Valve Company
  - c. Singer Valves
  - d. Or Pre-approved equivalent
2. Nonrising-Stem, Resilient-Seated Gate Valves:
  - a. Description: Ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
    - 1) Standard: 16" and smaller: AWWA C509.
    - 2) Standard: 16" and larger: AWWA C500.
    - 3) Minimum Pressure Rating: 250 psig working water pressure rating, with zero leakage.
    - 4) End Connections: Mechanical joint.
    - 5) Interior and Exterior Coating: Fusion bonded epoxy complying with AWWA C550.

## 2.11 GATE VALVE ACCESSORIES AND SPECIALTIES

### A. Tapping-Sleeve Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
  - b. East Jordan Iron Works, Inc.
  - c. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
  - d. McWane, Inc.; Kennedy Valve Div.
  - e. McWane, Inc.; M & H Valve Company Div.
  - f. Mueller Co.; Water Products Div.
  - g. U.S. Pipe and Foundry Company.

2. Description: Sleeve and valve compatible with drilling machine.
  - a. Full Body.
  - b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
  - c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
- B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.
  1. Extensions: Cast or ductile iron. The use of PVC extensions is prohibited.
  2. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

## 2.12 BUTTERFLY VALVES

- A. AWWA Butterfly Valves:
  1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. DeZURIK.
    - b. Pratt, Henry Company.
    - c. Val-Matic Valve & Manufacturing Corp.
  2. Description: AWWA Class 150BG (3" – 20")
- B. Butterfly valves 3 - 20" (80 - 500mm) shall meet or exceed the latest revision of AWWA Standard C504 for Class 150B butterfly valves and shall meet or exceed the requirements of this specification.
- C. Valve bodies shall be of cast iron per ASTM A126 Class B. Flange end valves shall be of the short body design with 125 lb. flanged ends faced and drilled per ANSI B16.1 standard for cast iron flanges. Mechanical Joint end valves shall meet the requirements of AWWA C111/ANSI 21.11.
- C. Discs shall be cast iron per ASTM A48 Class 40C. The disc seating edge shall be solid 316 stainless steel. The disc shall be securely attached to the valve shaft utilizing a field removable/replaceable 316 stainless steel torque screw or a tangential pin locked in place with a set screw.
- D. Valve shaft shall be type 304 stainless steel. Valve shaft seals shall be self-compensating V-type packing with a minimum of four sealing rings. One-piece molded shaft seals and o-ring shaft seals are not acceptable.

- E. The seat shall be of Buna-N for water, or as required for other services, and shall be molded in and vulcanized to the valve body. The seat shall contain an integral shaft seal protecting the valve bearings and packing from any line debris. Seats vulcanized to cartridge inserts in the valve body and seats on the disc are not acceptable.
- F. Valve shaft bearings shall be non-metallic and permanently lubricated.
- G. Unless otherwise specified, exterior and interior metallic surfaces of each valve shall be shop painted per the latest revision of AWWA C504.
- H. If the actual valve operating conditions are provided within this specification, actuator shall be sized to the specified conditions. If actual operating conditions are not provided within this specification, per AWWA C504, the valve actuator shall be sized to operate the valve at the rated working conditions of the valve. Each valve and valve actuator shall be assembled, adjusted, and tested as a unit per the latest revision of AWWA C504, by the valve manufacturer.
- I. Ten position locking levers shall be available for 3 - 8" (80 - 200mm) valves. Provision must be made for locking in any of the ten positions using a standard padlock.
- J. Valves 3-20" (80 - 500mm) shall have traveling nut manual actuators designed and tested per the requirements of AWWA C504. Housings shall be cast iron and shall be available in both weatherproof and buriable constructions with handwheel, chainwheel, or 2" (50mm) square AWWA nut inputs. All units shall have adjustable open and closed position stops.

3. Description: AWWA Class 150BG (24" and Larger)

- A. Butterfly valves 24 - 72" (600mm and larger) shall meet or exceed the latest revision of AWWA Standard C504 and shall meet or exceed the requirements of this specification. All valves shall comply with the requirements of the AWWA class specified or if the AWWA class is not specified, the valve shall meet the requirements of AWWA C504 class 150B.
- B. Valve bodies shall be of cast iron per ASTM A126 Class B. Flanged end valves shall be of the short body design with 125 lb. flanged ends faced and drilled per ANSI B16.1 standard for cast iron flanges. Mechanical joint ends shall meet the requirements of AWWA C111/ANSI A21.11.
- C. Discs shall be offset to provide an uninterrupted 360 degree seating edge and shall be cast iron per ASTM A48, Class 40C or ductile iron per ASTM A536 (65-45-12). The disc seating edge shall be solid 316 stainless steel. The disc shall be securely attached to the valve shaft using 304 stainless steel taper pins. Discs structures containing hollow cavities are not acceptable.
- D. Valve shaft shall be of type 304 stainless steel. Valve shaft seals shall be self-compensating V-type packing with a minimum of four sealing rings. One-piece molded shaft seals and o-ring shaft seals are not acceptable.

- E. The seat shall be of Buna-N for water, or as required for other services, and shall be retained within a dovetail groove in the valve body and locked in place by an epoxy compound edge. Compression between the seat and disc edge shall be adjustable from both the upstream and downstream side of the valve disc and the seat shall be field replaceable without disassembly of the disc and shaft. Seats with unidirectional adjustment, seats retained in the valve body by the use of fasteners and/or retaining rings, and seats retained on the valve disc are not acceptable.
- F. Valve shaft bearings shall be Teflon lined with a non-metallic fiberglass composite backing and shall be permanently lubricated.
- G. Unless otherwise specified, exterior and interior metallic surfaces of each valve shall be shop painted per the latest reversion of AWWA C504.
- H. If the actual valve operating conditions are provided within this specification, the valve actuator shall be sized to the specified conditions. If actual operating conditions are not provided within this specification, per AWWA C504, the valve actuator shall be sized to operate the valve at the rated working conditions of the valve. Each valve and valve actuator shall be assembled, adjusted, and tested as a unit per the latest revision of AWWA C504, by the valve manufacturer.
- I. Handwheel, chainwheel, and buried service nut actuators shall conform in all respects to AWWA C504.

4. Description: AWWA Class 250BG (24" and Larger)

- A. Butterfly valves 24" (600mm) and larger shall meet or exceed the design intention of the latest revision of AWWA Standard C504 and shall meet or exceed the requirements of this specification. Valves shall have a working pressure of 250 psi (1720 kPa).
- B. Valve bodies shall be of ductile iron per ASTM A536 (65-45-12). Flange end valves shall be of the short body design with 250 lb. flanged ends faced and drilled per ANSI B16.1 standard for cast iron flanges. Mechanical Joint end valves shall be of ductile iron per ASTM A536 (65-45-12) and the ends shall meet the requirements of AWWA C111/ANSI 21.11.
- C. Discs shall be offset to provide an uninterrupted 360 degree seating edge and shall be ductile iron per ASTM A536 (65-45-12). The disc seating edge shall be solid 316 stainless steel. The disc shall be securely attached to the valve shaft using 17-4 PH stainless steel taper pins. Disc structures containing hollow cavities are not acceptable.
- D. Valve shafts shall be of ASTM A564 Type 630 stainless steel. Valve shaft seals shall be self-compensating V-type packing with a minimum of four sealing rings. One-piece molded shaft seals and o-ring shaft seals are not acceptable.
- E. The seat shall be of Buna-N for water, or as required for other services, and shall be retained within a dovetail groove in the valve body and locked in place by an epoxy compound wedge. Compression between the seat and disc edge shall be adjustable

from both the upstream and downstream side of the valve disc and the seat shall be field replaceable without disassembly of the disc and shaft. Seats with unidirectional adjustment, seats retained in the valve body by the use of fasteners and/or retaining rings, and seats retained on the valve disc are not acceptable.

- F. Valve shaft bearings shall be PTFE lined with a non-metallic fiberglass composite backing and shall be permanently lubricated.
- G. Unless otherwise specified, exterior and interior metallic surfaces of each valve shall be shop painted per the latest revision of AWWA C504.
- H. If the actual valve operating conditions are provided within this specification, the valve actuator shall be sized to the specified conditions. If actual operating conditions are not provided within this specification, per AWWA C504, the valve actuator shall be sized to operate the valve at the rated working conditions of the valve. Each valve and valve actuator shall be assembled, adjusted, and tested as a unit per the latest revision of AWWA C504, by the valve manufacturer.
- I. Handwheel, chainwheel, and buried service nut actuators shall conform in all respects to AWWA C504.

B. Thermoplastic Butterfly Valves:

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Asahi/America
  - b. Or Pre-approved Equal
- 2. Description: ASTM D1784, Cell Classification 12454A (1 1/2" – 14")
  - a. All solid thermoplastic butterfly valves sizes 1-1/2" through 14" shall be of the Type-57 lined body design and bubble-tight seal (meeting or exceeding Class VI as defined by American National Standard Institute) with only the liner and disc as wetted parts.
  - b. The lever handle (sizes 1-1/2" thru 8") shall have a molded provision for a padlock. Gear operators shall be worm gear design, self-locking Plasgear™.
  - c. The spherical disc design for higher Cv values shall be of solid, abrasion resistant plastic.
  - d. Liner shall be molded and formed around the body, functioning as gasket seals with convex ring design on each side of the valve for lower bolt tightening torque and valve body shall have molded body stops and seat relief area to prevent over tightening of mating flanges.
  - e. Stem shall be of 316 stainless steel, non-wetted, have engagement over the full length of the disc and be locked into valve body by PP stem retainer.

- f. Valves shall have a molded ISO bolt pattern on top flange for actuator mount.
- g. The ball valves shall have a pressure rating of 230 psi for sizes "1/2" to 3" and 150 psi for 4" at 70 ° F.
- h. Type 21 Ball Valves must carry a two-year guarantee.

## 2.13 BALL VALVES

### A. Thermoplastic Ball Valves:

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Asahi/America
  - b. Or Pre-approved Equal
- 2. Description: ASTM D1784, Cell Classification 12454A (1 ½" – 4")
  - a. All TYPE 21 Ball Valves, sizes 1/2" to 4", shall be of true union design with two-way blocking capability.
  - b. All O-rings shall be EPDM or Viton® with PTFE seats.
  - c. PTFE seats shall have elastomeric backing cushion of the same material as the valve seals.
  - d. Stem shall have double O-rings and be of blowout-proof design.
  - e. The valve handle shall double as carrier removal and/or tightening tool.
  - f. ISO mounting pad shall be integrally molded to valve body for actuation.
  - g. PVC conforming to ASTM D1784 Cell Classification 12454-A.

## 2.14 CORPORATION VALVES AND CURB VALVES

### A. Manufacturers:

- 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
  - a. Mueller Co.; Water Products Div. H14350 Curb Valve.
  - b. Mueller Co.; Water Products Div. H15008 Corporation Valve

- B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.
  - 1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
  - 2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
- C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.
- D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
  - 1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

## 2.15 ACTUATORS

- A. Electric Actuators:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Bettis
    - b. Or pre-approved equal
  - 2. Description: The actuator shall consist of a sand cast CSA\* Certified enclosure complete with an internal high-torque reversible electric motor, terminal block, heat-treated alloy steel gearing, a minimum of two (2) 1/2" NPT conduit connections
  - 3. Actuator Sizing: All actuator torques must be published and must be guaranteed, by the original manufacturer, as minimum values. The actuator shall be sized to produce a torque equal to or greater than the maximum valve torque, including safety factor, as stated by the valve manufacturer for the service, operating conditions and ambient temperature intended.
  - 4. Ambient Temperature Range: The actuator shall be suitable for normal operation in ambient temperatures ranging from -40 to +140 °F (-40 to +60°C). For temperatures below 32°F (0°C), high-humidity environments or all outdoor applications the actuator shall be supplied with an electric heater and thermostat.
  - 5. Electric Motors: The actuator motor shall be of the reversible, high-torque, open frame ventilated design with built-in automatic resetting thermal overload protection, a minimum 30% duty cycle rating and be UL\* and CSA\* Certified Motors of 1/4 hp or less with not more than 7 amps of locked rotor current draw. When single phase motors are selected, they shall be supplied as a permanent split capacitor type operating from a 1Ph/60Hz/115VAC supply.

6. Reduction Gearing: The actuator shall use exclusively cut alloy gearing. All power gearing shall be grease lubricated for long life.
7. Limit Switches: All limit switches shall be independently operated by adjustable cams in each direction of operation. Provisions shall be made for up to six (6) additional cam operated switches, each being capable of operation at any point of travel.
8. Torque Limit Switches: All actuators of 2,000 lb-in (226 Nm) output torque or greater, shall be supplied with two (2) mechanical torque limiting switches which shall be responsive to maximum torque encountered in both directions of travel.
9. Manual Override:
  - a. Transfer to manual operation from motor operation shall not require the use of hand levers, solenoid shifters or handwheel depression and the transfer shall be positive and reliable.
  - b. Actuators of less than 1700 lb-in, except for the model 100, shall be supplied with a disengageable manual override mechanism. Disengagement of the motor drive shall permit the use of a wrench on the output shaft flats and shall by-pass the power gear drive and motor for manual operation.
  - c. Actuators of 2,000 lb-in (226 Nm) or greater output torque shall be supplied with a handwheel which will not rotate during motor operation, but must be operational at all times without danger of injury to operator. The handwheel shall not require more than 50 lbs. of rim force to operate under the most adverse conditions and be capable of assisting or opposing the motor without any form of declutching.
10. Enclosure: The actuator enclosure shall be a high-strength sand casting and must be certified by CSA\*, or equal third party tester, as acceptable for use in the following locations:
  - a. 9.1 Non-hazardous indoor or outdoor location to protect against wind-blown dust and rain, splashing water and hose-directed water (i.e. CSA Enclosure 4 – Weatherproof, conforms to IP-65).
  - b. 9.2 Hazardous locations classified as Class I and II, Groups C, D, E, F and G as defined in the National Electrical Code **plus** non-hazardous locations to protect against wind-blown dust and rain, splashing water and hose-directed water (i.e. CSA Enclosure 4 and 7 – Explosion-proof and Weatherproof).
11. Positioner/Controller: Integral positioning controller with appropriate control input (4-20 ma, 0-10 V, 1-5 V). Installed within actuator enclosure. Digital micro-processor solid state control. Pushbutton programming – eliminates zero and span pots. Minimum of 10 bit resolution. Calibration can be achieved off-line, thus no need for handheld calibrators. Electronic programmable fail position

## 2.16 WATER METERS

- A. Water meters will be furnished by the Owner.

## 2.17 RELIEF VALVES

### A. Air-Release Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. APCO
  - b. Crispin-Multiplex Manufacturing Co.
  - c. DeZurik.
  - d. GA Industries, Inc.
  - e. Val-Matic Valve & Manufacturing Corp.
2. Description: Hydromechanical device to automatically release accumulated air.
  - a. Standard: AWWA C512.
  - b. Pressure Rating: 300 psig.
  - c. Body Material: Cast iron or ductile iron.
  - d. Trim Material: Stainless steel.

### B. Air/Vacuum Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. APCO
  - b. Crispin-Multiplex Manufacturing Co.
  - c. DeZurik.
  - d. GA Industries, Inc.
  - e. Val-Matic Valve & Manufacturing Corp.
2. Description: Direct-acting, float-operated, hydromechanical device with large orifice to automatically release accumulated air or to admit air during filling of piping.
  - a. Standard: AWWA C512.
  - b. Pressure Rating: 300 psig.
  - c. Body Material: Cast iron or ductile iron.
  - d. Trim Material: Stainless steel.

### C. Combination Air Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. APCO
  - b. Crispin-Multiplex Manufacturing Co.
  - c. DeZurik.
  - d. GA Industries, Inc.

- e. Val-Matic Valve & Manufacturing Corp.
2. Description: Float-operated, hydromechanical device to automatically release accumulated air or to admit air.
  - a. Standard: AWWA C512.
  - b. Pressure Rating: 300 psig.
  - c. Body Material: Cast iron or ductile iron.
  - d. Trim Material: Stainless steel.

## 2.18 WATER METER BOXES

- A. Description: Water Meter Boxes will be furnished by utility company.

## 2.19 CONCRETE VAULTS

- A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.
  1. Ladder: Aluminum.
  2. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.
    - a. Dimension: 24-inch- minimum diameter, unless otherwise indicated.
  3. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

## 2.20 FIRE HYDRANTS

- A. Dry-Barrel Fire Hydrants:
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. M & H Valve Company.
    - b. Or pre-approved equivalent
  2. Description: Freestanding, with one **NPS 4-1/2** and two **NPS 2-1/2** outlets, **5-1/4-inch** main valve, drain valve, and **NPS 6** mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
    - a. Standard: AWWA C502.
    - b. Pressure Rating: **250 psig.**

- c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
- d. Operating and Cap Nuts: Pentagon, **1-1/2 inches** point to flat.
- e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
- f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that existing utility water main size, location, and invert are as indicated.

### 3.2 PREPARATION

- A. Preconstruction Site Photos:

1. As specified in Section 017000 - Execution and Closeout Requirements.
2. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 100 feet of pipe trench.
3. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
4. Include Project description, date taken, and sequential number on back of each photograph.

- B. Pipe Cutting:

1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
3. Grind edges smooth with beveled end for push-on connections.

- C. Remove scale and dirt on inside and outside before assembly.

- D. Prepare pipe connections to equipment with flanges or unions.

### 3.3 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
- C. Do not use flanges or unions for underground piping.

- D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.
- E. Underground water-service piping NPS 3/4 to NPS 3 shall be the following:
  - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
  - 2. PE, ASTM pipe; molded PE fittings; and heat-fusion joints.
  - 3. PVC, Schedule 40 pipe; PVC, Schedule 40 socket fittings; and solvent-cemented joints.
- F. Underground water-service piping NPS 4 to NPS 8 shall be the following:
  - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
  - 2. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
  - 3. PE, AWWA pipe; PE, AWWA fittings; and heat-fusion joints.
  - 4. NPS 4 and NPS 6: NPS 6 PVC, AWWA Class 150 pipe; PVC, AWWA Class 150 fabricated fittings; and gasketed joints.
  - 5. NPS 8: PVC, AWWA Class 200 pipe; PVC, AWWA Class 200 fabricated mechanical-joint, ductile-iron fittings; and gasketed joints.
- G. Water Meter Box Water-Service Piping NPS 3/4 to NPS 2 shall be same as underground water-service piping.
- H. Aboveground and Vault Water-Service Piping NPS 3/4 to NPS 3 shall be the following:
  - 1. Hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- I. Aboveground and vault water-service piping NPS 4 to NPS 8 shall be the following:
  - 1. Hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
  - 2. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.
  - 3. PVC, Schedule 80 pipe; PVC, Schedule 80 socket fittings; and solvent-cemented joints.

### 3.4 VALVE APPLICATIONS

- A. General Application: Use ends as indicated on drawings. Where specific ends are not indicated, use mechanical-joint-end valves for NPS 3 and larger underground installation; use threaded- or flanged-end valves for installation in vaults; use UL/FMG, nonrising-stem gate valves for installation with indicator posts; use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.
- B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
2. Use the following for valves in vaults and aboveground:
  - a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising stem.
  - b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, non-rising stem, resilient seated.
  - c. Check Valves: AWWA C508, swing type.
3. Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.
4. Relief Valves: Use for water-service piping in vaults and aboveground.
  - a. Air-Release Valves: To release accumulated air.
  - b. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
  - c. Combination Air Valves: To release or admit air.
5. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

### 3.5 PIPING INSTALLATION

- A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- B. Make connections larger than NPS 2 with tapping machine according to the following:
  1. Install tapping sleeve and tapping valve according to MSS SP-60.
  2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
  3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
  4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- C. Make connections NPS 2 and smaller with drilling machine according to the following:
  1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
  2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
  3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
  4. Install corporation valves into service-saddle assemblies.
  5. Install manifold for multiple taps in water main.
  6. Install curb valve in water-service piping with head pointing up and with service box.
- D. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
  1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.

- E. Install PE pipe according to ASTM D 2774 and ASTM F 645.
- F. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- G. Bury piping with depth of cover over top at least 36 inches, with top at least 12 inches below level of maximum frost penetration.
- H. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- I. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
  - 1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.
- J. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

### 3.6 JOINT CONSTRUCTION

- A. See Section 02080 "Piped Utilities - Basic Materials and Methods" for basic piping joint construction.
- B. Make pipe joints according to the following:
  - 1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
  - 2. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
  - 3. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
  - 4. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
  - 5. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

### 3.7 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
  - 1. Concrete thrust blocks.
  - 2. Locking mechanical joints.
  - 3. Set-screw mechanical retainer glands.
  - 4. Bolted flanged joints.
  - 5. Heat-fused joints.

6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
  1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
  2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

### 3.8 VALVE INSTALLATION

- A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.
- B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.
- C. MSS Valves: Install as component of connected piping system.
- D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- E. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves. Install full-size valved bypass.
- F. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

### 3.9 WATER METER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company's written instructions.

### 3.10 WATER METER BOX INSTALLATION

- A. Install water meter boxes in paved areas flush with surface.
- B. Install water meter boxes in grass or earth areas with top 2 inches above surface.

### 3.11 CONCRETE VAULT INSTALLATION

- A. Install precast concrete vaults according to ASTM C 891.

### 3.12 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. AWWA Fire Hydrants: Comply with AWWA M17.

### 3.13 CONNECTIONS

- A. See Section 02080 "Piped Utilities - Basic Materials and Methods" for piping connections to valves and equipment.
- B. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.
- C. Connect waste piping from concrete vault drains to storm-drainage system. See Section 02630 "Storm Drainage" for connection to storm-sewer piping.
- D. Ground equipment according to Section 16060 "Grounding and Bonding."
- E. Connect wiring according to Section 16120 "Conductors and Cables."

### 3.14 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure or 150 psig, whichever is more, for 6 hours. Provide pressure charts to Engineer.
- C. Leakage Tests: Conduct leakage test in accordance with AWWA C600 for ductile iron or AWWA C605 for PVC.
  1. Pressure test piping system according to the following:
    - a. Test Pressure: Not less than 150 psig or 1.5 times working pressure, whichever is greater.
    - b. Slowly fill section to be tested with water; expel air from piping at high points.
    - c. Install corporation cocks at high points.
    - d. Close air vents and corporation cocks after air is expelled.
    - e. Raise pressure to specified test pressure.
    - f. Observe joints, fittings, and valves under test.
    - g. Remove and renew cracked pipes, joints, fittings, and valves showing visible leakage, and retest.
    - h. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
    - i. Maintain pressure within plus or minus 5 psi of test pressure.
    - j. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
    - k. Compute maximum allowable leakage using following formula:
      - 1)  $L = SD \times \sqrt{P/C}$ .
      - 2)  $L = \text{testing allowance, gph}$ .
      - 3)  $S = \text{length of pipe tested, feet}$ .

- 4) D = nominal diameter of pipe, inches.
- 5) P = average test pressure during hydrostatic test, psig.
- 6) C = 148,000.

1. If pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

m. Leakage:

- 1) If test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.
- 2) Correct visible leaks regardless of quantity of leakage.

D. Prepare reports of testing activities.

### 3.15 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 02300 "Earthwork."

### 3.16 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Preliminary flushing: Before chlorination, fill lines to remove all air pockets and flush to remove particulates. Flushing velocity shall not be less than 2.5 feet per second.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651.
4. Bacteriological testing: After final flushing and before new mains are connected to the distribution system, bacteriological testing shall be performed in accordance with AWWA C651.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 331413

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