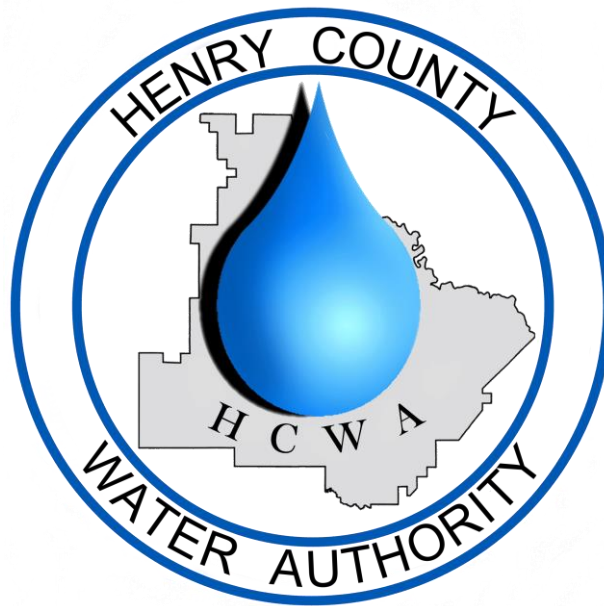


PROJECT MANUAL

SOUTHEASTERN BOOSTER PUMP STATION



**HENRY COUNTY WATER AUTHORITY
MCDONOUGH, GEORGIA**

MAY 2020

Section 00 01 05

Certifications

The following licensed professionals are responsible for the various portions of the project manual by which their seal is affixed:

- Division 00 - Procurement and Contracting Requirements
- Division 01 - General Requirements
- Division 31 - Earthwork
- Division 32 - Exterior Improvements
- Division 33 - Utilities
- Division 40 - Process Integration



David Bishop, PE

- Division 07 - Thermal and Moisture Protection
- Division 08 - Openings
- Division 09 - Finishes



Al Johnson, PE

- Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)



Chris Horner, PE

Division 26 - Electrical



George Boyd, PE

END OF SECTION

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SOUTHEASTERN BOOSTER PUMP STATION

**HENRY COUNTY WATER AUTHORITY
MCDONOUGH, GEORGIA**

Sealed Bids for furnishing all materials, labor, tools, equipment and appurtenances necessary for the construction of the Southeastern Booster Pump Station will be received at the Henry County Water Authority, 1695 Highway 20 West, McDonough, Georgia 30253, until 2:00 p.m., local time, on June 25th, 2020, and then at said location publicly opened and read aloud.

The Project consists of constructing one booster pump station containing a packaged pump skid with two 250 HP pumps and a space for a future pump; one split faced block building approximately 30 feet by 45 feet; an electrical room containing variable frequency drives, necessary electrical gear to support the pumps, and HVAC units; 16-inch and 24-inch waterlines connecting the new booster pump station with the existing water main; and landscaping and concrete driveway.

The Instructions to Bidders, Bid, Contract Agreement, Drawings, Specifications and forms of Bid Bond, Performance Bond, Payment Bond and other Contract Documents may be examined at the following:

Henry County Water Authority
100 Westridge Industrial Blvd.
McDonough, Georgia 30253
and
1695 Highway 20 West
McDonough, Georgia 30253

Barge Design Solutions, Inc.
1201 Front Avenue, Suite F
Columbus, Georgia 31901
(706) 321-4590

Copies of the Bidding Documents may be purchased from Lellyett and Rodgers Company. Details for ordering are available at <https://bidding.bargedesign.com> or via phone at 615-250-9145. Cost of the Bidding Documents is \$300.00 per set. No part of the purchase will be refunded.

Bidders must meet the requirements set forth below in order to be eligible to submit a bid:

1. The Bidder must purchase the Bidding Documents from Lellyett and Rodgers Company.
2. The Bidder must attend the Pre-Bid Meeting located at 1695 Highway 20 West, McDonough, Georgia 30253 at 2:00 PM, local time, June 11th, 2020.

Each Bid must be accompanied by a Bid Bond, prepared on the form of Bid Bond attached to the Contract Documents, duly executed by the Bidder as principal and having as surety thereon a surety company licensed to do business in the State of Georgia and listed as a certified company in the latest issue of U.S. Treasury Circular 570, in the amount of five percent of the Bid.

Advertisement for Bids

The Owner will make payments, within 45 days, in response to the Contractor's monthly Applications for Payment, which are accompanied by the Engineer's Certificate for Payment, for work performed to date plus cost of stored materials, less retainage. Payments, Applications for Payment, Certificates for Payment, and retainage shall be in accordance with the provisions of the Contract Documents.

No bid may be withdrawn within 60 calendar days after the scheduled time for receipt of bids.

All bidders must have a Georgia Utility Contractor License and shall comply with all requirements of the State of Georgia.

The Owner will in no way be liable for any costs incurred by any bidder in the preparation of its Bid in response to this Invitation to Bid.

The successful Bidder for this Contract will be required to furnish a satisfactory Performance Bond and Payment Bond each in the amount of 100 percent of the Bid.

The Owner reserves the right to reject all Bids, to waive informalities and to readvertise.

HENRY COUNTY WATER AUTHORITY

Lindy Farmer Jr.
General Manager

END OF SECTION

ARTICLE 1 – DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office* – The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered. The issuing office for this Project is Barge Design Solutions, Inc., 1201 Front Avenue, Suite F, Columbus, GA 31901.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the advertisement or invitation to bid may be obtained from the Issuing Office, or its designated printing facility, as indicated in the Advertisement for Bids. There will be no refund of the purchase price of Bidding Documents.
- 2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

- 3.01 The minimum qualifications of a responsible Bidder include the following requirements:
- A. The Bidder shall maintain a permanent place of business. This requirement applies to the Bidder where the Bidder is a division of a corporation, or where the Bidder is 50 percent or more owned by a person, corporation or firm.
- B. The Bidder has a Georgia Utility Contractor License to perform the work under this contract.
- C. The Bidder shall demonstrate adequate construction experience and sufficient equipment resources to properly perform the work under and in conformance with the Contract Documents. This evaluation will be based upon a list of completed or active projects and a list of construction equipment available to the Bidder to perform the work. The Owner may make such investigations as deemed necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may reasonably request. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the Project contemplated therein.

Instructions to Bidders

- D. The Bidder shall demonstrate financial resources of sufficient strength to meet the obligations incident to the performance of the work covered by these Contract Documents. The ability to obtain the required Performance and Payment Bonds will not alone demonstrate adequate financial capability.
 - E. The Bidder shall demonstrate that he is familiar with the work covered by these Contract Documents.
- 3.02 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit with the Bid written evidence such as previous experience, present commitments, and such other data as may be called for below.
- A. Completion of Statement of Bidder's Qualifications, as included elsewhere in this Project Manual.
 - B. Bidder's Georgia Utility Contractors License.
- 3.03 To demonstrate Bidder's qualifications to perform the Work, within three days of Owner's request, Bidder shall submit written evidence such as financial data and such other data as may be requested by Owner.
- 3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.
- 3.05 A Bidder may be deemed as not responsible if:
- A. Bidder fails to furnish adequate information for the Owner to determine if the Bidder is deemed to possess adequate construction experience and sufficient equipment resources or fails to provide such information in a timely manner.
 - B. Bidder fails to furnish information, evidence, and statements of the principal owner when the Bidder is owned 50 percent or more by another firm, corporation, or person.
 - C. Bidder is in arrears on any existing contracts, interested in any litigation against the Owner or has defaulted on a previous contract.
 - D. Bidder fails to have access to adequate equipment.
 - E. Bidder has uncompleted work which in the judgment of the Owner will hinder or prevent prompt completion of additional work, if awarded.
- 3.06 Acceptance of the Bidder's documentation and substantiation or Contract Award by the Owner does not relieve the Bidder of liability for non-performance as covered in the Contract Documents, nor will the Bidder be exempted from any other legal recourse the Owner may elect to pursue.

ARTICLE 4 – EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE**4.01 *Subsurface and Physical Conditions***

- A. The Supplementary Conditions identify:
1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous 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).
- B. Copies of reports and drawings referenced in Paragraph 4.01.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.02 of the General Conditions has been identified and established in Paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 *Underground Facilities*

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

4.03 *Hazardous Environmental Condition*

- A. The Supplementary Conditions identify any reports and drawings known to Owner relating to a Hazardous Environmental Condition identified at the Site.
- B. Copies of reports and drawings referenced in Paragraph 4.03.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.06 of the General Conditions has been identified and established in Paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

- 4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not

Instructions to Bidders

shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 4.06 of the General Conditions.

- 4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.
- 4.06 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of contract documents (other than portions thereof related to price) for such other work.
- 4.07 It is the responsibility of each Bidder before submitting a Bid to:
- A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;
 - B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
 - C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;
 - D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Paragraph 4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Paragraph 4.06 of the Supplementary Conditions as containing reliable "technical data";
 - E. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding 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 Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;
 - F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

- G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
 - H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
 - I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 – PRE-BID CONFERENCE

- 5.01 A Pre-Bid Conference will be held if so indicated in the Advertisement for Bids. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 – SITE AND OTHER AREAS

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

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed, delivered or otherwise issued to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.
- 7.03 Questions and other inquiries shall be submitted to the Issuing office, Attention: David Bishop, David.Bishop@bargedesign.com.

ARTICLE 8 – BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of five percent of Bidder's maximum Bid price and in the form of a Bid bond (on the form attached) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.
- 8.02 If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within ten days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.
- 8.03 Attorneys-in-Fact of other officers who sign bid bonds for a surety company must file with such bonds a certified copy of his power of attorney authorizing him to sign said bonds.

ARTICLE 9 – CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

- 11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents. No substitution requests will be considered.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

- 12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute without an increase in the Bid.
- 12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no

written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

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

ARTICLE 13 – PREPARATION OF BID

- 13.01 The Bid Form is included with the Bidding Documents.
- 13.02 All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each Bid item and alternate item listed therein. In the case of optional alternatives, the words “No Bid,” “No Change,” or “Not Applicable” may be entered.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.
- 13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.
- 13.06 A Bid by an individual shall show the Bidder’s name and official address.
- 13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- 13.08 All names shall be printed in ink below the signatures.
- 13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

ARTICLE 14 – BASIS OF BID; COMPARISON OF BIDS

14.01 *Lump Sum and Unit Prices*

- A. Bidders shall submit a bid on a lump sum or unit price basis, as indicated on the Bid schedule, for each item of Work listed in the Bid schedule.

Instructions to Bidders

- B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

14.02 *Allowances*

- A. For cash allowances the various other Bid prices shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 11.02.B of the General Conditions.

ARTICLE 15 – SUBMITTAL OF BID

15.01 With each set of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, Bid Bond Form and the required documents listed below. The unbound copy of the Bid Form is to be completed and submitted with the Bid security along with the documents listed below. The Bidder shall submit one original of all documents in the envelope.

- A. Statement of Bidders Qualifications
- B. Non-Collusion Affidavit of Prime Bidder
- C. Corporate Certificate
- D. Georgia Security and Immigration Compliance Act Affidavits
- E. Contractor's License Certification

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bids and shall be enclosed in a sealed envelope which shall also contain the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to the place indicated in the Advertisement for Bids.

15.03 In addition to the requirements of Article 15.02 above, the Bidder shall provide on the outside of the envelope containing the bid the Bidder's name and "Bid for Southeastern Booster Pump Station".

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- 16.02 If a Bidder, after the Bid opening determines that its Bid contained an appreciable error in the calculation of its Bid, the Bidder may withdraw its Bid, subject to the provisions of, and, if the mistake meets the criteria in, O.C.G.A. 36-91-52.
- 16.03 A bid may be withdrawn after the time period stated in the Advertisement for Bids after the date of the opening of the bids, provided that the Bidder has not been notified within said time period that his bid has been accepted.

ARTICLE 17 – OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

- 18.01 All Bids will remain subject to acceptance for the period of time stated in the Advertisement for Bids, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.
- 19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- 19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 19.04 A bid may be declared by the Owner to be non-responsive for, but not limited to, any of the following reasons:
- A. Bid contains blanks, Proposal is not complete or required accompanying documents, certifications, and statements are not included.

Instructions to Bidders

- B. Bid contains modifications or alterations of the Bid Form or other Contract Documents.
 - C. Bid is a qualified or conditional bid.
 - D. Bid contains unrealistic data, erroneous data, inaccurate data, or data that cannot be documented or substantiated.
- 19.05 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.
- 19.06 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.
- 19.07 The Contracts will be awarded to the responsive, responsible Bidders submitting the lowest Bid complying with the conditions of the Contract Documents. Award will be made on the basis of the prices given in the Bid at the discretion of the Owner.

ARTICLE 20 – CONTRACT SECURITY AND INSURANCE

- 20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

ARTICLE 21 – SIGNING OF AGREEMENT

- 21.01 When Owner or Engineer issues a Notice of Award to the Successful Bidder, the Notice of Award will be accompanied by the required number of unsigned counterparts of the Agreement along with the other Contract Documents, which are identified in the Agreement as attached thereto. Within ten days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.
- 21.02 Upon failure of the Bidder to execute the required bonds or to sign the required contract within ten days after the contract is awarded, he will be considered to have abandoned his proposal and the Owner may annul the award. By reason of the uncertainty of market prices of materials and labor, and it being impracticable and extremely difficult to fix the amount of damages to which the Owner would be put by reason of said Bidder's failure to execute said bonds and contract within ten days, the bid security accompanying the proposal shall be the agreed amount of damages which the Owner will suffer by reason of such failure on the part of the Bidder and shall thereupon immediately be forfeited to the Owner. The filing of a proposal will be considered as an acceptance of this provision.

ARTICLE 22 – DELETED**ARTICLE 23 – DELETED****ARTICLE 24 – DELETED****ARTICLE 25 – DELETED****ARTICLE 26 – PERMITS, EASEMENTS AND RIGHTS-OF-WAY**

26.01 All anticipated federal, state, or local permits required for the Project, which are the responsibility of the Owner, have been obtained.

26.02. All rights-of-way and easements required for the Project, which are the responsibility of the Owner, have been obtained.

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www.acec.org

American Society of Civil Engineers
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SOUTHEASTERN BOOSTER PUMP STATION

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

Henry County Water Authority
100 Westridge Ind. Blvd
McDonough, GA 30253

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for period of time after the Bid opening as stated in the Advertisement for Bids, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER’S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

<u>Addendum No.</u>	<u>Addendum Date</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

- B. Bidder has visited the Site 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. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.
- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating

- to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in SC-4.02 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable "technical data."
- E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding 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 Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
 - F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
 - G. Bidder 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 Bidding Documents.
 - H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
 - I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
 - J. Where this Bid Form contains the provision for a bid based on a lump sum price, the Bidder shall be responsible for having prepared its own estimate of the quantities necessary for the satisfactory completion of the Work specified in these Contract Documents and for having based the lump sum price bid on its estimate of quantities.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid 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.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Item No.	Description	Estimated Qty.	Unit	Unit Price	Total Price
1.	Furnishing all products, materials and equipment and performing all labor necessary to complete and put into operation the Southeastern Booster Pump Station, including all work shown on the Drawings and/or specified and not included in Items 2 through 4 below, the total amount of:		Lump Sum		\$
2.	Cash Allowances				
a.	Soils and Concrete Testing		ALLOWANCE		\$ 4,000.00
b.	Construction Verification Surveying		ALLOWANCE		\$ 1,000.00
c.	Emerson – SCADA Integration		ALLOWANCE		\$ 47,000.00
*** Additional Work If Ordered By The Engineer ***					
3.	Trench Stabilization				
a.	Beyond Bedding	20	CY	\$	\$
b.	Filter Fabric	50	LF	\$	\$
4.	Removal of Unsuitable Material and Replacement with				
a.	Crushed Stone	20	CY	\$	\$
b.	Suitable Earth Material	20	CY	\$	\$

BID TOTAL, ITEMS 1 THROUGH 4, INCLUSIVE, THE AMOUNT OF _____

 _____ DOLLARS (\$ _____).

Bidder acknowledges Unit Prices have been determined in accordance with Paragraph 11.03.C of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

- A. Bid Bond
- B. Statement of Bidders Qualifications
- C. Non-Collusion Affidavit of Prime Bidder
- D. Corporate Certificate
- E. Georgia Security and Immigration Compliance Act Affidavits
- F. Contractor's License Certification

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

9.01 This Bid submitted by:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Doing business as: _____

Attest: _____
(Notary)

Name (typed or printed): _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner – attach evidence of authority to sign)

Name (typed or printed): _____

Attest: _____
(Signature of another Partner)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature)

Name (typed or printed): _____

Title: _____
(CORPORATE SEAL)

Attest: _____
(Signature of Corporate Secretary)

Name (typed or printed): _____

A Joint Venture

Name of Joint Venturer: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner)

Name (typed or printed): _____

Title: _____

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

All Bidders shall complete the following:

Bidder's Business address: _____

Phone: _____ Facsimile: _____

Primary Contact: _____

Primary Contact E-mail: _____

Submitted on: _____, 20____.

END OF SECTION

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BID BOND

STATE OF GEORGIA

COUNTY OF HENRY

KNOW ALL MEN BY THESE PRESENTS, that we, _____, as
[Insert Proper Name of Contractor]

Principal, and _____, as Surety, are held and firmly bound
[Insert Proper Name of Surety]

unto the HENRY COUNTY WATER AUTHORITY for the sum of _____
[Insert Penal Sum in words and numerals]

Dollars (\$ _____) lawful money of the United States, for the payment of which sum will and truly to be made, we bind ourselves, our heirs, personal representatives, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted to the Owner a Proposal for construction of:

NOW THEREFORE, the conditions of this obligation are such that if the Bid be accepted, the Principal shall within ten (10) days after receipt of confirmed contract documents execute a contract in accordance with the Bid upon the terms, conditions and prices set forth therein, and in the form and manner required by the Owner and execute a sufficient and satisfactory Performance Bond and Payment Bond payable to the Owner, each in an amount of one hundred percent (100%) of the total contract price, in form and with security satisfactory to the Owner, or in the event of the failure of the Contractor to execute and deliver the Contract Agreement and give said Performance and Payment Bonds, the Contractor shall pay the Owner the difference not to exceed the penalty hereof between the amount specified in said Proposal and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said Proposal, and execute the Special Assurance form, then this obligation shall be void; otherwise, it shall be and remain in full force and virtue in law; and the Surety shall, upon failure of the Principal to comply with any or all of the foregoing requirements within the time specified above, immediately pay to the aforesaid Owner, upon demand, the amount hereof in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

This bond is given pursuant to and in accordance with the provisions of O.C.G.A. § 36-10-1 et seq. and all the provisions of the law referring to this character of bond as set forth in said sections or as may be hereinafter enacted and these are hereby made a part hereof to the same extent as it set out herein in full.

IN WITNESS WHEREOF, the said Principal has hereunder affixed its signature and said Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers, on this _____ day of _____, 20____.

PRINCIPAL:

SURETY:

(Typed Name)

(Typed Name)

BY: _____ (SEAL)
(Signature)

BY: _____ (SEAL)
(Signature)

(Printed Name, Title, Address)

(Printed Name, Title, Address)

ATTEST:

ATTEST:

(Typed Name)

(Typed Name)

BY: _____ (SEAL)
(Signature)

BY: _____ (SEAL)
(Signature)

(Printed Name, Title, Address)

(Printed Name, Title, Address)

Bid Bond (2016)

Statement of Bidder's Qualifications

All questions must be answered, and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information desired. Attach all additional sheets to this statement. (Sample "Project Information Form" contained at the end of this Section.)

- 1. Name of Bidder: _____
- 2. Permanent main office address and phone number: _____

- 3. When organized: _____
- 4. If a Corporation, where incorporated: _____
- 5. How many years have you been engaged in the contracting business under your present firm or trade name? _____
- 6. Contracts on hand. (Complete a "Project Information Form", or provide same required information in a similar format, for each Contract on hand.)
- 7. General description of type of work performed by your company: _____

- 8. Have you ever failed to complete any work awarded to you? If so, where and why? _____

- 9. Have you ever defaulted on a contract? If so, where and why? _____

- 10. Attach a list of the most important projects recently completed by your company which are similar in scope to this Project. (Complete a "Project Information Form", or provide same required information in a similar format, for each Project listed.)
- 11. Names, background and experience of the principal members of your organization, including officers:

Name	Position	Years Experience
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Statement of Bidder's Qualifications

12. The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement of Bidder's Qualifications.

I, _____, certify that I am _____ of the Bidder, and that the answers to the foregoing questions and statements contained therein are true and correct.

BIDDER: _____

By: _____
(name signed)

(name printed or typed)

Title: _____

Date: _____

Subscribed and sworn to me this ___ day of _____, 20__.

NOTARY PUBLIC: _____
(name signed)

(name printed or typed)

Commission Expires: _____
(Date)

(SEAL)

Project Information Form

Project Title: _____

Project Description: _____

Major Subcontractors: _____

Major Suppliers: _____

Project Owner:

- Owner Name: _____
- Contact Person: _____
- Phone Number: _____

Engineer/Construction Manager:

- Company Name: _____
- Contact Person: _____
- Phone Number: _____

Contract Amount:

- Initial: _____
- Final: _____

Contract Time

- Initial: _____
- Final: _____
- Completion Date: _____

END OF SECTION

Non-Collusion Affidavit of Prime Bidder

STATE OF _____

COUNTY OF _____

I, _____, being first duly sworn, deposes and says that:

He or she is _____

(Owner, Partner, Officer, Representative or Agent)

of _____, the Bidder that has submitted the attached Bid;

He or she is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

Such Bid is genuine and is not a collusive or sham Bid;

Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this Affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against Henry County Water Authority or any person interested in the proposed Contract; and

The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this Affiant.

BIDDER: _____

By: _____

(name signed)

(name printed or typed)

Title: _____

Date: _____

Subscribed and sworn to me this ___ day of _____, 20___

NOTARY PUBLIC: _____

(name signed)

(name printed or typed)

Commission Expires: _____

(SEAL)

END OF SECTION

Section 00 45 53
Corporate Certificate

I, _____, certify that I am the Secretary of the Corporation named as Bidder in the foregoing Bid; that _____, who signed said Bid on behalf of the Contractor was then _____ of said Corporation; that said Bid was duly signed for and on behalf of said Corporation by authority of its Board of Directors, and is within the scope of its corporate powers; that said Corporation is organized under the laws of the State of Georgia.

This _____ day of _____, 20_____.

Corporate
Secretary:

(name signed)

(name printed or typed)

(SEAL)

END OF SECTION

**CERTIFICATION OF SPONSOR
DRUG-FREE WORKPLACE**

I hereby certify that I am a principle and duly authorized representative of _____, (“Contractor”), whose address is _____, _____, _____, and I further certify that:

- (1) The provisions of Section 50-24-1 through 50-24-6 of the Official Code of Georgia Annotated, relating to the “Drug-Free Workplace Act” have been complied with in full; and
- (2) A drug-free workplace will be provided for Contractor’s employees during the performance of the Agreement; and
- (3) Each Subcontractor hired by Contractor shall be required to ensure that the subcontractor’s employees are provided a drug-free workplace. Contractor shall secure from that subcontractor the following written certification: “As part of the subcontracting agreement with Contractor, _____ certifies to Contractor that a drug-free workplace will be provided for the Subcontractor’s employees during the performance of this Agreement pursuant to paragraph (7) of subsection (b) of the Official Code of Georgia Annotated, Section 50-24-3”; and
- (4) The undersigned will not engage in unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana during the performance of the Agreement.

CONTRACTOR:

Signature

Name: _____

Title: _____

Georgia Security and Immigration Compliance Act Affidavits

- [] The Henry County Water Authority (Owner) and Contractor agree that compliance with the requirements of O.C.G.A. Sec. 13-10-91 and Rule 300-10-1 of the Rules of the Georgia Department of Labor are conditions of this Agreement for the physical performance of services.

The Contractor further agrees that its compliance with the requirements of O.C.G.A. Sec. 13-10-91 and DOL Rule 300-10-1-.02 is attested to on the executed Contractor Affidavit and Agreement attached hereto as EXHIBIT A.

If employing or contracting with any subcontractor(s) in connection with this Agreement, Contractor further agrees:

- (1) To secure from the subcontractor(s) such subcontractor(s)' indication of the employee-number category applicable to the subcontractor(s); and
- (2) To secure from the subcontractor(s) an affidavit attesting to the subcontractor's compliance with O.C.G.A. Sec. 13-10-91 and DOL Rule 300-10-1; such affidavit being in the form attached hereto and referenced as EXHIBIT A-1; and
- (3) To submit such subcontractor affidavit(s) to the Owner when the subcontractor(s) is retained, but in any event, prior to the commencement of work by the subcontractor(s).

The failure of Contractor to supply the affidavit of compliance at the time of execution of this Agreement and/or the failure of Contractor to continue to satisfy the obligations of O.C.G.A. §13-10-91 and DOL Rule 300-10-1 as set forth in this Agreement during the term of the Agreement shall constitute a material breach of the contract. Upon notice of such breach, Contractor shall be entitled to cure the breach within ten days, upon providing satisfactory evidence of compliance with the terms of this Agreement and State law. Should the breach not be cured, the Owner shall be entitled to all available remedies, including termination of the contract and damages.

SEE AFFIDAVITS ON FOLLOWING PAGES

**CONTRACTOR AFFIDAVIT & AGREEMENT
EXHIBIT A**

- [] 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 contracting with Henry County Water Authority, has registered with, is authorized to use and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91. The undersigned affirms that it is using and will continue to use the federal work authorization program throughout the contract period.

- [] The undersigned further agrees that should it employ or contract with any subcontractor(s) for the physical performance of services pursuant to the contract with Henry County Water Authority, the Contractor will secure from the subcontractor(s) verification of compliance with O.C.G.A. § 13-10-91 on the attached Subcontractor Affidavit. (EXHIBIT A-1). The Contractor further agrees to maintain records of such compliance and shall provide a copy of each such verification to Henry County Water Authority, at the time the subcontractor(s) is retained to perform such services.

EEV / Basic Pilot Program* User Identification Number

Date of Authorization

BY: Authorized Officer or Agent

Date Signed

[Contractor Name]

Title of Authorized Officer or Agent of Contractor

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME ON THIS THE

____ DAY OF _____, 20____

Notary Public

My Commission Expires: _____

**The applicable federal work authorization program as of the effective date of the statute is the Basic Pilot program of the Systematic Alien Verification for Entitlements (SAVE) Program Office of U.S. Citizenship and Immigration Service (USCIS).*

**SUBCONTRACTOR AFFIDAVIT
EXHIBIT A-1**

[] By executing this affidavit, the undersigned subcontractor 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 under a contract with _____ on behalf of Henry County Water Authority, has registered and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91.

EEV / Basic Pilot Program* User Identification Number

Date of Authorization

BY: Authorized Officer or Agent

Date Signed

[Subcontractor Name]

Title of Authorized Officer or Agent of Subcontractor

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME ON THIS THE

____ DAY OF _____, 20____

Notary Public
My Commission Expires: _____

**The applicable federal work authorization program as of the effective date of the statute is the Basic Pilot program of the Systematic Alien Verification for Entitlements (SAVE) Program Office of U.S. Citizenship and Immigration Service (USCIS).*

END OF SECTION

Contractor's License Certification

Bidder/Contractor's Name: _____

Georgia Utility Contractor's License Number: _____

Expiration Date of License: _____

I certify that the above information is true and correct and that the classification noted is applicable to the Bid for this Project.

BIDDER: _____

By: _____

(name signed)

(name printed or typed)

Title: _____

Date: _____

END OF SECTION

THIS AGREEMENT is by and between Henry County Water Authority ("Owner") and
_____ ("Contractor")

Owner and Contractor 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:

Southeastern Booster Pump Station

ARTICLE 2 – THE PROJECT

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

Southeastern Booster Pump Station

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Barge Design Solutions, Inc. (Engineer), which is 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. For the purposes of authority under this Contract, the terms Landscape Architect and Architect shall be deemed synonymous with Engineer.

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 *Days to Achieve Substantial Completion and Final Payment*

A. The Work will be substantially completed within 210 consecutive calendar days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 240 consecutive calendar 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 loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in

accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$500.00 for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$500.00 for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment 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 an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs 5.01.A below:

- A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit, the sum of which is _____ (Dollars) (\$_____).

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. Contractor shall submit Applications for Payment in accordance with Article 14 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 submitted monthly by a day of the month established at the Pre-Construction Conference during performance of the Work as provided in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of 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 in the General Requirements.

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 Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.

- a. 90 percent of Work completed (with the balance being retainage).; and
 - b. 90 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
 - c. 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.
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 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 tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 – INTEREST

- 7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of one half percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
 - B. Contractor has visited the Site 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 federal, state, and local 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 contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities), if any, that have been identified in Paragraph SC-4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph SC-4.06 of the Supplementary Conditions as containing reliable "technical data."

- E. Contractor has considered the information known to Contractor; 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, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 8.01.E above, Contractor does not consider that 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 Documents.
- 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.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

- A. The Contract Documents consist of the following:
 - 1. This Agreement (pages 1 to _____, inclusive).
 - 2. Performance bond (pages _____ to _____, inclusive).
 - 3. Payment bond (pages _____ to _____, inclusive).
 - 4. General Conditions (pages _____ to _____, inclusive).
 - 5. Supplementary Conditions (pages _____ to _____, inclusive).
 - 6. Specifications as listed in the table of contents of the Project Manual.
 - 7. Drawings as listed on the Drawing Index, with each sheet bearing the following general title: Southeastern Booster Pump Station.
 - 8. Addenda (numbers _____ to _____, inclusive), incorporated herein.

-
9. Exhibits to this Agreement (enumerated as follows):
- a. Contractor's Bid (pages _____ to _____, inclusive), as shown in Section 00 41 00 of this Project Manual.
10. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
- a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change 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 Paragraph 3.04 of 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. 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, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 Successors and Assigns

- A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect 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 anything 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.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

This Agreement will be effective on ____ day of _____, 20 ____, (which is the Effective Date of the Agreement).

OWNER:

CONTRACTOR

By: _____

By: _____

Title: _____

Title: _____

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

Attest: _____

Attest: _____

Title: _____

Title: _____

Address for giving notices:

Address for giving notices:

END OF SECTION

This document was prepared in part from material (EJCDC C-520 Suggested Form of Agreement Between Owner and Contractor for Construction Contract (Stipulated Price)) which is copyrighted as indicated below:

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American Council of Engineering Companies
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(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
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www.agc.org

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Residency Status Affidavit

**Affidavit Verifying Residency Status of an Applicant as Required by
The Georgia Security and Immigration Compliance Act**

By executing this affidavit under oath, as an applicant for a Henry County Water Authority contract or other public benefit as referenced in the Georgia Security and Immigration Compliance Act (O.C.G.A. § 50-36-1), I am stating the following with respect to my application and award for a contract with the Henry County Water Authority.

_____ **I am a United States citizen**

OR

_____ **I am a legal permanent resident 18 years of age or older or I am an otherwise qualified alien or non-immigrant under the Federal Immigration and Nationality Act 18 years of age or older and lawfully present in the United States.***

Attach a copy of the document verifying your status (front and back) to this Affidavit.

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 Code Section 16-10-20 of the Official Code of Georgia.

Signature of Applicant

Date

Printed Name

*Alien registration number for non-citizens

Applying on Behalf of/Name of Associated Business

SUBSCRIBED AND SWORN BEFORE ME
ON THIS ____ DAY OF _____,
20__

Notary Public

My Commission Expires:

*Note: O.C.G.A. 50-36-1(e)(2) requires that aliens under the federal Immigration and nationality Act, Title 8 U.S.C., as amended, provide their alien registration number. Because legal permanent residents are included in the federal definition of "alien", legal permanent residents must also provide their alien registration number.

END OF SECTION

PERFORMANCE BOND (Contractor)

_____, a corporation duly
[Insert Proper Name of Surety]

organized and existing under the laws of the State of _____, and duly authorized to issue bonds in the State of Georgia, as surety ("Surety"), and _____

_____, as principal
[Insert Proper Name of Contractor]

("Contractor"), enters into, execute this bond ("Performance Bond"), and bind themselves, their heirs, executors, administrators, successors and assigns, both jointly and severally in favor of the **Henry County Water Authority** as obligee ("Owner"), in the penal sum of

_____ dollars (\$ _____),
[Insert Penal Sum in words and numerals]

as of _____.
[Insert Date of Construction Contract]

WHEREAS, the Contractor has executed a contract with the Owner of even date herewith ("Construction Contract") for construction of:

[Insert Description and Location of the Project]

("Project"); and

WHEREAS, the Owner has required the Contractor to furnish this Performance Bond containing the terms and conditions set forth herein as a condition to executing the Construction Contract with the Contractor;

NOW THEREFORE, the Surety and the Contractor, both jointly and severally, and for themselves, their heirs, administrators, executors and successors agree:

1.

The Construction Contract is hereby incorporated herein and by reference made a part hereof to the same extent and effect as though it were copied verbatim herein. The Surety and the Contractor are bound for the full performance of the Construction Contract, including, without exception, all of its terms and conditions, both express and implied.

2.

If the Contractor is in default of the Construction Contract and the Owner, by written notice to the Contractor and the Surety, declares the Contractor to be in default and terminates the right of the Contractor to proceed, the Surety shall thereupon give an unequivocal notice in writing to the Owner within 15 days after receipt of said notice as to which of the actions permitted to the Surety in Paragraph 3 it will take.

3.

Upon default and termination of the Contractor and notice to the Contractor and Surety as provided in Paragraph 2 above, the Surety shall, within 15 days, proceed to take one or, at its option, more than one of the following courses of action:

(A) Proceed itself, or through others acting on its behalf, to complete full performance of the Construction Contract including, without limitation, correction of defective and nonconforming work performed by or on behalf of the Contractor. During such performance by the Surety, the Owner shall pay the Surety from its own funds only such sums as would have been due and payable to the Contractor in the absence of the default and termination.

(B) Applicable law permitting, and with the prior written consent of the Owner, obtain bids or proposals from contractors previously identified as being acceptable to the Owner, for full performance of the Construction Contract. The Surety shall furnish the Owner a copy of such bids or proposals upon receipt of same. The Surety shall promptly select, with the agreement of the Owner, the best responsive bid or proposal and shall promptly tender the contractor submitting it, together with a contract for fulfillment and completion of the Construction Contract executed by the completing contractor, to the Owner for the Owner's execution. Upon execution by the Owner of the contract for fulfillment and completion of the Construction Contract, the completing contractor shall furnish to the Owner a performance bond and a separate payment bond, each in the form of those bonds previously furnished to the Owner for the Project by the Contractor. Each such bond shall be in the penal sum of the (1) fixed price for completion, (2) guaranteed maximum price for completion, or (3) estimated price for completion, whichever is applicable. The Owner shall pay the completing contractor from its own funds only such

sums as would have been due and payable to the Contractor under the Construction Contract as and when they would have been due and payable to the Contractor in the absence of the default and termination. To the extent that the Owner is obligated to pay the completing contractor sums which would not have then been due and payable to the Contractor under the Construction Contract, the Surety shall provide the Owner with such sums in a sufficiently timely manner that the Owner can utilize such sums in making timely payment to the completing contractor; or,

(C) Take any and all other acts, if any, mutually agreed upon in writing by the Owner and the Surety.

4.

In addition to those duties set forth hereinabove, the Surety shall promptly pay the Owner all loss, costs and expenses resulting from the Contractor's default(s), including, without limitation, fees, expenses and costs for architects, engineers, consultants, testing, surveying and attorneys fees, court costs, expert witness fees, litigation expenses, liquidated or actual damages, as applicable, for delay in completion of the Project, and fees, expenses and costs incurred at the direction, request, or as a result of the acts or omissions of the Surety.

5.

In no event shall the Surety be obligated to the Owner hereunder for any sum in excess of the Penal Sum. As used in this Performance Bond, the term "Penal Sum" means the amount stated as the penal sum in the preamble of this Performance Bond, as that amount may be adjusted from time to time pursuant to Paragraph 6 below.

6.

No agreement, modification, omission, addition, or change in or to the Construction Contract, change in work covered by the Construction Contract, or extension of time for the completion of the Construction Contract shall impair, affect, or release the Surety of this Performance Bond. The Surety waives notice of any changes to the Construction Contract including, without limitation, changes in the contract time, the contract price, or the work to be performed. If the total amount payable by the terms of the Construction Contract is increased to an amount in excess of the then current Penal Sum, then, automatically and without notice to or any action required of any party, the Penal Sum shall be increased

as the total amount payable by the terms of the Construction Contract is increased.

7.

This Performance Bond is provided by the Surety for the sole and exclusive benefit of the Owner, together with its successors or assigns. No other party, person or entity shall have any rights against the Surety hereunder.

8.

Any notice required to be given under the terms of this document shall be deemed to have been given on the date the same is hand-delivered to the parties of this document, deposited in the United States mail to the addresses hereinafter stated with sufficient postage affixed thereto to insure delivery or sent by Certified Mail, Return Receipt Requested:

Surety:

Attn:

Contractor:

Attn:

Owner:

**Henry County Water Authority
1695 Highway 20 West
McDonough GA 30253
Attn: Lindy Farmer, General Manager**

9.

Any statutory limitation, which may be contractually superseded, to the contrary notwithstanding, any action hereon may be instituted so long as the applicable statute of limitations governing the Construction Contract has not run or expired.

IN WITNESS WHEREOF, the parties have hereunto set their hands and seals the day and year first above written.

CONTRACTOR:

SURETY:

(Typed Name)

(Typed Name)

BY: _____ (SEAL)
(Signature)

BY: _____ (SEAL)
(Signature)

(Printed Name, Title, Address)

(Printed Name, Title, Address)

ATTEST:

ATTEST:

(Typed Name)

(Typed Name)

BY: _____ (SEAL)
(Signature)

BY: _____ (SEAL)
(Signature)

(Printed Name, Title, Address)

(Printed Name, Title, Address)

PAYMENT BOND (Contractor)

_____, a corporation duly
[Insert Proper Name of Surety]
organized and existing under the laws of the State of _____, and duly authorized to
issue bonds in the State of Georgia, as surety ("Surety"), and
_____, as principal ("Contractor"), enter
[Insert Proper Name of Contractor]
into, execute this bond ("Payment Bond"), and bind themselves, their heirs, executors, administrators,
successors and assigns, both jointly and severally in favor of the Henry County Water Authority, as
obligee ("Owner") in the penal sum of
_____ dollars (\$ _____), as of _____.
[Insert Penal Sum in words and numerals] *[Insert Date of Construction Contract]*

WHEREAS, the Contractor has executed a contract with the Owner of even date herewith
("Construction Contract") for construction of:

[Insert Description and Location of the Project]

("Project"); and,

WHEREAS, the Owner has required the Contractor to furnish this Payment Bond containing the
terms and conditions set forth herein as a condition to executing the Construction Contract with the
Contractor;

NOW THEREFORE, the Surety and the Contractor, both jointly and severally, and for
themselves, their heirs, administrators, executors and successors agree:

1.

The Construction Contract is hereby incorporated herein and by reference made a part hereof to
the same extent and effect as though it were copied verbatim herein. The Surety and the Contractor are
bound for the full performance of the Construction Contract including without exception all of its terms and
conditions, both express and implied, and, without limitation, specifically including Contractor's obligation
to pay for labor, materials, machinery, equipment and insurance provided in connection with the
Construction Contract performance.

2.

For purposes of this Payment Bond, Beneficiary is defined as any subcontractor or other person
supplying labor, materials, machinery, or equipment in the prosecution of the work provided for in the
Construction Contract, or any other person entitled to the protection of this Payment Bond pursuant to the
provisions of Title 36, Chapter 91, Official Code of Georgia Annotated.

3.

Every Beneficiary who has not been paid in full for labor or material furnished in the prosecution of the work on the Project before the expiration of a period of ninety (90) days after the day on which the last of the labor was done or performed by such person or the material or equipment or machinery was furnished or supplied by such person for which such claim is made, or when he or she has completed his or her subcontract for which claim is made, shall have the right to bring an action on this Payment Bond for the amount, or the balance thereof, unpaid at the time of the commencement of such action and to prosecute such action to final execution and judgment for the sum or sums due such person; provided, however, that:

(A) Any person having a direct contractual relationship with a subcontractor but no contractual relationship, express or implied, with the Contractor where the Contractor has not complied with the notice of commencement requirements in accordance with Code Section 36-91-92, Official Code of Georgia Annotated, shall have the right of action upon this Payment Bond upon giving written notice to the Contractor within ninety (90) days from the day on which such person did or performed the last of the labor or furnished the last of the material or machinery or equipment for which such claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the material was furnished or supplied or for whom the labor was performed or done; provided, however, that: (i) the Contractor's failure to supply a copy of the notice of commencement within ten calendar days of receipt of a written request from a subcontractor, materialman or person shall render the provisions of this paragraph 3(A) inapplicable to such subcontractor, materialman or person, and (ii) the Contractor's failure to file a notice of commencement shall render the notice to contractor requirements of this paragraph 3(A) inapplicable.

(B) Any person having direct contractual relationship with a subcontractor but no contractual relationship express or implied with the Contractor where the Contractor has complied with the notice of commencement requirements in accordance with subsection (a) of Code Section 36-91-92, Official Code of Georgia Annotated, shall have the right of action on this Payment Bond provided such person shall, within thirty (30) days from the filing of the notice of commencement or thirty (30) days following the first delivery of labor, material, machinery or equipment, whichever is later, give to the Contractor a written notice setting forth:

(i) The name, address and telephone number of the person providing labor, material, machinery or equipment;

(ii) The name and address of each person at whose instance the labor, material, machinery or equipment is being furnished;

(iii) The name and the location of the Project; and

(iv) A description of the labor, material, machinery or equipment being provided and, if known, the contract price or anticipated value of the labor, material, machinery or equipment to be provided or the amount claimed to be due, if any; and

(C) Nothing contained in this Payment Bond shall limit the right of action of a Beneficiary to the ninety (90) day period referenced in paragraph 3(A) above.

The notice required under paragraph 3(A) of this Payment Bond may be served by registered or certified mail, postage prepaid, or statutory overnight delivery, duly addressed to the Contractor, at any place at which the Contractor maintains an office or conducts his or her business or at his or her residence, by depositing such notice in any post office or branch post office or any letter box under the control of the United States Postal Service; alternatively, notice may be served in any manner in which the sheriffs of the State of Georgia are authorized by law to serve summons or process.

4.

Contractor and Surety shall promptly make payments of all taxes, licenses, assessments, contributions, penalties, and interest thereon, when, and if, the same may be lawfully due the State of Georgia or any County, Municipality, or political subdivision thereof by reason of and directly connected with the performance of the contract, or any part thereof.

5.

The Surety's obligation hereunder shall not exceed the Penal Sum. As used in this Payment Bond, the term "Penal Sum" means the amount stated as the penal sum in the preamble of this Payment Bond, as that amount may be adjusted from time to time pursuant to paragraph 6 below plus the amount incurred by the Owner under paragraph 9 below.

6.

The Surety waives notice of any changes to the Construction Contract including, without limitation, changes in the contract time, the contract price, or the work to be performed. If the total amount payable by the terms of the Construction Contract is increased to an amount in excess of the then current Penal Sum, then, automatically and without notice to or any action required of any party, the Penal Sum shall be increased as the total amount payable by the terms of the Construction Contract is increased. No agreement, modification, omission, addition, or change in or to the Construction Contract, change in the work covered by the Construction Contract, or extension of time for the completion of the Construction Contract shall impair, affect, or release the Surety of this Payment Bond.

7.

No action can be instituted hereunder after one (1) year from the completion of the Construction Contract and the acceptance of the Project by the Owner and any other applicable public authorities.

8.

The Surety hereby agrees that no final settlement between the Owner and the Contractor shall abridge the right for any beneficiary hereunder whose claim may be unsatisfied.

9.

In the event that the Owner is required to enforce this Bond through any type of legal proceeding, the Contractor and Sureties shall pay all costs, including but not limited to attorney's fees, court costs, expert witness fees, litigation expenses, and any other cost incurred by the Owner in the enforcement of this Bond. Also, if the Owner is named in any type of legal proceeding concerning payment of any funds under the Contract or under this Bond, the Contractor and Sureties shall pay all costs, including but not limited to attorney's fees, court costs, expert witness fees, litigation expenses, and any other cost incurred by the Owner in the defense of such claim.

10.

Any Notice required to be given under the terms of this document shall be deemed to have been given on the date the same is hand-delivered to the parties to this document, deposited in the United States mail to the address hereinafter stated with sufficient postage affixed thereto to insure delivery, or sent by Certified Mail, Return Receipt Requested.

Surety: _____

Attn: _____

Contractor: _____

Attn: _____

Owner: Henry County Water Authority
1695 Highway 20 West
McDonough, Georgia 30253
Attn: Lindy D. Farmer, Jr., General Manager

11.

Notwithstanding any provision herein that may be to the contrary, this Payment Bond is intended to be a statutory payment bond under applicable laws of the State of Georgia and shall be so construed.

CONTRACTOR:

SURETY:

[Typed Name] [SEAL]

[Typed Name] [SEAL]

By: _____
[Signature]

By: _____
[Signature]

[Printed Name, Title and Address]

[Printed Name, Title and Address]

Payment Bond Contractor. (February 2016)

**STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT**

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by



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STANDARD GENERAL CONDITIONS OF THE
CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

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

13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
- 16.1 Designer - The individual or entity named as such in the Agreement, if a different person or entity from Engineer.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined. The term Drawings shall be considered synonymous with the term Plans.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 01 of the Specifications. The General Requirements are applicable to all Sections of the Specifications and to the entire Work.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
- 25.1 Liquidated Damages – amounts shall be as stipulated in the Agreement. Liquidated damages shall apply to the Contract Times for the Project. Liquidated Damages shall be both additive and cumulative. Liquidated Damages shall end upon Substantial Completion, Completion of the Work associated with each Milestone Date, and upon final completion of the Work. Liquidated damages are not a penalty, but constitute liquidated damages for loss

to the Owner because of increases in expenses for administration, legal counsel, accounting, engineering, construction supervision, inspection, and any other expenses incurred directly as a result of the delay of the Contractor in completing the work. This provision for liquidated damages shall be effective between the parties ipso facto without necessity for demand or putting in default by any notice or other means than by the terms of these Contract Documents, the Contractor hereby waiving any such other notice of default and acknowledging that the Contractor shall be deemed to be in default by the mere act of his failure to complete the work within the Contract Time, or within any valid extension of such time hereunder.

26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed. The Owner may designate an authorized representative to exercise the authority, in whole or in part, identified in these contract Documents, with such designation being identified in the Supplementary Conditions.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in ~~the~~ its table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
40. *Shop Drawings*—All drawings, diagrams, illustrations, brochures, schedules, specified design related submittals, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work that will be fabricated or installed. Shop drawings may also mean detail drawings, working drawings, construction drawings, and engineering data.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents to provide the following: (i) the Owner full time, uninterrupted, continuous operation of the work; and (ii) all required functional, performance, and operational or startup testing has been successfully demonstrated for all components, devices, equipment, and systems to the satisfaction of the Engineer in accordance with the requirements of the Specifications; and (iii) all required inspections and other work necessary for the Engineer to certify "substantially complete" have been completed. ~~, 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.
- 44.1 Submittals – All administrative documents, Shop Drawings, Samples, product data, manufacturer's literature, quality control documents, design related documents, record documents, contract close-out documents, and/or any other specified document prepared or assembled by or for Contractor and submitted by Contractor to the Owner and/or Engineer.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.

47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, materials, tools, equipment, incidentals, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

- A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.
 2. Where the word “similar” occurs in the Contract Document, it shall have a general meaning and not be interpreted as being identical, and all details shall be worked out in relation to their location and their connection with other parts of the Work.

C. *Day*:

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

D. *Defective*:

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

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

- 1, The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

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

or any additional insured may reasonably request) which Contractor ~~is and~~ Owner respectively ~~are~~ required to purchase and maintain in accordance with Article 5.

2.02 Copies of Documents

- A. Owner ~~shall~~ will furnish to Contractor up to ~~ten~~ four printed or hard copies of the ~~Drawings and Project Manual~~ Contract Documents and one counterpart of the executed Contract Agreement. Additional copies will be furnished upon request at the cost of reproduction.

2.03 Commencement of Contract Times; Notice to Proceed

- A. ~~The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated~~ date established in the Notice to Proceed. A Notice to Proceed may be given at any time within ~~30-60~~ 60 days after the Effective Date of the Agreement. ~~In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.~~

2.04 Starting the Work

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

2.05 Before Starting Construction

- A. Preliminary Schedules: Within 10 days after the Commencement of the Contract Time ~~Effective Date of the Agreement~~ (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 2. a preliminary Schedule of Submittals; which indicates each required Submittal and the dates for submitting, time for reviewing and processing each Submittal (periodic Submittals may be listed by a common monthly date); and
 3. a preliminary Schedule of Values for all of the Work in a format acceptable to the Engineer and in accordance with the requirements specified in the General Requirements, which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 Preconstruction Conference; Designation of Authorized Representatives

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. ~~At least 10 days before submission of the first Application for Payment a~~ Not more than ten days after the preconstruction conference, a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
1. The Progress Schedule will be acceptable to Engineer as being the Contractor's schedule for the 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. The Progress Schedule may subsequently be adjusted in accordance with Paragraph 6.04 and applicable provisions of the General Requirements.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals. The Schedule of Submittals may subsequently be adjusted in accordance with Paragraph 6.04 and applicable provisions of the General Requirements.
 3. Contractor's Schedule of Values will be acceptable to the Engineer as to form and substance if it is provided in accordance with the General Requirements. ~~provides a reasonable allocation of the Contract Price to component parts of the Work.~~

ARTICLE 3 – CONTRACT DOCUMENTS; INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The individual components of the Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.
- D. Each and every clause or other provision required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be amended to make such insertion.

E. “Imperative” or “Command” type language is used in the Contract Documents. This command language refers to and is directed to the Contractor.

F. Emphasis, such as italics, underlining, bold text or quotes, may have been used throughout the Contract Documents. Use of emphasis shall not change the meaning of the term emphasized.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.
3. All sections of governing standard specifications relating to measurement and payment shall not apply to the work specified herein.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

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

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).
2. In resolving inconsistencies within the Contract Documents, precedence shall be given in the following descending order:
 - a. Change Orders, with latest Change Order taking precedent over preceding Change Orders
 - b. Work Change Directives
 - c. Field Orders
 - d. Engineer's written interpretations and clarifications
 - e. Notice to Proceed
 - f. Addenda
 - g. Contract Agreement
 - h. Supplementary Conditions
 - i. General Conditions
 - j. Specifications
 - k. Drawings
 1. Schedules on Drawings
 2. Notes on Drawings
 3. Details on Drawings
 4. Large Scale Drawings
 5. Small Scale Drawings
 6. Dimensions given as Figures

7. Scaled Dimensions

I. Bidding Requirements

3.04 *Amending and Supplementing Contract Documents*

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

3.05 *Reuse of Documents*

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

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

3.07 Contract Times

- A. All Contract Times and time limits stated in the Contract Documents are of the essence of the Agreement.
- B. The Contractor shall proceed with the Work at a rate of progress which will ensure completion within the Contract Times.
- C. It is expressly understood and agreed by and between the Contractor and the Owner, that the Contract Times for the Work described herein are reasonable time, taking into consideration the average climatic and economic conditions, and other factors prevailing in the locality of the Work.
- D. If the Contractor shall fail to perform the Work required within the Contract Times, or extended Contract Times if authorized by Change Order, then the Contractor shall pay to the Owner the full amount of liquidated damages specified in the Contract Documents for each calendar day that the Contractor shall be in default after the Contract Times stipulated in the Contract Documents.

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

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
1. those reports ~~known to Owner~~ of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by the Engineer in preparing the Contract Documents; -and

2. those drawings ~~known to Owner~~ of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities that have been utilized by the Engineer in preparing the Contract Documents).

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

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

4.03 *Differing Subsurface or Physical Conditions*

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

1. is of such a nature as to establish that any “technical data” on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

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

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

C. *Possible Price and Times Adjustments:*

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

4.04 *Underground Facilities*

- A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

- d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

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

D. The dimensions and descriptions given on the Drawings for adjacent work by others, if any, (including any existing facilities or utilities previously constructed for Owner) are based on the design drawings and not as-built drawings. Prior to commencing the Work, the Contractor shall verify all as-built conditions and information whenever existing facilities or utilities may impact the Work. Failure of Contractor to so verify all as-built conditions prior to commencing the Work shall bar Contractor from later seeking additional compensation for conflicts with existing facilities or utilities.

E. Prior to the construction or installation of any proposed facility or pipeline, the Contractor shall expose all existing utilities true to their vertical and horizontal location, within the vicinity of the Work. In order to avoid conflicts between existing and proposed facilities or utilities, the Contractor shall either relocate the existing or proposed utility on a temporary or permanent basis, or shall take whatever means necessary to protect the existing facilities or utilities during the installation of proposed utilities, as approved by the Engineer. No additional payment will be made for the relocation of existing utilities or for any work associated with the protection of existing facilities or utilities.

4.05 *Reference Points*

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

grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

- B. Engineer may check the lines, elevations, and reference marks set by Contractor, and Contractor shall correct any errors disclosed by such check. Such a check shall not be considered as approval of Contractor's work and shall not relieve Contractor of the responsibility for accurate construction of the entire Work. Contractor shall furnish personnel to assist Engineer in checking lines and grades.
- C. The Contractor shall review the Contract Documents and the Project site to determine the presence and location of any property or rights-of-way monuments or markers, and to assess the possibility of disruption to these monuments or markers. It will be the Contractor's responsibility to flag, erect guard post, or provide offset references for the protection or the re-monumentation of these property or rights-of-way monuments or markers. In the event these monuments or markers are covered over or disturbed, it will be the Contractor's responsibility to employ a surveyor licensed in the state of that the Project is located to re-establish those monuments or markers of property or rights-of-way, which were present prior to Work on the Project.
- D. It shall be the Contractor's responsibility to verify all reference points shown on the Contract Documents prior to beginning Work on the site. This verification shall be conducted by professionally qualified personnel in a manner which will verify the accuracy of the information shown in the Contract Documents. On projects which involve the connection to, or additions to existing structures, the elevations of these existing structures shall also be verified. Any findings which differ from those shown on the Contract Documents shall be submitted in writing to the Engineer for resolution.
- E. Additional surveys necessary for the construction staking shall be performed by the Contractor, the cost of which shall be incorporated into the appropriate items of Work. On projects in which payment is classified by depth of cut, the construction staking shall be performed in a manner that will allow for the determination of cut classification.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may issue a Work Change Directive or Change Order as appropriate regarding said condition. ~~order the portion of the Work that is in the area affected by such condition to be deleted from the Work.~~ If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner’s own forces or others in accordance with Article 7.
- G. ~~To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual’s or entity’s own negligence.~~

- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or ~~arbitration or other dispute resolution~~ costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

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

5.02 *Licensed Sureties and Insurers*

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

1. Surety shall be in good standing with the agency having jurisdiction over sureties and insurance companies for the state in which the Project is located.
2. Surety and Insurers must have an A.M. Best Financial Strength Rating of A or higher, with a Financial Size Category of X or higher.
3. The surety shall have an underwriting limitation in Circular 570 in excess of the Contract Amount.
4. No surety will be accepted who is now in default or delinquent on any bond.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. ~~Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.~~
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by ~~reasonably~~ available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
 5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
 6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 — *Owner's Liability Insurance*

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

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, ~~Owner~~Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (~~subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations~~). This insurance shall:

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

~~B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.~~

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal

refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

- ~~D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.~~
- ~~E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.~~

5.07 Waiver of Rights

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraphs 5.04 and 5.06 by Contractor will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. ~~Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by ~~Owner~~Contractor as trustee or otherwise payable under any policy so issued.~~
- ~~B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:~~
- ~~1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and~~
 - ~~2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.~~

~~C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.~~

5.08 *Receipt and Application of Insurance Proceeds*

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

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

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

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

ARTICLE 6 –CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, provide quality control, 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. Any method of work suggested by the Owner or Engineer, but not specified, shall be used at the risk and responsibility of the Contractor; and the Owner and Engineer will assume no responsibility therefore. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. Contractor shall also designate, in writing, a representative, hereinafter referred to as Project Manager, assigned to the Project on a full-time basis during execution of the Work who shall have the authority to act on behalf of Contractor, including executing the orders or directions of the Engineer without delay. This Superintendent and/or Project Manager shall have full authority to promptly supply products, tools, plant equipment, and labor as may be required to diligently prosecute the Work. All communications given to or received from the Superintendent and/or the Project Manager shall be binding on Contractor.
- C. If at any time during the Project the Superintendent or Project Manager leaves the Project site while Work is in progress, Engineer shall be notified and provided with the name of Contractor’s representative having responsible charge.
- D. Contractor shall also designate the person responsible for Contractor’s quality control while Work is in progress. Engineer shall be notified in writing prior to any change in quality control representative assignment.
- E. Prior to the Commencement of the Contract Time, Contractor shall furnish to the Owner and Engineer the names, resumes, 24 hour contact information and other relevant information associated with the Project Manager and the Superintendent that are to be assigned to this project. The Project Manager and Superintendent must be acceptable to the Owner and Engineer.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, skilled, 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. Contractor shall, upon demand from the Engineer, immediately remove any manager, superintendent, foreman or workman whom the Engineer or Owner may consider incompetent or undesirable.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

- C. Regular working hours may be Monday through Friday, excluding holidays, occurring between the hours of 7:00 AM and 7:00 PM, unless restricted otherwise. Contractor shall establish regular scheduled work times, e.g., four 10-hour days, five 8-hour days, or five 10-hour days within the hours and days allowed above. Approval for specific work outside regular scheduled work times shall be requested no less than 48 hours prior to the requested work period. Contractor shall request approval of changes in regular scheduled work times no less than one week prior to the desired change. Occasional unscheduled overtime on weekdays may be permitted provided reasonable notice is given to Engineer. Night work will not be established as a regular procedure, excluding emergencies, except with written permission. Such permission, if granted, shall be upon such terms and conditions deemed appropriate in the Engineer's sole discretion.
- D. Contractor shall pay all extra costs incurred by the Owner associated with work, outside of normal working hours, including additional support services, inspection services, testing services, utilities or other applicable costs. The cost associated with the Owner's inspection overtime will be the amounts as provided in the Supplementary Conditions per hour per individual, depending upon individuals assigned to the Project, the type of work being inspected, and the date of the invoice; i.e., allowing for salary escalation. Contractor will not be responsible for extra costs associated with inspection overtime for work in excess of 40 hours per week when such overtime work is explicitly required by the Contract Documents.
- E. Except in the case of emergencies or other unusual circumstances, no work shall be permitted on the project on Sunday.
- F. The Engineer will determine to what extent extraordinary onsite personnel work is required during Contractor's overtime work or working hours outside regular scheduled work hours.
- G. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine his operations to work which will not be affected adversely thereby. No portion of the work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by the Contractor to perform the work in a proper and satisfactory manner.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, quality control, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified ~~or, and if not specified,~~ shall be of good quality, and new and unused, except as otherwise provided in the Contract Documents and shall be installed in an undamaged condition. All products provided on this Project shall be products currently manufactured by the manufacturer, i.e., products shall not be discontinued or out-of-date products nor shall they be of the last production run of the product. Contractor shall incorporate the previous sentence in any contract or agreement between Contractor and subcontractor or supplier supplying products provided on this Project. All special warranties and guarantees required by the SpecificationsContract Documents 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.
- D. Without limiting the responsibility or liability of the Contractor pursuant to this agreement, all warranties given by manufacturers on materials or equipment incorporated in the work are hereby assigned by the Contractor to the Owner. Such assignment shall be effective upon completion of Contractor's warranty period. If requested, the Contractor shall execute formal assignments of said manufacturer's warranties to the Owner. All such warranties shall be directly enforceable by the Owner. Such assignment shall in no way affect the Contractor's responsibilities and duties during the warranty period.
- E. Wherever a stock size of manufactured item or piece of equipment is specified by its nominal size, it shall be the responsibility of the Contractor to determine the actual space requirements for setting and for entrance to the setting space and to make all necessary allowances and adjustments therefor in his work without additional cost to the Owner.
- F. Equipment and Construction Plant. All equipment and construction plant shall be suitable to produce the quality of work and materials required for the satisfactory completion of the work within the Contract Time and shall be satisfactory to the Engineer. The Contractor shall provide adequate and suitable equipment and construction plant to meet the requirements of the work as specified in these Contract Documents. The Contractor shall remove unsuitable equipment from the site of the work when ordered to do so by the Engineer. The Contractor shall obtain written permission from the Owner prior to constructing temporary buildings or other structures on land owned or leased by the Owner. If permission is granted, said buildings or other structures shall comply with all applicable regulations regarding their construction and maintenance and shall be satisfactory to the Owner.

6.04 *Progress Schedule*

- A. Contractor shall provide all resources, labor, materials, equipment, services, etc. necessary to adhere to the Progress Schedule established in accordance with Paragraph 2.07 and the General Requirements as it may be adjusted from time to time as provided below.
1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in and the General Requirements) an updated the Progress Schedule that will not result in changing the Contract Times and an updated Schedule of Submittals with each partial payment request, but no less than monthly. Contractor's failure to provide acceptable updated Progress Schedule and Schedule of Submittals will delay processing of the pay request until receipt of the acceptable updated Progress Schedule and/or an updated Schedule of Submittals. Such adjustments will updates and adjustments shall comply with any provisions of the General Requirements applicable thereto.
 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.
 3. Number of anticipated days associated with weather conditions, as defined in the General Requirements, shall be included on the critical path of Project Schedule.
- B. The Contractor shall implement the detailed schedule of activities to the fullest extent possible between Project Coordination Meetings.

- C. The Contractor shall prepare its daily report by 10:00 a.m. of the day following the report date. This daily report will contain, as a minimum, the weather conditions; number of workers by craft, including supervision and management personnel on site; active and inactive equipment on site; work accomplished by schedule activity item; problems; and visitors to the jobsite.
- D. If a current activity or series of activities on the overall project schedule is behind schedule and if the late status is not due to an excusable delay for which a time extension would be forthcoming, the Contractor shall attempt to reschedule the activity to be consistent with the overall Project schedule so as not to delay any of the Contract milestones. The Contractor agrees that:
1. The Contractor shall attempt to expedite the activity completion so as to have it agree with the overall progress schedule. Such measures as the Contractor may choose shall be made explicit during the Project Coordination Meeting.
 2. If, within two weeks of identification of such behind-schedule activity, the Contractor is not successful in restoring the activity to an on schedule status, the Contractor shall:
 - a. Carry out the activity with the scheduled crew on an overtime basis until the activity is complete or back on schedule.
 - b. Increase the crew size or add shifts so the activity can be completed as scheduled.
 - c. Commit to overtime or increased crew sizes for subsequent activities, or some combination of the above as deemed suitable by the Engineer.
 3. These actions shall be taken at no increase in the Contract amount.
- E. The Contractor shall maintain a current copy of all construction schedules on prominent display in the Contractor's field office at the Project site.
- F. The Contractor shall cooperate with the Owner and Engineer in all aspects of the Project scheduling system. Failure to implement the Project scheduling system or to provide specified schedules, diagrams and reports, or to implement actions to re-establish progress consistent with the overall progress schedule may be causes for withholding of payment.
- G. If the Progress Schedule reflects a completion date prior to the completion date established by the Agreement, this shall afford no basis to claim for delay should Contractor not complete the Work prior to the projected completion date. Instead, all "float" between the completion date in Contractor's schedule and the completion date established in the Agreement shall belong to and is available to the Contractor and the Owner.

6.05 *Substitutes and "Or-Equals"*

- A. See General Requirements.——Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

~~1. "Or-Equal" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:~~

~~a. in the exercise of reasonable judgment Engineer determines that:~~

- ~~1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;~~
- ~~2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and~~
- ~~3) it has a proven record of performance and availability of responsive service.~~

~~b. Contractor certifies that, if approved and incorporated into the Work:~~

- ~~1) there will be no increase in cost to the Owner or increase in Contract Times; and~~
- ~~2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.~~

~~2. Substitute Items:~~

~~a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.~~

~~b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.~~

~~c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.~~

~~d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:~~

~~1) shall certify that the proposed substitute item will:~~

- ~~a) perform adequately the functions and achieve the results called for by the general design,~~
- ~~b) be similar in substance to that specified, and~~
- ~~c) be suited to the same use as that specified;~~

~~2) will state:~~

- ~~a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;~~
- ~~b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and~~
- ~~c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;~~
- ~~3) will identify:~~
 - ~~a) all variations of the proposed substitute item from that specified, and~~
 - ~~b) available engineering, sales, maintenance, repair, and replacement services; and~~
- ~~4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.~~
- ~~B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.~~
- ~~C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.~~
- ~~D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.~~
- ~~E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.~~
- ~~F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or equal" at Contractor's expense.~~

6.06 Concerning Subcontractors, Suppliers, and Others

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Acceptance of any Subcontractor, other person or organization by Owner shall not constitute a waiver of any right of Owner to reject defective Work. Contractor shall not be required to employ any Subcontractor, ~~Supplier,~~ or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, ~~and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued.~~ No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade. Such arrangement shall not operate to make the Engineer or the Owner an arbitrator to establish subcontract limits between Contractor and Subcontractor.
- G. All Work performed for Contractor by a Subcontractor or Supplier ~~will~~ shall be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. ~~Whenever any such agreement is with a~~

~~Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.~~

H. Owner or Engineer may furnish to any Subcontractor, Supplier or other person or organization, to the extent practicable, information about amounts paid on their behalf to Contractor in accordance with Contractor's Applications for Payment.

I. Specialty Subcontractors: Contractor shall utilize the services of Specialty Subcontractors on those parts of the Work which is declared as specialty work in Specifications and which, under normal contracting practices, is best performed by Specialty Subcontractors, as required by the Engineer in Engineer's sole discretion, at no additional cost to the Owner. If Contractor desires to self-perform specialty work, Contractor shall submit a request to the Owner, accompanied by evidence that Contractor's own organization has successfully performed the type of work in question, is presently competent to perform the type of work, and the performance of the work by Specialty Subcontractors will result in materially increased costs or inordinate delays.

J. The Contractor shall perform a minimum of 20 percent of the onsite labor with its own employees.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent, copyrights, trademarks or other intellectual property held by others. If a particular invention, design, process, product, software 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 or Engineer in the Contract Documents. Furthermore, the Contractor represents and warrants that all licenses, fees and / or royalties for any invention, design, process, product, software or device used in this Project have been paid and the Contractor has the right to use. 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, trademark or other intellectual property infringement 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. These provisions shall survive the expiration, termination or cancellation of this agreement.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction, ~~permits and licenses~~ temporary permits and licenses, necessary and incidental to the due and lawful prosecution of the work, including all permits on any part of the Work as required by law in connection with the Work. Owner ~~shall~~ will assist Contractor, when required by the permitting agency necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court ~~or arbitration or other dispute resolution~~ costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times, or both. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.
- D. It is understood and agreed that the Contractor shall be familiar with and shall observe and comply with, all Federal, State, County, and local laws, codes, ordinances, regulations, orders, and decrees, including air and water pollution and noise abatement regulations, existing, or enacted subsequent to the execution of the Contract, that in any manner affect those engaged or

employed in the work, or the materials or equipment used in the work, or which in any way affect the conduct of the work. The Contractor shall strictly observe all applicable laws and regulations as to public safety, health and sanitation. No pleas of misunderstanding or ignorance on the part of the Contractor will in any way serve to modify or mitigate the provisions of these Contract Documents. The Contractor and his Surety shall indemnify and save harmless the Owner and the Engineer and all their officers, agents, and servants against any claim or liability arising from, or based on the violation of, any such law, code, ordinance, regulation, order or decree, whether by himself, his agents or his employees.

F. Where professional engineering and/or architectural services are required in connection with any of the components required by the Contract, all Bidders and component suppliers must make certain that there is full compliance with all applicable laws of the state in which the Project is located and any other state governing professional engineering and/or architecture. The Owner and Engineer do not warrant that any entity listed as an acceptable manufacturer is or will be in compliance with such laws.

G. Any fines levied against the Owner for failure of Contractor to properly maintain required NPDES erosion and sediment control measures or any other related requirements will be deducted as set-offs from payments due Contractor.

6.10 Taxes

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

6.11 Use of Site and Other Areas

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

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

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials,

rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

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

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all ~~necessary~~ precautions for the safety of, and shall provide the ~~necessary~~ protection to prevent pollution of or damage, injury or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. The property, improvements or facilities at the site shall be replaced or restored to a condition as good as when Contractor entered upon the Site. In case of failure on the part of Contractor to restore such property, or make good such damages or injury, the Owner may, after 48 hours written notice, or sooner in the case of an emergency, proceed to repair, rebuild, or otherwise restore such property, improvements or facilities as may be deemed necessary. The cost thereof will be deducted from any monies due or which may become due Contractor under this Contract.
- H. Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.
- I. The Contractor shall give due notice to any controlling person, department, or public service company, prior to adjusting items to grade and shall be held strictly liable to the Owner if any such items are disturbed, damaged or covered up during the course of the work.
- J. Fire hydrants on or adjacent to the work shall be kept accessible to the fire-fighting apparatus at all times, and no material or obstruction shall be placed within 10 feet of any hydrant. Adjacent premises must be given access, as far as practicable, and obstruction of sewer inlets, gutters and ditches will not be permitted.
- K. Public Safety and Convenience
1. The Contractor shall conduct his operations in a manner that will offer the least possible obstruction and inconvenience to the public and he shall not have under construction an amount of work greater than he can prosecute properly with due regard to the rights of the public.
 2. Construction operations shall be conducted in a manner that will cause as little inconvenience as possible to abutting property owners. Convenient access to driveways, houses, buildings or other facilities in the vicinity of the work shall be maintained and temporary access facilities for public roadways shall be provided and maintained in satisfactory condition.

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.
- B. The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards, including sufficient lights and danger signals on or near the work; it shall erect suitable railings, barricades, covers, or other protective devices about unfinished work, open trenches, holes, embankments or other hazards and obstructions; where hazards to workmen or the public exist. The Contractor shall provide, at all times, all necessary watchmen on the project, for the safety of employees, delivery personnel, and the general public, and to diligently guard and protect all work and materials, including Owner-furnished equipment. Construction equipment shall be suitably night-marked and lighted as necessary for safety considerations.

6.16 *Emergencies*

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

6.17 *Shop Drawings, ~~and Samples~~ and Other Submittals*

- A. Contractor shall submit ~~Shop Drawings and Samples~~ Submittals to Engineer for review and approval in accordance with the accepted or adjusted Schedule of Submittals (as required by Paragraph 2.07). Each submittal ~~will~~ shall be identified as Engineer may require.
1. *Shop Drawings:*
 - a. Submit number of copies specified in the General Requirements.
 - b. Data shown on the Shop Drawings ~~will~~ shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
 2. *Samples:*
 - a. Submit number of Samples specified in the Specifications.

- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
- B. Where a ~~Shop Drawing or Sample~~ any Submittal is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Submittal Procedures:*
 1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
 2. Each Shop Drawing and Sample submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will return as incomplete or will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval or disapproval 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 or disapproval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto.

The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation ~~notation~~ Field Order thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.
4. Review by the Owner or Engineer of any plan or method of work proposed by the Contractor shall not relieve the Contractor of any responsibility therefor, and such review shall not be considered as an assumption of any risk or liability by the Owner or Engineer, or any officer, agent, or employee thereof. The Contractor shall have no claim on account of the failure or inefficiency of any plan or method so reviewed.

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.

F. Excessive Submittal Resubmission: Engineer will record time required by Engineer for excessive Submittal review occasioned by Contractor's resubmission, in excess of two resubmissions of any required Submittal, caused by unverified, unchecked or unreviewed, incomplete, inaccurate or erroneous, or nonconforming Submittals. Upon receipt of Engineer's accounting of time and costs, Contractor will reimburse Owner for the charges of Engineer's review for excessive resubmissions through set-offs from the recommended Owner payments to Contractor as established in Paragraph 14.02.D. of these General Conditions.

G. In the event that Contractor provided a submittal for a previously approved item, whether such is as a substitution or in addition to the previously approved item, Contractor shall reimburse Owner for Engineer's charges for such time as may be required to perform all reviews of the substitute item, unless the change is specifically requested by the Owner.

6.18 *Continuing the Work*

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

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

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

6.20 Indemnification and Liability

- A. It is understood and agreed that the Contractor shall be deemed and considered an independent contractor in respect to the work covered by these Contract Documents, and shall assume all risks and responsibility for casualties of every description in connection with the work, except that he shall not be held liable or responsible for delays or damage to work caused by acts of God, acts of public enemy, quarantine restrictions, general strikes throughout the trade, or freight embargoes not caused or participated in by the Contractor. The Contractor shall have charge and control of the entire work until completion and final acceptance of the work by the Owner. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity . Furthermore, Contractor agrees to

defend, indemnify, and hold HCWA and all of its officers, agents, employees, appointed officials and elected officials whole and harmless against any and all claims for damages, costs, and expenses of persons or property that may arise out of, or be occasioned by, or from any negligent act, or omission of the Contractor, or any agent, servant, or employee of the Contractor in the execution of the performance of this agreement, without regard to whether such persons are under the direction of HCWA agents or employees.

- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor ~~under Paragraph 6.20.A~~ shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. the negligent preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. negligently giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.
- D. Contractor, Subcontractors, Suppliers and others on the Project, or their sureties, shall maintain no direct action against the Engineer, their officers, employees, affiliated corporations, consultants, and subcontractors, for any claim arising out of, in connection with, or resulting from the engineering services performed. Only the Owner will be the beneficiary of any undertaking by the Engineer.
- E. Defense of Suits: In case any action in court is brought against the Owner or the Engineer, or any officer, agent or employee of any of them, for the failure, omission, or neglect of the Contractor to perform any of the covenants, acts, matters, or things by this contract undertaken; or for injury or damage caused by the alleged negligence of the Contractor or his subcontractors or his or their agents, or in connection with any claim based on lawful demands of subcontractors, workmen, material-men, or suppliers, the Contractor shall indemnify, defend and save harmless the Owner and the Engineer and their officers, agents and employees, from all losses, damages, costs, expenses (including attorneys' fees), judgments, or decrees arising out of such action.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner

and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

6.22 Project Coordination Meetings

- A. The Contractor shall participate in Project Coordination Meetings to be held on the site monthly, or more often if conditions warrant, to establish the current state of completion and revise the schedule as necessary. The Project Coordination Meeting will be conducted by the Owner and/or the Engineer.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 Related Work at Site

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times or both that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work

with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

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

7.02 *Coordination*

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

7.03 *Legal Relationships*

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

7.04 Claims Between Contractors

- A. Should Contractor cause damage to the work or property of any separate contractor at the site, or should any claim arising out of Contractor's performance of the work at the site be made by any separate contractor against Contractor, Owner, Engineer, or any other person, Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by mediation, arbitration, or at law.
- B. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold Owner, Engineer, and the officers, directors, employees, agents, and other consultants of each and any of them harmless 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 directly, indirectly or

consequentially out of or resulting from any action, legal or equitable, brought by any separate contractor against Owner, Engineer, or the officers, directors, employees, agents, and other consultants of each and any of them to the extent based on a claim arising out of Contractor's performance of the Work. Should a separate contractor cause damage to the Work or property of Contractor or should the performance of work by any separate contractor at the site give rise to any other claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, or the officers, directors, employees, agents, and other consultants of each and any of them or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any mediator or arbitrator which seeks to impose liability on or to recover damages from Owner, Engineer, or the officers, directors, employees, agents, or other consultants of each and any of them on account of any such damage or claim.

C. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable hereto, Contractor may make a claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, and/or Engineer and the officers, directors, employees, agents, or other consultants of each and any of them for any delay, disruption, interference or hindrance caused by any separate contractor. This Paragraph does not prevent recovery from Owner, Engineer, and/or Designer for activities that are their respective responsibilities.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

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

8.03 *Furnish Data*

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

8.04 *Pay When Due*

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

8.05 *Lands and Easements; Reports and Tests*

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

8.06 *Insurance*

A. Owner's shall not have any responsibilities, ~~if any,~~ with respect to purchasing and maintaining liability and property insurance ~~are set forth in Article 5.~~

8.07 *Change Orders*

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

8.08 *Inspections, Tests, and Approvals*

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

8.09 *Limitations on Owner's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

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

8.11 *Evidence of Financial Arrangements*

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

8.12 *Compliance with Safety Program*

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

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

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

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in

accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

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

9.04 *Authorized Variations in Work*

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

9.05 *Rejecting Defective Work*

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

9.06 *Shop Drawings, Change Orders and Payments*

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

9.07 *Determinations for Unit Price Work*

- A. Engineer will have authority to determine the actual quantities and classifications of Unit Price Work performed by Contractor. If Engineer exercises such authority, Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

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

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

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents, except that Owner shall determine whether bonds, certificates of insurance and release of liens comply with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

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

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
 1. Owner may, in anticipation of possibly ordering an addition, deletion or revision to the Work, request Contractor to prepare a proposal of cost and times to perform Owner's contemplated changes in the Work. Contractor's written proposal shall be transmitted to the Engineer promptly, but not later than fourteen days after Contractor's receipt of Owner's written request and shall remain a firm offer for a period not less than sixty days after receipt by Engineer.
 2. Contractor is not authorized to proceed on an Owner contemplated change in the Work prior to Contractor's receipt of a Change Order (or Work Change Directive) incorporating such change into the Work.
 3. Owner's request for proposal or Contractor's failure to submit such proposal within the required time period will not justify a claim for an adjustment in Contract Price or Contract Time (or Milestones).

4. The Owner shall not be liable to the Contractor for any costs associated with the preparation of proposal associated with the Owner's contemplated changes in the Work.

- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

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

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

B. In signing a Change Order, the Owner and Contractor acknowledge and agree that:

1. The stipulated compensation (Contract Price or Contract Time, or both) set forth in the Change Order includes payment for:
 - a. the Cost of the Work covered by the Change Order,
 - b. Contractor's fee for overhead and profit,
 - c. interruption of Progress Schedules,
 - d. delay and impact, including cumulative impact, on other work under the Contract Documents, and

- e. extended home office and jobsite overhead;
- 2. the Change Order constitutes full mutual accord and satisfaction for the change to the Work;
- 3. No reservation of rights to pursue subsequent claims on the Change Order will be made by either party; and
- 4. No subsequent claim or amendment of the Contract Documents will arise out of or as a result of the Change Order.

10.04 *Notification to Surety*

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

10.05 *Claims and Disputes*

- A. *Engineer's Decision Required:* All Claims and disputes, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than ~~30~~10 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with written supporting data shall be delivered to the Engineer and the other party to the Contract within ~~60~~20 days (and monthly thereafter for continuing events) after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
 - 1. deny the Claim in whole or in part;
 - 2. approve the Claim; or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.
- G. No civil action with respect to any dispute, claim or controversy arising out of or relating to this Contract may be commenced without first giving fourteen (14) calendar day's written notice to HCWA of the claim and the intent to initiate a civil action.

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

11.01 *Cost of the Work*

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

and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 1. Full rental cost for rented, leased, and/or owned equipment shall not exceed the rates listed in the Rental Rate Blue Book published by Equipment Watch, a unit of Penton Media, Inc., as adjusted to the regional area of the Project. The most recent published edition in effect at the commencement of the actual equipment use shall be used.
 2. Rates shall apply to equipment in good working condition. Equipment not in good condition, or larger than required, may be rejected by Engineer or accepted at reduced rates.
 3. Equipment in Use: Actual equipment use time documented by the Engineer shall be the basis that the equipment was on and utilized at the Project site. In addition to the leasing rate above, equipment operational costs shall be paid at the estimated operating cost, payment category (and the table below), and associated rate set forth in the Blue Book if not already included in the lease rate.

The hours of operation shall be based upon actual equipment usage to the nearest full hour, as recorded by the Engineer.

<u>Actual Usage</u>	<u>Blue Book Payment Category</u>
<u>Less than 8 hours</u>	<u>Hourly Rate</u>
<u>8 or more hours but less than 7 days</u>	<u>Daily Rate</u>
<u>7 or more days but less than 30 days</u>	<u>Weekly Rate</u>
<u>30 days or more</u>	<u>Monthly Rate</u>

4. Equipment when idle (Standby): Idle or standby equipment is equipment on-site or in transit to and from the Work site and necessary to perform the Work under the modification but not in actual use. Idle equipment time, as documented by the Engineer, shall be paid at the leasing rate determined in 11.01.A.5.c., excluding operational costs.
5. Where a breakdown occurs on any piece of equipment, payment shall cease for that equipment and any other equipment idled by the breakdown. If any part of the Work is shutdown by the Owner, standby time will be paid during non-operating hours if diversion of equipment to other Work is not practicable. Engineer reserves the right to cease standby time payment when an extended shutdown is anticipated.
- 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 any of the Work that has been completed and accepted by the Owner, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D.), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee. If, however, any such loss or damage to the Work that has been accepted by Owner requires reconstruction and Contractor is placed in charge thereof, Contractor shall be paid for services, a fee proportionate to that stated in Paragraph 12.01.C.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as ~~telegrams~~, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.

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

11.02 Allowances

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

- b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- ~~D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:~~
 - ~~1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and~~
 - ~~2. there is no corresponding adjustment with respect to any other item of Work; and~~
 - ~~3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.~~

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

12.01 *Change of Contract Price*

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

- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a ~~mutually agreed lump sum value fixed by the Owner~~ or by unit price values fixed by the Owner (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and ~~agreement to a lump sum is not reached~~ where the method under Paragraph 12.01.B.2, is not selected by the Owner, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee*: The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent based on subcontractor's actual Cost of the Work;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor; except the maximum total allowable cost to Owner shall be the Cost of the Work plus a maximum collective aggregate fee for Contractor and all tiered Subcontractors of 26.8 percent.
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

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

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times ~~will~~ may be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, quarantine restrictions, strikes, freight embargoes, acts of war (declared or not declared), or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor ~~shall~~ may be entitled to an equitable adjustment in Contract Times, but not Contract Price, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court ~~or arbitration or other dispute resolution~~ costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.
- F. If the Progress Schedule reflects a completion date or milestone date prior to the completion date or milestone date established by the Contract Documents, this shall afford no basis to claim for delay should Contractor not complete the Work prior to the projected completion date. Should a change order be executed with a revised completion date or milestone date, the Progress Schedule shall be revised to reflect the new completion date or milestone date.

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

13.01 *Notice of Defects*

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

13.02 *Access to Work*

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

13.03 *Tests and Inspections*

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

- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.
- G. Tests required by Contract Documents to be performed by Contractor and that require test certificates to be submitted to Owner or Engineer for acceptance shall be made by an independent testing laboratory or agency licensed or certified in accordance with Laws and Regulations and applicable state and local statutes. In the event state license or certification is not required testing laboratories or agencies shall meet the following applicable requirements:
 - 1. "Recommended Requirements for Independent Laboratory Qualification", published by the American Council of Independent Laboratories.
 - 2. Basic requirements of ASTM E329, "Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" as applicable.
 - 3. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards or accepted values of natural physical constants.

13.04 *Uncovering Work*

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

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.
- B. If Owner stops Work under Paragraph 13.05.A. Contractor shall not be entitled to an extension of Contract Time or increase in Contract Price.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court ~~or arbitration or other dispute resolution~~ costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- C. Contractor shall promptly segregate and remove rejected products from the Site.
- D. If rejected products or Work is not removed within 48 hours, as provided in Paragraph 13.05 above, the Owner will have the right and authority to stop the Work immediately and will have the right to arrange for the removal of said rejected products or Work at the cost and expense of the Contractor.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions, and all to the satisfaction of the Owner:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or ~~arbitration or other dispute resolution~~ costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) ~~will~~shall be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.
- F. Repetitive malfunction of an equipment or product item shall be cause for replacement and an extension of the correction period to a date one year following acceptable replacement. A repetitive malfunction shall be defined as the third failure of an equipment or product item following original acceptance.

13.08 *Acceptance of Defective Work*

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

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time, as defined by the Engineer, after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

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

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

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

14.02 *Progress Payments*

A. *Applications for Payments:*

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

have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. Retainage:

a. _____ The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

b. _____ No form of collateral in lieu of cash will be acceptable as retainage.

c. _____ Amounts retained by the Contractor from payments due to suppliers and subcontractors (expressed as a percentage) shall not exceed that being retained by the Owner.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

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

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

- b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement; if any.
 4. Items entitling Owner to retain set-offs from the amount recommended, include but are not limited to:
 - a. Owner compensation to Engineer at an estimated average rate as specified in the Supplementary Conditions per each extra personnel hour for labor plus expenses because of the following Contractor-caused events:
 - (1) Witnessing retesting of corrected or replaced defective Work;
 - (2) Return visits to manufacturing facilities to witness factory testing or retesting;
 - (3) Submittal reviews in excess of three reviews by Engineer for substantially the same Submittal;
 - (4) Evaluation of proposed substitutes and in making changes to Contract Documents occasioned thereby;
 - (5) Hours worked by Contractor, in excess of normal work hours as defined by Article 6.02 of the General Conditions, necessitating Engineer to work overtime;
 - (6) Return visits to the Project by Engineer for Commissioning Activities not performed on the initial visit;
 - b. Fines levied against the Owner for Contractor's performance of NPDES Erosion and Sedimentation Control Measures or other permit violations.

c. The repair, rebuilding or restoration of property improvements or facilities by the Owner as outlined in Paragraph 6.13.

d. Liability for liquidated damages incurred by Contractor as set forth in the Agreement.

14.03 *Contractor's Warranty of Title*

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

B. No materials or supplies for the Work shall be purchased by Contractor or subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. Contractor warrants that Contractor has good title to all materials and supplies used by Contractor in the Work, free from all liens, claims or encumbrances.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion. Specific items of Work that must be completed prior to the Engineer's issuance of a certificate of Substantial Completion include, but are not limited to, the following:

1. Correction of all deficient Work items listed by all state, local, and other regulatory agencies or departments.

2. All submittals must be received and approved by the Engineer, including but not necessarily limited to, the following:

a. Record documents.

b. Factory test reports, where required.

c. Equipment and structure test reports.

d. Manufacturer's Certificate of Proper Installation.

e. Operating and maintenance information, instructions, manuals, documents, drawings, diagrams, and records.

f. Spare parts lists.

3. All additional warranty or insurance coverage requirements have been provided.

4. All manufacturer/vendor-provided operator training is complete and documented.

5. Other items of Work specified elsewhere as being prerequisite for Substantial Completion.

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

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may ~~request direct~~ Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to ~~be ready for~~ sufficiently progressed towards its intended use ~~and substantially complete~~. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work described in Paragraph 14.05.A.1 ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer

does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 Final Inspection

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

14.07 Final Payment

A. Application for Payment:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments. Under no circumstances will Contractor's application for final payment be accepted by the Engineer until all Work required by the Contract Documents has been completed.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment, if requested by the Engineer;
 - c. a list of all Claims against Owner that Contractor believes are unsettled;
 - d. an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work have been paid or otherwise satisfied;
 - e. the final Change Order signed by the Contractor to close the Contract; and
 - ~~f.~~ complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work, if requested by the Engineer.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for

which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance:

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

C. Payment Becomes Due:

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

14.08 Final Completion Delayed

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

14.09 Waiver of Claims

- A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees

specified therein, or from Contractor's continuing obligations under the Contract Documents;
and

2. a waiver of all Claims by Contractor against Owner ~~other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.~~

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 Owner May Suspend Work

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

15.02 Owner May Terminate for Cause

- A. The occurrence of any one or more of the following events will justify termination for cause:
 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; ~~or~~
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents;
 5. If Contractor abandons the Work, or sublets this Contract or any part thereof, without the previous written consent of Owner, or if the Contract or any claim thereunder shall be assigned by Contractor otherwise than as herein specified;
 6. Contractor is adjudged bankrupt or insolvent;
 7. Contractor makes a general assignment for the benefit of creditors;
 8. A trustee or receiver is appointed for Contractor or for any of Contractor's property;
 9. Contractor files a petition to take advantage of any debtor's relief act, or to reorganize under the bankruptcy or applicable laws;
 10. Contractor repeatedly fails to supply sufficient skilled workmen, materials or equipment;
 11. Contractor fails to make satisfactory progress toward timely completion of the work; or
 12. Contractor repeatedly fails to make prompt payments to subcontractors or material suppliers for labor, materials or equipment.

- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor, unless Contractor otherwise cures the deficiency in accordance with Paragraph 15.02.D.:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court ~~or arbitration or other dispute resolution~~ costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- ~~F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.~~

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate or discontinue, in whole or in part, 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. direct expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, ~~plus fair and reasonable sums for overhead and profit on such expenses;~~
 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court ~~or arbitration or other dispute resolution~~ costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; ~~and~~
 4. reasonable expenses directly attributable to termination; and-
 5. ten percent overhead and profit for those costs agreed to in Paragraphs 15.03.A.1 through 15.03.A.4 above.
- B. Contractor shall submit within 30 calendar days after receipt of notice of termination a written statement setting forth its proposal for an adjustment to the Contract Price to include only the incurred costs described in this clause. Owner shall review, analyze, and verify such proposal and negotiate an equitable amount and the Contract may be modified accordingly.
- C. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 Contractor May Stop Work or Terminate

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.
- C. Except as allowed in Paragraph A above, the Contractor shall not suspend the work and shall not remove any equipment, tools, supplies, materials, or other items without the written permission of the Owner.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 Methods and Procedures

- ~~A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.~~
- ~~B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.~~
- ~~C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:~~
- ~~1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or~~
 - ~~2. agrees with the other party to submit the Claim to another dispute resolution process; or~~
 - ~~3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.~~

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, or by facsimile transmission and followed by written confirmation, to the last business address known to the giver of the notice.
- B. All notices required of Contractor shall be performed in writing to the appropriate entity.
- C. Electronic mail and messages will not be recognized as a written notice.
- D. If the Contractor does not notify the Owner in accordance with Paragraph 10.05 of the belief that a field order, work by other contractors or the Owner, or subsurface, latent, or unusual unknown conditions entitles the Contractor to a Change Order, no consideration for time or money will be given the Contractor.

17.02 Computation of Times

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

17.03 *Cumulative Remedies*

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

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

- A. This Agreement is made and entered into in the State of Georgia and the rights and obligations of the parties hereto shall be governed by and construed according to the laws of the State of Georgia without giving effect to the principles of conflicts of laws. The Superior Court of Henry County, Georgia shall have jurisdiction over any disputes arising out of this agreement. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

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

17.07 *Addresses*

- A. Both the address given in the Bid form upon which this Agreement is founded, and Contractor's office at or near the site of the Work are hereby designated as places to either of which notices, letters, and other communications to Contractor shall be certified, mailed, or delivered. The delivering at the above named place, or depositing in a postpaid wrapper directed to the first-named place, in any post office box regularly maintained by the post office department, of any notice, letter or other communication to Contractor shall be deemed sufficient service thereof upon date of such delivery or mailing. The first-named address may be changed at any time by an instrument in writing, executed by Contractor, and delivered to and acknowledged by the Owner and Engineer. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter, or other communication upon Contractor personally.

17.08 *Forms and Record*

- A. The form of all Submittals, notices, change orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the Engineer.
- B. Contractor shall maintain throughout the term of the Contract, complete and accurate records of all Contractor's costs which relate to the work performed, including the extra work, under the terms of the Contract. The Owner, or its authorized representative, shall have the right at any reasonable time to examine and audit the original records.

C. Records to be maintained and retained by Contractor shall include, but not be limited to:

1. Payroll records accounting for total time distribution of Contractor's employees working full or part time on the work;
2. Cancelled payroll checks or signed receipts for payroll payments in cash;
3. Invoices for purchases, receiving and issuing documents, and all other unit inventory records for Contractor's stores, stock, or capital items;
4. Paid invoices and cancelled checks for materials purchase, subcontractors, and any other third parties' charges;
5. Original estimate and change order estimate files and detailed worksheets;
6. All project-related correspondence; and
7. Subcontractor and supplier change order files (including detailed documentation covering negotiated settlements).

D. Owner shall also have the right to audit: any other supporting evidence necessary to substantiate charges related to this agreement (both direct and indirect costs, including overhead allocations as they may apply to costs associated with this agreement); and any records necessary to permit evaluation and verification of Contractor compliance with contract requirements and compliance with provisions for pricing change orders, payments, or claims submitted by Contractor or any payees thereof. Contractor shall also be required to include the right to audit provision in the contracts (including those of a lump-sum nature) of all subcontractors, insurance agents, or any other business entity providing goods and services.

17.09 Assignment

A. Contractor shall not assign, sell, transfer or otherwise dispose of the whole or any part of this Contract or any monies due or to become due hereunder without written consent of the Owner. In case Contractor assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to Contractor shall be subject to prior liens of all persons, firms and corporations for services rendered or materials supplied for the performance of the Work called for under this Contract.

17.10 Inspection by Public Agencies

A. Authorized representatives of the federal, state, local and other governmental agencies having jurisdiction over the work or any part thereof shall have access to the work and any records relevant to the prosecution and progress of the work. The Contractor shall provide proper facilities for such access and inspection.

END OF SECTION

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC C-700 (2007 Edition, with Barge Modifications 01/09/18). All provisions which are not so amended or supplemented remain in full force and effect.

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

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

The provisions in this Section of the Specifications shall govern in the event of any conflict between this Section and the General Conditions.

SC-4.02 *Subsurface and Physical Conditions*

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

- C. The following reports of explorations and tests of subsurface conditions at or contiguous to the Site have been used by the Engineer in preparing the Contract Documents:
 - 1. Report dated March 1, 2018, prepared by Building & Earth Sciences, Inc., entitled: "Report of Subsurface Exploration and Geotechnical Evaluation Booster Pump Site, Henry County, Georgia". None of the "technical data" contained in such report may be relied upon by the Contractor.
- D. No drawings of physical conditions relating to existing surface or subsurface structures at the Site have been used by the Engineer in preparing the Contract Documents.

SC-4.06 *Hazardous Environmental Conditions*

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

- A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.
- B. Not Used.

SC-5.03 *Certificates of Insurance*

SC-5.03, following Paragraph E, add the following,

- F. Copies of endorsements showing that each additional insured identified herein have been added to the policies as an additional insured shall be attached to each of the certificates.

Supplementary Conditions

- G. Each insurance certificate for all coverages other than Worker's Compensation Insurance must show that a waiver of rights of recovery against any of the insured or the additional insured is in effect.
- H. Certificate for Worker's Compensation and Employer's Liability coverage must indicate inclusion or exclusion for any proprietor, partner, executive officer or member.

SC-5.04 *Contractor's Insurance*

SC-5.04.B.1, The additional insureds, in addition to the Owner and Engineer, shall include

- 1. CornerStone Design Services

SC-5.04.C, following Paragraph 5.04.B.6.b, Add,

- C. The limits of liability for the insurance required by paragraph 5.04.B.2 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:
 - 1. Worker's compensation, disability benefits and other similar employee benefit acts, and damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees as provided in Paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:
 - a. Workers Compensation: Statutory limits
 - b. Employer's Liability, Each Accident: \$1,000,000
 - c. Employer's Liability, Each Employee: \$1,000,000
 - d. Employer's Liability, Disease – Policy Limit: \$1,000,000
 - 2. Contractor's General Liability Insurance under paragraphs 5.04.A.3 through 5.04.A.5 of the General Conditions shall provide the following minimum limits and conditions:
 - a. Each Occurrence: \$1,000,000.
 - b. Damage to Rented Premises (each occurrence) \$100,000.
 - c. Medical Expenses (any one person) \$5,000.
 - d. Personal and Advertising Injury: \$1,000,000.
 - e. General Aggregate: \$2,000,000.
 - f. Products-Completed Operations Aggregate: \$2,000,000.
 - g. Explosion, collapse, and underground coverage shall be included with such indicated on the insurance certificate under General Liability.

- h. The general aggregate policy limits must be designated to the Project.
 - i. Contractual Liability coverage, as required under Paragraph 5.04.B.3 must be indicated on the insurance certificate under General Liability.
3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions, providing for Combined Single Limit (each accident) for all owned, hired, and non-owned vehicles: \$1,000,000.
 4. Provide Excess Liability or Umbrella Liability insurance providing protection for at least the hazards insured under the primary liability policies with the following limits:
 - a. General Aggregate: \$3,000,000.
 - b. Each Occurrence: \$3,000,000.
 5. Provide Professional (Errors and Omissions) Insurance: \$3,000,000.00.

SC-6.01 *Supervision and Superintendence*

SC-6.01. Paragraph B, second sentence,

Delete, "... on a full-time basis ..."

SC-6.01. Paragraph C,

Change, "...Project the Superintendent or Project Manager leaves the..."
To

"...Project both the Superintendent and Project Manager leave the ..."

SC-6.02 *Labor; Working Hours*

SC-6.02 Add the following subparagraph 6.02.D.1:

1. The following rates will apply for the overtime work on behalf of the Owner: \$75.00/hour to \$120.00/hour, depending on actual Resident Project Representative assigned to the Project.

SC-6.08 *Permits*

SC-6.08 Add the following subparagraphs 6.08.B.1:

1. The Owner will provide the following Permits:
 - a. Land Disturbance Permit

SC-6.09 *Laws and Regulations*

SC-6.09 Add the following subparagraph 6.08.H:

- H. Contractor shall perform those duties as they relate to O.C.G.A. Section 36-91-92 and O.C.G.A. Section 44-14-361.5, including filing the Notice of Commencement. Contractor shall provide Owner and Engineer with proof of having performed these duties before any progress payments or final payment shall be considered due and payable to the Contractor.

SC-6.13 *Safety and Protection*

- SC-6.13 Delete the second sentence of Paragraph 6.13.C.

SC-9.03 *Project Representative*

- SC-9.03 Add the following new paragraphs immediately after Paragraph 9.03.A:

- B. The Resident Project Representative (RPR) will be Engineer's employee or agent at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions. RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall be only through or with the full knowledge and approval of Contractor. The RPR shall:
1. *Schedules:* Review the progress schedule, schedule of Shop Drawing and Sample submittals, and schedule of values prepared by Contractor and consult with Engineer concerning acceptability.
 2. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences and other project-related meetings, and prepare and circulate copies of minutes thereof.
 3. *Liaison:*
 - a. Serve as Engineer's liaison with Contractor, working principally through Contractor's authorized representative, assist in providing information regarding the intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
 4. *Interpretation of Contract Documents:* Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
 5. *Shop Drawings and Samples:*
 - a. Record date of receipt of Samples and approved Shop Drawings.

-
- b. Receive Samples which are furnished at the Site by Contractor and notify Engineer of availability of Samples for examination.
 6. *Modifications:* Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
 7. *Review of Work and Rejection of Defective Work:*
 - a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress will not produce a completed Project that conforms generally to the Contract Documents or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
 8. *Inspections, Tests, and System Startups:*
 - a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
 - b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.
 9. *Records:*
 - a. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
 - b. Maintain records for use in preparing Project documentation.
 10. *Reports:*
 - a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule and schedule of Shop Drawing and Sample submittals.

- b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
 - c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, damage to property by fire or other causes, or the discovery of any Hazardous Environmental Condition.
 - 11. *Payment Requests:* Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
 - 12. *Certificates, Operation and Maintenance Manuals:* During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.
 - 13. *Completion:*
 - a. Participate in a Substantial Completion inspection, assist in the determination of Substantial Completion and the preparation of lists of items to be completed or corrected.
 - b. Participate in a final inspection in the company of Engineer, Owner, and Contractor and prepare a final list of items to be completed and deficiencies to be remedied.
 - c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the Notice of Acceptability of the Work.
- C. The RPR shall not:
- 1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
 - 2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
 - 3. Undertake any of the responsibilities of Contractor, Subcontractors, Suppliers, or Contractor's superintendent.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work unless such advice or directions are specifically required by the Contract Documents.
5. Advise on, issue directions regarding, or assume control over safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
8. Authorize Owner to occupy the Project in whole or in part.

SC-14.02.D.4.e After paragraph 14.02.D. 4.d, add the following:

5. The following rates will be for the additional services performed by the Engineer on behalf of the Owner: \$75.00/hour to \$250.00/hour, depending upon staff level person involved.

SC-14.02.E After paragraph 14.02.D, add the following:

E. Prompt Payment Clause

1. Owner and Contractor agree that all partial payments and final payments shall be subject to the Georgia Prompt Pay Act, as originally enacted and amended, and as set forth in O.C.G.A. 13-11-1 through 13-11-11, except as provided below to the extent authorized by law.
2. Interest Rate: For purposes of computing interest on late payments, the rate of interest shall be one-half percent per month or a pro-rata fraction thereof on the unpaid balance as may be due.
3. Payment Periods:
 - a. When Contractor has performed in accordance with the provisions of these Contract Documents, the Owner shall pay Contractor within 30 days of receipt by the Owner or the Owner's representative of any properly completed Application for Payment, based upon work completed or service provided pursuant to the terms of these Contract Documents.
 - b. When a subcontractor has performed in accordance with the provisions of its subcontract and the subcontract conditions precedent to payment have been satisfied, Contractor shall pay to that subcontractor and each subcontractor shall pay to its subcontractor, within ten days of receipt by Contractor or subcontractor of each periodic or final payment, the full amount received for such subcontractors work and materials based on work completed or service provided under the subcontract, less retainage

expressed as a percentage, but such retainage shall not exceed that retainage being held by the Owner, provided that the subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete its work as contractor in its reasonable discretion may require, including but not limited to a payment and performance bond.

4. Interest on Late Payment: Except otherwise provided in these Contract Documents and/or in O.C.G.A. 13-11-5, if a periodic or final payment to Contractor is delayed by more than the time allotted in Paragraph 14.02.E.3b, or if a periodic or final payment to a subcontractor is delayed more than ten days after receipt of periodic or final payment by Contractor or Subcontractor, the Owner, Contractor, or subcontractor, as the case may be, shall pay interest to its Contractor, or subcontractor beginning on the day following the due dates as provided in Paragraph 14.02.E.3b, at the rate of interest as provided herein. Interest shall be computed per month or a pro-rata fraction thereof on the unpaid balance. There shall be no compounded interest. No interest is due unless the person or entity being charged interest received "Notice" as provided in Paragraph 14.02.E.5. Acceptance or progress payments or final payment shall release all claims for interest on said payments.
5. Notice of Late Payment and Request of Interest: Any person or entity asserting entitlement to interest on any periodic or final payment pursuant to the provisions of this Prompt Payment Clause shall provide "notice" to the person or entity being charged interest of the charging party's claim to interest on late payment. "Notice" shall be in writing, served by U.S. Certified Mail – Return Receipt Requested at the time the properly completed Application for Payment is received by the Owner or Owner's representative, and shall set forth the following:
 - a. A short and concise statement that interest is due pursuant to the provisions of the Georgia Prompt Pay Act and this Prompt Payment Clause;
 - b. The principal amount of the periodic or final payment which is allegedly due to the charging party; and
 - c. The first day and date upon which the charging party alleges that said interest will begin to accrue, pursuant to the provisions of the Georgia Prompt Pay Act and this Prompt Payment Clause.
6. These "Notice" provisions are of the essence; therefore, failure to comply with any requirement as set forth in the Prompt Payment Clause precludes the right to interest on any alleged late payment to which said "Notice" would otherwise apply.
7. Integration with the Georgia Prompt Pay Act: Unless otherwise provided in these Contract Documents, the parties hereto agree that these provisions of this Prompt Payment Clause supersede and control all provisions of the Georgia Prompt Pay Act (O.C.G.A. 13-11-1 through 13-11-11), as originally enacted and as amended, and that any dispute arising between the parties hereto as to whether or not the

provisions of this contract or the Georgia Prompt Pay Act control will be resolved in favor of these Contract Documents and its terms.

END OF SECTION

Part 1 General

1.1 Section Includes

- A. Work by Contractor.
- B. Owner-Furnished Items.
- C. Contractor Use of Site and Premises.
- D. Owner Occupancy.
- E. Quantities.

1.2 Work by Contractor

- A. The work to be performed under this Contract shall consist of furnishing all labor, materials, tools, equipment and incidentals and performing all work required to construct complete in place and ready to operate the improvements shown in the Contract Documents. These improvements include, but are not limited to, the following:
 - 1. Constructing one booster pump station containing a packaged pump skid with two 250 HP pumps and a space for a future pump; one split faced block building approximately 30 feet by 45 feet; an electrical room containing variable frequency drives, necessary electrical gear to support the pumps, and HVAC units; 16-inch and 24-inch waterlines connecting the new booster pump station with the existing water main; and landscaping and concrete driveway.
- B. All work described above shall be performed as shown on the Drawings and as specified.
- C. Contractor shall install temporary barbed wire fence around the perimeter of the project boundary prior to beginning work on site.
- D. Project Location
 - 1. The equipment and materials to be furnished will be installed at the locations shown on the Drawings.

1.3 Owner Furnished Items

- A. Products furnished to the site and paid for by Owner:

Summary of Work

1. Skid mounted pump system including pumps, piping, flow meter, valves, and appurtenances as detailed on the bill of material included in Appendix A.
 2. Emerson SCADA Integration and Equipment as detailed on the scope and bill of materials included in Appendix A.
- B. Owner's Responsibilities:
1. Arrange for and deliver Owner-reviewed shop drawings, product data, and samples to Contractor.
 2. Arrange and pay for product delivery to site.
 3. On delivery, inspect products jointly with Contractor.
 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 5. Arrange for manufacturers' warranties, inspections and service.
- C. 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.

1.4 Quantities

- A. The Owner reserves the right to alter the quantities of work to be performed or to extend or shorten the improvements at any time when and as found necessary, and the Contractor shall perform the work as altered, increased or decreased. Payment for such increased or decreased quantity will be made in accordance with the Instructions to Bidders. No allowance will be made for any change in anticipated profits nor shall such changes be considered as waiving or invalidating any conditions or provisions of the Contract and Bond.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. The Bid lists each item of the Project for which payment will be made. No payment will be made for any items other than those listed in the Bid.
- B. Required items of work and incidentals necessary for the satisfactory completion of the work which are not specifically listed in the Bid, and which are not specified in this section to be measured or to be included in one of the items listed in the Bid, shall be considered as incidental to the work. All costs thereof, including Contractor's overhead costs and profit, shall be considered as included in the lump sum or unit prices bid for the various Bid items. The Contractor shall prepare the Bid accordingly.
- C. Work includes furnishing all plant, labor, equipment, tools and materials, which are not furnished by the Owner and performing all operations required to complete the work satisfactorily, in place, as specified and as indicated on the Drawings.

1.2 Descriptions

- A. Measurement of an item of work will be by the unit indicated in the Bid.
- B. Final payment quantities shall be determined from the record drawings. The record drawing lengths, dimensions, quantities, etc. shall be determined by a survey after the completion of all required work. Said survey shall conform to Section 01 78 39 of these Specifications. The precision of final payment quantities shall match the precision shown for that item in the Bid.
- C. Payment will include all necessary and incidental related work not specified to be included in any other item of work listed in the Bid.
- D. Unless otherwise stated in individual sections of the Specifications or in the Bid, no separate payment will be made for any item of work, materials, parts, equipment, supplies or related items required to perform and complete the work. The costs for all such items required shall be included in the price bid for item of which it is a part.
- E. Payment will be made by extending unit prices multiplied by quantities provided and then summing the extended prices to reflect actual work. Such price and payment shall constitute full compensation to the Contractor for furnishing all plant, labor, equipment, tools and materials not furnished by the Owner and for performing all operations required to provide to the Owner the entire Project, complete in place, as specified and as indicated on the Drawings.

1.3 Cash Allowances

A. General

1. The Contractor shall include in the Bid Total all allowances stated in the Contract Documents. These allowances shall cover the net cost of the services provided by a firm selected by the Owner. The Contractor's handling costs, labor, overhead, profit and other expenses contemplated for the original allowance shall be included in the items to which they pertain and not in allowances.
2. No payment will be made for nonproductive time on the part of testing personnel due to the Contractor's failure to properly coordinate testing activities with the work schedule or the Contractor's problems with maintaining equipment in good working condition.
3. No payment shall be provided for services which fail to verify required results.

- B. Should the net cost be more or less than the specified amount of the allowance, the Contract will be adjusted accordingly by change order. The amount of change order will not recognize any changes in handling costs at the site, labor, overhead, profit and other expenses caused by the adjustment to the allowance.

C. Documentation

1. Submit copies of the invoices with each periodic payment request from the firm providing the services.
2. Submit results of services provided which verify required results.

D. Schedule of Cash Allowances

1. Soils and Concrete Testing: Allow the amount provided in the Bid for the services of a geotechnical engineering firm and testing laboratory to verify soils conditions including trench excavation and backfill and similar issues and for the testing of concrete cylinders for poured in place concrete.
2. Construction Verification Surveying
 - a. Allow the amount provided in the Bid for construction surveying by an independent surveying firm, selected by the Owner, to perform horizontal and vertical alignment checks at the discretion of the Engineer.
 - b. This allowance is solely for the use of the Engineer for verification of the Contractor's reference points, centerlines and work performed. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary bench marks or verifying that the work has been performed accurately.
3. Emerson SCADA Integration

- a. Allow the amount provided in the Bid for SCADA Integration by Emerson for the equipment and services as indicated in Appendix A.

1.4 Erosion and Sedimentation Control

A. General

1. No separate payment shall be made for temporary and/or permanent erosion and sedimentation controls. All temporary and/or permanent erosion and sedimentation control costs shall be included in the lump sum bid item.
2. No payment will be made for any portion of the Project for which temporary erosion and sedimentation controls are not properly maintained.

1.5 Earthwork

A. Earth Excavation

1. No separate payment will be made for earth excavation. The cost of such work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.
2. No separate payment will be made for providing sheeting, bracing and timbering.

B. Rock Excavation

1. No separate payment will be made for rock excavation.

C. Foundation Excavation

1. Costs for undercutting, foundation preparation, and removal and replacement of unsuitable material, where shown on the Drawings or specified, shall be included in the lump sum bid.
2. Payment for removal and replacement of unsuitable material which is ordered by the Engineer which is not shown on the Drawings or specified shall be made at the unit price bid for:
 - a. Replacement with Crushed Stone.
 - b. Replacement with Suitable Earth Material.
4. No separate payment will be made for concrete backfill of trenches beneath structures. The cost of this work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.
5. Additional costs of corrective work, made necessary by unauthorized excavation

Measurement and Payment

of earth or rock, shall be borne by the Contractor.

- D. Dewatering: No separate payment will be made for dewatering required to accomplish the work.
- E. Backfilling: No separate payment will be made for backfilling or excavation, hauling and placement of borrow material. The cost of all such work and all costs incidental thereto shall be included in the unit price bid for the item to which the work pertains.

1.6 Trench Excavation and Backfill

- A. No separate or additional payment shall be made for any special or unique method, means, techniques or equipment necessary for the Contractor's compliance with these Specifications, regulatory requirements, permits, laws or regulations which govern this Project.
- B. Trench Excavation: No separate payment shall be made for trench excavation. All costs shall be included in the unit price bid for the item to which it pertains.
- C. Sheet piling, Bracing and Shoring: No separate payment will be made for providing sheet piling, bracing and timbering.
- D. Trench Rock Excavation: No separate payment will be made for trench rock excavation.
- E. Dewatering Excavations: All costs of equipment, labor and materials required for dewatering shall be included in the price bid for the item to which it pertains.
- F. Trench Foundation and Stabilization
 - 1. No payment for trench stabilization shall be authorized until after the trench has been dewatered. If the pipe is installed in an inadequately prepared trench bottom, the Engineer shall notify the Contractor in writing of the deficiency and will not authorize payment for that length of pipe which was improperly installed.
 - 2. Payment for trench stabilization shall be made on the basis of the amount authorized and the unit price bid for Trench Stabilization. Payment shall include all costs for the removal and disposal of the unsuitable material and replacement with crushed stone. No additional payment will be made for material required for specified bedding.
 - 3. Payment for filter fabric shall be at the unit price bid for Filter Fabric under trench stabilization. Payment shall include all costs for the placement of filter fabric.

1.7 Site Utilities

- A. Solid sleeves and fittings necessary for connections to existing site utilities, even if not shown on the Drawings, are considered incidental to the Project and will not be paid for separately. Additionally, no payment will be made for fittings provided due to the

Contractor's sequence of construction, layout problems, tie-ins or repairs.

1.8 Additional Work

- A. Additional work or increase in the quantities of certain classes of work over those included in the lump sum for Item 1 of the Bid, when ordered by the Engineer, shall be measured and paid for in accordance with the following Paragraphs. Measurement of the quantities of additional work shall be made by the Engineer.
- B. The unit prices bid shall be applicable to any single occurrence of additional work ordered by the Engineer, which do not exceed the quantity in the Bid. Should a single occurrence exceed the quantity in the Bid, the Contractor and the Owner shall both have the right to negotiate a new unit price which is more representative of the larger quantity of work being ordered by the Engineer for that single occurrence. The aforementioned shall not relieve the Owner of its right to require the Contractor to provide additional work at the unit prices bid, nor shall it limit the number of times the additional work can be ordered at the unit prices bid, as long as each single occurrence does not exceed the quantity in the Bid.
- C. The unit prices bid under Additional Work if Ordered by the Engineer shall include all material costs, labor costs, overhead costs, schedule impact costs, incidental costs, and profit.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. This section outlines the restrictions and requirements for substitutions, product and manufacturer options, and construction method options.

1.2 Definitions

- A. For the purposes of these Contract Documents, a “substitute item” shall be defined as one of the following:
 - 1. A product or manufacturer offered as a replacement to a specified product or manufacturer.
 - 2. A product or manufacturer offered in addition to a specified product or manufacturer.
- B. For the purposes of these Contract Documents, a “substitute construction method” shall be defined as one of the following:
 - 1. A mean, method, technique, sequence or procedure of construction offered as a replacement for a specified mean, method, technique, sequence or procedure of construction.
 - 2. A mean, method, technique, sequence or procedure of construction offered in addition to a specified mean, method, technique, sequence or procedure of construction.

1.3 General

- A. An item or construction method, which is offered where no specific product, manufacturer, mean, method, technique, sequence or procedure of construction is specified or shown on the Drawings, shall not be considered a substitute and shall be at the option of the Contractor, subject to the provisions in the Contract Documents for that item or construction method.
- B. For products specified only by a referenced standard, the Contractor may select any product by any manufacturer, which meets the requirements of the Specifications, unless indicated otherwise in the Contract Documents.
- C. If the manufacturer is named on the Drawings or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the Specifications and Drawings are acceptable.
- D. Whenever the Engineer's design is based on a specific product of a particular manufacturer, that manufacturer will be shown on the Drawings and/or listed first in the list of approved manufacturers in the Specifications. Any Bidder intending to furnish products of other than the first listed manufacturer, or furnish substitute items, shall:

Substitution Procedures

1. Verify that the item being furnished will fit in the space allowed, perform the same functions and have the same capabilities as the item specified,
2. Include in its Bid the cost of all accessory items which may be required by the other listed substitute product,
3. Include the cost of any architectural, structural, mechanical, piping, electrical or other modifications required, and
4. Include the cost of required additional work by the Engineer, if any, to accommodate the item.

1.4 Approvals

- A. Approval, of a substitution as an acceptable manufacturer, of the Engineer is dependent on determination that the product offered is essentially equal in function, performance, quality of manufacture, ease of maintenance, reliability, service life and other criteria to that on which the design is based; and will require no major modifications to structures, electrical systems, control systems or piping systems.

1.5 Substitutions and Options

A. After Notice to Proceed

1. Substitute items will be considered only if the term "equal to" precedes the names of acceptable manufacturers in the Specification.
2. Where items are specified by referenced standard or specified as indicated in Article 1.3, Paragraph B above, such items shall be submitted to the Engineer for review.
3. The Contractor shall submit shop drawings on the substitute item for the Engineer's review in accordance with Section 01 33 00.
4. No substitutions will be considered for the manufacturers listed in the Bid.

B. Prior to Opening of Bids

1. No consideration or approvals will be made for products specified by a referenced standard, or specified as indicated in Article 1.3, Paragraph B, above. Such consideration may occur only after the Notice to Proceed.
2. No consideration or approvals will be made for products being offered where the term "equal to" precedes the name of an approved product. Such substitution consideration may occur only after the Notice to Proceed.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. The work under this Section includes preparation and submittal of a schedule of values.

1.2 General

- A. Timing of Submittal: Submit to the Engineer, a schedule of values allocated to the various portions of the work, within 10 days after Notice to Proceed. The first progress payment will not be made until the next pay cycle following the Engineer's approval of the Contractor's values.
- B. Supporting Data: Upon request of the Engineer, support the values with data which will substantiate their correctness.
- C. Use of Schedule: The schedule of values, unless objected to by the Engineer, shall be used only as a basis of the Contractor's Application for Payment.

1.3 Form and Content of Schedule of Values

- A. Form and Identification
 - 1. Type schedule on 8-1/2 x 11-inch white paper.
 - 2. Contractor's standard forms and automated printout may be used.
 - 3. Identify schedule with:
 - a. Title of Project and location.
 - b. Engineer.
 - c. Name and address of Contractor.
 - d. Contract designation.
 - e. Date of submission.
- B. Schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction. Breakdown shall be by structure, then by CSI Format, for ease of field verification of quantities completed in each structure.

- C. Format
 - 1. Follow the Table of Contents of the Contract Documents as the format for listing the component items.
 - 2. Identify each item with the number and title of the respective major section of the Specifications.
- D. For each major line item list sub-values of major products or operations under the item.
- E. For the Various Portions of the Work:
 - 1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
 - 2. For items on which progress payments will be requested for stored materials, break down the value into:
 - a. The cost of the materials, delivered and unloaded, with taxes paid.
 - b. The total installed value, including Contractor's overhead and profit, less item a. above.
- F. The sum of all values listed in the schedule shall equal the Bid Total.
- G. The value of the work associated with conducting the Operating Test Period shall be provided for the Project.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. Work under this Section includes all scheduling and administering of pre-construction and progress meetings as herein specified and necessary for the proper and complete performance of this work.
- B. Scheduling and Administration by Engineer:
 - 1. Prepare agenda.
 - 2. Make physical arrangements for the meetings.
 - 3. Preside at meetings.
 - 4. Record minutes and include significant proceedings and decisions.
 - 5. Distribute copies of the minutes to participants.

1.2 Preconstruction Conference

- A. The Engineer shall schedule the preconstruction conference prior to the issuance of the Notice to Proceed.
- B. Representatives of the following parties are to be in attendance at the meeting:
 - 1. Owner.
 - 2. Engineer.
 - 3. Contractor and superintendent.
 - 4. Major subcontractors.
 - 5. Representatives of governmental or regulatory agencies when appropriate.
- C. The agenda for the preconstruction conference shall consist of the following as a minimum:
 - 1. Distribute and discuss a list of major subcontractors and a tentative construction schedule.
 - 2. Critical work sequencing.
 - 3. Designation of responsible personnel and emergency telephone numbers.
 - 4. Processing of field decisions and change orders.

Project Meetings

5. Adequacy of distribution of Contract Documents.
6. Schedule and submittal of shop drawings, product data and samples.
7. Pay request format, submittal cutoff date, pay date and retainage.
8. Procedures for maintaining record documents.
9. Use of premises, including office and storage areas and Owner's requirements.
10. Major equipment deliveries and priorities.
11. Safety and first aid procedures.
12. Security procedures.
13. Housekeeping procedures.
14. Work hours.

1.3 Project Coordination Meetings

- A. Attend regular monthly meetings as directed by the Engineer.
- B. Hold called meetings as the progress of the work dictates.
- C. The meetings shall be held at the location indicated by the Engineer.
- D. Representatives of the following parties are to be in attendance at the meetings:
 1. Engineer.
 2. Contractor and superintendent.
 3. Major subcontractors as pertinent to the agenda.
 4. Owner's representative as appropriate.
 5. Representatives of governmental or other regulatory agencies as appropriate.
- E. The minimum agenda for progress meetings shall consist of the following:
 1. Review and approve minutes of previous meetings.
 2. Review work progress since last meeting.
 3. Note field observations, problems and decisions.

4. Identify problems which impede planned progress.
5. Review off-site fabrication problems.
6. Review Contractor's corrective measures and procedures to regain plan schedule.
7. Review Contractor's revision to the construction schedule as outlined in the Supplementary Conditions.
8. Review submittal schedule; expedite as required to maintain schedule.
9. Maintenance of quality and work standards.
10. Review changes proposed by Owner for their effect on the construction schedule and completion date.
11. Complete other current business.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. Preparing, furnishing, distributing, and periodic updating of the construction schedules as specified herein.
- B. The purpose of the schedule is to demonstrate that the Contractor can complete the overall Project within the Contract Time and meet all required interim milestones.

1.2 Submittals

- A. Overall Project Schedule (OPS)
 - 1. Submit the schedule within 10 days after date of the Notice to Proceed.
 - 2. The Engineer will review the schedule and return it within 10 days after receipt.
 - 3. If required, resubmit within 10 days after receipt of a returned copy.
- B. Near Term Schedule (NTS)
 - 1. Submit the first Near Term Schedule within 10 days of the Notice to Proceed.
 - 2. The Engineer will review the schedule and return it within 10 days after receipt.
- C. Submit an update of the OPS and NTS with each progress payment request.
- D. Submit the number of copies required by the Contractor, plus four copies to be retained by the Engineer.

1.3 Approval

- A. Approval of the Contractor's detailed construction program and revisions thereto shall in no way relieve the Contractor of any of Contractor's duties and obligations under the Contract. Approval is limited to the format of the schedule and does not in any way indicate approval of, or concurrence with, the Contractor's means, methods and ability to carry out the work.

1.4 Overall Project Schedule (OPS)

- A. The Contractor shall submit to the Owner for approval a detailed Overall Project Schedule of the Contractor's proposed operations for the duration of the Project. The OPS shall be in the form of a Gantt/bar chart.

B. Gantt/Bar Chart Schedule

1. Each activity with a duration of five or more days shall be identified by a separate bar. Activities with a duration of more than 20 days shall be subdivided into separate activities.
2. The schedule shall include activities for shop drawing preparation and review, fabrication, delivery, and installation of major or critical path materials and equipment items.
3. The schedule shall show the proposed start and completion date for each activity. A separate listing of activity start and stop dates and working day requirements shall be provided unless the information is shown in text form on the Gantt/bar chart.
4. The schedule shall identify the Notice to Proceed date, the Contract Completion date, major milestone dates, and a critical path.
5. The schedule shall be printed on a maximum 11 x 17-inch size paper. If the OPS needs to be shown on multiple sheets, a simplified, one page, summary bar chart showing the entire Project shall be provided.
6. The schedule shall have a horizontal time scale based on calendar days and shall identify the Monday of each week.
7. The schedule shall show the precedence relationship for each activity.

1.5 Near Term Schedule (NTS)

- A. The Contractor shall develop and refine a detailed Near Term Schedule showing the day to day activities with committed completion dates which must be performed during the upcoming 30-day period. The detailed schedule shall represent the Contractor's best approach to the Work which must be accomplished to maintain progress consistent with the Overall Project Schedule.
- B. The Near Term Schedule shall be in the form of Gantt/bar chart and shall include a written narrative description of all activities to be performed and describe corrective action to be taken for items that are behind schedule.

1.6 Updating

- A. Show all changes occurring since previous submission of the updated schedule.
- B. Indicate progress of each activity and show actual completion dates.
- C. The Contractor shall be prepared to provide a narrative report at the Progress Meetings. The report shall include the following:
 1. A description of the overall Project status and comparison to the OPS.

2. Identify activities which are behind schedule and describe corrective action to be taken.
3. A description of changes or revisions to the Project and their effect on the OPS.
4. A description of the Near Term Schedule of the activities to be completed during the next 30 days. The report shall include a description of all activities requiring participation by the Engineer and/or Owner.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. The Contractor shall furnish all equipment and labor materials required to provide the Owner with digital construction videos and photographs of the Project.
- B. Photo and video files shall become the property of the Owner and none of the videos or photographs shall be published without express permission of the Owner.

1.2 Pre and Post Construction Videos and Photographs

- A. Prior to the beginning of any work, the Contractor shall take videos and photographs of the work area to record existing conditions.
- B. Following completion of the work, another set of videos and photographs shall be made showing the same areas and features as in the pre-construction videos and photographs.
- C. All conditions which might later be subject to disagreement shall be shown in sufficient detail to provide a basis for decisions.

1.3 File Format, Media and Submittals

- A. Photographs shall be in "jpg" format.
- B. Videos shall be in a format viewable by Microsoft Windows Media Player or Apple QuickTime Player. Audio narration is desirable.
- C. Files shall be named such that what is being viewed is self-evident.
- D. Files shall be submitted on a flash drive, compact disk (CD) or a digital video disk (DVD). If submitted on DVD, disk shall be recorded in "Minus R" format.
- E. The pre-construction videos and photographs shall be submitted to the Engineer within 25 calendar days after the date of receipt by the Contractor of Notice to Proceed. Post-construction videos and photographs shall be provided prior to final acceptance of the Project.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. The work under this Section includes submittal to the Engineer of shop drawings, product data and samples required by the various Sections of these Specifications.
- B. Submittal Contents: The submittal contents required are specified in each Section.
- C. Definitions: Submittals are categorized as follows:
 - 1. Shop Drawings
 - a. Shop drawings shall include technical data, drawings, diagrams, procedure and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instructions, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.
 - b. Provide newly-prepared information with graphic information at accurate scale (except as otherwise indicated) with name or preparer (firm name) indicated. The Contract Drawings shall not be reproduced by any method for use as or in lieu of detail shop drawings. Show dimensions and note dimensions that are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawings to be used in connection with the Work without appropriate final "Action" markings by the Engineer.
 - c. Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet and detail, Specification Section, schedule or room numbers shown on the Contract Drawings.
 - d. Minimum assembly drawings sheet size shall be 11 x 17-inches.
 - e. Minimum detail sheet size shall be 8-1/2 x 11-inches.
 - f. Minimum Scale:
 - i. Assembly Drawings Sheet, Scale: 1-inch = 30 feet.
 - ii. Detail Sheet, Scale: 1/4-inch = 1 foot.
 - 2. Product Data
 - a. Product data includes standard published information on materials, products and systems, not specially prepared for this Project, other than the designation of selections from among available choices printed therein.

- b. Collect required data into one submittal for each unit of work or system and mark each copy to show which choices and options are applicable to the Project. Include manufacturer's standard published recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked and special coordination requirements.
3. Samples
 - a. Samples include both fabricated and un-fabricated physical examples of materials, products and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.
 - b. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples, not less than three units, where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where the Engineer's selection is required. Prepare samples to match the Engineer's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture and "kind" by the Engineer. Engineer will note "test" samples, except as otherwise indicated, for other requirements, which are the exclusive responsibility of the Contractor.
4. Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the work but not processed as shop drawings, product data or samples.

1.2 Specific Category Requirements

- A. General: Except as otherwise indicated in the individual work sections, comply with general requirements specified herein for each indicated category of submittal. Submittals shall contain:
 1. The date of submittal and the dates of any previous submittals.
 2. The project title.
 3. Numerical submittal numbers, starting with 1.0, 2.0, etc. Revisions to be numbered 1.1, 1.2, etc.

4. The Names of:
 - a. Contractor.
 - b. Supplier.
 - c. Manufacturer.
5. Identification of the product, with the Specification Section number, permanent equipment tag numbers and applicable Drawing No.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards, such as ASTM.
9. Notification to the Engineer in writing, at time of submissions, of any deviations on the submittals from requirements of the Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8 x 3-inch blank space for Contractor and Engineer stamps.
12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria and coordination of the information within the submittal with requirements of the work and of Contract Documents.
13. Submittals showing more than the particular item under consideration shall have all but the pertinent description of the item for which review is requested crossed out.

1.3 Routing of Submittals

- A. Submittals and routine correspondence shall be routed as follows:
 1. Supplier to Contractor (through representative if applicable).
 2. Contractor to Engineer.
 3. Engineer to Contractor and Owner.
 4. Contractor to Supplier.

Part 2 Products

2.1 Shop Drawings

- A. Unless otherwise specifically directed by the Engineer, make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.
- B. Submit all shop assembly drawings, as a digital image, pdf format, scanned at the original scale.
- C. Submit all shop drawings as a digital image, pdf format, scanned at the original scale.

2.2 Manufacturer's Literature

- A. Where content of submitted literature from manufacturers includes data not pertinent to this submittal, clearly indicate which portion of the contents is being submitted for the Engineer's review.

2.3 Samples

- A. Samples shall illustrate materials, equipment or workmanship and established standards by which completed work is judged.
- B. Unless otherwise specifically directed by the Engineer, all samples shall be of the precise article proposed to be furnished.
- C. Submit all samples in the quantity which is required to be returned plus one sample which will be retained by the Engineer.

2.4 Colors

- A. Unless the precise color and pattern is specifically described in the Contract Documents, wherever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Engineer for review and selection.
- B. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited to the installation, completely describe the relative costs and capabilities of each.

Part 3 Execution

3.1 Contractor's Coordination of Submittals

- A. Prior to submittal for the Engineer's review, the Contractor shall use all means necessary to fully coordinate all material, including the following procedures:

1. Determine and verify all field dimensions and conditions, catalog numbers and similar data.
 2. Coordinate as required with all trades and all public agencies involved.
 3. Submit a written statement of review and compliance with the requirements of all applicable technical Specifications as well as the requirements of this Section.
 4. Clearly indicate in a letter or memorandum on the manufacturer's or fabricator's letterhead, all deviations from the Contract Documents.
- B. Each and every copy of the shop drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement.
- C. The Owner may backcharge the Contractor for costs associated with having to review a particular shop drawing, product data or sample more than two times to receive a "No Exceptions Taken" mark.
- D. Grouping of Submittals
1. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items.
 2. No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor's responsibility to assemble the shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to the Engineer along with Contractor's comments as to compliance, non-compliance or features requiring special attention.
- E. Schedule of Submittals
1. Within 30 days of Contract award and prior to any shop drawing submittal, the Contractor shall submit a schedule showing the estimated date of submittal and the desired approval date for each shop drawing anticipated. A reasonable period shall be scheduled for review and comments. Time lost due to unacceptable submittals shall be the Contractor's responsibility and some time allowance for resubmittal shall be provided. The schedule shall provide for submittal of items which relate to one another to be submitted concurrently.

3.2 Timing of Submittals

- A. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.
- B. In scheduling, allow sufficient time for the Engineer's review following the receipt of the submittal.

3.3 Reviewed Shop Drawings

A. Engineer Review

1. Allow a minimum of 30 days for the Engineer's initial processing of each submittal requiring review and response, except allow longer periods where processing must be delayed for coordination with subsequent submittals. The Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow a minimum of two weeks for reprocessing each submittal. Advise the Engineer on each submittal as to whether processing time is critical to progress of the work, and therefore the work would be expedited if processing time could be foreshortened.
2. Acceptable submittals without any comments will be marked "No Exceptions Taken".
3. Submittals containing comments for clarification will be marked "Exceptions Noted".
4. Submittals marked "Revise and Resubmit" must be revised to reflect required changes and the initial review procedure repeated.
5. The "Rejected" notation is used to indicate products which are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.

B. No work or products shall be installed without a drawing or submittal bearing the "No Exceptions Taken" notation. The Contractor shall maintain at the job site a complete set of shop drawings bearing the Engineer's stamp.

C. Substitutions: In the event the Contractor obtains the Engineer's approval for the use of products other than those which are listed first in the Contract Documents, the Contractor shall, at the Contractor's own expense and using methods approved by the Engineer, make any changes to structures, piping and electrical work that may be necessary to accommodate these products.

D. Use of the "No Exceptions Taken" notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the Contract Documents. The Engineer's review shall not relieve the Contractor of responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the work of all trades.

3.4 Resubmission Requirements

A. Shop Drawings

1. Revise initial Drawings as required and resubmit as specified for initial submittal, with the resubmittal number shown.
2. Indicate on Drawings all changes which have been made other than those requested by the Engineer.

B. Project Data and Samples: Resubmit new data and samples as specified for initial submittal, with the resubmittal number shown.

END OF SECTION

Part 1 General

1.1 Scope

- A. Permits and Responsibilities: The Contractor shall, without additional expense to the Owner, be responsible for obtaining all necessary licenses and permits, including building permits, and for complying with any applicable federal, state, county and municipal laws, codes and regulations, in connection with the prosecution of the work.
- B. The Contractor shall take proper safety and health precautions to protect the work, the workers, the public and the property of others.
- C. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the work, except for any completed unit of construction thereof which may heretofore have been accepted.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Description

- A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code or standard, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for bids. This shall include the furnishing of materials, testing of materials, fabrication and installation practices. In those cases where the Contractor's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.
- B. The inclusion of an organization under one category does not preclude that organization's standards from applying to another category.
- C. In addition, all work shall comply with the applicable requirements of local codes, utilities and other authorities having jurisdiction.
- D. All material and equipment, for which a UL Standard, an AGA or NSF approval or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.
- E. The standards which apply to this Project are not necessarily restricted to those from organizations which are listed in Article 1.2.

1.2 Standard Organizations

A. Piping and Valves

ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
DIPRA	Ductile Iron Pipe Research Association
FCI	Fluid Controls Institute
MSS	Manufacturers Standardization Society
NCPI	National Clay Pipe Institute
NSF	National Sanitation Foundation
PPI	Plastic Pipe Institute
Uni-Bell	PVC Pipe Association

Codes and Standards

B. Materials

AASHTO American Association of State Highway and Transportation Officials
ANSI American National Standards Institute
ASTM American Society for Testing and Materials

C. Painting and Surface Preparation

NACE National Association of Corrosion Engineers
SSPC Steel Structures Painting Council

D. Electrical and Instrumentation

AEIC Association of Edison Illuminating Companies
AIEE American Institute of Electrical Engineers
EIA Electronic Industries Association
ICEA Insulated Cable Engineers Association
IEC International Electrotechnical Commission
IEEE Institute of Electrical and Electronic Engineers
IES Illuminating Engineering Society
IPC Institute of Printed Circuits
IPCEA Insulated Power Cable Engineers Association
ISA The Instrumentation, Systems, and Automation Society
NEC National Electric Code
NEMA National Electrical Manufacturers Association
NFPA National Fire Protection Association
REA Rural Electrification Administration
TIA Telecommunications Industries Association
UL Underwriter's Laboratories
VRCI Variable Resistive Components Institute

E. Aluminum

AA Aluminum Association
AAMA American Architectural Manufacturers Association

F. Steel and Concrete

ACI American Concrete Institute
AISC American Institute of Steel Construction, Inc.
AISI American Iron and Steel Institute
CRSI Concrete Reinforcing Steel Institute
NRMA National Ready-Mix Association
PCA Portland Cement Association
PCI Prestressed Concrete Institute

G. Welding

ASME American Society of Mechanical Engineers
AWS American Welding Society

H. Government and Technical Organizations

AIA	American Institute of Architects
APHA	American Public Health Association
APWA	American Public Works Association
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASQC	American Society of Quality Control
ASSE	American Society of Sanitary Engineers
CFR	Code of Federal Regulations
CSI	Construction Specifications Institute
EDA	Economic Development Administration
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FmHA	Farmers Home Administration
FS	Federal Specifications
IAI	International Association of Identification
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
NBFU	National Board of Fire Underwriters
(NFPA)	National Fluid Power Association
NBS	National Bureau of Standards
NISO	National Information Standards Organization
OSHA	Occupational Safety and Health Administration
SI	Salt Institute
SPI	The Society of the Plastics Industry, Inc.
USDC	United States Department of Commerce
WEF	Water Environment Federation

I. General Building Construction

AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AITC	American Institute of Timber Construction
APA	American Parquet Association, Inc.
APA	American Plywood Association
BHMA	Builders Hardware Manufacturers Association
BIFMA	Business and Institutional Furniture Manufacturers Association
DHI	Door and Hardware Institute
FM	Factory Mutual Fire Insurance Company
HPMA	Hardwood Plywood Manufacturers Association
HTI	Hand Tools Institute
IME	Institute of Makers of Explosives
ISANTA	International Staple, Nail and Tool Association
ISDSI	Insulated Steel Door Systems Institute
IWS	Insect Screening Weavers Association
MBMA	Metal Building Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NAGDM	National Association of Garage Door Manufacturers

 Codes and Standards

NCCLS	National Committee for Clinical Laboratory Standards
NFPA	National Fire Protection Association
NFSA	National Fertilizer Solutions Association
NKCA	National Kitchen Cabinet Association
NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
RMA	Rubber Manufacturers Association
SBC	SBCC Standard Building Code
SDI	Steel Door Institute
SIA	Scaffold Industry Association
SMA	Screen Manufacturers Association
SPRI	Single-Ply Roofing Institute
TCA	Tile Council of America
UBC	Uniform Building Code

J. Roadways

AREA	American Railway Engineering Association
DOT	Department of Transportation

K. Plumbing

AGA	American Gas Association
NSF	National Sanitation Foundation
PDI	Plumbing Drainage Institute
SPC	SBCC Standard Plumbing Code

L. Refrigeration, Heating, and Air Conditioning

AMCA	Air Movement and Control Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
CGA	Compressed Gas Association
CTI	Cooling Tower Institute
HEI	Heat Exchange Institute
IIAR	International Institute of Ammonia Refrigeration
NB	National Board of Boilers and Pressure Vessel Inspectors
PFMA	Power Fan Manufacturers Association
SAE	Society of Automotive Engineers
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMC	SBCC Standard Mechanical Code
TEMA	Tubular Exchangers Manufacturers Association

M. Equipment

AFBMA	Anti-Friction Bearing Manufacturers Association, Inc.
AGMA	American Gear Manufacturers Association
ALI	Automotive Lift Institute
CEMA	Conveyor Equipment Manufacturers Association

CMAA	Crane Manufacturers Association of America
DEMA	Diesel Engine Manufacturers Association
MMA	Monorail Manufacturers Association
OPEI	Outdoor Power Equipment Institute, Inc.
PTI	Power Tool Institute, Inc.
RIA	Robotic Industries Association
SAMA	Scientific Apparatus Makers Association

1.3 Symbols

- A. Symbols and material legends shall be as scheduled on the Drawings.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. The work under this Section defines the minimum scope of services to be provided by the Contractor during installation, start-up, operating test period, and operator training using factory representatives of the manufacturers of the equipment provided.
- B. Furnish all labor, materials, tools, equipment, and services for the cleaning up or preparation of all equipment which is required in conjunction with the instruction work to be performed for the Owner's personnel.
- C. Perform additional instruction of the Owner's personnel for any and all items of work that are incomplete at the time initial instruction sessions are scheduled.
- D. Although such work may not be explicitly specifically indicated elsewhere, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation, and to provide instructions upon the functions of that installation.
- E. Provide instruction for all equipment and systems for which operating and maintenance data is required.
- F. Instruction sessions may be combined to some extent between several pieces of similar equipment within the same training session, but only if that combination is defined in the Contractor's instruction program submittal and approved by the Engineer.
- G. One instruction session for each major type of equipment will be required. The Contractor shall anticipate that up to ten of the Owner's employees will participate in any particular instruction session and shall be prepared to provide the required number of handouts, manuals, and tools for each session.

1.2 Qualification

- A. Qualification of the manufacturer's representatives for installation, start-up, and operator training purposes shall be appropriate for the equipment being installed. Manufacturer's representatives shall be subject to the approval of the Engineer. Where equipment has significant process complexity, furnish the services of engineering personnel knowledgeable in the process involved and the function of the equipment.
- B. References in various equipment sections of the terms "factory representative" or "field representative" shall mean an employee of the equipment manufacturer who is completely knowledgeable of the manufacturing, installation, operation and maintenance of the equipment. A sales representative does not qualify, unless it is documented that they have been specifically trained by the Manufacturer. Any field or factory representative not an active employee of the manufacturer must provide documentation from the manufacturer stating that the individual, by name, has been

formally trained in the installation, operation and maintenance of the equipment and is authorized to make the required certification to perform the required services.

1.3 Submittals

- A. No later than one hundred twenty days prior to scheduled Substantial Completion of the Work, the Contractor shall submit a list of proposed instruction sessions for the entire Project. This list shall be organized by Specification Section and its contents will be subject to the approval of the Engineer and Owner.
- B. After approval of the list of the proposed instruction sessions and no later than sixty days prior to the scheduled Substantial Completion of the Work, submit course outlines and training material for each of the approved instruction sessions. Outlines shall be organized by Specification Section, and their contents shall be subject to the approval of the Engineer.
- C. After approval of the program content, the Contractor shall submit a proposed schedule for each of the approved instruction sessions which are to be organized by Specification Section, and the scheduled dates will be subject to the approval of the Engineer.
- D. Submit a separate instruction request/report (form attached) for each system or type of equipment, subject to the Owner's approval of availability of personnel.
 - 1. Submit request/report with preliminary information indicated, to the Engineer at least two weeks prior to first instruction period.
 - 2. After each instruction session, submit three copies of the completed report to the Engineer.

1.4 Coordination

- A. Do not begin instructions until component assembly or system has been tested as specified in Section 01 75 16 and is in satisfactory operating condition.
- B. Prior to instruction sessions, assemble instructional aids, tools, test equipment, and "Final" copies of Operations and Maintenance Manuals.
- C. All instruction sessions shall be planned and scheduled such that the Owner's participants will utilize copies of the Project Operations and Maintenance Manuals which will have been previously provided. These copies are in addition to the quantities which have to be provided to the Owner under Section 01 78 23. The use of draft copies of these manuals will be acceptable.
- D. The Contractor shall schedule and coordinate the visits of factory representatives during installation, start-up and operator training in accordance with the requirements of Section 01 75 16 of these Specifications.
- E. The Contractor shall notify the Engineer 72 hours prior to any impending visit by factory representatives so that the Engineer can be present.

1.5 Installation, Start-Up, and Testing Services

- A. The Contractor shall furnish the services of a factory representative to provide the Pre-Start-Up Maintenance, Installation, Inspection, Functional Testing, and Operational Testing in accordance with Section 01 75 16 and the equipment sections of these Specifications.

1.6 Operator Training Services

- A. Provide all instruction as required to ensure understanding of all operating and maintenance procedures by the Owner designated personnel.
- B. Instruct Owner's personnel in operation and maintenance of equipment and systems. Provide all necessary instruction to satisfaction of the Owner.
- C. Training sessions shall be scheduled at the convenience of the Owner and may have to be scheduled outside of the Contractor's normal working hours.
- D. Explain use of Operating and Maintenance Manuals.
- E. Tour building areas involved and identify:
 - 1. Maintenance and access points.
 - 2. Control locations and control equipment.
- F. Explain Operating Sequences
 - 1. Identify location and show operation of switches, valves, etc., used to start, stop, and adjust systems.
 - 2. Explain use of flow diagrams, operating sequences, diagrams, etc.
 - 3. Demonstrate operation through complete cycle(s) and full range of operation in all modes, including testing and adjusting relevant to operation
- G. Explain use of control equipment, including temperature settings, switch modes, available adjustments, reading of gauges, and functions that must be serviced only by authorized factory representative.
- H. Explain Trouble Shooting Procedures
 - 1. Demonstrate commonly occurring problems.
 - 2. Note procedures which must be performed by factory personnel.
- I. Explain Maintenance Procedures and Requirements
 - 1. Point out items requiring periodic maintenance.

2. Demonstrate typical preventive maintenance procedures and recommend typical maintenance intervals.
 3. Demonstrate other commonly occurring maintenance procedures not part of preventive maintenance program.
 4. Identify maintenance materials to be used.
- J. Furnish all tools and/or test equipment required for proper instruction of the Owner's personnel. Tools and/or test equipment shall be distributed in "sets" with each two participants having a "set" to work with and retain upon completion of the instruction. Each participant shall sign for their tools at the start of the instruction session, and copies of the assignment documents shall be provided to the Engineer by the Contractor.
- K. Thirty-day operating period after start-up: The manufacturers' representative for each piece of equipment shall return to the Project site 30 days after successful completion of the operating test to review the equipment performance, correct any equipment problems, and conduct follow-up operation and maintenance classes as required by the Owner. This follow-up trip is required in addition to the specified services of manufacturer's representative prior to and during equipment start-up. At this time, if there are no equipment problems, each manufacturer shall certify to the Owner in writing that his equipment is fully operational and capable of meeting operating requirements. If the certification is accepted by the Engineer and Owner, the warranty period for that piece of equipment shall be considered to have begun as of the start-up date. If the equipment is operating incorrectly, the factory representative will make no certification to the Owner until the problems are corrected and the equipment demonstrates a successful 30 days operating period. At the conclusion of that period, the warranty start date will be decided upon by the Owner.
- L. Six-month operating period after start-up: The manufacturer's representative for each piece of equipment shall return to the Project site six months after the successful completion of the operating test to review the equipment performance, correct any equipment problems, and conduct follow-up operation and maintenance classes as required by the Owner. This follow-up trip is required in addition to the specified services of manufacturer's representative prior to and during equipment start-up. At the time of this trip, if there are no equipment problems, each manufacturer shall certify to the Owner in writing that his equipment is fully operational and capable of meeting operating requirements. If the equipment is operating incorrectly, the service representative will make no certification to the Owner until the problems are corrected and the equipment demonstrates a successful 30-day operating period after problems are corrected.

1.7 Documentation

- A. The Contractor shall obtain from all manufacturers an electronic file of all operation and training information and training presentation materials in searchable Adobe Acrobat Portable Document Format (PDF). The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated. File(s) shall be

identified by specification section. All documents shall be scanned at 300dpi or greater utilizing optical character recognition (OCR) software. All text in the document must be text selectable with the exception of pages which are in their entirety drawings or diagrams. Word searches of the PDF document must function successfully. PDF files that fail to comply with the indexing and searchable features described above will not be acceptable.

- B. At the completion of each training session, the training session will be certified by representatives from the Manufacturer, Contractor, Owner and Engineer. A training attendance roster for each session identifying all participants shall be delivered by the Contractor to the Engineer.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Manufacturer Services

EQUIPMENT AND SYSTEMS INSTRUCTION REPORT

PROJECT: _____

SYSTEM OR EQUIPMENT: _____

CONTRACTOR NAME: _____ CONTRACT NO. _____

SPECIFICATION SECTION

NOTE: The Contractor's Representative must maintain and complete this report during instruction.

PRELIMINARY INFORMATION

1. To be completed by the Contractor:

A. Proposed dates for instruction period: From _____ To _____

B. Name of Representative Instructor: _____

C. Approximate number of hours of training required: _____

2. To be completed by the Owner:

A. Owner's Designated Personnel to receive instruction: (Identify supervisor, if required).

- | | |
|----------|-----------|
| 1) _____ | 6) _____ |
| 2) _____ | 7) _____ |
| 3) _____ | 8) _____ |
| 4) _____ | 9) _____ |
| 5) _____ | 10) _____ |

B. Training Session Location: _____

RECORD INFORMATION (To be Completed after Instruction Session)

Instructor's Signature: _____ Date Instruction Completed: _____

Engineer's Signature: _____

Owner's Signature: _____

SPECIAL CONSIDERATIONS/NOTES:

Part 1 General

1.1 Scope

- A. This Section includes testing which the Owner may require, beyond that testing required of the manufacturer, to determine if materials provided for the Project meet the requirements of these Specifications.
- B. This work also includes all testing required by the Owner to verify work performed by the Contractor is in accordance with the requirements of these Specifications, i.e., concrete strength and slump testing, soil compaction, etc.
- C. This work does not include materials testing required in various sections of these Specifications to be performed by the manufacturer, e.g., testing of pipe.
- D. The testing laboratory or laboratories will be selected by the Owner. The testing laboratory or laboratories will work for the Owner.

1.2 Payment for Testing Services

- A. The cost of testing services required by the Contract to be provided by the Contractor shall be paid for by the Owner through the CASH ALLOWANCE, i.e., concrete testing, soil compaction, and asphalt testing.
- B. The cost of additional testing services not specifically required in the Specifications, but requested by the Owner or Engineer, shall be paid for by the Owner through the CASH ALLOWANCE.
- C. The cost of material testing described in various sections of these Specifications or as required in referenced standards to be provided by a material manufacturer, shall be included in the price bid for that item and shall not be paid for by the Owner.
- D. The cost of retesting any item that fails to meet the requirements of these Specifications shall be paid for by the Contractor. Retesting shall be performed by the testing laboratory working for the Owner.

1.3 Laboratory Duties

- A. Cooperate with the Owner, Engineer and Contractor.
- B. Provide qualified personnel promptly on notice.
- C. Perform specified inspections, sampling and testing of materials.
 - 1. Comply with specified standards, ASTM, other recognized authorities, and as specified.
 - 2. Ascertain compliance with requirements of the Contract Documents.

Testing Laboratory Services

- D. Promptly notify the Engineer and Contractor of irregularities or deficiencies of work which are observed during performance of services.
- E. Promptly submit three copies (two copies to the Engineer and one copy to the Contractor) of report of inspections and tests in addition to those additional copies required by the Contractor with the following information included:
 - 1. Date issued
 - 2. Project title and number
 - 3. Testing laboratory name and address
 - 4. Name and signature of inspector
 - 5. Date of inspection or sampling
 - 6. Record of temperature and weather
 - 7. Date of test
 - 8. Identification of product and Specification section
 - 9. Location of Project
 - 10. Type of inspection or test
 - 11. Results of test
 - 12. Observations regarding compliance with the Contract Documents
- F. Perform additional services as required.
- G. The laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, or approve or accept any portion of the work.

1.4 Contractor Responsibilities

- A. Cooperate with laboratory personnel, provide access to work and/or comply with manufacturer's requirements.
- B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.
- C. Furnish copies of mill test reports.

- D. Furnish required labor and facilities to:
 - 1. Provide access to work to be tested;
 - 2. Obtain and handle samples at the site;
 - 3. Facilitate inspections and tests;
 - 4. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory.
- E. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.
- F. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the Engineer, and shipped to the laboratory by the Contractor at Contractor's expense.
- G. Copies of all correspondence between the Contractor and testing agencies shall be provided to the Engineer.

1.5 Quality Assurance

- A. Testing shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.6 Product Handling

- A. Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the work.

1.7 Furnishing Materials

- A. The Contractor shall be responsible for furnishing all materials necessary for testing.

1.8 Code Compliance Testing

- A. Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.9 Contractor's Convenience Testing

- A. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.10 Schedules for Testing

A. Establishing Schedule

1. The Contractor shall, by advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site to provide the required testing.
2. Provide all required time within the construction schedule.

B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

C. When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay will be back-charged to the Contractor and shall not be borne by the Owner.

1.11 Taking Specimens

A. Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory or the Engineer.

1.12 Transporting Samples

A. The Contractor shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. Limit blowing dust caused by construction operations by applying water or employing other appropriate means or methods to maintain dust control, subject to the approval of the Owner. As a minimum, this may require the use of a water wagon twice a day to suppress dusty conditions.

1.2 Protection of Adjacent Property

- A. The Bidders shall visit the site and note the buildings, landscaping, roads, parking areas and other facilities near the work site that may be damaged by their operations. The Contractor shall make adequate provision to fully protect the surrounding area and will be held fully responsible for all damages resulting from Contractor's operations.
- B. Protect all existing facilities (indoors or out) from damage by dust, fumes, spray or spills (indoors or out). Protect motors, bearings, electrical gear, instrumentation and building or other surfaces from dirt, dust, welding fumes, paint spray, spills or droppings causing wear, corrosion, malfunction, failure or defacement by enclosure, sprinkling or other dust palliatives, masking and covering, exhausting or containment.

END OF SECTION

Part 1 General

1.1 Work Included

- A. This Section includes the provisions for the installation and the removal of soil erosion protection and sediment control measures in compliance with the requirements of the National Pollutant Discharge Elimination System (NPDES) program.
- B. The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control measures, to ensure economical, effective, and continuous erosion control throughout the construction and post- construction period.

1.2 Related Sections

- A. Section 31 23 33 – Trenching and Backfilling.
- B. Section 32 92 19 – Seeding.

1.3 Reference Standards

- A. ASTM C88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- B. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- C. ASTM C131 – Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- D. ASTM C535 – Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- E. ASTM D448 – Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
- F. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³).
- G. ASTM D-1682 – Standard Test Methods for Breaking Load and Elongation of Textile Fabrics.
- H. ASTM D-177 – Methods of Testing Rubber Hose (Withdrawn 1933).
- I. AASHTO M-288 – Geotextile Specification for Highway Applications.

- J. State of Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges (the GDOT specifications), latest edition.

1.4 Quality Assurance

- A. Contractor is responsible for and must implement all stormwater controls prior to any site work within the project area. Controls must remain in place until after the completion final site stabilization as defined in GAR100002.
- B. Referenced Standards:
 - 1. General NPDES Permit No. GAR100002 for Storm Water Discharges Associated with Construction Activity for Infrastructure Projects.
 - 2. Georgia Soil and Water Conservation Commission's (GSWCC) Manual for Erosion and Sediment Control in Georgia (latest edition).
 - 3. State of Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges (the GDOT specifications), latest edition.
 - 4. National Stone Association, Aggregate Classification (the NSA Classification).
 - 5. Erosion and Sedimentation Control Plan (E&SC Plan) as required by the NPDES Permit.
 - 6. Refer to the permit for a complete discussion of the associated requirements.
- C. Comply with applicable requirements of all governing authorities having jurisdiction. The Specifications and the Plans are not represented as being comprehensive, but rather to convey the intent to provide complete slope and erosion protection with sediment control for both the Owner's and adjacent property. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation will be installed by the Contractor at no additional cost to the Owner. Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.
- D. Erosion control measures shall be established before commencing any earth disturbing activities and maintained during the entire duration of construction activities. 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 additional erosion protection and sediment control measures.
- E. Basic Principles
 - 1. Coordinate the land disturbance activities to fit the topography, soil types and conditions.
 - 2. Minimize the disturbed area and the duration of exposure to erosive elements.
 - 3. Provide temporary or permanent stabilization to disturbed areas immediately after rough grading is complete.

4. Safely convey runoff from the site to a stable outlet to prevent flooding and damage to downstream facilities resulting from increased runoff from the site.
5. Retain sediment on site that was generated on site.
6. Minimize encroachment upon watercourses.

F. Implementation

1. The Contractor is solely responsible for the control of erosion within the Project site and the prevention of sedimentation from leaving the Project site or entering waterways.
 2. The Contractor shall install temporary and permanent erosion and sedimentation controls which will ensure that runoff from the disturbed area of the Project site shall pass through a filter system before exiting the Project site.
 3. The Contractor shall provide temporary and permanent erosion and sedimentation control measures to prevent silt and sediment from entering the waterways. Where required by regulatory authorities, the Contractor shall obtain a Land Disturbance Permit that allows encroachments on the 60-foot vegetative buffer in specific areas. The Contractor shall exercise extreme care during land disturbance operations within the 60-foot vegetative buffer to prevent degradation of the stream.
 4. The Contractor shall limit land disturbance activity to those areas shown on the Drawings.
 5. The Contractor shall maintain erosion and sedimentation control measures within disturbed areas on the entire site at no additional cost to the Owner until the acceptance of the Project. Maintenance shall include mulching, reseeding, clean out of sediment barriers and sediment ponds, replacement of washed out or undermined rip rap and erosion control materials, to the satisfaction of the Engineer.
 6. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor.
 7. The Contractor shall use all means necessary to control dust on and near the work and all off-site borrow areas, in accordance to the Manual for Erosion and Sediment Control in Georgia (latest edition). The Contractor should thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors and concurrent performance of work on the site.
 8. Surface water runoff originating upgrade of exposed area shall be controlled to reduce erosion and sediment migration during the period of exposure.
- G. All land-disturbing activities shall be done in accordance with specific regional requirements as to the time of year that clearing can occur on a project due to the presence of endangered or threatened species.

1.5 Submittals

- A. Submittals shall be in accordance with Section 01 33 00 and shall include:
- B. Stormwater Pollution Prevention Plan (SWPPP) following the EPA SWPPP template, Version 1.1 signed and sealed by an engineer licensed in the State of Georgia.
- C. Record data for the erosion and sediment control devices.
- D. Joint Notice of Intent with Owner for NPDES permitting.
- E. Joint Notice of Change with owner (if necessary).
- F. NPDES General permit number for the project.
- G. Record Data – Inspection Reports: Provide inspection procedure and example inspection form to be used on twice weekly basis. Inspections are required to be performed seventy-two (72) hours or more apart each week the site is active. Provide inspection form to document any major grading activities or periods when construction activity ceases for fourteen (14) calendar days or more.
- H. Certification of Completed Plan.
- I. Joint Notice of Termination with Owner for NPDES permitting.

Part 2 Products

2.1 Sediment Control Fence

- A. Type NS (Non-Sensitive Areas), or Non-Reinforced, silt fence shall meet the requirements of the GSWCC Manual for Erosion and Sediment Control in Georgia, latest edition. Installation and maintenance shall be in accordance with GSWCC and this Section of the Specifications and as indicated on the Drawings.
- B. Type S (Sensitive Areas), or Reinforced, silt fence shall meet the requirements of the GSWCC's Manual for Erosion and Sediment Control in Georgia, latest edition. Installation and maintenance shall be in accordance with GSWCC and this Section of the Specifications and as indicated on the Drawings.
- C. Posts and fasteners for silt fence shall meet the requirements of the GSWCC Manual for Erosion and Sediment Control in Georgia, latest edition, Tables 6-27.2 and 6-27.3.
- D. Silt fence fabric shall be an approved product on the Georgia DOT Qualified Product List No. 36, latest edition.
- E. The Drawings indicate where Type S or Type NS silt fence is required.

2.2 Grass Seed

- A. See Section 32 92 19 – Seeding.

2.3 Filter Fabric

- A. Plastic filter fabric shall conform to the Georgia Department of Transportation Standard Specifications, Section 881.06 for woven fabrics.
- B. Filter fabric shall be an approved product on the Georgia Department of Transportation Qualified Product List No. 28, latest edition.

2.4 Straw Bales

- A. The straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as Bahia, Bermuda, etc., furnished in air dry condition. Provide bales with a standard cross section of 14 by 18 inches. Wire-bound or string-tie all bales. Use either wooden stakes or steel posts to secure the straw bales to the ground. Wooden stakes utilized for this purpose, shall have a minimum dimension of 2 by 2 inches in cross section and have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales, shall have a minimum mass of 1.33 pounds/linear foot and a minimum length of 3 feet.

2.5 Temporary Mulching

- A. Dry straw or hay: Shall be applied at a depth of 2 to 4 inches providing complete soil coverage. Material shall be clean, seed free cereal hay or straw.
- B. Wood waste (chips, sawdust or bark): Shall be applied at a depth of 2 to 3 inches. Organic material from the clearing stage of development should remain on site, be chipped, and applied as mulch.
- C. Mulch Binder: Mulch on slopes exceeding 3 (horizontal) to 1 (vertical) shall be held in place by the use of a mulch binder, as approved by the Engineer. The mulch binder shall be non-toxic to plant and animal life and shall be approved by the Engineer.

2.6 Construction Exit

- A. Stone: Use sound, tough, durable stone resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Aggregate size shall be in accordance with the National Stone Association Size R 2 (1.5 to 3.5 inch stone) or Type 3 rip rap stone conforming to Section 805.01 of the Georgia Department of Transportation Standard Specifications.
- B. Geotextile: The geotextile underliner must be placed the full length and width of the entrance. Geotextile selection shall be based on AASHTO M288-98 specification:

1. For subgrades with a CBR greater than or equal to 3 or shear strength greater than 90 kPa, geotextile must meet requirements of section AASHTO M288 Section 7.3, Separation Requirements.
2. For subgrades with a CBR between 1 and 3 or shear strength between 30 and 90 kPa, geotextile must meet requirements of AASHTO M288 Section 7.4, Stabilization Requirements.

2.7 Miscellaneous

- A. Fasteners: Fasteners shall conform to the requirements of the various soil retention blanket manufacturers.

Part 3 Execution

3.1 Preparation

- A. Where required, according to construction best management practices, prior to General Stripping of Topsoil and Excavating:
 1. Install perimeter dikes and swales.
 2. Excavate and shape sediment basins and traps.
 3. Construct pipe spillways and install stone filter where required.
 4. Install erosion protection and sediment control measures including rock filter dams and silt fence.
 5. Machine compact all berms, dikes and embankments for basins and traps.
- B. Construct sediment basins and traps where indicated on Drawings during rough grading as grading progresses. If no sediment basin is on site, maintain minimum disturbance area requirements for BMP measures.
- C. Temporarily seed basin slopes and topsoil stockpiles.
 1. Rate: ½ lb./1000 SF.
 2. Application of temporary stabilization must be initiated within fourteen (14) days to disturbed areas of a site where construction activities have temporarily or permanently ceased.
 3. Reseed as required until good stand of grass is achieved.
- D. Install stabilized construction entrance(s).

3.2 Installation

A. Silt Fence (with and without backing)

1. Sediment barriers shall not be used in any flowing stream, creek or river.
2. Sediment barriers shall be installed as shown on the Drawings and as directed by the Engineer.
3. Along stream buffers and other sensitive areas, two rows of Type S silt fence or one row of Type S silt fence backed by hay bales shall be used.
4. Sediment barriers shall be maintained to ensure the depth of impounded sediment is no more than one half of the original height of the barrier or as directed by the Engineer. Torn, damaged, destroyed or washed out barriers shall be repaired, reinforced or replaced with new material and installed as shown on the Drawings and as directed by the Engineer.
5. Sediment Barrier Removal
 - a. Sediment barrier shall be removed once the disturbed area has been stabilized with a permanent vegetative cover and the sediment barrier is no longer required as directed by the Engineer.
 - b. Accumulated sediment shall be removed from the barrier and spread over the site.
 - c. All non-biodegradable parts of the barrier shall be disposed of properly.
 - d. The disturbed area created by barrier removal shall be permanently stabilized.

B. Protection of Bare Areas

1. Apply seeding and soil retention blanket to bare areas including new embankment areas, fills, stripped areas, graded areas or otherwise disturbed areas, which have a grade greater than 5% or which will be exposed for more than 14 days.
2. Bare working areas on which it is not practical or desirable to install seeding and soil retention blankets shall be temporarily sloped to drain at a minimum of 0.2% and a maximum of 5% grade. These areas shall then be "trackwalked" with a crawler dozer traveling up and down the slope to form the effect of small "terraces" with the tracks of the dozer. Apply a minimum of three (3) coverages to each area with the dozer tracks.
3. Route runoff from the areas through the appropriate silt fence system and other controls as necessary.
4. Protect earth spoil areas by "trackwalking" and silt fences.

C. Interceptor Swale

1. Interceptor swales may have a v-shape or be trapezoidal with a flat bottom and side slopes of 2:1 or flatter. These are used to shorten the length of exposed slope by intercepting runoff and can also serve as perimeter swales preventing off-site runoff from entering the disturbed area or prevent sediment-laden runoff from leaving the construction site or disturbed area. Minimum compaction for the swale shall be 90% of maximum density as determined by Standard Proctor compaction test (ASTM D698). The swales should remain in place until the disturbed area is permanently stabilized.
2. Stone Stabilization shall be used when grades exceed 2% or velocities exceed 4 feet per second and shall consist of a layer of crushed stone 3" thick, or flexible channel liner soil retention blankets. Stabilization shall extend across the bottom of the swale and up both sides of the channel to minimum height of 3" above the design water surface elevation based on a two year storm.
3. Interceptor swale shall be installed across exposed slopes during construction and should intercept no more than five (5) acres of runoff. Swales shall have a minimum bottom width of 2'-0" and a maximum depth of 1'-6" with side slopes of 3:1 or flatter. Swale must have positive drainage for its entire length to an outlet.
4. Swales should be inspected on a weekly basis during wet weather and repairs should be made promptly to maintain a consistent cross section.
5. All trees, brush, stumps, obstructions and other material shall be removed and disposed of so as not to interfere with the proper functioning of the swale.
6. Outlet: Each swale must have an adequate outlet. The outlet may be a constructed or natural waterway, a stabilized vegetated area or another energy dissipation device. In all cases, the outlet must discharge in such a manner as to not cause erosion or sedimentation problems. Protected outlets should be constructed and stabilized prior to construction of the swale.

D. Temporary Stabilized Construction Entrance/Exit

1. Construction exit(s) shall be placed as shown on the Drawings and as directed by the Engineer. A construction exit shall be located at any point traffic will be leaving a disturbed area to a public right of way, street, alley, sidewalk or parking area.
2. Placement of Construction Exit Material: The ground surface upon which the construction exit material is to be placed shall be prepared to a smooth condition free from obstructions, depressions or debris. The geotextile underliner shall be placed to provide a minimum number of overlaps and a minimum width of one foot of overlap at each joint. The stone shall be placed with its top elevation conforming to the surrounding roadway elevations. The stone shall be dropped no more than three feet during construction.

3. Construction Exit Maintenance: The Contractor shall regularly maintain the exit with the top dressing of stone to prevent tracking or flow of soil onto public rights of way and paved surfaces as directed by the Engineer. This shall require periodic top dressing with 1.5 - 3.5 inch stone, as conditions demand.
4. Construction Exit Removal: Construction exit(s) shall be removed and properly disposed of when the disturbed area has been properly stabilized, the tracking or flow of soil onto public rights of way or paved surfaces has ceased and as directed by the Engineer.
5. When necessary, vehicles must be cleaned to remove sediment prior to entry 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 or other sedimentation/filtration device. All sediment shall be prevented from entering any storm drain, ditch or watercourse using approved methods.

E. Surface Roughening and Tracking

1. All construction slopes require surface roughening to facilitate stabilization with vegetation, particularly slopes steeper than 3:1. Slopes to be covered with rolled erosion control products need not be roughened.
2. Cut Slope Roughening for Areas to be Mowed:
 - a. Stair-step grade slopes with a gradient steeper than 3:1.
 - b. Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
 - c. Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
 - d. Do not make individual vertical cuts more than 2 feet in soft materials or more than 3 feet in rocky materials.
3. Fill Slope Roughening for Areas Not to be Mowed
 - a. Place fill slopes with a gradient steeper than 3:1 in lifts not to exceed 9 inches, and make sure each lift is properly compacted. Ensure that the face of the slope consists of loose, uncompacted fill 4 to 6 inches deep.
 - b. Do not blade or scrape the final slope.
4. Cuts, Fills, And Graded Areas That Will Be Mowed
 - a. Make mowed slopes no steeper than 3:1.

- b. Roughen these areas to shallow grooves by normal tilling, disking, harrowing, or use of cultipacker-seeder. Make the final pass of any such tillage implement on the contour.
 - c. Make grooves, formed by such implements, close together (less than 10 inches) and not less than 1 inch deep.
 5. Roughening with Tracked Machinery
 - a. Limit roughening with tracked machinery to sandy soils to avoid undue compaction of the soil surface.
 - b. Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during final grading operations.
 - c. Seeding – immediately seed and mulch roughened areas to obtain optimum seed germination and growth.
 6. Periodically check the seeded slopes for rills and washes. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.
 7. If roughening is washed away in a storm, the surface will have to be re-roughened and new seed laid.
- F. Concrete Truck Wash-Out Facility
 1. Install sand filter bed of at least fifty (50 ft²) square feet in area and at least twelve (12") inches in depth. Bottom of filter bed shall allow filtered wash water to percolate into the subgrade.
 2. Install twelve (12") inch high berm around periphery of filter bed to prevent stormwater runoff contamination of the filter sand.
 3. Remove, dispose, and replace filter sand that becomes clogged to such a degree that wash water does not immediately percolate down into the filter bed.
 4. Maintain sand filter bed until all concrete has been placed on the project site.
 5. Upon completion of all concrete placements on the project site remove and dispose of filter sand, backfill bed with compacted select fill to 90% Standard Proctor Density and restore the disturbed surface.

3.3 During Construction Period

- A. Inspect at least twice every 7 days, at least 72 hours apart, and no more than 24 hours after a rainfall event of one half inch or greater.
- B. All erosion and sediment control measures and other protective measures identified in the SWPPP must be maintained in effective operating condition.

- C. The Contractor shall ensure that sedimentation and erosion that occur due to work activities are minimized and contained within the designated project work areas. Erosion and sedimentation occurring outside the work area will be resolved by and coordinated by Contractor with impacted landowners as required.
- D. Maintain Basins, Dikes, Traps, Stone Filters, Etc.:
 - 1. Inspect according to the schedule outlined in Item "A" above.
 - 2. Repair or replace damaged or missing items.
- E. After rough grading, sow temporary grass cover over all exposed earth areas not draining into sediment basin or trap.
- F. Construct inlets as soon as possible. Install protective measures around inlets as described in this specification and detailed on Drawings.
- G. Provide necessary swales and dikes to direct all stormwater towards and into sediment basins and traps.
- H. Do not unnecessarily disturb existing vegetation (grass and trees).
- I. Take appropriate measures to minimize materials transported or tracked by construction vehicles onto any roadway.
- J. Excavate sediment out of basins and traps when capacity has been reduced by 50 percent.
- K. Topsoil and Fine Grade Slopes and Swales, Etc. Seed and mulch per project specifications as soon as areas become ready.

3.4 Near Completion of Construction

- A. Eliminate basins, dikes, traps, etc.
- B. Grade to finished or existing grades.
- C. Fine grade all remaining earth areas, then seed and mulch.
- D. Remove remaining sediment controls (silt fence, rock berms, etc.) once final stabilization, meeting GAR100002 requirements, has been achieved.

END OF SECTION

Part 1 General

1.1 Scope

- A. The Contractor shall provide transportation of all equipment, materials and products furnished under these Contract Documents to the work site. In addition, the Contractor shall provide preparation for shipment, loading, unloading, handling and preparation for installation and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the work.
- B. All equipment, materials and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the Owner prior to being incorporated into the work.

1.2 Transportation

- A. All equipment shall be suitably boxed, crated or otherwise protected during transportation.
- B. Where equipment will be installed using existing cranes or hoisting equipment, the Contractor shall ensure that the weights of the assembled sections do not exceed the capacity of the cranes or hoisting equipment.
- C. Small items and appurtenances such as gauges, valves, switches, instruments and probes which could be damaged during shipment shall be removed from the equipment prior to shipment, packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

1.3 Handling

- A. All equipment, materials and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation.
- B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice.
- C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.
- D. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Product Storage and Handling Requirements

Part 1 General

1.1 Scope

- A. The work under this Section includes, but is not necessarily limited to, the furnishing of all labor, tools and materials necessary to properly store and protect all materials, equipment, products and the like, as necessary for the proper and complete performance of the work.

1.2 Storage and Protection

A. Storage

1. Maintain ample way for foot traffic at all times, except as otherwise approved by the Owner.
2. All property damaged by reason of storing of material shall be properly replaced at no additional cost to the Owner.
3. Packaged materials shall be delivered in original unopened containers and so stored until ready for use.
4. All materials shall meet the requirements of these Specifications at the time that they are used in the work.
5. Store products in accordance with manufacturer's recommendations.

B. Protection

1. Use all means necessary to protect the materials, equipment and products in accordance with manufacturer's recommendations of every section before, during and after installation and to protect the installed work and materials of all other trades.
2. All materials shall be delivered, stored and handled to prevent the inclusion of foreign materials and damage by water, breakage, vandalism or other causes.
3. Substantially constructed weather-tight storage sheds, with raised floors, shall be provided and maintained as may be required to adequately protect those materials and products stored on the site which may require protection from damage by the elements.

- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary for the approval of the Owner and at no additional cost to the Owner.

- D. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending

between supports. Items such as pipe, structural steel and sheet construction products shall be stored with one end elevated to facilitate drainage.

- E. Unless otherwise permitted in writing by the Owner, building products and materials such as cement, grout, plaster, gypsumboard, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc., shall be stored indoors in a dry location. Building products such as rough lumber, plywood, concrete block and structural tile may be stored outdoors under a properly secured waterproof covering.
- F. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.3 Extended Storage

- A. In the event that certain items of major equipment such as air compressors, pumps and mechanical aerators have to be stored for an extended period of time, the Contractor shall provide satisfactory long-term storage facilities which are acceptable to the Owner. The Contractor shall provide all special packaging, protective coverings, protective coatings, power, nitrogen purge, desiccants, lubricants and exercising necessary or recommended by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

1.4 Owner Furnished Equipment

- A. The Contractor shall provide storage and protection for all Owner furnished equipment and materials, including extended storage as specified above.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. Construction staking shall include all of the surveying work required to layout the work and control the location of the finished Project. The Contractor shall have the full responsibility for constructing the Project to the correct horizontal and vertical alignment, as shown on the Drawings, as specified, or as ordered by the Engineer. The Contractor shall assume all costs associated with rectifying work constructed in the wrong location.
- B. From the information shown on the Drawings and the information to be provided as indicated under Project Conditions below, the Contractor shall:
 - 1. Be responsible for setting reference points and/or offsets, establishment of baselines, and all other layout, staking, and all other surveying required for the construction of the Project.
 - 2. Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and shall bear the cost of re-establishing same if disturbed.
 - 3. Stake out the permanent and temporary easements or the limits of construction to ensure that the work is not deviating from the indicated limits.
 - 4. Be responsible for all damage done to reference points, baselines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, baselines, center lines and temporary bench marks as a result of the operations.
- C. Baselines shall be defined as the line to which the location of the work is referenced, i.e., edge of pavement, road centerline, property line, right-of-way or survey line.
- D. Record Drawing surveys shall be performed in accordance with Section 01 78 39 of these Specifications.

1.2 Project Conditions

- A. The Drawings provide the location and/or coordinates of principal components of the Project. The alignment of some components of the Project may be indicated in the Specifications. The Engineer may order changes to the location of some of the components of the Project or provide clarification to questions regarding the correct alignment.
- B. The survey points, control points, and baseline to be provided to the Contractor shall be limited to only that information which can be found on the Project site by the Contractor.

Construction Layout

- C. Additionally, the Engineer will provide the following:
 - 1. One vertical control point on the Project site with its elevation.
 - 2. A minimum of two horizontal control points on the Project site with their coordinates shown on the Drawings.

1.3 Quality Assurance

- A. The Contractor shall furnish documentation, prepared by a surveyor currently registered in the State in which the Project is located, confirming that staking is being done to the horizontal and vertical alignment shown in the Contract Documents. This requires that the Contractor hire, at the Contractor's own expense, a currently registered surveyor, acceptable to the Owner, to provide ongoing construction staking or confirmation of such.
- B. Any deviations from the Drawings shall be confirmed by the Engineer prior to construction of that portion of the Project.
- C. Construction Surveying Cash Allowance
 - 1. This cash allowance is solely for the use of the Engineer for verification of the Contractor's reference points, centerlines and work performed and is not to be used by the Contractor to provide cut sheets.
 - 2. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary bench marks, verifying that the work has been performed accurately, and all other work covered by this Section.

1.4 Site Work

- A. Staking Precision: The precision of construction staking shall match the precision of a component's location indicated on the Drawings. Staking of utilities shall be done in accordance with generally accepted practice for the type of utility.
- B. Paved Surfaces: The Contractor shall establish a reference point for establishing and verifying the paving subgrade and finished grade elevations. Any variance with plan grades shall be identified by the Contractor and confirmed by the Engineer prior to constructing the base.

1.5 Pressure Mains and Accessories

- A. Staking Precision: The precision of construction staking required shall be that which the correct location of the main can be established for construction and verified by the Engineer. Where the location of components of the main, e.g. fittings, valves, road crossings and are not dimensioned, the establishment of the location of these components shall be based upon scaling these locations from the Drawings with

relation to readily identifiable land marks, e.g., survey reference points, power poles, manholes, etc.

B. Reference Points

1. Reference points shall be placed, at or no more than three feet, from the outside of the construction easement or right-of-way. The location of the reference points shall be recorded in a log with a copy provided to the Engineer for use, prior to verifying reference point locations. Distances shall be accurately measured to 0.01 foot.
2. The Contractor shall give the Engineer reasonable notice that reference points are set. The reference point locations must be verified by the Engineer prior to commencing clearing and grubbing operations.

END OF SECTION

Part 1 General

1.1 Work Included

- A. Section includes requirements for cleanup, re-stabilization, restoration, and disposal to maintain a safe and well-kept job site and properly repair disturbed areas.

1.2 Quality Assurance

- A. Daily, and more often if necessary, conduct inspections verifying that requirements of cleanliness are being met.
- B. In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

1.3 Cleaning Materials and Equipment

- A. Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness.
- B. Use only the cleaning materials, methods and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

1.4 Cleaning During Construction

- A. (For Interior Areas) Proceed with construction cleanup concurrently with construction progress.
 - 1. Remove mud, oil, grease, soil, gravel, trash, scrap, debris, and excess materials that are unsightly or may cause accidents to persons or properties.
 - 2. Remove water from floor areas where electrical power tools are to be used and prevent stains on concrete that will be exposed in finish work.
 - 3. Select and employ cleaning materials and equipment with care to avoid scratching, marring, defacing, staining, or discoloring surfaces cleaned.
- B. (For Exterior Areas) Throughout all phases of construction, including suspension of work, and until the Final Acceptance, the Contractor shall keep the site clean and free from rubbish and debris. The Contractor shall also abate dust nuisance by cleaning, sweeping and sprinkling with water, or other means as necessary. The

use of water resulting in mud on driveways, parking lots or streets will not be permitted as a substitute for sweeping or other methods.

1. The road(s) on the construction site shall be paved immediately after the installation of underground utilities and the construction and underground/final inspection of storm drainage, curbs, and gutters. The exit road on the construction site shall be paved first.
 2. Vehicles exiting the construction site shall have all dirt clods and mud removed from their tires.
 3. Materials and equipment shall be removed from the site as soon as they are no longer necessary. Before the final inspection, the site shall be cleared of equipment, unused materials and rubbish so as to present a satisfactory clean and neat appearance. All cleanup costs shall be included in the Contractor's Bid.
 4. Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately, and the area cleaned.
 5. Excess excavated material from catch basins or similar structures shall be removed from the site immediately. Sufficient material may remain for use as backfill if permitted by the Specifications. Forms and form lumber shall be removed from the site as soon as practicable after stripping.
- C. Failure of the Contractor to comply with the Engineer's cleanup orders may result in an order to suspend work until the condition is corrected. No additional compensation will be allowed as a result of such suspension.

1.5 Final Cleaning

- A. Upon completion of the work, the Contractor shall remove from the site all plant, materials, tools and equipment belonging to him, and leave the site with an appearance acceptable to the Owner.
- B. Thoroughly clean all equipment and materials installed and deliver over such materials and equipment in a bright, clean, polished and new appearing condition.
- C. Restore or replace all landscape features scarred or damaged by the Contractor's equipment or operations as nearly as possible to original condition, at the Contractor's expense. The Owner will approve the method of restoration to be used.
- D. The Contractor shall remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction, as directed by the Owner. It is anticipated that excavation, filling and plowing of roadways will be

required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The restored areas shall be filled, graded, and spread with sufficient topsoil to provide a minimum depth of four inches of suitable soil for the growth of grass, and the entire area shall be seeded or sodded with the original type of grass. Areas shall be restored to original contours as shown on the Plans. If the Plans do not cover the specific areas to be restored, the areas shall be graded to drain and give a smooth transition to the surroundings.

1.6 Measurement and Payment

- A. No separate payment will be made for any items of work, materials, parts, equipment, supplies, or related items required to perform and complete the requirements of this section. The costs for all such items required shall be considered subsidiary to other items of this Contract and shall not be paid for separately.

1.7 Disposal of Waste

- A. The definitions contained in Georgia Environmental Protection Division Rules 391-3-4-.01 shall be applicable to this Project. The term waste shall include excess and surplus materials and shall include liquid and solid wastes.
- B. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
- C. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
- D. Remove and transport waste in a manner that will prevent spillage on adjacent surfaces and areas.
- E. Burning: Do not burn waste materials on site.
- F. Waste removed from the Project site shall be disposed of in sites permitted by the Georgia Environmental Protection Division for the acceptance of type of waste being disposed. The acceptable types of permitted disposal facilities are as follows:
 - 1. Inert Waste Landfills.
 - 2. Municipal Solid Waste Landfills.
 - 3. Municipal Solid Waste Landfills permitted to receive only construction and demolition wastes.

- G. Exceptions to Paragraph F are as follows:
1. Hazardous waste shall be disposed of in accordance with Georgia Environmental Protection Division Rules 391-3-11.
 2. Asbestos-containing waste shall also be handled and disposed of in accordance with Georgia Environmental Protection Division Rules 391-3-14.
 3. Excess earth material and excess excavated rock material may be placed on sites for which the Contractor provides to the Owner a signed affidavit from the property owner that the placement of such material is acceptable to the property owner. The Contractor and property owner shall be responsible for all permitting of such disposal.
- H. No waste shall be placed at a transfer station facility.
- I. The Contractor shall maintain records related to all waste removed from the Project site so as to allow the Owner or the Engineer to readily determine the following:
1. Date waste removed from Project site.
 2. Name of hauler (company and driver) transporting such waste.
 3. General description of waste transported.
 4. "Truck tickets" indicating the waste disposal site and amount of waste disposed therein.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. The work under this Section includes, but is not necessarily limited to, the provision of all labor and material required to perform installation inspection and start-up of all equipment and mechanical systems installed under this Contract.
- B. The work defined under this Section includes providing the services of a trained factory representative in accordance with the requirements of Section 01 43 33 of these Specifications.
- C. Certification of start-up and full testing shall be performed by the manufacturer using the services of a factory representative trained in this type service.
- D. Unless otherwise specified, the Contractor shall furnish all labor, materials, water, air, oil, power, fuel, chemicals, test equipment and other items required to conduct the field tests, including any retests.
- E. The cost of all field testing shall be included in the Contract Price and no separate payment will be made.

1.2 Coordination

- A. The Contractor shall not proceed with any functional test or operating test until the operation and maintenance manuals for the equipment have been submitted and been designated "No Exceptions Taken". The Contractor shall coordinate all activities required for starting of systems including the visits by the factory representatives, particularly where an equipment item's operation is dependent on the operation of other equipment. Prior to calling the factory representative, the Contractor shall ensure that all necessary related equipment, structures, piping and electrical work is complete. Any required revisits to the site by the factory representative shall be provided by the Contractor.

1.3 Pre Start-Up Maintenance

- A. After installation and prior to start-up, all grease-lubricated joints, shaft couplings and bearings shall be flushed out and re-greased. All oil reservoirs and sumps shall be completely drained and flushed and refilled with the proper lubricant. All operating fluid and gas reservoirs shall be filled with the proper fluid and gases. Screens and filters shall be checked for contamination and replaced if necessary. Belt drives shall be checked and tension adjusted, as needed. The equipment shall then be tagged, signed and dated, indicating that the equipment has been properly lubricated and prepared for start-up.

1.4 Installation Inspection

- A. Prior to energizing any piece of equipment or performing a functional test, a factory representative of the equipment manufacturer shall inspect the installation of the equipment. The factory representative shall determine if the equipment has been installed in accordance with the manufacturer's recommendations, pre-start-up maintenance has been performed, and is ready for start-up and the initiation of the functional test.
- B. Should the installation inspection indicate that the equipment has been improperly installed or prepared for start-up, the Contractor shall provide such modifications or adjustments as required for the equipment to operate properly.
- C. The factory representative shall certify that the equipment has been installed in accordance with the Drawings, Specifications, and the manufacturer's recommendations and that the equipment is ready for start-up and functional testing to be performed.

1.5 Functional Test

- A. Following the installation inspection by factory representative, perform a functional test on each piece of equipment. The functional test shall consist of operation of the equipment on a normal duty cycle for a sufficient period of time to determine satisfactory operation. Time required for functional testing shall be as specified in the equipment specifications or a minimum one continuous eight-hour period, whichever is longer. To the maximum extent practical, exercise the full capabilities of all equipment including remote operation, instrumented control schemes, alternate modes of operation and emergency operation. Equipment shall be checked for any abnormal noise or vibration as part of the functional test, and any observed abnormal conditions corrected prior to certification.
- B. Should the results of the functional test indicate that the equipment has failed to perform in accordance with the Specifications, the Contractor shall make, at no additional cost to the Owner, all modifications or adjustments as required for satisfactory operation, including replacement of any or all components, if necessary. Following the modifications or adjustments, the Contractor shall repeat the functional test. This procedure shall be repeated until the results of the test indicate that the equipment has satisfied the requirements of the applicable Specification Section.
- C. After the functional test is completed, each manufacturer shall certify, in writing, that tests were made in accordance with the Specifications and the manufacturer's recommendations, that the functional tests and start-up operation have been satisfactory, and that the equipment is fully operational and capable of meeting operating requirements.

1.6 Operating Test Period

- A. Following the functional test, the Contractor shall place each system into service and undergo an operational test under normal service conditions. The minimum time for

the operating test period for each system shall be 30 consecutive days, excluding time that the equipment is taken out of service.

- B. Where required in the equipment specifications, process performance testing shall be performed during the operating test period in accordance with the requirements of the equipment specifications. The Contractor shall provide all materials and labor, including the services of a factory representative, necessary to perform the performance testing.
- C. The test period shall commence upon the initiation of operation of all systems and shall end after the successful operation of the equipment for the minimum time required.
- D. The Contractor shall repair and make all modifications required due to mechanical failure of the equipment during the operating test period. Should the equipment fail to meet the performance testing requirements, a factory representative shall evaluate the equipment and determine the cause of the process failure. The Contractor shall make all modifications recommended by the manufacturer.

1.7 Certification

- A. Upon completion of start up, the Contractor shall provide written Installation and Start-Up Report from all equipment manufacturers' factory representatives. Report shall address the equipment installation's compliance with manufacturer's requirements and note any problems noted that may affect the warranty, operation or longevity of the equipment. Written certification shall indicate that tests were made in accordance with the manufacturer's recommendations, that the test and start-up operation has been satisfactory completed and that the equipment is fully operational under design requirements. Written certification shall be filed with the Engineer on the manufacturers stationary.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

Manufacturer's Installation and Start-up Report

<u>GENERAL INFORMATION:</u>	
Owner: _____	Contractor: _____
Facility: _____	System: _____
Location: _____	Specification Number: _____
Tag: _____	
<u>MANUFACTURER:</u>	
Manufacturer Name: _____	
Address: _____	
City/State/Zip: _____	
Phone Number: _____	Fax Number: _____
E-Mail: _____	
Manufacturer's Representative: _____	

- | | | | |
|--|----------------------------|----------------------------|------------------------------|
| 1. Required safety equipment available? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 2. Are equipment tags correct and attached to equipment? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 3. Are rotating equipment safety guards in place and secure? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 4. Shaft and couplings aligned? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 5. Have belt drives been aligned? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 6. Bearings lubricated? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 7. Oil reservoirs filled with proper lubricant? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 8. Rotation verified? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 9. Is equipment level? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 10. Equipment anchored properly? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 11. Equipment grouted properly? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 12. Required utilities available? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 13. Nozzles free from loads? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 14. Are required pressure and temperature gauges and sensors installed? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 15. Have any shipping coatings/sealants been removed? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 16. Does any paint/coating damage need to be repaired? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 17. Have moving parts been checked for proper running clearance? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 18. Is there any observed leakage of lubricants or fluids from equipment? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 19. Are all electrical power connections made and properly torqued? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 20. Are electrical overloads properly set? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 21. Are current transformers properly wired for polarity? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 22. Are control enclosures per the specified NEMA classification and material? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |

Startup Procedures

- 23. Are instrumentation connections terminated? Y N N/A
- 24. Are signal cable shield leads grounded in accordance with Manufacturer's recommendations? Y N N/A
- 25. Are required spare parts on-site, inventoried and properly stored? Y N N/A
- 26. Are Operations and Maintenance Manuals on-site and complete? Y N N/A
- 27. Are all installation requirements of the O&M Manuals performed? Y N N/A
- 28. Does equipment have a record of maintenance and exercise as recommended by the manufacturer during storage? Y N N/A
- 29. Are there any observed installation issues that impact the equipment warranty? Y N N/A

Additional items noted during installation inspection by Manufacturer's Start-up Representative:

I certify as an authorized Factory Representative, that the equipment is installed in accordance with the Manufacturer's recommendations and is ready for start-up and initial operation.

Factory Representative: _____
 Representing: _____
 Mailing Address: _____

 Phone Number: _____
 E-mail Address: _____

Date: _____
 (If employed by other than the Manufacturer)

Startup Procedures

START-UP REPORT:

- 1. Does equipment operate and perform in accordance with the specification? Y N N/A
- 2. Have all specified modes of operation been tested and verified? Y N N/A
- 3. Do all system indicators, readouts, controls and operator interfaces operate? Y N N/A
- 4. Have variable speed units been tested throughout the available speed range? Y N N/A
- 5. Have multi-speed motors been tested on all available speeds? Y N N/A
- 6. Did equipment exhibit any abnormal vibration during operation? Y N N/A
- 7. Did equipment exhibit any abnormal noise during operation? Y N N/A
- 8. Are bearings operating at normal temperature? Y N N/A
- 9. Do bearings display any roughness in operation? Y N N/A
- 10. Prior to start-up, or during initial operation, was any leakage of lubricant observed? Y N N/A
- 11. Was any leakage of process fluids observed during start-up? Y N N/A
- 12. Has operation of equipment protective systems been verified? Y N N/A
- 13. Is the equipment ready to place into operation? Y N N/A

Additional items noted during start-up by Manufacturer's Start-up Representative:

I certify as an authorized Factory Representative, that the equipment has been properly started up in accordance with the Manufacturer's recommendations and is ready for initial operation.

Factory Representative: _____

Date: _____

END OF SECTION

Part 1 General

1.1 Scope

- A. The Contractor shall provide five copies of a complete and comprehensive reference manual (Operating and Maintenance Manual) containing operating and maintenance data to enable operators and plant engineers to correctly operate, service and maintain all equipment and accessories covered by the Specifications and Drawings. The data contained in the manual shall explain and illustrate clearly and simply all principles and theory of operation, operating instructions, maintenance procedures, calibration procedures and safety precautions and procedures for the equipment involved.
- B. No separate payment will be made for the Operating and Maintenance Manual and the cost of said manual shall be included in the Contract Price.

1.2 Submittal Schedule

- A. The Contractor shall submit, for the Engineer's approval, three preliminary drafts of proposed formats and outlines of contents of manuals within 60 calendar days after the Notice to Proceed. The Engineer will notify the Contractor, in writing, of any deficiencies in the manual and will return one copy of the manual for completion and/or correction.
- B. Submit three preliminary copies of manuals before the work covered by the Contract Documents is 40 percent complete. The Contractor must also submit three copies of the manual in digital format as specified below. The Engineer will notify the Contractor, in writing, of any deficiencies in the manual and will return one copy of the manual for completion and/or correction.
- C. Resubmissions: Clearly identify each correction or change made. The resubmission shall be accompanied by a letter listing all comments made by the Engineer and the actions or response by the manufacturer or vendor to each comment. Where the Engineers comment applies to multiple areas of the initial submittal the response shall address all areas. The response letter shall also address where supplemental information has been provided and where it is located within the resubmission.
- D. Before the work covered by the Contract Documents is 70 percent complete, the Contractor must submit six final copies of the revised and completed manual, complete in detail as specified below. The Contractor must also submit five copies of the manual in digital format as specified below.
- E. Digital Copies of Manuals: Operations and Maintenance Manuals shall be provided by the Contractor in digital format concurrently with both the preliminary and final hard copy submissions. Materials available in digital format shall be furnished in accordance with the following:
 - 1. All textual data shall be provided as an electronic file in searchable Adobe Acrobat Portable Document Format (PDF). The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated. File(s) shall be identified by utilization of a "twelve dot three" convention

(XXXXXX.XX.YY.pdf) where X is the eight digit number corresponding to the specification section, and YY is an identification number. All documents shall be scanned at 300dpi or greater utilizing optical character recognition (OCR) software. All text in the document must be text selectable with the exception of pages which are in their entirety drawings or diagrams. Word searches of the PDF document must function successfully. PDF files that fail to comply with the indexing and searchable features described above will not be acceptable. All drawing data shall be provided in digital format compatible with AutoCAD Version as designated by the Engineer.

2. Materials not available in original digital format (available only in paper format) shall be scanned as noted above into a PDF format and cleaned to remove smudges, fingerprints, artifacts, and other extraneous marks. All notes, version stamps, etc. shall be preserved. Color maps shall be scanned in not less than the number of colors of the document or 16 colors, whichever is greater. Color photographs shall be saved in not less than 256 colors. Black and white or monochrome scans (non-text) shall not be less than 16 gray scale levels. Color maps, color photographs, and black and white and gray scale photograph files shall be saved as GIF or JPG files, compatible with Adobe Photoshop Version 4.0. Documents shall be scanned in the existing color format of the document, i.e. color documents shall be scanned in color, and black and white or monochrome in gray scale.
3. After the documents are in correct digital format, they shall be furnished to the Engineer as a 120 mm, 680mb, 74-minute CD ROM. All media transmittals shall be accompanied by a detailed paper printout of the files on the media. This printout shall consist of a file name, file size, date of creation, submittal number, and a brief but accurate description of the file. Files shall not be transmitted electronically. Five copies of the CD for each Operation and Maintenance Manual shall be provided to the Engineer.

1.3 Submittal Format

- A. Each hard copy of the manual shall be assembled in one or more loose leaf binders, each with title page, typed table of contents, typed list of tables, typed list of figures, and heavy section dividers with reinforced holes and numbered plastic index tabs. Binders shall be uniform for all manuals and shall be 3-ring, hardback type, with transparent vinyl pocket front cover suitable for inserting identifying cover and with a transparent vinyl pocket on the spine for label. All data shall be punched for binding. Composition and printing shall be arranged so that punching does not obliterate any data. The cover and binding edge of each manual shall have the project title, specification section number and title, and manual title printed thereon, all as approved by the Engineer.
- B. All copies of shop drawings, figures and diagrams shall be reduced to either 8-1/2 x 11-inches or to 11-inches in the vertical dimension and as near as practical to 17-inches in the horizontal dimensions. Such sheets shall be folded to 8-1/2 x 11-inches. The manual and other data shall be printed on first quality paper, 8-1/2 x 11-inch size with standard 3-hole punching. Binders shall be labeled Vol. 1 of "X", Vol. 2 of "X", etc., where "X" is the total number of volumes in the set where more than one is required. The table of contents for the entire set, identified by volume

number, shall appear in each binder. Text, figures and drawings shall be clearly legible and suitable for dry process reproductions.

- C. Each submittal shall have a cover sheet that includes the following information:
 - 1. The date of submittal and the dates of any previous submittals.
 - 2. The Project title.
 - 3. Submittal numbering shall be in accordance with Section 01 33 00 of these Specifications.
 - 4. The names of:
 - a. Contractor.
 - b. Supplier.
 - c. Manufacturer.
 - 5. Identification of the product, with the Specification section number, permanent equipment tag numbers and applicable Drawing No.
- D. The Engineer will not recommend final acceptance of the Work until the Operating and Maintenance Manual is complete and satisfactory to Engineer.

1.4 Contents of Operating and Maintenance Manual

- A. Each manual shall include a title page which includes all information specified in Article 1.3, paragraph C of this Section. In addition, the title page shall include manufacturer's address, phone number, facsimile number, and contact; manufacturer's equipment name and model number; supplier's address, phone number, facsimile number, and contact.
- B. Each manual shall include a table of contents identifying the location of each item listed below, for each component supplied. For items not applicable to a component, the table of contents shall list N/A for the page number.
- C. For all equipment, the Contractor shall furnish a complete, detailed listing of all equipment, components and accessories showing component name, manufacturer, model number and quantity information shall be furnished for each component as outlined below:
 - 1. A summary page shall be provided for each piece of equipment detailing the following information:
 - a. Equipment Number
 - b. Equipment Description
 - c. Serial Number

Operating and Maintenance Data

- d. Model Number
 - e. Manufacturer
 - i. Address
 - ii. Phone
 - iii. Representative
 - f. Supplier
 - i. Address
 - ii. Phone
 - iii. Representative
 - g. Local Service Provider
 - i. Address
 - ii. Phone
 - iii. Representative
 - h. Location of Equipment
 - i. Equipment Design Criteria
 - i. HP
 - ii. Flow Rate, etc.
 - j. Performance Data
 - k. Normal Operating Characteristics
 - l. Limiting Conditions
2. Detailed disassembly, overhaul and reassembly, installation, alignment, adjustment and checking instructions.
 3. Detailed operating instructions for start-up, calibration, routine and normal operation, regulation and control, safety, shutdown and emergency conditions. Detailed list of settings for relays, pressure switches, temperature switches, level switches, thermostats, alarms, relief valves, rupture discs, etc.
 4. Detailed preventative maintenance procedures and schedules, including detailed lubrication instructions and schedules, identification of required lubricants and operating fluids (description, specification and trade name of at least two manufacturers), and diagrams illustrating lubrication points.

5. Detailed guide to equipment and/or process “troubleshooting”.
6. Detailed parts lists identified by title, materials of construction, manufacturer's part number, list of recommended spare parts identified as specified above, current cost list for recommended spare parts, predicted life of parts subject to wear, and an exploded or concise cut-away view of each equipment assembly. The manufacturer's part numbers must match those used for the spare parts, documentation, identification, and turn-over. Should no spare parts be required, state in the Table of Contents that “No spare parts are required”.
7. Electrical and instrumentation schematics, including motor control centers, control panels, wiring diagrams, instrument panels and analyzer panels. All panels must have as-built schematics inside them at contract close-out.
8. List of all special tools supplied and description of their use. Special tools include any tool not normally available in an industrial hardware or mill supply house. Should no special tools be required, state in the Table of Contents that “No special tools are required”.
9. List of names and addresses of nearest service centers for parts, overhaul and service.
10. Procedures for storing, handling and disposing of any chemicals or products used with the equipment or system.
11. For equipment and systems, also provide the following:
 - a. Control and wiring diagrams provided by the controls manufacturer.
 - b. Sequence of operations by the controls manufacturer.
 - c. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
12. The supplier's operation and maintenance information will address the particular equipment furnished, with specific details on operation and maintenance practices. General data is not acceptable. Information contained in the manual which is not appropriate to the Project shall be marked out and noted as “N/A”.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

SAMPLE COVER PAGE

COMPLETE PROJECT TITLE

LOCATION OF PROJECT

OPERATING and MAINTENANCE DATA

FOR SUBMITTAL NUMBER (AS LISTED IN PCM)

TITLE OF SUBMITTAL

CONTRACTOR: (Name only Required)

SUPPLIER: (Name only required)

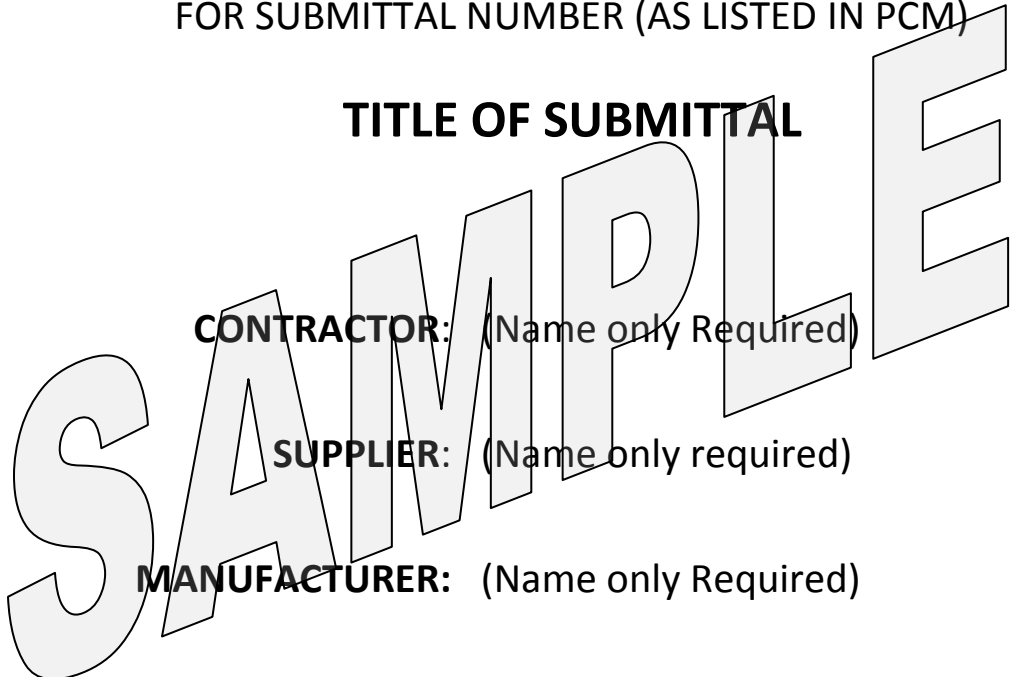
MANUFACTURER: (Name only Required)

SPECIFICATION SECTION:

EQUIPMENT TAG NUMBER:

DRAWING NUMBER:

DATE OF SUBMISSION



SAMPLE TITLE PAGE

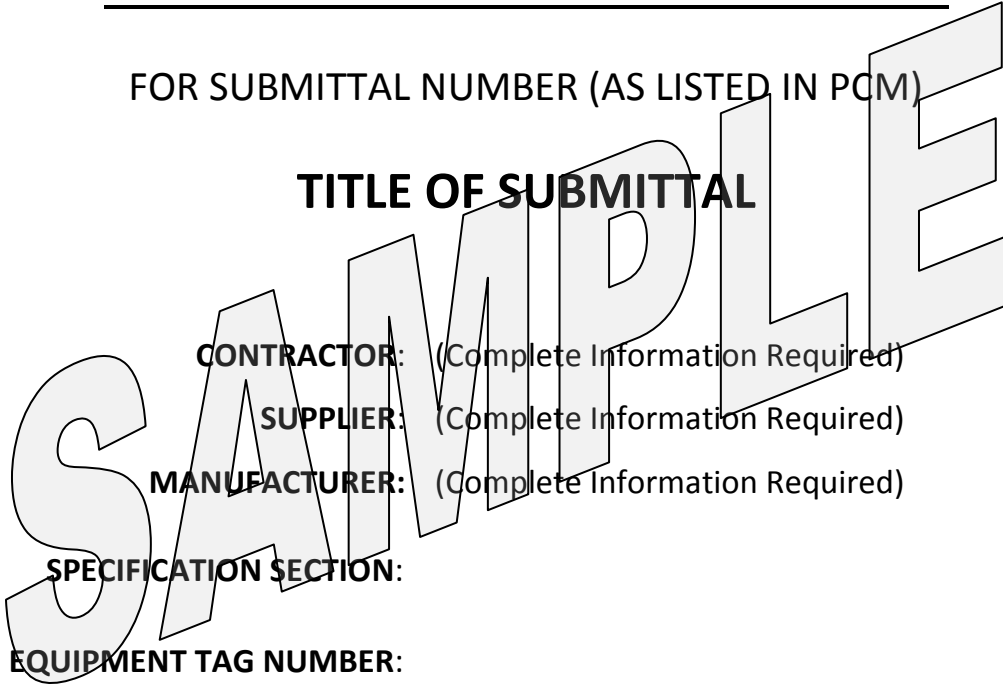
COMPLETE PROJECT TITLE

LOCATION OF PROJECT

OPERATING and MAINTENANCE DATA

FOR SUBMITTAL NUMBER (AS LISTED IN PCM)

TITLE OF SUBMITTAL



CONTRACTOR: (Complete Information Required)

SUPPLIER: (Complete Information Required)

MANUFACTURER: (Complete Information Required)

SPECIFICATION SECTION:

EQUIPMENT TAG NUMBER:

DRAWING NUMBER:

DATE OF SUBMISSION

SAMPLE MANUAL REVIEW CHECK LIST

**FINAL COPIES / PRELIMINARY COPIES
OPERATION AND MAINTENANCE MANUAL CHECK LIST**

PROJECT NUMBER:

PROJECT NAME:

SECTION:

SECTION Requirements

- 1.03 - A ___ 3 ring loose leaf binder with transparent covers on binder and cover
- 1.03 - A ___ Title Page, Table of Contents, Section dividers and List of tables & figures
- 1.03 - B ___ Drawings and figures shall be legible and 11" in the vertical dimension
- 1.03 - C ___ Cover Page including: Date of Submittal & any previous submissions, Project & Manual Title, Names of Contractor, Supplier, Manufacturer, Spec. Section, Equip. Tag Number & Drawing No
- 1.04 - A ___ Title Page: All cover page information & manufacturers and suppliers address, phone & fax number and contact person; manufacturer's equipment name and model number
- 1.04 - B ___ Table of Contents identifying the location of each item listed
- 1.04 - C.1 ___ Provide equipment function, operating char., performance data, limiting cond. and pump curves
- 1.04 - C.2 ___ Detailed: disassembly, overhaul, reassemble, installation, alignment, adjusting & checking Instructions
- 1.04 - C.3 ___ Operating instructions for start up, calibration, normal operation, shutdown, etc.
- 1.04 - C.3 ___ List of settings for relays, pressure switch, temperature switch, level switch and alarms
- 1.04 - C.4 ___ Preventive maintenance procedures and diagrams illustrating lubrication points
- 1.04 - C.5 ___ Troubleshooting Guide
- 1.04 - C.6 ___ Detailed parts list, manufacturer's part number and exploded view
- 1.04 - C.6 ___ List of recommended spare parts and predicted life of parts subject to wear
- 1.04 - C.7 ___ Electrical and instrumentation schematics
- 1.04 - C.8 ___ Special tools list
- 1.04 - C.9 ___ Closest service centers, Contact person name and addresses
- 1.04 - C.10 ___ Procedure for storing, handling and disposing of any chemicals used
- 1.04 - C.11 ___ Equip & Systems provide Control & Wiring Diag., Sequence of Operations, Charts of tag numbers, location & function of each valve
- 1.04 - C.12 ___ Suppliers O&M information will address the particular equipment furnished, with specific details on operation and maintenance practices

Remarks:

END OF SECTION

Part 1 General

1.1 Project Maintenance and Warranty

- A. Maintain and keep in good repair the work covered by these Drawings and Specifications until acceptance by the Owner.
- B. The Contractor shall warrant all work for a period of time as stated in the General Conditions. The Owner will give notice of observed defects with reasonable promptness.
- C. The Contractor shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another Contractor or the Owner, or to perform any work which is normally performed by a maintenance crew during operation.
- D. In the event of multiple failures of major consequences prior to the expiration of the Correction Period described in the General Conditions, the affected unit shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences. All related components which may have been damaged or rendered non-serviceable as a consequence of the failure shall be replaced. A new warranty and Correction Period, as described in the General Conditions, against defective or deficient design, workmanship, and materials shall commence on the day that the item is reassembled and placed back into operation. As used herein, multiple failure shall be interpreted to mean two or more successive failures of the same kind in the same item or failures of the same kind in two or more items. Major failures may include, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts, broken or chipped gear teeth, premature bearing failure, excessive wear or excessive leakage around seals. Failures which are directly and clearly traceable to operator abuse, such as operations in conflict with published operating procedures or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over- or under-lubrication and using maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the one-year warranty. Should multiple failures occur in a given item, all products of the same size and type shall be disassembled, inspected, modified or replaced as necessary and rewarranted for one year from the date of reassembly.
- E. The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of the work performed by the Contractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.
- F. Except as noted on the Drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility not designated for removal, resulting from

Warranties

the Contractor's operations, shall be promptly repaired by the Contractor at no cost to the Owner.

- G. The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for the duration of the Correction Period, as defined in the General Conditions. In the event the repairs and maintenance are not made immediately, and it becomes necessary for the owner of the road to make such repairs, the Contractor shall reimburse the owner of the road for the cost of such repairs.
- H. In the event the Contractor fails to proceed to remedy the defects upon notification within 15 days of the date of such notice, the Owner reserves the right to cause the required materials to be procured and the work to be done, as described in the Drawings and Specifications, and to hold the Contractor and the sureties on Contractor's bond liable for the cost and expense thereof.
- I. Notice to Contractor for repairs and reconstruction will be made in the form of a registered letter addressed to the Contractor at Contractor's home office.
- J. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability within the law of the place of construction.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. The work under this Section includes, but is not necessarily limited to, the compiling, maintaining, recording and submitting of Project record documents as herein specified.
- B. Record documents include, but are not limited to:
 - 1. Drawings;
 - 2. Specifications;
 - 3. Change orders and other modifications to the Contract;
 - 4. Engineer field orders or written instructions, including Requests for Information (RFI) and Clarification Memorandums;
 - 5. Reviewed shop drawings, product data and samples;
 - 6. Test records.
- C. The Contractor shall maintain on the Project site throughout the Contract Time an up to date set of Record Drawings.

1.2 Maintenance of Documents and Samples

- A. Storage
 - 1. Store documents and samples in the Contractor's field office, apart from documents used for construction.
 - 2. Provide files and racks for storage of documents.
 - 3. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with format of these Specifications.
- C. Maintenance
 - 1. Maintain documents in a clean, dry, legible condition and in good order.
 - 2. Do not use record documents for construction purposes.
 - 3. Maintain at the site for the Owner one copy of all record documents.
- D. Make documents and samples available at all times for inspection by Engineer.

Record Documents

- E. Failure to maintain the Record Documents in a satisfactory manner may be cause for withholding of a certificate for payment.

1.3 Quality Assurance

- A. Unless noted otherwise, Record Drawings shall provide dimensions, distances and coordinates to the nearest 0.1 foot.
- B. Unless noted otherwise, Record Drawings shall provide elevations to the nearest 0.01 foot for all pertinent items constructed by the Contractor.

1.4 Recording

- A. Label each document "Project Record" in neat, large printed letters.
- B. Recording
 - 1. Record information concurrently with construction progress.
 - 2. Do not conceal any work until required information is recorded.

1.5 Record Drawings

- A. Record Drawings shall be reproducible, shall have a title block indicating that the drawings are Record Drawings, the name of the company preparing the Record Drawings, and the date the Record Drawings were prepared.
- B. Legibly mark drawings to record actual construction, including:
 - 1. All Construction
 - a. Changes of dimension and detail.
 - b. Changes made by Requests for Information (RFI), field order, clarification memorandums or by change order.
 - c. Details not on original Drawings.
 - 2. Site Improvements, Including Underground Utilities
 - a. Horizontal and vertical locations of all exposed and underground utilities and appurtenances, both new facilities constructed and those utilities encountered, referenced to permanent surface improvements.
 - b. Location of and dimensions of roadways and parking areas, providing dimensions to back of curb when present.

- c. The locations shall be referenced to at least two easily identifiable, permanent landmarks (e.g., power poles, valve markers, etc.) or benchmarks.
3. Structures
 - a. Depths of various elements of foundation in relation to finish first floor datum or top of wall.
 - b. Location of internal and buried utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

1.6 Specifications

- A. Legibly mark each section to record:
 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 2. Changes made by Requests for Information (RFI), field order, clarification memorandums, or by change order.

1.7 Submittal

- A. At contract closeout, deliver Record Documents to the Engineer for the Owner.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
 1. Date.
 2. Project title and number.
 3. Contractor's name and address.
 4. Title and number of each record document.
 5. Signature of Contractor or Contractor's authorized representative.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Summary

- A. Section includes standing-seam metal roof panels.

1.2 Preinstallation Meetings

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 Action Submittals

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.4 Informational Submittals

- A. Product test reports.
- B. Warranties: Sample of special warranties.

1.5 Closeout Submittals

- A. Maintenance data.

1.6 Quality Assurance

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.7 Warranty

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

- B. Special Warranty on 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.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

Part 2 Products

2.1 Performance Requirements

- A. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for steep-slope roof products.
- B. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:
 - 1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
- C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E1680 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft.
- E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
- F. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.

- G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 60.
- H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 Standing-Seam Metal Roof Panels

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
 - 2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.
- B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
 - 1. 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:
 - a. AEP Span; A BlueScope Steel Company.
 - b. Architectural Building Components.
 - c. Architectural Metal Systems.
 - d. MBCI.
 - e. Merchant and Evans.
 - f. VICWEST.

2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Nominal Thickness: 0.028 inch.
 - b. Exterior Finish: Three-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
3. Clips: One-piece fixed to accommodate thermal movement.
 - a. Material: 0.064-inch- nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
 - b. Material: 0.062-inch- thick, stainless-steel sheet.
4. Panel Coverage: 12 inches.
5. Panel Height: 1.0 inch to 1.5 inches.

2.3 Underlayment Materials

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.
 3. 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:
 - a. Carlisle Residential; a division of Carlisle Construction Materials.
 - b. Owens Corning.
- B. Felt Underlayment: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felts.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 Miscellaneous Materials

- A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Gutters and Downspouts: Formed from same material as roof panels according to SMACNA's "Architectural Sheet Metal Manual." Finish to match metal roof panels.
- E. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
 - 2. Joint Sealant: ASTM C920; as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.5 Fabrication

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 Finishes

- A. Panels and Accessories:
 - 1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 - 2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
 - 3. Concealed Finish: White or light-colored acrylic or polyester backer finish.

Part 3 Execution

3.1 Preparation

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.2 Underlayment Installation

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.
1. Apply over the entire roof surface.
 2. Apply over the roof area indicated below:
 - a. Rake edges for a distance of 18 inches.
 - b. Hips and ridges for a distance on each side of 12 inches.
 - c. Roof-to-wall intersections for a distance from wall of 18 inches.

3.3 Metal Panel Installation

- A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with 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 clip, metal roof panel, and factory-applied sealant are completely engaged.
 5. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. 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.

3.4 Cleaning and Protection

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION

Part 1 General

1.1 Section Includes

- A. Clean and prepare joint surfaces.
- B. Sealant and backing materials.

1.2 Submittals

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide data on sealant materials, characteristics and required surface preparation.
- C. Samples: Submit samples of sealant colors.
- D. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques and other applicable requirements.

1.3 Warranty

- A. Provide 5-year warranty under provisions of Section 01 78 36.
- B. Warranty: Replace sealants which fail because of loss of cohesion or adhesion, or do not cure.

Part 2 Products

2.1 Acceptable Manufacturers

- A. Dow Corning.
- B. Sika Corp.
- C. Tremco, Inc.
- D. Substitutions: Under provisions of Section 01 25 00.

2.2 Sealant Materials

- A. Silicone Sealant (Type D): ASTM C920, Grade NS, Class 25, single component, fungus resistant, chemical curing, non-sagging, non-staining, non-bleeding; color as selected; 790 manufactured by Dow Corning.

2.3 Accessories

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Filler: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

Part 3 Execution

3.1 Inspection

- A. Verify joint dimensions, physical, and environmental conditions are acceptable to receive work of this Section.
- B. Beginning of installation means acceptance.

3.2 Preparation

- A. Clean, prepare, and size joints in accordance with manufacturer's instructions. Remove any loose materials and other foreign matter which might impair adhesion of sealant.
- B. Verify that joint shaping materials and release tapes are compatible with sealant.
- C. Examine joint dimensions and size materials to achieve required width/depth ratios.
- D. Use joint filler to achieve required joint depths, to allow sealants to perform properly.
- E. Use bond breaker where required.

3.3 Installation

- A. Perform work in accordance with ASTM C804 for solvent release sealants.
- B. Install sealant in accordance with manufacturer's instructions.
- C. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.
- D. Tool joints concave.
- E. Joints: Free of air pockets, foreign embedded matter, ridges, and sags.

3.4 Schedule

- A. Exterior Wood or Metal: Type D: color selected to match finish color.
- B. Flashing and Sheet Metal: Type D; color as selected to match finish.
- C. Bedding Joints (Sills, thresholds, etc.): Type E; color - clear.
- D. Interior Joints Not Subject to Movement (door and window frames, countertops, etc.): Type A, color - white for paint finish or clear for exposed applications.

END OF SECTION

Part 1 General

1.1 Summary

- A. Section includes hollow-metal work.

1.2 Definitions

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 Action Submittals

- A. Product Data: For each type of product.
- B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

1.4 Informational Submittals

- A. Product test reports.

Part 2 Products

2.1 Manufacturers

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products equal to:
 - 1. Ceco Door; ASSA ABLOY.

2.2 Exterior Hollow-Metal Doors and Frames

- A. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.
 - 1. Physical Performance: Level B according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.

- c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum A40 coating.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Manufacturer's standard insulation material.
3. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
4. Frames:
- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - b. Construction: Knocked Down (in existing walls) and Face welded.
5. Exposed Finish: Factory prime.

2.3 Frame Anchors

A. Jamb Anchors:

- 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, 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.

2.4 Materials

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.

- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).
- I. Glazing: Clear tempered glazing.
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat.

2.5 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 metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 2. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.
- C. Hollow-Metal Frames: 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.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - 3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, 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 one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
- D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 3. Provide loose stops and moldings on inside of hollow-metal work.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.6 Steel Finishes

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: SDI A250.10.

2.7 Accessories

- A. Louvers: Provide sightproof louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
- B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

Part 3 Execution

3.1 Installation

- A. Hollow-Metal Frames: Install hollow-metal frames for doors of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
- C. Glazing: Comply with hollow-metal manufacturer's written instructions.
 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.2 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 Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

Part 1 General

1.1 Summary

- A. Section Includes: Electrically operated overhead coiling doors, operators, controls and accessories.

1.2 References

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3 Performance Requirements

- A. Structural Performance:
 - 1. Wind Loads: Uniform pressure of 20 p.s.f.

1.4 Submittals

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Product Data: Submit manufacturer's product data and installation instructions.
- C. Shop Drawings: Provide drawings indicating guide details, head and jamb conditions, clearances, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.
- D. Quality Assurance Submittals: Submit the following:
 - 1. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.
 - 2. Certificates: Submit installer qualifications.

1.5 Quality Assurance

- A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity and trained and authorized by the door dealer to perform the work of this section.
- B. Pre-installation Meetings: Verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

1.6 Delivery, Storage and Handling

- A. General: Comply with Division 1 Product Requirements.
- B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- D. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.7 Warranty

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under contract documents.

1.8 Manufacturer

- A. Manufacturer:
 - 1. Raynor Door P.O. Box 448, 1101 East River Road, Dixon, IL 61021-0448; Telephone: (800) 472-9667, (815) 288-1431; Fax: (815) 288-7142; E-mail: thegarage@raynor.com; website: www.raynor.com.
 - 2. or approved equals by Overhead Door or Wayne-Dalton.
- B. Manufacturer Product Designation: DURACOIL STANDARD.

1.9 Door Operators

- A. Provide doors designed for electric motor operation.
 - 1. Drive Orientation: For hand-chain, hand-crank or electric motor operated doors, orient the drive from either left-hand or right-hand side when facing the reference side of the door (side with counterbalance or hood exposed).
- B. Manufacturer Product Designation: Raynor ControlHoist Standard with Solid State motor controller (Model Series CHS).
 - 1. Type: Jackshaft with manual chain hoist.
 - 2. Motor Horsepower Rating: Continuous 1/2 HP.
 - 3. Electrical Requirements: 115-volt single phase.
 - 4. Duty Cycle: 30 cycles/hour.
 - 5. Control Wiring: Three button momentary contact "open-close-stop". Solid State motor controller 24-volt control with provisions to select up to 6 standard wiring types plus delay on reverse, mid stop, maximum run timer, and door lock feature.
 - 6. Model Number: CSH-211.
 - 7. Provide Monitored Photo Eyes to comply with UL325.

1.10 Curtain

- A. Material: Interlocking steel slats, 22-gauge (0.030 inch minimum thickness), roll-formed from commercial quality hot-dipped galvanized (G-90) steel in compliance with ASTM A-653. Slat Type: Insulated Flat Slat with back cover.
 - 1. Insulation: Polyisocyanurate with R-value 6.24 and U-value 0.160.
 - a. Back Covers: Galvanized steel, 24 gauge (0.023 inch) minimum thickness.
- B. Mounting: Face Mounting: fasten to face of wall on each side of door opening.
- C. Endlocks: Lateral movement of the slats to be contained by means of zinc-plated malleable endlocks fastened with two zinc-plated steel rivets.
- D. Bottom Bar and Seal: Two roll-formed galvanized steel angles, minimum 1-1/2 inches by 1-1/2 inches by 1/8 inch (38.1 mm x 38.1 mm x 3.2 mm) with single-contact type bottom astragal. Structural angle bottom bar to receive one coat of rust-inhibitive primer.
- E. Vision Panels: None.

1.11 Guides

- A. Guide Assemblies: To consist of three structural steel angles, minimum 3 inches by 2 inches by 3/16 inch and fitted with removable curtain stops. Steel guides to be provided with one coat of rust-inhibitive primer.
- B. Jamb Construction: Steel Jambs with self-tapping fasteners.
- C. Weather Seal: Snap-on vinyl seal.

1.12 Counterbalance System

- A. Headplates: 3/16 inch steel plate, attached to wall angle of guide assembly with 1/2 inch diameter class 5 case hardened bolts. Inside of drive bracket fitted with sealed ball bearing. Provide head plates with one coat of rust-inhibitive primer.
- B. Barrel: Minimum 4-1/2 inches O.D. and 0.120 inch wall thickness structural steel pipe. Deflection of pipe under full load shall not exceed 0.03 inch per foot of span.
- C. Counterbalance: Provide torsion counterbalance mechanism as follows: Oil-tempered, helical torsion springs, grease packed and mounted on a continuous steel torsion shaft.

1.13 Enclosures

- A. Hood: Round Hood: 24-gauge steel, finish-painted to match curtain.
- B. Hood Baffle: With EPDM rubber seal to inhibit air infiltration through hood cavity.

Part 2 Execution

2.1 Manufacturer's Instructions

- A. Comply with instructions and recommendations of door manufacturer.

2.2 Acceptable Installers

- A. Only factory trained installers will be accepted and must be full time employees of the door dealer who supplies material for the project.

2.3 Examination

- A. Site Verification of Conditions: Verify through direct observation and field measurement that site conditions are acceptable for installation of doors, operators, controls and accessories. Ensure that openings square, flush and plumb.
- B. Do not proceed with installation of doors, operators, controls and accessories until unacceptable conditions are corrected.

2.4 Installation

- A. General: Install door, guide and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.
- B. Related Products Installation: Refer to Related Sections paragraph for related products installation.

2.5 Adjusting

- A. General: Lubricate bearings and sliding parts and adjust doors for proper operation, balance, clearance and similar requirements.

2.6 Cleaning

- A. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.
- B. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.

END OF SECTION

Part 1 General

1.1 Scope

- A. Work specified in this section is subject to the provisions of Division 01.
- B. Furnish and install air outlets and inlets of the size, type, capacity, and characteristics described within the Contract Documents.

1.2 References

- A. This Specification references the latest edition of the publications listed below. Work shall be performed, and materials shall be furnished in accordance with these publications as referenced herein:
 - 1. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) Standards
 - HVAC Duct Construction Standards
 - 2. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standards
 - ASHRAE 70 Methods of Testing for Rating the Performance of Outlets and Inlets
 - 3. Air Conditioning and Refrigeration Institute (ARI) Standards
 - ARI 650 Air Outlets and Inlets
 - 4. National Fire Protection Association (NFPA) Standards
 - NFPA 90A Installation of Air Conditioning and Ventilating Systems
 - 5. Air Movement and Control Associations (AMCA) Standards
 - AMCA 500 Test Method for Louvers, Dampers, and Shutters
 - 6. Air Diffusion Council (ADC) Standards
 - ADC 1062: GRD Test Code for Grilles, Registers, and Diffusers
 - 7. American Society for Testing and Materials (ASTM Standards)
 - ASTM E 90 Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions

1.3 Submittals

- A. Submit shop drawings and product data in accordance with the provisions of Sections 01 33 00 and 01 78 39.
- B. Submit product data on all air inlets and outlets including actuators proposed for installation under this section.
- C. Submit charts for color selection.
- D. Submit sound attenuation data for acoustical products and sound power data for all outlets.
- E. Submit airflow versus pressure drop performance data.
- F. Submit louver schedule indicating type and sizes to suit field verified wall openings.

Part 2 Products

2.1 Combination Louvers

- A. Drainable Blade Combination Louvers.
 - 1. Frame shall be welded, box style with downspouts in jambs and mullions and extruded from 6063T5 aluminum.
 - 2. Frame depth shall be 6-inches.
 - 3. Frame minimum thickness shall be 0.081-inch.
 - 4. Stationary blade minimum thickness shall be 0.081-inch.
 - 5. Adjustable blade minimum thickness shall be 0.081-inch.
 - 6. Adjustable blade edge seal shall be vinyl.
 - 7. Adjustable blade pivot bearing shall be Nylon.
 - 8. Stationary blades shall have drain gutters.
 - 9. Provide with 0.081-inch thick extended sill.
 - 10. Provide with continuous appearing stationary blades.
 - 11. Provide with Kynar 500 finish on all exposed surfaces, color selected by the Engineer during shop drawing review.

12. Provide with aluminum insect or bird screen, mounted on interior side of louver, as indicated on the Louver Schedule on the Drawings.
13. Provide 120v/1ph actuator.
14. Louver air flow performance shall be AMCA certified. See the Louver Schedule on the Drawings for louver air flow performance.
15. Acceptable Manufacturers: Equal to Greenheck Model EAD-635.

Part 3 Execution

3.1 Louvers

- A. Louvers shall be installed according to the manufacturer's recommendations and shall be caulked and sealed at the frame and flanges to make the installation weathertight. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.
- B. Combination louver dampers shall be installed with required damper operators and linkage mechanisms (furnished by louver/damper manufacturer) and shall be field adjusted for full opening/closure stroke. Louvers shall be interlocked with exhaust fans as scheduled on the Drawings and as described in Division 23.
- C. Clean louver surfaces in accordance with manufacturer's instructions.
- D. Repair minor damaged surfaces as directed by the Engineer.

END OF SECTION

Part 1 General

1.1 Work Included

- A. Surface preparation.
- B. Field application of paints and other coatings.
- C. Materials for back-priming woodwork.
- D. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory - finished and unless otherwise indicated, including the following:
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Mechanical and Electrical:
 - a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
- E. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne, and lead items.
 - 6. Floors, unless specifically so indicated.
 - 7. Glass.
 - 8. Concealed pipes, ducts, and conduits.
 - 9. Operating parts or machined surfaces.
 - 10. Exterior face of split-face CMU.

1.2 Environmental Conditions

- A. Coatings shall be applied during good painting weather. Air and surface temperatures shall be within limits prescribed by the manufacturer for the coating being applied and work areas shall be reasonably free of airborne dust at the time of application and while coating is drying.

1.3 Environmental Regulations

- A. All materials provided shall meet the current VOC Regulations in effect for the project site.

1.4 Definitions

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.5 Submittals

- A. See Section 01 33 00 – Submittal Procedures for submittal procedures.
- B. Product Data: Provide data on all finishing products, including VOC content.
- C. Samples: Submit two paper chip samples, 3"x5" inch (76.2 x127 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Paint and Coatings: 1 gallon (4 L) of each color; store where directed.
 - 2. Label each container with color in addition to the manufacturer's label.

1.6 Quality Assurance

- A. Required Standards: Coatings subcontractor shall have and maintain on-site during all coating operations the proper industrial standards for use by the Owner or Owner's representative. Industrial standards to be maintained on-site include:
 - 1. SSPC (Structural Steel Painting Council) Steel Structures Painting Manual, Volume 1.
 - 2. SSPC-VIS-1 - Pictorial Surface Preparation Standards for Painting Steel Surfaces.

- B. Required Inspection Tools: Coatings subcontractor shall have and maintain on-site during all coating operations the proper industrial paint inspection tools for use by the Owner or Owner's representative. Inspection tools to be maintained on-site shall include, as appropriate:
1. Sling psychrometer kit.
 2. Testex tape kit.
 3. Zahn Cups Nos. 2, 3, 4 and 5 with a thermometer for air spray paint.
 4. Nordsen Mikrotest or equal wet mil gauge.
 5. National Bureau of Standard Calibration Chips.
 6. Took Gauge.
 7. Elcometer 10612 Pull Off Adhesion gauge with aluminum dollies and epoxy glue.
- C. Contractor shall obtain, from the supplier/manufacturer, material safety data sheets (MSDS) for all products, as well as any other special handling, application and cleanup precautions or recommendations. Contractor shall be responsible to follow these safety recommendations and precautions.
- D. Single Source Responsibility: Provide primers and other undercoat paint produced by the same manufacturer as finish coats. Use only thinner approved by paint manufacturer and use only within recommended limits.
- E. NSF Approval: All coating materials in contact with potable water shall comply with ANSI/NSF Standards 61, latest revision.
- F. Lead Prohibition: Lead will not be allowed in any coating material.

1.7 Qualifications

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years' experience in utility applications. The paints and paint products mentioned in the following specifications are set up as standards of quality. No request for substitution will be considered which decreases the film thickness and/or the number of coats to be applied, or which offers a change from the generic type of coating specified.
- B. Applicator: Company specializing in performing the work of this section with minimum five years' experience and a minimum five similar sized projects as references including Owner contact information, job size and type and materials used.

1.8 Delivery, Storage, and Handling

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.9 Field Conditions

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

1.10 Coordination

- A. Coordinate work under provisions of Division 1.
- B. Coordination of Work: review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

Part 2 Products

2.1 Materials

- A. All materials specified herein shall be as manufactured by:
 - 1. TNEMEC Co., Inc., North Kansas City, Missouri.
 - 2. Carboline, St. Louis, Missouri.
 - 3. Induron, Birmingham, Alabama.
 - 4. The Sherwin-Williams Company, Cleveland, Ohio.
 - 5. These products are specified to establish standards of quality and are approved for use on this project.

- B. Colors, where not specified, shall be as selected by the A/E from the paint manufacturer's color chart. All colors shall be certified lead free.
 - 1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
 - 2. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.2 Paints and Coatings - General

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each coating material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content: Provide coatings that comply with the most stringent requirements specified in the following:
 - 1. Local or state regulations.
 - 2. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 3. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

Part 3 Execution

3.1 Examination

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 2. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 Preparation

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri- sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- G. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

3.3 Materials Preparation

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain containers used in mixing and application of paint in a clean condition free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.4 Application

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Provide finish coats which are compatible with prime paints used.
 - 2. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until a paint film is of uniform finish.
 - 3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
 - 4. Paint interior surfaces of ducts, where visible through registers or grilles with flat, non-specular black paint.
 - 5. Paint back sides across panels, and removable or hinged covers to match exposed surfaces.
 - 6. Finish doors on tops, bottoms, and side edges same as faces.
 - 7. Sand lightly between each succeeding coat.
 - 8. No paint shall be applied when the air or surface temperature, as measured in the shade, is above or below that which is recommended by the manufacturer.
 - 9. Paint shall not be applied to wet or damp surfaces, and shall not be applied in rain, snow, fog, mist or when the surface temperature will be less than 5°F above the dew point.
 - 10. No paint shall be applied when the air or surface temperature will drop below the manufacturer's recommendation within eight hours after the application of the paint. Dew or moisture condensations should be anticipated, and if such conditions are prevalent, painting shall be delayed until it is certain that the surfaces are dry; further, the day's painting shall be completed well in advance of the probable time of day when the moisture condensation will occur, in order to permit the film the required drying time as specified by the manufacturer prior to the formation of moisture.

11. Care must be exercised that the coatings are not applied in too heavy a coat above that recommended by the manufacturer and that adequate drying time is permitted between the coats to assure the proper release of solvents.
 12. Mixing, thinning, pot life, application procedure, equipment, coverage, curing, re-coating, storage and number of coats shall be in accordance with coating manufacturer's instructions.
 13. Avoid degradation and contamination of blasted surfaces and avoid between coat contamination. Surfaces contaminated shall be cleaned before applying next coat. Method of cleaning contaminated surface shall be approved by the Owner or Owner's representative.
 14. Each application of material shall be worked into corners, crevices, joints, etc., and distributed evenly over flat surfaces. Spraying techniques that result in uniform wet pattern shall be used and dry spraying should be avoided. Dry spray shall be removed prior to coating being applied.
 15. All bolts, welds, sharp edges, and difficult access areas shall receive a primer brush coat or spray coat prior to primer spray application.
- B. Scheduling Painting: Apply first coat material to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration. Allow sufficient time between successive coating to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended by the coating manufacturer.
- D. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others. Re-coat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- F. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes or other surface imperfections.
- G. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

- H. Workmanship: Workmanship shall be of first class quality. Finish painting shall show no drips, runs, sags, holidays or other defects. The finish coat shall be free from noticeable laps or brush marks. Paint during application shall be continuously stirred and no thinner shall be added after the paint has been mixed. Paint shall be thoroughly worked into all joints, corners, and well brushed out over all surfaces. Should any coat of paint be judged as unsatisfactory, the Contractor shall remove the coat(s) as necessary and repaint at no additional cost to the Owner.

3.5 Clean-Up and Protection

- A. Damaged Coatings: Damaged coatings, pinholes, and holidays shall have edges feathered and repaired in accordance with the recommendations of the manufacturer, as approved by the Owner.
- B. All finish coats, including touch up and damage repair coats, shall be applied in a manner which will present a uniform texture and color match appearance.
- C. Unsatisfactory Application: If the item has an improper finish, color or insufficient film thickness, the surface shall be cleaned and top-coated with the specified material to obtain the specified color and coverage. Specific surface preparation information to be secured from the coatings manufacturer and the Owner.
1. All visible areas of chipped, peeled, or abraded paint shall be hand or power-sanded, feathering the edges. The areas shall then be primed, and finish coated in accordance with the specifications.
 2. Work shall be free of runs, bridges, shiners, laps or other imperfections. Evidence of these conditions shall be cause for rejection.
 3. Any defects in the coating system shall be repaired by the Contractor per written recommendations of the coating manufacturer.
- D. Guarantee and Anniversary Inspection
1. All work shall be warranted for a period of one year from date of acceptance of the project.
 2. The Owner will notify the Contractor at least 30 days prior to the anniversary date and shall establish a date for the inspection. Any defects in the coating system shall be repaired by the Contractor at no additional cost to the Owner. Should a failure occur to 25% or more of the painted surface, either interior or exterior, the entire surface shall be cleaned and painted in accordance with these specifications.
- E. Clean Up
1. All cloths and waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, all staging, scaffolding, and containers shall be removed from the site and/or destroyed in an approved and legal manner. Paint spots, oil or

stains upon adjacent surfaces and floors shall be completely removed, and the entire job left clean and acceptable to the Owner.

3.6 Painting Schedule

A. General:

1. Surfaces not to be Painted:
 - a. Exterior split-face of block.
 - b. Prefinished ceiling coverings.
 - c. Prefinished floor coverings.
 - d. Items with factory applied final finish.
 - e. Concealed ducts, pipes, and conduit.
 - f. Aluminum, except at wall expansion joints.
 - g. Prefinished equipment items.
 - h. Gaskets and expansion joints in piping system.
2. Shop primer on materials and products is not considered as primer coat under the painting schedule.

B. Painting Schedule

Exposures	Surfaces	System Schedules				
		Concrete & Concrete Block Substrate	Non-Ferrous Metals Substrate	Ferrous Metals Substrate	Wood Substrate	Other Substrate
Interior	Floors	134F-1	-	-	-	-
	Building Surfaces**	134	110	144	221	Drywall 160
	Equipment*	-	110 or 117	144	-	Galvanized 154-
	Piping*	-	117	144	-	-
	Cloth Cover for Insulation					160

Exterior Above Grade	Building Surfaces**	230	217	247	221	-
	Equipment*	-	217	247	-	-
	Piping*	-		247	-	-
	Cloth Cover for Insulation					160
Exterior Below Grade	Building Surfaces	134	217	247	-	-
	Piping*	-	217	247	-	-
Submerged Water	Piping*	-		344W	-	-
	Equipment*	-		344W	-	-
Submerged Wastewater	Piping*			544		
	Equipment*			544		
Corrosive Areas	Immersed Surfaces	634A		644		
	Building Surfaces	634A		644		
	Equipment			644		
	Digester Roofs	634H		644		
	Piping			644		
	Secondary Containment – Hypochlorite	637A				
	Secondary Containment – Other	637				
Headspace with High H ₂ S	Building Surfaces	634H		644H		
	Piping			644H		

* See coating, lining, and/or painting paragraphs in individual piping or equipment Specification Sections.

** See finish schedule for where each type shall be used.

C. Schedule Numbering Guide

First Number - Exposure		Second Number - Substrate		Third Number - Coating Type		Final Letter	
1	Interior and Weather Protected	1	Non-Ferrous Metals	1	Alkyd	S	Sewage
2	Exterior Weather Exposure	2	Wood	2	Asphaltic	W	Potable Water
3	Submerged in Potable Water but Protected from Sunlight	3	Concrete, Concrete Block, Masonry	4	Epoxy	F	Floors
4	Submerged in Potable Water and Exposed to Sunlight	4	Ferrous Metals	5	Vinyl	C	Severe Chemical Exposure
5	Submerged in Wastewater	5	Galvanized Ferrous Metals	6	Coal Tar	H	Headspace with High H ₂ S
6	Corrosive Areas	6	Drywall	7	Polyurethane		
		7	PVC Pipe	8	Acrylic		
		8	Fiberglass Reinforced Plastic	9	Zinc		
				0	Latex		

D. Project Specific Paint Schedule

Schedule below is for clarification only and shall not reduce the requirements stated previously in this Specification or the Contract.

Area	Location/Substrate	Paint System
36	Lower Level – Containment Area – Floor and 12" Up walls	634A
36	Walls – Entire Building	134
36	Upper Level - Floor	134F-1

E. Material Schedules

System: 110		Surface Preparation: SSPC-SP6				
Type: Acrylic Latex						
Use: Interior Ferrous/Non-Ferrous Metals						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	3.0-4.0	Carbocyclic 3359 DTM	Series 115	Aquanaut Acrylic Tan Primer	DTM B66 Series	Pitt-Tech 90-712
2nd	3.0-4.0	Carbocyclic 3359 DTM	Series 1028/1029	Aquanaut II	DTM B66 Series	Pitt-Tech 90-474
System	6.0-8.0					

Paint

System: 134 Type: Amidoamine or Polyamide Epoxy Use: Interior Concrete and Masonry		Surface Preparation: SSPC-SP13				
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	60-80 SF/Gal.	Carboguard 501	Series 130 Envirofill	Polyfill Block Filler	Kem Cati-Coat HS Epoxy Filler	Amerlock 400 BF
2nd	4.0	Carboguard 890	Series N69 Hi-Build Epoxoline II	Armorguard Epoxy	Macropoxy 646 FC Epoxy	Amerlock 2/400
3rd	4.0	Carboguard 890	Series N69 Hi-Build Epoxoline II	Armourguard Epoxy	Macropoxy 646 FC Epoxy	Amerlock 2/400
System	8.0					

System: 134F-1 Type: Epoxy Use: Interior Concrete Floors		Surface Preparation: SSPC-SP13			
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Sherwin Williams	Stonhard
1 st	6.0-10.0	Flowprime900	Series 238 Primer	Corobond 100	Standard Primer
2nd	100-105	Flowquartz 920 with Broadcast	Series 238 with Broadcast	Corobond 100	Stonshield with Broadcast
3rd	8.0-10.0	Flowquartz 920	Series 284 Clear	Cor-Cote HP	Stonshield sealer
System	125				

System: 134F-2 Type: Epoxy Use: Interior Concrete Floors		Surface Preparation: SSPC-SP13			
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Sherwin Williams	Stonhard
1 st	6.0-10.0	Flowprime900	Series 238 Primer	3579	Standard Primer
2nd	230-236	Flowtex942TG	Series 238	TPM115	Stonclad GS
3rd	8.0-10.0	Flowtex Grout Coat	Series 280 TnemeGlaze	3505	Stonkote GS-4
System	250				

System: 144		Surface Preparation: SP-10				
Type: Polyamide Epoxy						
Use: Interior Ferrous Metal						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	3.0 – 5.0	Carboguard 893 SG	Series 66-1211 Epoxoline Primer	Armorguard P-14 Primer	Macropoxy 646 FC Epoxy	Amerlock 2/400
2nd	4.0 – 6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline II	Armorguard Epoxy	Macropoxy 646 FC Epoxy	Amerlock 2/400
3rd	4.0 – 6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline II	Armorguard Epoxy	Macropoxy 646 FC Epoxy	Amerlock 2/400
System	12.0					

Paint

System: 147 Type: Polyurethane Use: Interior Ferrous Metal		Surface Preparation: SP-10				
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	3.0	Carboguard 893 SG	Series 66-1211 Epoxoline Primer	Armorguard P-14 Primer	Macropoxy 646 FC Epoxy	Amerlock 2/400
2nd	4.0 – 6.0	Carboguard 893 SG	Series N69-Color Hi-Build Epoxoline II	Armorguard Epoxy	Macropoxy 646 FC Epoxy	Amerlock 2/400
3rd	2.0 - 4.0	Carbothane 134 HG	Series 1074-Color Endura-Shield	Indurethane 5500 Enamel	Sherthane 2K Urethane	Amercoat 450H
System	10.0					

System: 154		Surface Preparation: SP-1 With Manufacturer's Recommended Pre-Treatment				
Type: Amidoamine or Polyamide Epoxy						
Use: Galvanized Metals						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	3.0-3.5	Pretreat Using Galvaseal WB	Series 27 Typoxy	Pretreat using Vinyl Wash Primer PE-70	Macropoxy 646 FC Epoxy	Pitt-Guard 97-145
2nd	3.0	Carboguard 561	Series N69	Induraguard SG	Macropoxy 646 FC Epoxy	Pitt-Guard 97-145
System	6.0					

Paint

System: 160 Type: Acrylic Latex Use: Interior Drywall		Surface Preparation: Clean and Dry				
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	As recommended by Manufacturer	Sanitile 100	Series 130	AC-220	Block Filler B42KW00046 Heavy Duty Acrylic Block Filler	PittGlaze Acrylic Block Filler 90-712
2nd	2.0 – 3.0	Carbocrylic 120	Series 6 Tneme-Cryl	AC-210 Acrylic Primer	DTM B66 Series	PittTech DTM Acrylic Primer 90-712
3rd	2.0-3.0	Carbocrylic 3359	Series 6 Tneme-Cryl	AC-230 or AC-240	DTM B66 Series	PittTech DTM Acrylic Satin 90-474
System	4.0-6.0					

System: 168		Surface Preparation: Clean & Dry				
Type: Acrylic Epoxy						
Use: Interior Drywall						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	1.0	Sanitile 120	51-792 PVA Sealer	AC-303	Prep Rite 200 Interior Latex Primer	Speed Hide 6-2
2nd	2.0 – 4.0	Carbocrylic 255	Series 113-Color H.B. Tneme-Tufcoat	AC-303	Waterbased Catalyzed Epoxy	Aquapon WB 98-1
3rd	2.0 - 4.0	Carbocrylic 255	Series 113-Color H.B. Tneme-Tufcoat		Waterbased Catalyzed Epoxy	Aquapon WB 98-1
System	5.0					

Paint

System: 217 Type: Epoxy-Polyurethane Use: Exterior Non-ferrous Metal		Surface Preparation: SSPC SP6				
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	2.5-3.0	Carbocrylic 120	Series 27	Induraguard SG Epoxy	Macropoxy 646 Epoxy	Amerlock 2/400
2nd	4.0-5.0	Carboguard 890	Series N69-Color Epoxoline II	Induraguard SG Epoxy	Macropoxy 646 Epoxy	Amerlock 2/400
3rd	2.5-3.0	Carbothane 133 HB	Series 1073	Indurathane 6000 PlusI	Hi-Solids Polyurethane, B65-300	Amercoat 450H
System	9.0-11.0					

System: 221		Surface Preparation: As Specified for Wood				
Type: Alkyd						
Use: Exterior Wood						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	2.0	Sanitile 120	Series 36-603 Undercoater	AC301	A-100 Alkyd Primer	Multi-Prime 97-680
2nd	1.5 – 2.0	Carbocoat 8225	Series 23-Color Enduratone	Armorlux 2500 Enamel	Industrial Enamel B-54	7 Line Series
3rd	1.5 – 2.0	Carbocoat 8225	Series 23-Color Enduratone	Armorlux 2500 Enamel	Industrial Enamel B-54	7 Line Series
System	5.0					

Paint

System: 230 Type: Acrylic Latex Use: Exterior CMU or Concrete		Surface Preparation: SSPC SP13				
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	As recommended by manufacturer	Sanitile 600	Series 218	AC220/AC210	CementPlex 875	Pitt-Glaze Acrylic Block Filler 16-90
2nd	2.0 – 3.0	Carbocrylic 120	Series 6	AC230,or AC240 or Aquanaut II	DTM B66 Series	PittTech DTM Acrylic Satin 90-474
3rd	2.0 – 3.0	Carbocrylic 3359	Series 1028/1029	AC230,or AC240 or Aquanaut II	DTM B66 Series	PittTech DTM Acrylic Satin 90-474
System						

System: 234		Surface Preparation: CC-3				
Type: Epoxy		Note: Concrete shall be at least 28 days old before any of these coatings are applied.				
Use: Exterior Concrete and Masonry						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	60-80 SF/Gal.	Sanitile 100	Series 130 Envirofill	AC-220	Loxon Primer	Perma-Crete LTC Primer
2nd	8.0	Flexide Elastomer	Series 156 Enviro-Crete	AC-403	Loxon Masonry Coating	Perma-Crete 4-22
3rd	8.0	Flexide Elastomer	Series 156 Enviro-Crete	AC-403	Loxon Masonry Coating	Perma-Crete 4-22
System	16.0					

Paint

System: 238		Surface Preparation: SSPC SP13			
Type: Acrylic		Note: Concrete shall be at least 28 days old before any of these coatings are applied.			
Use: Exterior Concrete and Masonry					
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	PPG	Sherwin Williams
1st	4.0	Carbocrete Sealer WB	Conformal Stain	Amercoat 220	H&C Acrylic Concrete Stain
2nd	4.0	Carbocrete Sealer WB	Conformal Stain	Amercoat 220	H&C Acrylic Concrete Stain
System	8.0				

System: 245		Surface Preparation: SP-5				
Type: Vinyl Ester						
Use: Ferrous Metal						
Coat	Minimum Dry Film Thickness (Mils)	Tnemec	Sauereisen	Carboline	Sherwin Williams	PPG
1 st	12.0 – 18.0	Series 120-5002 Vinester Beige Primer	Fibercrete	Plasite 4007 Off-White	Magnalux 304 FF Flake Filled Vinyl Ester	Polyspec PE-310
2 nd	12.0 – 18.0	Series 120-5001 Vinester Gray Finish	Fibercrete	Plasite 4007 Gray	Magnalux 304 FF Flake Filled Vinyl Ester	Polyspec VE-8303
System	24.0					

Paint

System: 247		Surface Preparation: SP-10				
Type: Zinc-Epoxy-Polyurethane						
Use: Exterior Ferrous Metal						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	3.0-3.5	Carbozinc 859	Series 90-97	Indurazinc MC67	Zinc-Clad IV or Zinc-Clad III	Amerlock 2/400
2nd	6.0-7.0	Carboguard 890	Series N69-Color Epoxoline II	Induraguard SG Epoxy	Macropoxy 646 B58-600 Epoxy	Amerlock 2/400
3rd	2.5-3.0	Carbothane 133 HB	Series 1073	Indurathane 6000 PlusI	Hi-Solids Polyurethane, B65-300	Amercoat 450H
System	11.5-16.5					

System: 257		Surface Preparation: SP-6				
Type: Epoxy Polyurethane						
Use: Exterior Non-Ferrous Metals						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1 st	2.5-3.0	Carbocyclic 120	Series 27 Typoxy	Induraguard SG Epoxy	Macropoxy 646 FC Epoxy	Pittguard 97-145
2 nd	4.0-5.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline II	Induraguard SG Epoxy	Macropoxy 646 FC Epoxy	Pittguard 97-145
3 rd	2.5-3.0	Carbothane 133	Series 1074-Color Endura-Shield IV	Indurathane 6600 Plus	Hi-Solids Polyurethane, B65-300	Pitthane Ultra 95-812
System	9.0-11.0					

Paint

System: 444 Surface Preparation: SP-10						
Type: Epoxy						
Use: Submerged Ferrous Metal						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	4.0 - 6.0	Carboguard 890/890 LT	Series N69-Color Hi-Build Epoxoline I	PE-54 Epoxy	Macropoxy 646 FC Epoxy	Amerlock 2/400
2nd	4.0 - 6.0	Carboguard 890/890 LT	Series N69-Color Hi-Build Epoxoline II	PE-54 Epoxy	Macropoxy 646 FC Epoxy	Amerlock 2/400
3 rd	4.0 – 6.0	Carboguard 890/890 LT	Series N69-Color Hi-Build Epoxoline II	PE-54 Epoxy	Macropoxy 646 FC Epoxy	Amerlock 2/400
System	12.0					

System: 542 Type: Asphaltic Use: Below Grade Piping						
Surface Preparation: SP-2 or SP-3						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	8.0 – 12.0	Bitumastic 300 M	46-465 H.B. Tnemecol	Ruff Stuff 2100	Targuard	Amercoat 78 HB
2nd	As Needed					
System	10.0					

Paint

System: 544		Surface Preparation: SP-10				
Type: Epoxy						
Use: Submerged Ferrous Metal						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	4.0 - 6.0	Carboguard 888	Series N69-Color Hi-Build Epoxoline II	PE-70	Macropoxy 646 B58-600	Amercoat 240
2nd	4.0 - 6.0	Carboguard 561	Series 69-Color Hi-Build Epoxoline II	Induraguard SG Epoxy	Macropoxy 646 B58-600	Amercoat 240
System	12.0					

System: 634H Type: Amine Cured Epoxy Use: Concrete and Masonry – Corrosive Environment		Surface Preparation: SSPC SP13				
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	As recommended by manufacturer.	Sanitile 600/600 TG	Series 218 Mortar Clad 434 Derma-Shield	Aquatopoxy	N/A	Amercoat 100 A
2nd	20.0-25.0	Sanitile 655	Series 435 Perma-Glaze	Permasafe 100 Epoxy	Cor-Cote SC	Novaguard 840
3rd	20.0-25.0	Sanitile 655	Series 435 Perma-Glaze	Permasafe 100 Epoxy	Cor-Cote SC	Novaguard 840
System						

Paint

System: 634A Type: Cycloaliphatic Amine Epoxy Use: Concrete and Masonry – Corrosive Environment						
Surface Preparation: SSPC SP13						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	As recommended by manufacturer.	Sanitile 600/600 TG	Series 218 Mortar Clad	Aquatopoxy	Cementplex 875	Pitt-Glaze 16-90
2nd	6.0	Carboguard 890	Series 104	Permasafe 100 Epoxy	Duraplate 235 B67-235	97-160
3rd	6.0	Carboguard 890	Series 104		Duraplate 235 B67-235	97-160
System						

System: 637		Surface Preparation: SSPC SP13				
Type: Flexible Polyurethane						
Use: Concrete and Masonry – Corrosive Environment						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	.Per Manufacturer's Recommendation	Sanitile 600/600 TG Phenoline 311	Series 218 Mortar Clad Series 201	N/A	Centec Silate MSM	Amercoat 370
2nd	20.0-25.0	Polibrid 705	Series 406	N/A	Envirolastic LT	Amerthane 490
3rd	20.0-25.0	Polibrid 705	Series 406	N/A	Sherflex Elastomer Polyurethane	Amerthane 490
System						

Paint

System: 637A Type: Polyurea Lining Use: Concrete and Masonry – Corrosive Environment						
Surface Preparation: SSPC SP13						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	Per Manufacturer's Recommendation.	Sanitile 600/600 TG	Series 218 Mortar Clad		TPM 700	Amerlock Sealer
2nd	5.0	Phenoline 311	Series 201		Corrobond 100	Amerthane 490
3rd	40-50	Polyclad 707	Series 400		Envirolastic AR425	
System						

System: 644		Surface Preparation: SP-10				
Type: Cycloaliphatic Epoxy						
Use: Corrosive Environment Ferrous Metal						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st	3.0 – 5.0	Carbozinc 859	Series 90-97 Tneme-Zinc	Indurazinc MC67	Zinc Clad IV or III	Amercoat 68 MCZ
2nd	6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline II	Ceramasafe 90 @ 15-20 mils	Dura Plate 235 B67-235	Amercoat 235
3rd	6.0	Carboguard 890	Series N69-Color Hi-Build Epoxoline II	Ceramasafe 90 @ 15-20 mils	Dura Plate 235 B67-235	Amercoat 235
System	15.0-17.0					

Paint

System: 644H		Surface Preparation: SP-10				
Type: Epoxy						
Use: Corrosive Environment Ferrous Metal						
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Tnemec	Induron	Sherwin Williams	PPG
1st						Amercoat 100A
2 nd	20-25	Plasite 4500S	Series 435 Perma-Glaze	Permasafe 100	Cor Cote SC	Novaguard 840
3rd	20-25	Plasite 4500S	Series 435 Perma-Glaze	Permasafe 100	Cor Cote SC	Novaguard 840
System	40-50					

END OF SECTION

Part 1 General

1.1 Scope

- A. All work specified in this section shall comply with the provisions of Division 23.
- B. Furnish and install all refrigerant piping, fittings, valves and accessories for heating, ventilating and air conditioning systems.

1.2 References

- A. The latest edition of the publications listed below are included as part of these Contract Documents:
 - 1. International Mechanical Code
 - 2. American Society for Testing and Materials (ASTM)
 - ASTM B 280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
 - ASTM B 88 Seamless Copper Water Tube
 - 3. Air Conditioning and Refrigeration Institute (ARI)
 - ANSI/ARI 710 Liquid-Line Driers
 - ANSI/ARI 720 Refrigerant Access Valves and Hose Connectors
 - ANSI/ARI 730 Flow-Capacity Rating and Application of Suction-Line Filters and Filter-Driers
 - ANSI/ARI 750 Thermostatic Refrigerant Expansion Valves
 - 4. American Welding Society (AWS)
 - ANSI/AWS A5.8 Specification for Brazing Filler Metals
 - ANSI/AWS D1.1 Structural Welding Code - Steel
 - 5. American Society of Mechanical Engineers (ASME)
 - ANSI/ASME Cast Copper Alloy Fittings for B16.26 Flared Copper Tubes

1.3 Submittals

- A. Submit product data for refrigerant piping components in accordance with the provisions of Sections 01 33 00 and 01 78 39.
- B. Submit piping layout drawings in sufficient detail to show all fittings, hanger and support locations and accessories.
- C. Submit written approval from the HVAC equipment manufacturer certifying that line sizes, line lengths and piping accessories are acceptable and shall cause no equipment performance problems.

1.4 Quality Assurance

- A. Pre-manufactured refrigerant piping assemblies shall be fabricated by companies with at least five years experience in manufacturing refrigerant piping assemblies.
- B. Installation of refrigerant piping shall be performed by skilled pipefitters with experience in refrigerant piping installation.

1.5 Delivery, Storage and Handling

- A. Store piping in a clean, dry location and not subject to damage.
- B. Store piping with evacuation charge intact and ends capped.
- C. Handle piping carefully to prevent kinked bends or flattened areas. Pipe with this damage shall not be installed on the Project.

Part 2 Products

2.1 Pipe and Pipe Fittings

- A. Refrigerant Piping
 - 1. Piping: Copper tubing, ASTM B 88, Type L, Hard Drawn, Soldered. Copper tubing for refrigeration service shall be ACR type shipped evacuated and with ends capped to prevent contamination.
 - 2. Fittings: Wrought copper, ANSI/ASME B16.26., soldered.
- B. Condensate Drains
 - 1. Piping: PVC pipe, ASTM D 1785 Schedule 40, solvent welded.
 - 2. Fittings: PVC socket type, ASTM D 2466, solvent welded.

2.2 Pipe Specialties

- A. Pipe Sleeves: Pipe sleeves shall be provided where pipes pass through any concrete or masonry walls or partitions, through any concrete floors or roofs, and through any fire rated enclosure. Annular spaces between wall (or insulation) and sleeve shall be packed with UL labeled fire proofing material sufficient to maintain or exceed the fire rating of the structure as manufactured by Dow or 3M. Provide escutcheons on both sides of sleeve to contain packing.
- B. Flexible Pipe Connections: Flexible connection for chiller refrigerant relief piping shall be flexible metal hose constructed of 320 stainless steel wire braid. Hose shall be designed for working pressure or not less than 125 psig and temperatures up to 250 degrees F and shall be 12-inches long with screwed end connections for chiller refrigerant relief piping.
- C. Unions: Unions shall be the same material and working pressure as the fittings specified for the piping system. Unions on piping 2-1/2-inches in size and larger shall have a bolted flanged joint.
- D. Dielectric Adaptors: Connection between copper and ferrous piping shall be made with an insulating type dielectric adapter.

Part 3 Execution

3.1 Installation

- A. Workmanship: Pipe shall be cut accurately to measurements established at the job site and worked into place without springing or forcing. Pipes shall be installed to permit free expansion and contraction without damage to joints, hangers or the building.
- B. Changes in direction shall be made with fittings, except where branches are two or more sizes less than the size of the main, the branch may be made using forged steel branch connections such as weldolets, threadolets, latrolets, sweepolets and elbolets by Bonney Forge, Capital Manufacturing, or WFI, Inc.
- C. Pitch/Grade: All piping shall be installed with sufficient pitch to ensure drainage and venting.
- D. Solder Joint Connections: Copper tubing shall be cut square, ends shall be reamed, and all filings removed from interior of pipe. Joints shall be soldered with solder applied through the feed holes and drawn through the full fitting length. Excess solder shall be wiped from joint before solder hardens. Solder shall be a 95/5 tin antimony solder with a petroleum base flux. Soldering to be in accordance with ANSI/AWS A5.8.
- E. Threaded Connections: Screw-thread joints shall be made with cut tapered threads. Joints shall be made tight with Teflon tape unless otherwise specified. Not more than

two threads shall show after the joint is made tight. Pipes shall have burrs removed by reaming cut end.

F. Welded Connections

1. Mitering or notching pipe to form elbows and tees will not be permitted. Field and shop bevels shall be in accordance with the recognized standards and shall be done by mechanical means or flame cutting. Where beveling is done by flame cutting, surfaces shall be cleaned of slag, scale and oxidation prior to welding. Before welding, the component parts to be welded shall be aligned so no strain is placed on the weld when finally positioned. Height shall be aligned so that not part of the pipe wall is offset by more than 20 percent of the wall thickness. Flanges and branches shall be set true. This alignment shall be preserved during the welding operations. Connections larger than 6-inches shall be made with backing rings at welds.
2. Where temperature of the component parts being welded reaches 32 degrees F or lower, the material shall be heated to approximately 100 degrees F for a distance of three feet on each side of the weld before welding, and the weld shall be finished before the material cools to 32 degrees F.
3. Defective welds shall be removed and replaced at no additional cost to the Owner. Repairing of defective welds by adding new material over the defects or by peening will not be permitted.
4. Electrodes shall be stored in a dry, heated area and shall be kept free of moisture or dampness during fabrication operations. Electrodes that have lost part of their flux shall be discarded.
5. Welding to be in accordance with ANSI/AWS D1.1.

G. Refrigerant lines to packaged HVAC equipment shall be sized by the equipment manufacturer prior to submittal. Written acceptance by the equipment manufacturer of the refrigerant line sizing shall be submitted.

H. Dielectric Isolation

1. Wherever copper, brass or bronze piping systems are connected to steel or iron piping systems, this connection shall be made with dielectric isolators. The dielectric isolators shall be so designed that non-ferrous piping materials shall be isolated by the use of Teflon or nylon isolating materials made up in the form of screwed type unions or insulating gaskets and bolt sleeves and washers for standard flanged connection. All dielectric isolators shall be selected for the pressure of the system involved.
2. Dielectric isolators shall be Watts, Epco, Crane or Maloney.

I. Insulation shall be applied to refrigerant piping after piping tests are completed and accepted. Suction piping shall be insulated. Liquid piping shall be insulated if

clamped with suction piping and the two lines shall be insulated as a unit. Hot gas piping shall not be insulated except where it passes through a finished space, supply or return air plenum or duct, or presents a personnel hazard through regular contact.

3.2 Flushing and Cleaning

- A. Refrigerant Piping: Flush all solid particles from the piping with compressed nitrogen or freon if the piping has not been evacuated. Purge piping with nitrogen or other gas acceptable by the pipe manufacturer to remove all moisture and contaminants.
- B. The systems shall not be used, except for chemical cleaning, until the Engineer has been assured that cleaning has been accomplished.

3.3 Field Quality Control

- A. All tests shall be made before piping is painted, covered, concealed or backfilled.
- B. The testing requirements for the respective systems shall include all those of the applicable governing codes, such as state, local and insurance, and those specified herein. All code-required inspection certificates shall be furnished by the Contractor to the Engineer.
- C. The Contractor shall provide all pumps, gauges, valves and other equipment and material necessary to properly conduct the tests. Before testing, remove or otherwise protect from damage, control devices, air vents, fixtures, meters and other equipment that is not designed to withstand test pressures.
- D. Systems receiving pneumatic test shall be filled with nitrogen gas and charged to test pressure. Hold test pressure for one hour minimum. Exterior surface of pipe shall show no cracks or leaks and shall be completely drop dry.
- E. Pneumatic Pressure Test Criteria
 - 1. Refrigerant Suction Piping: 200 percent of unit operating pressure.
 - 2. Refrigerant Liquid Piping: 200 percent of unit operating pressure.
 - 3. Refrigerant Gas Piping: 200 percent of unit operating pressure.
- F. If inspection or test shows defects, such defective work or material shall be replaced. All repairs to piping systems shall be made with new material. No caulking on screwed joints, cracks or holes will be acceptable. Failed welds must be cut out and replaced. Where it becomes necessary to replace pieces of pipe, such replacements shall be in the same length as the defective piece. Tests shall be repeated after all defects have been made good.

END OF SECTION

Part 1 General

1.1 Scope

- A. Work specified in this section is subject to the provisions of Division 01.
- B. Furnish and install unitary fans of the size, type, capacity and characteristics described within the Contract Documents.

1.2 References

- A. This Specification references the latest edition of the publications listed below. Work shall be performed, and materials shall be furnished in accordance with these publications as referenced herein.
 - 1. International Mechanical Code
 - 2. Underwriter's Laboratories (UL) Standards
 - UL 705 Power Ventilators
 - 3. National Fire Protection Association (NFPA) Standards
 - NFPA 70 National Electrical Code
 - NFPA 90A Installation of Air Conditioning and Ventilating Systems
 - 4. Air Movement and Control Association (AMCA) Standards
 - AMCA 99 Standards Handbook
 - AMCA 210 Laboratory Methods of Testing Fans for Rating Purposes
 - AMCA 300 Test Code for Sound Rating Air Moving Devices
 - 5. American Society for Testing and Materials (ASTM) Standards
 - D 4167 Standard Specification for Fiber-Reinforced Plastic Fans and Blowers

1.3 Submittals

- A. Submit product data in accordance with the provisions of Sections 01 33 00 and 01 78 39.

Fans

- B. Submit product data on all products proposed for installation under this section, including but not limited to the following:
 - 1. Wall-mounted propeller fans
- C. Submittal data shall include catalog cuts, performance curves and other information required to evaluate conformance with these Specification requirements. Data submitted shall include at least the following:
 - 1. Materials of construction.
 - 2. Fan performance data and AMCA certification.
 - 3. Fan motor, horsepower, starters, electrical data and/or disconnects where specified or shown.
 - 4. Roof curbs.
 - 5. Fan accessories.
 - 6. Installation and maintenance instructions.
 - 7. Spare parts lists.
 - 8. Disconnect switches where specified herein.

1.4 Quality Assurance

- A. Provide factory built and tested fan equipment. Test fans in accordance with AMCA 210 and 300. Fans shall bear the AMCA Certified Performance Seal for both air and sound performance.
- B. Provide factory balanced fan wheel and shaft assemblies. Provide statically and dynamically balanced fan assemblies. Imbalance shall not exceed limitations of the fan bearings for maximum rated design life.
- C. Belt drives shall be designed for not less than 150 percent of the connected driving capacity. Motor sheave shall be adjustable to provide not less than 20 percent speed variation. Sheaves shall be selected to drive the fan at a speed to produce the scheduled capacity when set in the approximate midpoint of the sheave adjustment. Motors with V-belt drives shall be provided with adjustable bases.
- D. Units shall be rigidly constructed of materials suitable for the intended service and shall be installed with accessories listed on the Contract Documents.
- E. Fans shall bear the Underwriter's Laboratories label.

Part 2 Products

2.1 Wall-Mounted Propeller Fans

- A. Provide belt driven sidewall propeller fans complete with fan blade, one-piece steel fan panel with spun venturi and driver support frame, motor and drive, bearings, gravity shutter, outlet screens, motor side guards and mounting collars.
- B. The propeller fan blade shall have six die formed gusseted blades welded to a spherically formed hub. Provide keyway slots and set screws to secure fan wheel to the shaft.
- C. The steel fan panel shall be of one-piece construction with spun venturi, formed flanges and welded corners. The fan panel shall have a drive support frame providing a rigid platform for the motor and shaft. Provide a thermally fused powdered epoxy coating 4-5 mils thick.
- D. Fan shaft shall be ground and polished steel with slotted keyways.
- E. Bearings shall be the ball bearing pillow block type. Bearing shall be rated for an average life of 100,000 hours.
- F. Provide matching factory fabricated motor side guards, outlet screens and mounting collars.
- G. Shutters for supply fans shall be motorized heavy-duty, weatherproof type constructed of 16-gauge galvanized steel. Shutters shall come complete with a properly sized control transformer. Shutters for exhaust fans shall be gravity type. Shutters shall be factory finished after assembly with a 5-mil thick epoxy coating in a color to be selected by the Architect at the time of shop drawing approval. Color charts shall be submitted with shutter shop drawings. All material edges and surfaces shall be thoroughly cleaned and deoxidized prior to application of an inhibitive primer.
- H. Acceptable Manufacturers: Greenheck, Loren Cook or Acme.

Part 3 Execution

3.1 Installation

- A. All units shall be installed in accordance with manufacturer's recommendations and as shown on the Drawings. Provide adequate supports from wall or structure to prevent sagging, vibration and damage.
- B. Units shall be interlocked and controlled as shown on the Drawings and as described in Division 23 of these Specifications.

3.2 Demonstration

- A. Verify proper rotation of fan wheel.
- B. Verify proper operation of backdraft damper.
- C. Adjust fan speed by adjusting or replacing sheaves to obtain proper air flow.
- D. Clean filters prior to acceptance by Owner.

END OF SECTION

Part 1 General

1.1 Scope

- A. Work specified in this section is subject to the provisions of Division 01.
- B. Furnish and install air outlets and inlets of the size, type, capacity, and characteristics described within the Contract Documents.

1.2 References

- A. This Specification references the latest edition of the publications listed below. Work shall be performed, and materials shall be furnished in accordance with these publications as referenced herein:
 - 1. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) Standards
HVAC Duct Construction Standards
 - 2. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standards
ASHRAE 70 Methods of Testing for Rating the Performance of Outlets and Inlets
 - 3. Air Conditioning and Refrigeration Institute (ARI) Standards
ARI 650 Air Outlets and Inlets
 - 4. National Fire Protection Association (NFPA) Standards
NFPA 90A Installation of Air Conditioning and Ventilating Systems
 - 5. Air Movement and Control Associations (AMCA) Standards
AMCA 500 Test Method for Louvers, Dampers, and Shutters
 - 6. Air Diffusion Council (ADC) Standards
ADC 1062: GRD Test Code for Grilles, Registers, and Diffusers
 - 7. American Society for Testing and Materials (ASTM Standards)
ASTM E 90 Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions

1.3 Submittals

- A. Submit shop drawings and product data in accordance with the provisions of Sections 01 33 00 and 01 78 39.
- B. Submit product data on all air inlets and outlets including actuators proposed for installation under this section.
- C. Submit charts for color selection.
- D. Submit sound attenuation data for acoustical products and sound power data for all outlets.
- E. Submit airflow versus pressure drop performance data.
- F. Submit louver schedule indicating type and sizes to suit field verified wall openings.

Part 2 Products

2.1 Combination Louvers

- A. Drainable Blade Combination Louvers.
 - 1. Frame shall be welded, box style with downspouts in jambs and mullions and extruded from 6063T5 aluminum.
 - 2. Frame depth shall be 6-inches.
 - 3. Frame minimum thickness shall be 0.081-inch.
 - 4. Stationary blade minimum thickness shall be 0.081-inch.
 - 5. Adjustable blade minimum thickness shall be 0.081-inch.
 - 6. Adjustable blade edge seal shall be vinyl.
 - 7. Adjustable blade pivot bearing shall be Nylon.
 - 8. Stationary blades shall have drain gutters.
 - 9. Provide with 0.081-inch thick extended sill.
 - 10. Provide with continuous appearing stationary blades.
 - 11. Provide with Kynar 500 finish on all exposed surfaces, color selected by the Engineer during shop drawing review.
 - 12. Provide with aluminum insect or bird screen, mounted on interior side of louver, as indicated on the Louver Schedule on the Drawings.

13. Provide 120v/1ph actuator.
14. Louver air flow performance shall be AMCA certified. See the Louver Schedule on the Drawings for louver air flow performance.
15. Acceptable Manufacturers: Equal to Greenheck Model EAD-635.

Part 3 Execution

3.1 Louvers

- A. Louvers shall be installed according to the manufacturer's recommendations and shall be caulked and sealed at the frame and flanges to make the installation weathertight. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.
- B. Combination louver dampers shall be installed with required damper operators and linkage mechanisms (furnished by louver/damper manufacturer) and shall be field adjusted for full opening/closure stroke. Louvers shall be interlocked with exhaust fans as scheduled on the Drawings and as described in Division 23.
- C. Clean louver surfaces in accordance with manufacturer's instructions.
- D. Repair minor damaged surfaces as directed by the Engineer.

END OF SECTION

Part 1 General

1.1 Scope

- A. All work specified in this section shall comply with the provisions of Division 01.
- B. Furnish and install air conditioning units of the size, type, capacity, and characteristics described within the Contract Documents.

1.2 References

- A. This Specification references the latest edition of the publications listed below. Work shall be performed, and materials shall be furnished in accordance with these publications as referenced herein:
 - 1. International Mechanical Code
 - 2. Underwriter's Laboratory (UL) Standards
 - 3. American National Standards Institute (ANSI) Standards
 - ANSI/ASHRAE 15 Safety Code for Mechanical Refrigeration
 - 4. National Fire Protection Association (NFPA) Standards
 - NFPA 70 National Electrical Code
 - NFPA 90A Installation of Air conditioning and Ventilating Systems
 - 5. Air Moving and Control Association (AMCA)
 - AMCA 210 Laboratory Methods for Testing Fans for Rating
 - AMCA 301 Method of Publishing Sound Ratings for Air Moving Devices

1.3 Quality Assurance

- A. The equipment manufacturer shall furnish a factory-trained representative to oversee the Contractor's test and start-up of equipment. The manufacturer's representative shall verify that the installation is done in accordance with the manufacturer's published guidelines and shall validate the manufacturer's warranty.

1.4 Warranty

- A. The warranty shall prevail through the first 12 months following start-up (compressors shall be guaranteed for a period of five years following start-up).

- B. Normal wearing items such as air filters, fan belts, etc. are excluded from this coverage.

1.5 Submittals

- A. Submit product data in accordance with the provisions of Section 01 33 00 and Section 01 78 39.
- B. Submittal data shall be complete with dimensional and performance data sufficient to verify conformance with all scheduled unit capacities.
- C. Submit installation and start-up instructions for units and all accessory items.
- D. Submit product data on the following at the minimum:
 - 1. Identification by equipment number.
 - 2. Performance Data: Including air quantity, KW input, brake horsepower, fan rpm, velocities, and pressure drops across various sections of the unit.
 - 3. Equipment operating weight.
 - 4. Catalog data marked to indicate specified components used.
 - 5. Unit specifications and Drawings describing construction methods, including materials, metal gauges, and component spacing and thickness.
 - 6. Fan characteristic curve for each fan selection.
 - 7. Operating sound level data of fan.
 - 8. Arrangement of unit.
 - 9. Complete dimensional data of each respective unit.
 - 10. Arrangement, locations, and size of drains and electrical connections.
 - 11. Cooling performance of unit.
 - 12. Complete description of filter media including materials, thickness, efficiency, and pressure drop at design airflow rates.
 - 13. Quantities and connection sizes of refrigeration pipes.
 - 14. Installation notes and mounting details.

Part 2 Products

2.1 General

- A. Both indoor units and outdoor condensers shall be shop-fabricated, completely factory-assembled, tested, piped, and wired. All operating and safety controls shall be furnished and factory installed.
- B. The air conditioning systems shall be designed to maintain proper temperature and humidity conditions in the rooms containing electrical and electronic equipment.
- C. The units shall be designed for high sensible heat ratio areas such as electrical, telecom, and computer rooms.
- D. The units shall meet or exceed the capacity and performance characteristics called for in the Equipment Schedules on the Plans.
- E. Acceptable Manufacturers: Lennox, Liebert Corporation and Mitsubishi.

2.2 Cabinet and Frame

- A. The cabinet of the unit shall be built on a one-piece welded frame with removable panels on four sides of the unit for easy service access with ¼-turn zeus fasteners.
- B. The framework shall be fabricated using minimum 14-gauge MIG welded tubular steel, finished using a powder paint coating process for maximum corrosion protection. The color of the unit shall be as selected by the Owner.
- C. All cabinet panels including access door panels shall be formed and welded from 18-gauge steel, finished with a textured powder coat paint process and insulated with 1" thick, 1.5 lb/ft³ density fiberglass insulation. All insulation products shall comply with NFPA-90A requirements for flame spread and smoke generation. Insulation adhesive shall be UL listed.
- D. All panels shall be locked with ¼-turn captive fasteners to quickly and easily facilitate internal access.

2.3 Evaporator Fan

- A. Fan(s) shall be capable of delivering the air quantity at the external static pressure specified in the Equipment Schedules.
- B. Fan(s) shall be centrifugal, forward curved, double width double inlet, and shall be statically and dynamically balanced as a complete assembly to a maximum vibration level of 2.6 mils in any plane.

- C. Fan(s) shall be mounted in the unit in a draw through arrangement. The fan(s) shall be mounted on a common shaft and shall be belt driven by one motor using a belt driven sheave. The fan shaft shall be heavy-duty steel and shall be supported using self-aligning pillow block ball bearings having a minimum life span of 100,000 hours. Fan bearings shall be supplied with grease zert fittings.
- D. Fan motors shall be standard efficiency open drip proof fan cooled design with a minimum efficiency rating of 92% using Class F insulation to prevent contamination of the air stream and tripping of the smoke detector in the event of a motor failure. Fan motor speed shall not exceed 1,750 rpm. Fan selection shall be made so that the fan motor does not operate within the service factor range of the motor. Fan motors shall meet or exceed standard IP54.
- E. All parts of the fan assembly shall be manufactured using heavy gauge steel. All parts of the fan assembly (fan wheels and scroll housing where applicable) shall be painted, galvanized or corrosion treated prior to unit assembly.
- F. The fan drive package shall be multi V-belt, variable pitch sized for 200% of the motor horsepower. All belts shall be matched sets.

2.4 Refrigeration Systems

- A. Each refrigeration circuit shall include hot gas mufflers, liquid line filter dryers, refrigerant sight glass with moisture indicator (adjustable), externally equalized expansion valves, and liquid line solenoid valves.
- B. The compressors shall be located in a separate compartment, so they may be serviced during operation of the equipment. The compressor shall be scroll type with vibration isolators, thermal overloads, oil sight glass, manual reset high pressure switch, pump down low-pressure switch, suction line strainer, reversible oil pumps for forced feed lubrication, a maximum operating speed of 1,750 RPM at 60 Hz, and a minimum EER of 11.1.
- C. The compressor control system shall have an automatic lead/lag sequencing feature that equalizes the run time of compressors in units with dual refrigeration circuits.
- D. Compressor shall be equipped with a positive start feature to avoid compressor short cycling and low-pressure lockout during winter start-up. The microprocessor control shall prevent compressor short cycling by delaying a compressor restart by 3 minutes from the last start.
- E. All refrigeration circuits shall be pre-piped and factory leak tested ready for field connection. All interconnecting refrigerant piping shall be of type L copper pipe. All units shall be factory run tested with refrigerant to verify operation prior to shipping.
- F. Evaporator coil shall be an A-frame design. Coil shall be manufactured using 3/8", 1/2", or 5/8" O.D. copper tubes mechanically bonded to aluminum fins. Fin density

shall not exceed 14 FPI. Coil shall be a minimum of 3 rows. Coil(s) circuiting shall be inter-twined in a counter-flow configuration.

- G. The refrigeration circuit shall include the following refrigeration specialties: thermal expansion valve with external equalizer, refrigerant distributor, liquid line pump-down solenoid valve, liquid line sight glass, liquid line filter-dryer, fully field adjustable high and low-pressure cut-out switches, suction line strainer, suction, liquid, and hot gas line gauge ports, suction and liquid line service valves, and hot gas muffler.

2.5 Evaporator Drain Pan

A stainless steel, corrosion free condensate drain pan shall be provided under the evaporator coil.

2.6 Condensate Pump

- A. The unit manufacturer shall provide a condensate pump (shipped loose for field installation) designed to remove condensate from evaporator (and humidifier when specified). Pump shall be capable of pumping at a rate of 25 GPH against 15' of head.
- B. Pump model supplied shall be readily available from any local refrigeration part supplier.
- C. Unit manufacturer shall provide factory wiring, relays, fuses, and/or contactors for fully automatic pump operation. The condensate pump shall be powered using a separate transformer (if transformer is required) from the transformer powering the unit microprocessor controls.

2.7 Air Filters

- A. The filter chamber shall be an integral part of the system, located at the entrance of return air path. The filter chamber shall have the provision to house 4" filters.
- B. The filters shall be 4" deep-pleated type with MERV 11 rating (60-65% per ASHRAE 52.1). The filters shall be listed as UL Class 2.
- C. Furnish three sets of filters for each unit.

2.8 Unit Controls

- A. The unit manufacturer shall provide microprocessor-based control system with automatic control and monitoring, LCD backlit display panel, and control keys for user input.
- B. The controls shall be menu driven with on-screen prompts for easy user operation. The display shall include system information such as room conditions, operational status, alarms, control and alarm set points, and all user selections including alarm

delays, sensor calibration, DIP switch selections, and diagnostics. All indicators shall be language form. No symbols or codes shall be acceptable.

- C. System configuration and setting shall be stored in nonvolatile memory and safeguarded in the event of power failure.
- D. The system shall have programmable password access to prevent unauthorized changes of the system configuration and settings.
- E. The control system shall have a built-in testing routine to simplify field testing and troubleshooting.
- F. The system shall have a manual disconnect switch of the non-locking type, which can be accessed outside of the unit while the door is closed. High voltage electrical components shall not be accessible unless the switch is off.

2.9 Microprocessor Controller Alarms

- A. The control system shall have the following alarms:
 - 1. High/Low temperature.
 - 2. High/Low humidity.
 - 3. Short cycle.
 - 4. Compressor overload.
 - 5. High/Low voltage.
 - 6. Filter dirty.
 - 7. Fan overload.
 - 8. Loss of airflow.
 - 9. High head pressure.
 - 10. Low suction pressure.
 - 11. Loss of power.
 - 12. Smoke detected.
 - 13. Water under floor.
 - 14. Common fault alarm for remote reporting.

- B. Alarm messages, when programmed, shall comprise text description and occurrence time. Messages shall be ranked in the sequence of occurrence for fault analysis.
- C. When a programmed alarm condition exists, the factory mounted audible alarm shall sound and the common alarm output shall close until acknowledged. Active alarm record shall remain until the alarm condition is cleared.
- D. A historical event log shall be provided.

2.10 Liquid Detection System

- A. Unit manufacturer shall provide pre-wired liquid detection single point sensors. Sensors shall be pre-wired at the factory to the unit microprocessor and ready for placement in the field by the installing contractor.
- B. 2 sensors shall be provided per unit.

2.11 Smoke Detector

Where called out in the equipment schedules on the Drawings, provide a factory mounted and wired smoke detector to shut unit down in the event of the presence of smoke.

2.12 Air-Cooled Condenser

- A. Condenser shall be supplied by the manufacturer of air conditioner unit. The condenser shall be sized to reject the unit's total heat of rejection, plus 3.5% at the outdoor design conditions applicable to the Project location. Any reduction in the heat transfer performance due to corrosion resistant coating shall be accounted while sizing the condenser.
- B. The air-cooled condenser shall be low-profile, slow speed, multiple direct drive, propeller fan type. The condenser shall be constructed of heavy gauge aluminum.
- C. The condenser coil shall be constructed of aluminum fins and copper tubes staggered in direction of airflow and arranged for vertical air discharge. Condenser coil shall be factory leak tested to 300 psig.
- D. The low ambient control for condenser shall be with variable fan speed control. The fan speed control system shall provide positive start-up and operation in ambient temperatures as low as -20 deg F. The control system shall be complete with transducers, thermostats and electrical control circuit, factory pre-wired in the control panel. The transducer shall automatically sense the head pressure of the compressor and control the variable speed fan on the condenser to properly maintain the head pressure.
- E. Manufacturer shall provide a factory-mounted, non-fused, locking disconnect.

Part 3 Execution

3.1 Installation

- A. Locate units to provide manufacturer's suggested clearances for service access to filters, motors, drives, and fan bearings. Sufficient clearance shall be allotted for removal of fan shaft and coil. Install equipment so that it is level and properly supported.
- B. Install and adjust each unit in accordance with the Drawings and the manufacturer's recommendations. Install all safety devices as recommended by manufacturer and/or required by local code.
- C. Isolate sheet metal duct connections from all portions of the unit using flex connections.
- D. The installing contractor is responsible for providing refrigerant and charging the unit.
- E. The installing contractor shall supply and install control wiring, line voltage wiring, and refrigerant piping between indoor and outdoor units.
- F. Demonstrate operation of unit complete with all control functions and safety devices. Provide written certification that such demonstration has been successfully completed to the Engineer.
- G. Anchor condensing units to service pads with full-size, type 316 stainless steel, ½" minimum diameter bolts, minimum 4-inches embedment. Minimum of one bolt per leg is required.
- H. Make certain that piping connections to equipment do not cause any strain on equipment. Route condensate piping to drain in accordance with applicable codes.
- I. Make certain that vibration isolation has been installed per manufacturer's instructions and isolation devices are performing satisfactorily.
- J. Manufacturer's representative shall verify that all shipping lugs and component tie-downs have been removed and/or placed in the operating position prior to equipment start-up.
- K. Install new air filters prior to final acceptance and occupancy by the owner. Do not operate the units at any time without proper air filters in place.
- L. Startup: Installing contractor's technician shall be responsible for startup of the equipment under direct supervision of a factory-trained and qualified service technician.
- M. Checkout: Manufacturer shall provide a factory-trained service representative to verify the proper operation of the equipment. Prior to startup, the representative shall inspect the installation, including the external interlock and power connections. Once the pre-

start check is completed, he or she shall then supervise initial operation and the calibration of operating and safety controls.

- N. The factory trained service representative shall forward a startup report in three copies to the Engineer when the unit is operating properly. The report shall contain all pressure and control settings, alarm response settings, run condition voltage readings per phase, suction temperature and pressure at compressor, discharge temperature and pressure at compressor, liquid line temperature and pressure and shall list minor discrepancies to be corrected which do not affect safe and reliable operation.
- O. One additional copy of the startup report and one copy of installation, operation, and maintenance manual, including sources for repair parts, shall be left in the control panel of the unit.

3.2 Adjusting and Cleaning

- A. Air System Balance: Test and Balance to be performed by certified NEBB or AABC T&B contractor.
- B. Lubricate unsealed bearings prior to startup.
- C. Do not operate units until filters are installed. If operated without filters, completely clean ductwork, coils, fans and fan scrolls, and the interior of the unit.

END OF SECTION

Part 1 General

1.1 Scope

- A. All work specified in this section is subject to the provisions of Division 01.
- B. Furnish and install electric heaters of the type and capacity scheduled in the Contract Documents.

1.2 Submittals

- A. Submit product data in accordance with the provisions of Sections 01 33 00 and 01 78 39.
- B. Submit product data on all products proposed for installation under this section, including but not limited to the following:
 - 1. Unit heaters, corrosion resistant.
- C. Submittal data shall include catalog cuts and other information required to evaluate conformance with these Specification requirements. Data submitted shall include at least the following:
 - 1. Materials of construction.
 - 2. Heating capacity.
 - 3. Electrical requirements.
 - 4. Accessory items.
 - 5. Installation and maintenance instructions.
 - 6. Disconnects.

1.3 Coordination

- A. Electric heaters of a specific manufacturer have been used as the basis of design. Any modifications to controls, electrical connections, structural supports, etc., that result from the use of equipment by any other manufacturer shall be coordinated with all other trades; this coordination shall occur before delivery of the equipment from the manufacturer. Any modifications shall be performed without incurring additions to the Contract.

Part 2 Products

2.1 Unit Heaters, Corrosion Resistant

- A. Heavy stainless steel sheet metal housing and fan with stainless steel hardware, adjustable discharge louvers and rear wire protective grille.
- B. Epoxy painted, totally enclosed, permanently lubricated ball bearing fan motor.
- C. NEMA 4X rated electrical enclosure.
- D. Each unit heater shall be provided with an integral thermostat with adjustable setpoint (40 - 90 degrees F).
- E. Moisture and corrosion resistant automatic reset thermal cutout and 3-pole heavy-duty contactor.
- F. Wall mounting brackets, epoxy painted.
- G. Acceptable Manufacturers: Chromalox HD3D, Q-Mark JUW or Indeco Triad Series.

Part 3 Execution

3.1 Installation

- A. Electric heaters shall be installed in complete conformance with the manufacturer's recommendations and the Contract Documents.
- B. Coordinate electrical construction with heater installation.
- C. Mount wall mounting brackets rigidly to building structure with amply sized anchor bolts or machine bolts.
- D. Touch up any epoxy painted surfaces damaged during installation with paint materials recommended by the heater manufacturer.

3.2 Demonstration

- A. Test operating controls for proper heater operation to maintain temperature setpoint conditions.
- B. Verify proper operation of all safety controls.
- C. Adjust discharge louvers for even air distribution in the heated space.

END OF SECTION

Part 1 General

1.01 Scope

- A. The electrical work commences with the point of electrical service where shown on the Drawings and includes furnishing all material and labor for a complete electrical installation.
- B. The requirements of Division 01 apply to all work hereunder. The General and Special Conditions are a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

1.02 Definitions

- A. Provide: Furnish, install, and connect.
- B. Product Data: Catalog cuts and descriptive literature.
- C. Shop Drawings: Factory prepared specific to the installation.
- D. Low Voltage: 0-600 volts.
- E. High Voltage: Above 600 volts.
- F. Indicated: Shown on the Drawings.
- G. Noted: Indicated or specified elsewhere.

1.03 Material Not Furnished

- A. Unless otherwise noted, the following are furnished and installed under other Divisions:
 - 1. Motors
 - 2. Motor starters (except motor control centers)
 - 3. Electric heating and air conditioning equipment
 - 4. Building energy management systems
 - 5. Electrical heat tracing
 - 6. Pilot and control devices for the above equipment
- B. All power wiring including associated terminations is provided under this Division. Control and signal wiring shown on the electrical drawings, including associated terminations is also provided under this Division. Control wiring for mechanical equipment not shown on the electrical drawings is provided under Division 23. Where antenna cables and/or digital communications cables (Ethernet cables, fiber optic

cables, RS-485 cables, etc.) are specified under the Instrumentation Division, cable pulling and installation in raceways shall be provided under this Division with any required splices and all terminations provided under that Division.

1.04 Local Conditions

Power will be supplied by the utility company distribution system. Verify and comply with all power company requirements for metering and transformer pads. Make necessary arrangements with the power company for temporary service requirements.

1.05 Quality Assurance

- A. Provide the complete electrical installation in accordance with the National Electrical Code (NFPA 70), Life Safety Code (NFPA 101), and in accordance with applicable local codes. Obtain all necessary permits and have all work inspected by appropriate authorities.
- B. All products shall be designed, manufactured, and tested in accordance with industry standards. Where applicable, products shall be labeled or listed by third party certification agencies.
- C. Industry Standards: Standards organizations and their abbreviations, as used herein, are as follows. Applicable date for industry standards is that in effect on the date of advertisement of the Project.
 - 1. American National Standards Institute (ANSI)
 - 2. American Society for Testing and Materials (ASTM)
 - 3. Federal Specifications (FS)
 - 4. Institute of Electrical and Electronics Engineers (IEEE)
 - 5. Insulated Cable Engineers Association (ICEA)
 - 6. National Electrical Manufacturers Association (NEMA)
 - 7. National Fire Protection Association (NFPA)
 - 8. Underwriters Laboratories, Inc. (UL)

1.06 Submittals

- A. Make all submittals in accordance with the requirements of Division 01. Approval drawings consist of shop drawings, product data and other information as noted in the individual equipment sections. Except as noted, submittal information is for approval and equipment may not be installed until submittals have been returned with stamped approval.

- B. Information required "for reference" such as product samples, similar unit test reports and time current curves is for the purpose of determining the suitability of a product, selecting breaker settings, etc. This information is to be submitted at the same time as approval data; however, this information will not be returned and stamped approval is not required prior to installation.
- C. Except as noted, installation instructions are not required to be submitted. However, it is the Contractor's responsibility to obtain installation information from the manufacturer for all equipment prior to installing the equipment.

1.07 Record Drawings

- A. Furnish record drawings in accordance with the requirements of Division 01. Record drawings consist of submittal data as listed above, operation and maintenance data, and as-built drawings. Record drawings are to reflect the final installation, including any changes during approval, manufacturing tests, and installation.
- B. In addition to other required sets, furnish one set of operation and maintenance data for all apparatus requiring service. This set is to be bound in hardback, 3-ring binder(s) located in a hinged metal cabinet in the electrical room and shall include:
 - 1. Title page with Project name; installing contractor's name, address and telephone number; date of installation and warranty period.
 - 2. Index sheet.
 - 3. Complete manufacturer's operation and maintenance data with tabs (corresponding to the index) separating each item or system. Include the name, address, and phone number of the nearest sales and service organization for each item.
 - 4. Coordination Study and written certification that devices have been set in accordance with the study.
- C. As-Built Drawings: Furnish one set of prints maintained at the job site at all times with all changes during construction marked thereon. Include on the as-built drawings sufficient dimensions to permit location of underground conduits.
- D. Submit the results of any tests required in the individual equipment sections.

1.08 Coordination Study

- A. Description: Submit a coordination study with recommended settings for all fault protective devices within the scope of the study. The study shall be prepared by a registered professional engineer, who is not an employee of the Contractor, equipment supplier, or other party having a financial interest in the results of the study. The preparer shall certify that the protective device settings recommended represent a reasonable engineering compromise between equipment protection and selective coordination.
- B. Documentation: Provide tabulations of recommended settings and time current curves

showing the degree of coordination obtained with the recommended settings. Also show equipment inrush characteristics and applicable protection limits such as motor stall times, transformer ANSI damage limits, cable heating limits and NEC overcurrent protection requirements. Include manufacturing tolerance and damage bands in plotted fuse characteristics. Terminate device characteristic curves at a point reflecting the maximum symmetrical or asymmetrical fault current seen by the device.

- C. Scope: The study extends from the service entrance equipment down to, and including, the low voltage motor control centers. Panelboards and other equipment downstream from the low voltage motor control centers need not be included, except as required to obtain settings for equipment within the study scope.
- D. Fault Currents: Maximum available fault current shall be provided by the Utility Company. Maximum three phase symmetrical values for all major busses shall be determined by the study preparer. Any other values needed are to be calculated as part of the study. Values supplied by the Engineer are to be used solely for determination of device settings - equipment ratings are as elsewhere noted.
- E. Study Data: The Contractor is responsible for providing field data (conductor materials, existing device types, nameplate information, etc.) to the study preparer. The Contractor is also responsible for providing to the study preparer shop drawing data on new equipment. The study preparer is responsible for obtaining all other needed data (equipment data, time current curves, etc.)
- F. Submittal Requirements: Submit the coordination study prior to, or concurrent with, distribution equipment within the study scope. This is to allow suggested improvements (relay ranges, CT ratios, etc.) that may arise in performing the study to be incorporated prior to equipment fabrication. Review procedures are as specified in Article 1.06 above.

1.09 Arc Flash Study

- A. Description: Submit an arc flash study to facilitate compliance with NFPA 70E, Handbook for Electrical Safety in the Workplace. Arc Flash Study shall be performed using software specifically for the purpose and all calculations shall comply with IEEE 1584.
- B. Documentation: Provide an Arc Flash analysis summary including as a minimum the following information:
 - 1. Equipment name
 - 2. Equipment voltage
 - 3. Available fault current (3 phase bolted)
 - 4. Arcing fault current
 - 5. Protective device operating time
 - 6. Arc flash boundary (in.)

7. Working distance (in.)
8. Incident Energy (cal/cm²)
9. Protective clothing category

Provide arc flash warning nameplates for each individual equipment item. Nameplates shall include the wording "WARNING – Arc Flash Hazard. Protective Equipment Required". Nameplate shall also include the analysis data as listed above, settings (where applicable) of the equipment main protective device and a description of protective clothing required.

- C. Scope: Study shall include MDP, MCC and Panel LA.
- D. Study Data and Submittal Requirements: Fault current and equipment data are as specified above under "Coordination Study", Arc Flash Study shall be included with or submitted concurrently with the coordination study.

1.10 Delivery, Storage, and Handling

- A. Ship products to the job site in their original packaging. Receive and store products in a suitable manner to prevent damage or deterioration. Keep equipment upright at all times.
- B. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

Part 2 Products

2.01 Materials

Provide only new products of the manufacturer's latest design.

2.02 Substitutions

- A. Where the words "equal to" follow or precede the listed acceptable manufacturers, equal products of other manufacturers are acceptable and request for substitution may be made during submittal stage.
- B. Where the words "or equal" follow the listed acceptable manufacturers, products of other manufacturers must be submitted and approved prior to the Bid, in accordance with the Instructions to Bidders of the Contract Documents.

Part 3 Execution

3.01 Installation

- A. The complete installation is to be accomplished by skilled electrical tradesmen, with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality, sub-standard work will be rejected.
- B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for the Engineer's consideration.
- C. Do not stub up conduits prior to receipt of approved shop drawings showing conduit entry locations.
- D. Prior to final inspection, clean all dirt, mud and construction debris from all boxes, cabinets, manholes and equipment enclosures.

3.02 Certification and Tests

- A. Prior to request for final review, test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.
- B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems' demonstration.
- C. After final review and acceptance, turn over to the Owner all keys for electrical equipment locks. Present to the Owner or the Owner's designated representative, demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

END OF SECTION

Part 1 General

1.01 Scope

This Section includes basic materials and methods common to all Sections of Division 26.

1.02 Submittals

Submit product data.

Part 2 Products

2.01 Conduit

- A. Rigid Steel Conduit: ANSI C80.1; hot dip galvanized; minimum size 3/4-inch.
- B. Rigid Aluminum Conduit: UL 6; ANSI C80.5; minimum size 3/4-inch.
- C. Intermediate Metal Conduit (IMC): UL 1242; hot dip galvanized; minimum size 3/4-inch.
- D. PVC Coated Conduit: NEMA RN-1 or UL-6 rigid steel conduit with factory applied external 40 mil PVC coating and urethane interior coating. Prior to coating, treat conduit with a heat polymerizing adhesive so the bond between metal and coating is greater than the tensile strength of the coating. Minimum size 3/4-inch.
- E. Liquidtight Flexible Conduit: UL listed liquidtight.
- F. Rigid Nonmetallic Conduit: NEMA TC-2; Schedule 40 PVC.
- G. Couplings: Fittings and Conduit Bodies: NEMA FB-1; threaded for rigid steel, aluminum and IMC; compression type with O-ring for liquidtight flexible conduits.

2.02 Conductors

- A. Building Wire: NEMA WC-5; single conductor; 98 percent conductivity copper; 75/90 degrees C; 600 volt PVC insulated with nylon jacket; type THWN/THHN for sizes #1 AWG and smaller. Sizes larger than #1 AWG are XLP insulation type XHHW. Minimum size #12 AWG.
- B. Control Wire: Same as building wire except minimum size #14 AWG.
- C. Instrumentation Signal Cables: #16 AWG stranded tinned copper conductors; 600 volt polyethylene insulation; twisted pair or three conductor construction; 100 percent coverage aluminum polyester shield; #18 stranded tinned copper drain wire; vinyl outer jacket; UL listed.

- D. Category 6 Ethernet Cables: Copper conductor, 300 volt insulation, rated 60 degrees C, individual conductors twisted together and covered with a PVC jacket; UL listed.
- E. Fiber Optic Cables: Multimode, 62.5/125 OM1, outdoor, tight buffered fiber optic cable meeting functional requirements of ICEA-S-87-640, TIA-568 and TIA-598; rated -40 degrees C to +85 degrees C; polyethylene outer cable jacket. Provide number of strands as shown on the Drawings (six strands minimum). Lash to 1/4-inch stainless steel messenger cable where routed aerially.

2.03 Boxes

- A. Sheet Metal Boxes: NEMA OS-1; galvanized steel.
- B. Cast Boxes: NEMA 250; NEMA Type 4, galvanized cast iron box and cover, neoprene gasket, stainless steel cover screws, UL listed as raintight. Provide flat-flanged type for surface mounting.
- C. Corrosion Resistant Boxes: UL 508, 316 stainless steel, NEMA Type 4X. For boxes larger than 12-inches in any dimension provide hinge on one side and stainless steel clamp latches (equal to Hoffman A-L23SS) on the other side(s). Equal to Hoffman Bulletin A-4.

2.04 Wiring Devices

- A. Switches: FS W-S-896, 20 amp, 120-277 volt, gray handle.
- B. Receptacles: NEMA WD-1; 5-20R; nylon face; gray. Exceptions: Provide specific use receptacles where indicated.
- C. Indoor Device Plates: Type 302 stainless steel, 0.030-inch thick minimum, satin finish.
- D. Indoor Corrosion Resistant (NEMA 4X) Cover Plates: Type 302 stainless steel, specification grade, gasketed, with silicone rubber mat, equal to Pass & Seymour 4515 or 4151FS for toggle switches. Cast aluminum, gasketed, equal to Pass & Seymour CA Series for receptacles. For heat tape, instruments, or other devices which are continuously plugged in, provide die cast aluminum, suitable for wet locations while-in-use, equal to Hubbell WP26.
- E. Outdoor Weatherproof (NEMA 3R and NEMA 4X) Cover Plates: Stainless steel, specification grade, gasketed, equal to Sierra WP Series for toggle switches. Die cast aluminum, suitable for wet locations while in use, equal to Hubbell WP26 for all outdoor receptacles.

2.05 Disconnect Switches

- A. Disconnect Switches: UL-98 and NEMA KS-1; heavy duty, quick make, quick break type; horsepower and i2t rated. Provide lever type operating handle directly connected to the switch mechanism; rocker types are not acceptable. Include padlocking provisions and nameplate clearly indicating "ON" and "OFF" positions. Equip all switches with a ground lug and, where neutral conductors are scheduled, provide

insulated neutral lugs. Where indicated on the Drawings provide DPDT auxiliary contacts rated 10 amps at 120 VAC minimum.

- B. Fusible Switches: Equip with rejection clips for fuse types noted.
- C. Enclosure: Stainless steel meeting NEMA 3R, 4X and 12 requirements for all process areas and outdoors. Sheet metal; NEMA 1 for indoor dry locations only.
- D. Acceptable Manufacturers: ABB/General Electric, Eaton, or Square D.

2.06 Enclosed Circuit Breakers

- A. Main Circuit Breaker: NEMA AB-1; FS W-C-375; integral solid state trip device with adjustable pick up and time delay settings for long time, short time, and ground fault. For breakers rated 1200 amps and above, equip with arc flash energy-reducing maintenance switch with local status indicating light conforming to NEC Article 240.87. Provide UL service entrance label.
- B. General Purpose Circuit Breakers: NEMA AB-1; thermal magnetic trip with magnetic pickup adjustment above 100 amps. Where molded case switches are indicated, provide breaker as specified above with non-adjustable magnetic trip element only.
- C. Enclosure: Stainless steel meeting NEMA 3R, 4X and 12 requirements for all process areas and outdoors. Sheet metal; NEMA 12 for indoor dry locations only.
- D. Interrupting Rating: As Indicated.
- E. Acceptable Manufacturers: ABB/General Electric, Eaton, or Square D.

2.07 Individual Motor Starters

- A. Manual Starters: NEMA ICS-2; general purpose type; trip-free mechanism; with overload relays. Provide pushbutton operation for integral horsepower sizes, and toggle switch or lever for fractional sizes.
- B. Magnetic Starters: NEMA ICS-2; NEMA size 0 minimum; magnetically held contactor with field replaceable coil and contacts; bimetallic or melting alloy overload relay, manually reset. Starter shall be rated in accordance with NEMA size designations; fractional sizes and ratings per IEC recommendations are not acceptable.
- C. Magnetic Starter Controls: All controls are 120 volts. Equip each starter with a control power transformer fused on the primary and secondary. Provide starter and overload relay auxiliary contacts for run, stop and overload indication. Equip with red run light, green stop light and amber overload light on the enclosure door. Provide one spare normally open starter auxiliary contact, and door mounted operator interface pushbuttons or selector switches as indicated.
- D. Combination Starters: Molded case circuit breaker rated 42,000 AIC.
- E. Enclosure: Stainless steel meeting NEMA 3R, 4X and 12 requirements for all process

areas and outdoors. Sheet metal; NEMA 12 for indoor dry locations only.

- F. Pushbuttons, Selectors and Pilot Lights: 30mm, 600 volt, heavy duty, factory sealed; NEMA 4/4X equal to Allen-Bradley Bulletin 800H for starters with NEMA 4X enclosures or NEMA 4/13 equal to Allen-Bradley Bulletin 800T for starters with NEMA 12 enclosures. Provide LED lamps in pilot lights.
- G. Acceptable Manufacturers: Allen-Bradley, ABB/General Electric, Eaton, or Square D.

2.08 Contactors

- A. Control Relays: NEMA A600; heavy duty, machine tool type convertible contacts; electrically held 120 volt coil. Equal to Allen-Bradley Bulletin 700 Type P.
- B. General Purpose Contactors: NEMA ICS-2; electrically held; 2-wire control; 120 volt coil. Size and number of contacts as indicated.
- C. Lighting Contactors: NEMA ICS-2; mechanically held; 3 wire control; 120 volt coil. Size and number of contacts as indicated.
- D. Enclosure: NEMA ICS-6; Type 12 unless otherwise noted.
- E. Pushbuttons, Selectors and Pilot Lights: 30mm, 600 volt, heavy duty, factory sealed; NEMA 4/4X equal to Allen-Bradley Bulletin 800H for contactors in NEMA 4X enclosures or NEMA 4/13 equal to Allen-Bradley Bulletin 800T for contactors in NEMA 12 enclosures. Provide LED lamps in pilot lights.
- F. Acceptable Manufacturers: ASCO, ABB/General Electric, Eaton, or Square D.

2.09 Control Stations

- A. Pushbuttons, Selectors and Pilot Lights: 30mm, 600 volt, heavy duty, factory sealed. Provide LED lamps in pilot lights.
- B. Enclosure: Stainless steel meeting NEMA 4X and NEC Class I, Division 2, Group C and D requirements.
- C. Acceptable Manufacturers: Equal to Allen-Bradley Bulletin 800H.

2.10 Individual Surge Suppressors

- A. Surge Suppressor: Listed in accordance with UL 1449, 4th Edition and UL 1283. Device shall provide surge current diversion paths for 120 VAC circuit application; L-N, L-G, and N-G. Device shall be fused with a surge rated fuse and incorporate a thermal cutout device. An audible alarm shall indicate protection failure. Minimum surge current capability shall be 50 kA.
- B. Enclosure: NEMA 4X stainless steel.
- C. Acceptable Manufacturers: Equal to Advanced Protection Technologies TE/XP Series

(suppressor) and Hoffman (enclosure).

2.11 Fuses

- A. Fuses: Current limiting, non-renewable type, rated 200,000 AIC, with rejection feature; Class J or as required by load for ratings 600 amp and below and Class L for ratings 601 amp and above.
- B. Acceptable Manufacturers: Bussmann, Chase-Shawmut, or Littelfuse.

2.12 Plywood Backboards

Backboards: Grade BC plywood, 3/4-inch thick.

2.13 Supporting Devices

- A. Support Channel: Stainless steel, galvanized or painted steel.
- B. Hardware: Stainless steel, galvanized, nickel plated, or zinc plated steel.
- C. Threaded Rods: 3/8-inch diameter, stainless steel or galvanized steel.
- D. Where outdoor, wet, corrosive or NEMA 4X areas are indicated, use stainless steel channel, straps, hardware and rods. Additional material requirements are indicated on the Drawings.

2.14 Electrical Identification

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Wire and Cable Markers: Plastic, split sleeve or tubing type, plastic, equal to Brady Type XC or T & B Type SM.

2.15 Grounding

- A. Bare Conductors: ASTM B-8; stranded; hard drawn copper. Size unless otherwise noted is #4/0 AWG.
- B. Ground Rods: UL 425H; 3/4-inch x 10 feet; high strength steel core with metallicly bonded copper jacket.

Part 3 Execution

3.01 Conduit

- A. Unless otherwise noted, use only rigid steel or IMC conduits.
- B. Provide flexible conduit for connections to motors and other vibrating equipment. Maximum length is 3 feet unless approved by the Engineer.

- C. Use suitable equipment for all bends. Crushed or deformed conduits may not be installed. Cut threaded ends square and ream to remove burrs. Paint threads with zinc compound.
- D. Run exposed conduits parallel or perpendicular to building surfaces. Support conduits above ceilings to the building structure independent of the ceiling support system. Coordinate with other trades and avoid hot piping when possible. Where unavoidable, maintain 3-inch clearance when crossing and 12-inch clearance when paralleling hot pipes. Cap exposed conduit ends during construction.
- E. Support conduits to prevent distortion of alignment by wire pulling operations. Fasten single conduits with one-hole malleable iron straps. For multiple runs use channel and clamps. Wire, perforated pipe straps and the like are not acceptable support means.
- F. Support conduit at a maximum of seven feet on center and within three feet of each box, cabinet, or fitting. Hang trapeze assemblies with threaded rods not less than 3/8-inch diameter. Remove all temporary supports prior to pulling conductors.
- G. Do not support conduits from electrical distribution equipment or control panels.
- H. All connections are to be wrench tightened and electrically continuous. No running threads are permitted.
- I. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Use conduit bodies to make sharp changes in direction. For sizes 2-inches and larger, use "LBD" or similar fittings to permit a straight pull from either direction. In no case shall a fitting be used which results in bending radius too small for the cable.
- J. Where conduit penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating.
- K. PVC Coated Conduit: Exercise care not to damage the coating during cutting, threading, bending, and assembly. Follow the manufacturer's installation instructions. Use vise jaws, bending equipment, strap wrenches, and other tools which are specifically designed for coated conduits. Do not use chain vise, pipe wrench, channel locks or the like. Nicks or small damaged areas (1/2-inch maximum) may be repaired with a manufacturer approved compound. Replace items if coating is damaged in excess of 1/2-inch. Fill space between PVC coating and reducing fittings with silicone sealant.
- L. Rigid nonmetallic conduit may be used for underground concrete encased duct banks. Exception: Use rigid steel or IMC conduit for analog signal circuits; 4 to 20 mA and AC or DC signals less than 25 volts.
- M. Where PVC conduit is indicated, make a transition to rigid steel below grade or slab and continue above with rigid steel conduit. Provide bell ends in handholes.
- N. Conduits left empty for future use shall have a 200 pound tensile strength polyolefin line pulled through and tied off at each end.

3.02 Conductors and Connectors

- A. Use only stranded conductors. Exceptions: Solid conductors may be used for receptacle branch circuit wiring, sizes #10 and #12 AWG only.
- B. Use 90 degree C insulated conductors for all lighting circuits. Use 75 degree C insulated conductors elsewhere, unless Drawings note otherwise.
- C. Do not pull conductors until the conduit system is complete. Swab conduits prior to pulling and use pulling compound for all pulls. Do not exceed the manufacturer's pulling tension.
- D. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- E. Avoid all unnecessary splices. Where unavoidable, make splices in outlet boxes or pull boxes.
- F. Identify all conductors throughout the electrical system. For control and signal circuit, use numbered wire markers at all terminals. For power circuits color code per NEC.
- G. Make connections to circuit breakers, disconnect switches, panel mains, etc. with solderless lugs. Use mechanical connectors for stranded conductors.
- H. Continuity Tests: Ring all conductors for continuity and replace any open conductors.
- I. Ground Fault Tests: Meggar all feeder circuits for grounds. Compile and submit a list of meggar readings. Replace all conductors measuring less than 2 megohms to ground.

3.03 Boxes

- A. Provide boxes as shown on the Drawings and as required for splices, taps, wire pulling, and equipment connections. Support boxes independently of conduit. Provide knockout closures for unused openings.
- B. Box locations shown on the Drawings are approximate unless dimensioned. Coordinate mounting heights and locations of outlets mounted above counters, benches, backsplashes, and other furnishings. Locate outlet boxes to permit handicap access per ANSI A117.1. Where receptacles are indicated 18-inches above finished floor, dimension is to the bottom of the box. At the option of the Owner's representative, any outlet may be relocated by up to ten feet before it is permanently installed, without incurring additional cost. Install adjacent devices at the same elevation in a common box with one face plate. Install adjacent devices at different elevations in one vertical line.
- C. Unless otherwise noted, use only cast outlet boxes. Sheet metal boxes may be used where concealed above ceilings or in dry walls, exposed in electrical closets, and for telephone wiring.
- D. Field drill conduit holes in tap, junction and pull boxes so as to afford the maximum

bending radius for the conductors.

- E. Use PVC coated boxes wherever PVC coated conduit is indicated. Exceptions: stainless steel is permitted for boxes larger than 4 inches square.

3.04 Wiring Devices

- A. Secure devices to outlet boxes without depending on device plates to pull them tight. Install a bonding jumper between all devices and outlet boxes. Install receptacles with ground pole down.
- B. For cord and plug connected equipment, coordinate receptacle configuration with equipment supplied.

3.05 Disconnect Switches

- A. Provide switches with voltage, ampere, and number of poles as indicated on the Drawings.
- B. Switches are non-fused type, unless Drawings note otherwise, or the switch is used as a disconnect for an item of equipment with a maximum fuse size designated on the nameplate. In such cases, provide fusible type with appropriate fuse. If fusible switches protect conductors with an ampacity less than the rating of the switch, provide a nameplate on the inside front cover of the switch designating the maximum allowable fusing.
- C. Install switches so they are rigidly supported and readily accessible. Where mounted on stud walls, provide a plywood backboard secured to the studs with the switch secured to the backboard. Provide stainless steel mounting channel or phenolic spacers to give nominal 1/2-inch separation from concrete walls in wet or damp locations.
- D. For disconnect switches serving motors with space heaters, provide lamecoid nameplate engraved "WARNING – Motor space heater energized with switch open".

3.06 Enclosed Circuit Breakers

- A. Provide breakers with voltage, ampere, number of poles, and interrupting ratings as indicated on the Drawings.
- B. Install breakers so they are rigidly supported and readily accessible. Where mounted on stud walls, provide a plywood backboard secured to the studs with the breaker secured to the backboard. Provide stainless steel mounting channel or phenolic spacers to give nominal 1/2-inch separation from concrete walls in wet or damp locations.

3.07 Individual Motor Starters

- A. Select and install heater elements in motor starters to match installed motor characteristics. Do not use NEC motor full load ampere data for heater selection.
- B. Provide a typed label inside each motor starter enclosure door identifying the motor

served and listing the motor nameplate data. Provide an engraved nameplate on the exterior of the enclosure door identifying the motor served, the horsepower, voltage and phase rating.

- C. Install starters so they are rigidly supported and readily accessible. Where mounted on stud walls, provide a plywood backboard secured to the studs with the starter secured to the backboard. Provide stainless steel mounting channel or phenolic spacers to give nominal 1/2-inch separation from concrete walls in wet or damp locations.

3.08 Contactors

- A. Install timer and lighting controls for contactors as indicated.
- B. Install indicator lights and selector switches in enclosure door as indicated.

3.09 Control Stations

Install control stations so they are rigidly supported and located so as not to impair access to equipment for maintenance.

3.10 Individual Surge Suppressors

Install suppressors so they are rigidly supported and accessible.

3.11 Fuses

Equip all fusible devices with fuses. Replace all blown fuses up to final acceptance of the Project. At the completion of the Project, turn over to the Owner spare fuses for each type and size installed; six each for ratings 60 amps and below, and three each for ratings above 60 amps.

3.12 Plywood Backboards

Provide plywood backboards for small, surface mounted items of electrical distribution equipment in areas such as mechanical rooms, electrical closets, and equipment rooms where support is required to span structural voids or to reinforce wall material. Secure backboards to the building structure and paint with two coats of exterior latex paint. Coordinate paint color with Owner.

3.13 Supporting Devices

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using appropriate devices.
- B. Unless noted otherwise, use beam clamps on exposed metal structure; toggle bolts or hollow wall fasteners in hollow masonry, plaster, precast hollow-core planks, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or adhesive anchors on cast-in-place concrete walls and slabs; self-drilling inserts in precast hollow-core planks; and sheet metal screws in sheet metal

studs.

- C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- D. Do not attach to precast double-tee flanges or the bottom of the stem. Use pre-installed holes in side of stem.
- E. Do not attach to bottom side of cast-in-place concrete beam.
- F. Do not attach to cast-in-place concrete columns.
- G. Do not use powder-actuated anchors.
- H. Do not use perforated straps or wire.
- I. Make all supports from the structure, not the work of other trades. Do not drill or cantilever from structural steel members. Install supports so as not to weaken the structure.
- J. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- K. Install free-standing electrical equipment on concrete pads. Anchor to concrete pad in accordance with manufacturer's recommendations and applicable Structural anchorage practices.
- L. Install surface-mounted cabinets and panelboards on channel or plywood backboard with minimum of four anchors.
- M. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.
- N. Cutting, drilling, nicking, or damaging reinforcing steel or pre-stressed tendons is not permitted. Therefore, when drilling into any existing concrete for anchorage, Contractor shall locate existing reinforcing steel and/or pre-stressed tendons using concrete imaging equipment, such as cover meter based on pulse induction method, unless prior approval is obtained from the Engineer. Provide minimum spacing of 3 inches between anchors and existing reinforcing steel/pre-stressed tendons. Notify Engineer immediately if the location of the anchors would not allow 3-inch spacing to reinforcing steel/pre-stressed tendons.
- O. If drilling results in concrete spalling, spalling shall be repaired by the trade performing the drilling.

3.14 Electrical Identification

- A. Provide nameplates for all switchboards, panelboards, transformers, disconnect switches, individual motor starters, and other items of electrical distribution equipment. Engrave with the equipment identification as indicated; and the voltage, current and

interrupting rating. Attach nameplates with screws or rivets; adhesives are not acceptable. Exception: Two-part epoxy glue may be used for NEMA 4/4X enclosures.

- B. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring.

3.15 Grounding

- A. Except as noted, use insulated ground conductors only where installed in a raceway. Use bare conductors for ground rod connections and bonding of buildings, structures etc. Where a bare conductor is installed in a raceway use only non-metallic raceways; do not install bare conductors in metallic raceways.
- B. Drive ground rods so the top is 3 to 6-inches below finished grade. If rock is encountered then rods may be driven at an angle or grounding plates, as approved by the Engineer, may be used.
- C. Where bare conductors emerge from concrete encasement, provide a 4-inch length of Schedule 40 PVC conduit set in the concrete to protect the conductor.
- D. Route a bare conductor through each duct bank. Connect to building ground grid.
- E. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- F. Notify the Owner's representative at least one week in advance that the ground system for each building or structure is ready for inspection. Obtain written notice to proceed before filling trenches, pouring slabs, or otherwise covering the work.

END OF SECTION

Part 1 General

1.1 Scope

- A. Dry type two winding transformers.

1.2 Submittals

- A. Submit product data. Include outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, loss data, efficiency at 25, 50, 75 and 100 percent rated load, sound level, tap configurations, insulation system type, and rated temperature rise.

1.3 Delivery, Storage and Handling

- A. Store in a warm, dry location with uniform temperature. Cover ventilating openings to keep out dust.
- B. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet, or snow if handled in inclement weather.

Part 2 Products

2.1 Acceptable Manufacturers

- A. Dry type transformers shall be equal to ABB/General Electric, Eaton, or Square D.

2.2 Dry Type Transformers

- A. Dry Type Transformers: NEMA ST-20; factory-assembled, air cooled dry type transformers; ratings as indicated. Transformers are two winding power type. Three phase units are connected delta primary and wye secondary. Scott or Tee connections and autotransformers are not acceptable.
- B. Insulation: 220 degrees C, 150 degree C rise for ratings 30 kVA and larger; 185 degrees C, 115 degree C rise for ratings below 30 kVA.
- C. Taps: Two, 5 percent below rated primary for ratings 15 kVA and smaller; six, 2-1/2 percent two above and four below rated primary for ratings larger than 15 kVA.
- D. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- E. Mounting: Transformers 75 kVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 75 kVA shall be suitable for floor or trapeze mounting.
- F. Isolate core and coil from enclosure using vibration-absorbing mounts.

Part 3 Execution

3.1 Installation

- A. Set transformer plumb and level. Clear walls and ceilings by at least 6-inches to allow for air circulation.
- B. Use flexible conduit, two foot minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

3.2 Field Quality Control

- A. Check for damage and tight connections prior to energizing transformer.
- B. Measure secondary voltage under normal load conditions and make appropriate tap adjustments.

END OF SECTION

Part 1 General

1.01 Scope

Main distribution panel.

1.02 Submittals

- A. Shop Drawings: Front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; and electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and equipment short circuit rating.
- B. Protective Device Trip Settings: Provide tabulation of each adjustable trip device indicating "As Found" and "As Set" conditions.

1.03 Record Drawings

- A. Shop Drawings: As listed in Article 1.02, corrected to reflect the equipment as-built.
- B. Operation and Maintenance Data: Spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.04 Delivery, Storage and Handling

- A. Arrange shipping splits as required for installation. Individually wrap each section and mount on shipping skids.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with NEMA PB-2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

Part 2 Products

2.01 Acceptable Manufacturers

Switchboards shall be manufactured by ABB/General Electric, Eaton, or Square D.

2.02 Switchboard Construction and Ratings

- A. Switchboard: Factory-assembled; dead front; metal-enclosed; front accessible; self-supporting switchboard assembly conforming to NEMA PB-2; complete from

Switchboards

incoming line terminals to load-side terminations. Provide UL service entrance label where used as service equipment.

- B. Switchboard Electrical Ratings and Configurations: As indicated.
- C. Devices: Panel mounted.
- D. Bus: Copper, sized in accordance with NEMA PB-2. Provide a copper ground bus through the length of the switchboard.
- E. Enclosure: NEMA PB-2 Type 1 - General Purpose. Sections align at the rear for mounting against a wall.
- F. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

2.03 Switching and Overcurrent Protective Devices

Molded Case Circuit Breakers: NEMA AB-1; FS W-C-375; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole.

2.04 Instruments and Sensors (Switchboard Mains)

- A. Circuit Monitor: Microprocessor based unit for measuring multiphase variables including amps, volts, VARS, watts, volt-amps, power factor, demand values and harmonic distortion indication. Communications: ModBus RTU protocol; digital and analog inputs and outputs; RS232 port on front; RS485 ports on rear. Equal to ABB/General Electric Power Quality Meter.
- B. Current Transformers: ANSI C57.13; 5 ampere secondary, bar or window type, with single secondary winding and secondary shorting device, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.
- C. Potential Transformers: ANSI C57.13; 120 volt single secondary, disconnecting type with integral fuse mountings, primary/secondary ratio as required, burden and accuracy consistent with connected metering and relay devices, 60 Hertz.

2.05 Surge Protective Devices

- A. Surge protective devices (SPD) and all components shall be designed, manufactured, tested and listed in accordance with the latest edition of ANSI/UL 1449 4th Edition.
- B. UL designation: Type 2.
- C. Electrical Requirements
 - 1. Maximum Continuous Operating Voltage (MCOV): Not less than 115% of the nominal system voltage.

2. Protection Modes: Protect all modes (L-L, L-N, etc.), of the electrical system being utilized with a minimum of seven mode protection.
3. Nominal Discharge Current (I_n): 20kA.
4. Voltage Protection Rating (VPR) shall not exceed the following:

Voltage Rating	L-N	L-G	N-G	L-L
208Y/120-240	700	700	700	1,200
480Y/277	700	700	700	2,000
240 Δ	n/a	1,500	n/a	3,000
480 Δ	n/a	1,500	n/a	2,000

5. Surge Current Capacity: ANSI/IEEE C62.41 Category C; 240 kA per phase, 120 kA per mode.
6. EMI/RFI noise suppression: -50db attenuation at 100 kHz tested per MIL-STD 220B.

D. SPD Design

1. Unit shall incorporate thermally protected metal-oxide varistors (MOVs).
2. All internal components shall be hardwired and soldered; no plug-in modules will be permitted.
3. Provide LED status for each protected phase, a form C dry contact for remote status, and a surge event counter.
4. SPD shall be mounted integral to the electrical distribution equipment.

Part 3 Execution

3.01 Installation

- A. Install switchboard on concrete pad in locations shown on Drawings in accordance with manufacturer's written instructions and NEMA PB-2-1. Anchor to concrete pads in accordance with manufacturer's recommendations and applicable Structural anchorage practices. Drilling into reinforcing steel or pre-stressed tendons is not permitted. Therefore, when drilling into any concrete for anchorage, Contractor shall locate reinforcing steel and/or pre-stressed tendons using concrete imaging equipment such as cover meter based on pulse induction method, unless prior approval is obtained from the Engineer. Provide minimum spacing of 3 inches between anchors and reinforcing steel/pre-stressed tendons. Notify Engineer immediately if the location of the anchors will not allow 3-inch spacing to reinforcing steel/pre-stressed tendons. If drilling results in concrete spalling, spalling shall be repaired by the trade performing the drilling.
- B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

3.02 Field Quality Control

- A. Inspect completed installation for physical damage, proper alignment, anchorage and grounding.
- B. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each. Test voltage shall be 1,000 volts, and minimum acceptable value for insulation resistance is 2 megohms.
- C. Check tightness of accessible bolted bus joints using a calibrated torque wrench. Tightness shall be in accordance with manufacturer's recommended values.
- D. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

Part 1 General

1.01 Scope

Panelboards.

1.02 Submittals

Submit shop drawings.

Part 2 Products

2.01 Acceptable Manufacturers

Equipment shall be manufactured by ABB/General Electric, Eaton, or Square D.

2.02 Panelboards

- A. Panelboards: NEMA PB-1; UL 67.
- B. Rating: Voltage and ampere ratings are shown on the Drawings. Unless otherwise indicated interrupting ratings (RMS symmetrical) are 42,000 amps for 480 volt panelboards and 10,000 amps for 240 and 208 volt panelboards.
- C. Boxes: Code gauge galvanized steel; sized to accommodate devices indicated and afford wire bending space in accordance with NEC requirements.
- D. Fronts: Surface or flush as indicated, door-in-door construction, finished in light grey enamel over a rust inhibitor. Furnish flush lock for fronts less than 48-inches high and vault type handle with three point catch for fronts 48-inches and higher. Key all locks alike.
- E. Bus: Copper, arranged for bolt-on circuit breakers. Furnish insulated neutral bus and ground bus with main lug bonded to the box.
- F. Circuit Breakers: NEMA AB-1; molded case type, thermal-magnetic trip with internal common trip on multipole breakers. Provide breaker fully rated for interrupting ratings noted; series ratings are not acceptable.
- G. Ground Fault Protection: Where indicated with "GFI Circuit Breaker", provide UL Class A ground fault circuit interrupter tripping at 5 mA for circuits that supply receptacles. Provide UL listed ground fault interrupter tripping at 30 mA for equipment ground fault protection for circuits that supply electric heat tracing.
- H. Provide engraved nameplates giving the voltage rating and panel designation as indicated. Provide a UL service entrance label for panelboards used as service entrance equipment.

2.03 Surge Protective Devices

- A. Surge protective device (SPD) and all components shall be designed, manufactured, tested and listed in accordance with the latest edition of ANSI/UL 1449 4th edition.
- B. UL Designation: Type 2.
- C. Electrical Requirements
 - 1. Maximum Continuous Operating Voltage (MCOV): Not less than 115% of the nominal system voltage.
 - 2. Protection Modes: Protect all modes (L-L, L-N, etc.), of the electrical system being utilized with a minimum of seven mode protection.
 - 3. Nominal Discharge Current (I_n): 20kA.
 - 4. Voltage Protection Rating (VPR):

Voltage Rating	L-N	N-G	L-G	L-L
208Y/120-240	700	700	700	1,200
480Y/277	700	700	700	1,200
240 Δ	-	-	1,500	3,000
480 Δ	-	-	900	1,800

- 5. Surge Current Capacity: ANSI/IEEE C62.41 Category C; 80kA per phase, 40kA per mode.
- 6. EMI/RFI Noise Suppression: -50db attenuation at 100kHz tested per MIL-STD 220B.
- D. SPD Design
 - 1. Unit shall incorporate thermally protected metal-oxide varistors (MOVs).
 - 2. All internal components shall be hardwired and soldered; no plug-in modules will be permitted.
 - 3. Provide LED status for each protected phase, form C dry contact for remote status and surge event counter.
 - 4. SPD shall be mounted integral to the electrical distribution equipment.

Part 3 Execution

3.01 Installation

- A. Install boxes so they are rigidly supported and correctly aligned. Anchor panelboards to the wall or support stand in accordance with manufacturer's recommendations and applicable Structural anchorage practices. Select mounting height so that operating

handles are not higher than 6 feet 6-inches nor lower than 24-inches above the floor.

- B. To the extent possible, extend conduits directly to panelboards without using junction boxes or wireways. Where the area of conduits exceeds the conduit penetration area of the box or enclosure, provide auxiliary gutter. Material and NEMA rating of wireway shall match material of panelboard. In no case shall the wireway contain any wiring other than wiring exclusively fed from the panelboard. Do not mix voltage systems. Do not pass wiring between wireways.
- C. Prior to energizing panelboards clean out construction dirt and debris. Paint any scratches on the trims or dead front barriers. Meggar each phase to phase and ground to insure that no short circuits exist.
- D. Adjust panel barriers so that no openings occur between them and the panel front. Provide filler plates and plugs as necessary to maintain dead front integrity.
- E. Type directory cards with circuit loads and/or area served. Note spare circuits in pencil.

3.02 Field Quality Control

Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

END OF SECTION

Part 1 General

1.1 Section Includes

- A. Clearing and grubbing.
- B. Excavation and disposal of all wet and dry materials (including rock) encountered that must be removed for construction purposes.
- C. Sheeting, shoring, bracing, and timbering.
- D. Dewatering of trenches and other excavations.
- E. Pipe bedding.
- F. Backfilling and tamping of trenches, foundations, and other structures.

1.2 Related Sections

- A. Section 32 92 19 – Seeding.

1.3 Definitions

- A. Degree of Compaction: Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D698, for general soil types, abbreviated as percent laboratory maximum density.
- B. Hard Materials: Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.
- C. Rock: Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement.

1.4 Submittals

- A. The following shall be submitted in accordance with Section 01 33 00 - Submittal Procedures:
- B. Test Reports – Submit copies of all laboratory and field test reports within 24 hours of the completion of the test.
 - 1. Borrow Site Testing: Fill and backfill test
 - 2. Select material test

Trenching and Backfilling

3. Porous fill test for capillary water barrier
4. Density tests

1.5 Delivery, Storage, and Handling

- A. Perform in a manner to prevent contamination or segregation of materials.

1.6 Requirements for Off Site Soil

- A. Soils brought in from off site for use as backfill shall be tested for petroleum hydrocarbons, BTEX, PCBs and HW characteristics (including toxicity, ignitability, corrosivity, and reactivity). Backfill shall not contain concentrations of these analytes above the appropriate State and/or EPA criteria, and shall pass the tests for HW characteristics. Determine petroleum hydrocarbon concentrations by using appropriate State protocols. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5035/8260B. Perform complete TCLP in accordance with EPA SW-846.3-3 Method 1311. Perform HW characteristic tests for ignitability, corrosivity, and reactivity in accordance with accepted standard methods. Perform PCB testing in accordance with accepted standard methods for sampling and analysis of bulk solid samples. Provide borrow site testing for petroleum hydrocarbons and BTEX from a grab sample of material from the area most likely to be contaminated at the borrow site (as indicated by visual or olfactory evidence), with at least one test from each borrow site. For each borrow site, provide borrow site testing for HW characteristics from a composite sample of material, collected in accordance with standard soil sampling techniques. Do not bring material onsite until tests results have been received and approved by the Owner.

1.7 Field Measurements

- A. Verify that survey bench mark and intended elevations for the Work are as shown on the drawings.

1.8 Quality Assurance

- A. Utilities: Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Report damage to utility lines or subsurface construction immediately to the Engineer.

Part 2 Products

2.1 Soil Materials

- A. Satisfactory Materials: Any materials classified by ASTM D2487 as GW, GP, GM, GP-GM, GW-GM, GC,GP-GC, GM-GC, SW, or SP, free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

- B. Unsatisfactory Materials: Materials which do not comply with the requirements for satisfactory materials. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 3 inches. The Engineer shall be notified of any contaminated materials.
- C. Backfill and Fill Material: Provide ASTM D2321 materials as listed in Tables 1, 2, and 3.
- D. Topsoil: Provide as specified in Section 32 92 19 - Seeding.

2.2 Utility Bedding Material

- A. Provide ASTM D2321 materials as listed in Tables 1, 2, and 3.

2.3 Borrow

- A. Obtain borrow materials required in excess of those furnished from excavations from sources outside of Owner's property.

Part 3 Execution

3.1 Protection

- A. Shoring and Sheeting
 1. 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.
 2. Wherever employees may be exposed to moving ground or cave-ins, shore and lay back exposed earth excavation surfaces more than 5 feet high to a stable slope, or else provide some equivalent means of protection. Effectively protect trenches less than 5 feet 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.
 3. Trench excavation safety protection shall be accomplished as required by the most recent provisions of Part 1926, Subpart P - Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration (OSHA) Standards and Interpretations, as may be amended. Comply with all OSHA

Trenching and Backfilling

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 Georgia 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.

4. 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.
5. 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.
6. Fill and compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing as specified herein.
7. 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.
8. A "Qualified Person", as defined by OSHA regulations, shall be on-site at all times during activities requiring trench safety provisions.

B. Drainage and Dewatering

1. Provide for the collection and disposal of surface and subsurface water encountered during construction.
2. Drainage: So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. Where applicable, the Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils, prevent erosion and undermining of foundations. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed. Excavated slopes and backfill

surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3. Dewatering:

- a. Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 2 feet below the working level.
- b. Operate dewatering system continuously until construction work below existing water levels is complete. Submit performance records weekly.

C. Underground Utilities

1. Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of all existing utilities prior to starting construction. The Contractor shall contact the State One-Call Service, Public Utilities Department, and affected utilities for assistance in locating existing utilities.

- D. Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.2 Surface Preparation

- A. Clear and grub project.
- B. Identify required lines, levels, contours, and datum.
- C. Protect plant life, lawns, and other features remaining as part of final landscaping.
- D. Maintain and protect above and below grade utilities which are to remain.

3.3 Excavation

- A. Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for

subsequent construction due to exposure to weather. Excavations below indicated depths will not be permitted except to remove unsatisfactory material.

1. **Blasting:** Where permitted and allowed by the Owner and Engineer as an acceptable trenching option, blasting shall be performed in accordance with appropriate criteria established by the National Fire Protection Association and all Local, County, State, and Federal codes and ordinances. The Contractor shall be responsible for obtaining all permits at no cost to the Owner. Blasting for utility excavation must be done in such a manner as to minimize the fracturing of rock beyond the required excavation. The Contractor shall consider the elevation of utilities in relation to the blasting charge and the relative alignment of existing and proposed trenches. Blasting within such areas shall be accomplished only by qualified Contractors who hold blasting licenses from a qualified agency. Any damage to existing utilities resulting from blasting shall be repaired at the Contractor's expense. Sand shall not be used for bedding for backfill in trenches that have been blasted.
- B. 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 inch to 2 inch sized crushed stone up to the level of the lines, grades, and/or cross sections shown on the Drawings. The top 6 inches of this refill shall be ASTM D2321 Class I crushed stone for bedding
- C. Unless specified otherwise, refill excavations cut below indicated depth with bedding material and compact to 95 percent of ASTM D698 maximum density. Satisfactory material removed below the depths indicated, without specific direction of the Engineer, shall be replaced with satisfactory materials to the indicated excavation grade. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Engineer.
- D. **Pipe Trenches:**
 1. Unless the construction of lines by tunneling, jacking, or boring is called for by the Drawings or specifically authorized by the Engineer, make excavation for pipelines in open cut and true to the lines and grades shown on the Drawings or established by the Engineer on the ground. Cut the banks of trenches between vertical parallel planes equidistant from the pipe centerline. The horizontal distance between the vertical planes (or, if sheeting is used, between the inside faces of that sheeting) shall vary with the size of the pipe to be installed, but shall not be more than the distance determined by the following formula: $4/3d + 15$ inches, where "d" represents the internal diameter of the pipe in inches. When approved in writing by the Engineer, the banks of trenches from the ground surface down to a depth not closer than 1 foot above the top of the pipe may be excavated to nonvertical and nonparallel planes, provided the excavation below that depth is made with vertical and parallel sides equidistant from the pipe centerline in accordance with the formula given above. Any cut made in excess of the formula $4/3d + 15$ inches shall be at the expense of the Contractor and may be cause for the Engineer

to require that stronger pipe and/or a higher class of bedding be used at no cost to the Owner.

2. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement. Tamp if necessary to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least 6 inches below the bottom of the pipe.
3. Excavate bell holes for bell and spigot pipe at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper jointing of the pipe. Do not excavate bell holes more than 2 joints ahead of pipe laying.
4. Provide minimum depths of "Bedding Material" as defined in Tables 1, 2, and 3.
5. Do not excavate pipe trenches more than 200 feet ahead of the pipe laying and perform all work so as to cause the least possible inconvenience to the public. Construct temporary bridges or crossings when and where the Engineer deems necessary to maintain vehicular or pedestrian traffic.
6. In all cases where materials are deposited along open trenches, place them so that in the event of rain no damage will result to the work and/or to adjacent property.

E. Hard Material and Rock

1. Any material that is encountered within the limits of the required excavation that cannot be removed except by drilling and/or blasting, 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.
2. Should rock be encountered in the excavation, remove it by blasting or other methods. Where blasts are made, cover the excavation with enough excavation material and/or timber or steel matting to prevent danger to life and property. The Contractor shall secure, at his own expense, all permits required by law for blasting operations and the additional hazard insurance required. Observe all applicable laws and ordinances pertaining to blasting operations.
3. Excavate rock over the horizontal limits of excavation and to a depth of not less than 6 inches below the bottom of pipe up to 30 inches in diameter and not less than 12 inches below the bottom of larger pipes if rock extends to such depth. Then backfill the space below grade with ASTM D2321 Class I crushed stone or other approved material, tamp to the proper grade, and make ready for construction.

F. Excavated Materials

1. Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Paragraph "DISPOSITION OF SURPLUS MATERIAL."

3.4 Filling and Backfilling

- A. Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

B. Backfill and Fill Material Placement For Utilities

1. Begin backfilling after the line construction is completed and then inspected and approved by the Engineer. Place this backfill simultaneously on either side of the pipe in even layers that before compaction are no more than 6 inches deep. Thoroughly and completely tamp each layer into place before placing additional layers.

- C. At locations of improvements subject to damage by displacement, tamp and thoroughly compact the backfill in layers that, before compaction, are 6 inches deep. In other areas, the backfill for the upper portion of the trenches may be placed without tamping but shall be compacted to a density equivalent to that of adjacent earth material as determined by laboratory tests. Use special care to prevent the operation of backfilling equipment from causing any damage to the pipe.

- D. If earth material for backfill is, in the opinion of the Engineer, too dry to allow thorough compaction, then add enough water so that the backfill can be properly compacted. Do not place earth material that the Engineer considers too wet or otherwise unsuitable.

- E. Wherever excavation has been made within easements across private property, the top 1 foot of backfill material shall consist of topsoil, as defined in Section 32 92 19 - Seeding.

- F. Wherever trenches have been cut across or along existing pavement and driveways, including gravel or dirt drives, temporarily pave the backfill of such trenches by placing ASTM D2321 Class I crushed stone as the top 12 inches of the backfill. Maintain this temporary pavement either until the permanent pavement is restored or until the project is accepted by the Owner.

- G. Conduct backfilling around manholes, inlets, outfalls, and/or structures in the same manner as specified above for pipelines except that even greater care is necessary to prevent damage to the utility structure.

- H. Do not use power operated tampers to tamp that portion of the backfill around the pipe within 1 foot above the pipe.

- I. 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, whenever directed to do so by the Engineer.
- J. Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the Engineer's requiring that the Contractor's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.
- K. Compaction Requirements: Under buildings and 2 times the depth of pipe beyond, and under roads and 2 times the depth beyond the shoulder, compact to 98 percent maximum density in accordance with ASTM D698. In all other locations, compact to 90 percent maximum density.

3.5 Borrow

- 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.

3.6 Finish Operations

- A. Grading: Finish grades as indicated within one-tenth of one foot. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.
- B. Protection of Surfaces: Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.7 Disposition of Surplus Material

- 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. 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. The Contractor shall dispose of these surplus and waste materials off-site in an appropriate manner in conformity with pertinent codes and ordinances. Leave the surface of the work in a neat and workmanlike condition, as described below.
- C. 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.

3.8 Field Quality Control

- A. Sampling: Take the number and size of samples required to perform the following tests.
- B. Testing: Perform one of each of the following tests for each material used. Provide additional tests for each source change.
 - 1. Bedding Material and Fill and Backfill Material Testing: Test fill and backfill material in accordance with ASTM C136 for conformance to ASTM D2487 gradation limits; ASTM D1140 for material finer than the No. 200 sieve; ASTM D4318 for liquid limit and for plastic limit; ASTM D698 or ASTM D1557 for moisture density relations, as applicable.
 - 2. Density Tests: Test density in accordance with ASTM D1556, or ASTM D6938. When ASTM D6938 density tests are used, verify density test results by performing an ASTM D1556 density test at a location already ASTM D6938 tested as specified herein. Perform an ASTM D1556 density test at the start of the job, and for every 10 ASTM D6938 density tests thereafter. Test each lift at randomly selected locations with one test per 400 linear feet in each lift.

Table 1: Backfilling and Compaction of Trenches for Pressure Pipes in Unimproved Areas

Layer*	Depth			Material**			
	≤15"Ø	18"-38"Ø	>38"Ø	DIP	PVC	HDPE	Conc
A	4" min	6" min	12" min	I B	II	II	I B
B1	½ OD			III	II	II	III
B2	½ OD			III	II	II	III
C	6"			III	II	II	III
D	6"			IV A	II	II	IV A
E	Varies			IV A	IV A	IV A	IV A
F	12"			As specified in Section 32 92 19			

*See Figure 1.

**Bedding material to be used in wet conditions for all layers.

Table 2: Backfilling and Compaction of Trenches for Gravity Lines in Unimproved Areas

Layer*	Depth			Material**			
	≤15"Ø	18"-38"Ø	>38"Ø	DIP	PVC	HDPE	Conc
A	4" min	6" min	12" min	I B	II	II	I B
B1	½ OD			I B	II	II	I B
B2	½ OD			III	II	II	III
C	6"			III	II	II	III
D	6"			IV A	II	II	IV A
E	Varies			IV A	IV A	IV A	IV A
F	12"			As specified in Section 32 92 19			

*See Figure 1.

**Bedding material to be used in wet conditions for all layers.

Table 3: Backfilling and Compaction of Trenches in Paved Areas

Layer*	Depth			Material			
	≤15"Ø	18"-38"Ø	>38"Ø	DIP	PVC	HDPE	Conc
A	4" min	6" min	12" min	I B	II	II	I B
B1	½ OD			I B	II	II	I B
B2	½ OD			I B	II	II	I B
C	6"			I B	II	II	I B
D	6"			I B	II	II	I B
E	Varies			I B	II	II	I B
F	12"			As required for pavement base			

*See Figure 1.

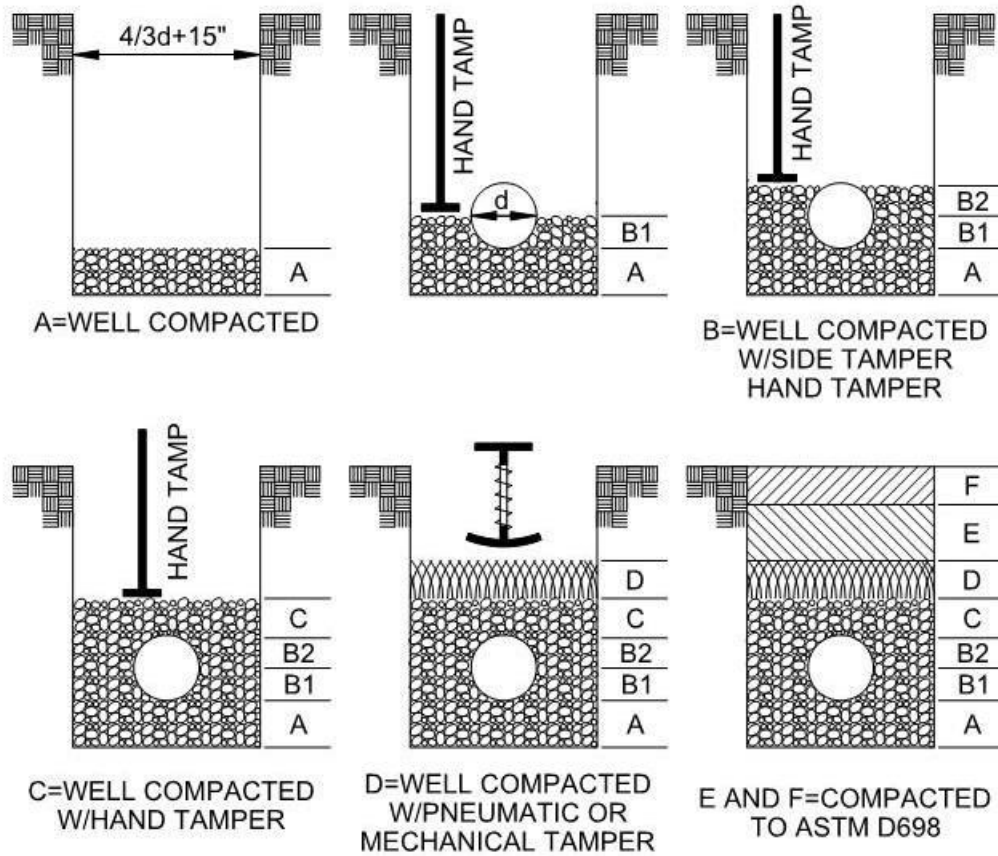


Figure 1: Backfilling and Compaction of Trenches

END OF SECTION

Part 1 General

1.1 Section Includes

- A. Small portland cement concrete paving jobs such as access roads, driveways, sidewalks, and parking lots, complete including materials, formwork, and finishing.

1.2 Design

- A. This materials and construction specification is intended to be used on projects where the design was completed using UFC 3-250-01FA Pavement Design for Roads, Streets, Walks, and Open Storage Areas, ACI 330R, Guide for the Design and Construction of Concrete Parking Lots or ACI 325.12R, Guide for Design of Jointed Concrete Pavements for Streets and Local Roads, or equivalent.

1.3 Submittals

- A. Submit the following in accordance with Section 01 33 00 Submittal Procedures:
- B. Action Submittals:
 - 1. Product Data:
 - a. Curing materials.
 - b. Admixture.
 - c. Dowels and reinforcement: Submit a complete list of materials including type, brand and applicable reference specifications.
 - 2. Design Data:
 - a. Concrete Mix Design: Thirty days minimum prior to concrete placement, submit a mix design, with applicable tests, for each strength and type of concrete for approval. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, slag, and admixtures; and applicable reference specifications. Provide mix proportion data using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required. Submittal shall clearly indicate where each mix design will be used when more than one mix design is submitted. Obtain acknowledgement of approvals prior to concrete placement. Submit a new mix design for each material source change.

C. Informational Submittals

1. Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix will be suitable for the job conditions. The laboratory test reports shall include mill test and all other test for cementitious materials, aggregates, and admixtures. Provide maximum nominal aggregate size, combined aggregate gradation analysis, percentage retained and passing sieve, and a graph of percentage retained versus sieve size. Test reports shall be submitted along with the concrete mix design.
2. Test Reports:
 - a. Aggregate Tests.
 - b. Concrete Slump Tests.
 - c. Air Content Tests.
 - d. Compressive Strength Tests.
 - e. Certificates.
 - f. Ready-mixed Concrete Plant.
 - g. Batch Tickets.
 - h. Cementitious Materials.

1.4 Delivery, Storage, and Handling

- A. In accordance with AASHTO M 157.

1.5 Quality Assurance

- A. Ready-mixed Concrete Plant Certification: Unless otherwise approved by the Engineer, ready mixed concrete shall be produced and provided by a National Ready-Mix Concrete Association (NRMCA) certified plant.
- B. Contractor Qualifications: Unless waived by the Engineer, the Contractor shall meet one of the following criteria:
 1. Contractor shall have at least one National Ready Mixed Concrete Association (NMRCA) certified concrete craftsman and at least one American Concrete Institute (ACI) Flatwork Finisher Certified craftsman on site, overseeing each placement crew during all concrete placement.
 2. Contractor shall have no less than three NRMCA certified concrete installers and at least two American Concrete Institute (ACI) Flatwork Finisher Certified installers, who shall be on site working as members of each placement crew during all concrete placement.

- C. Sampling and testing of materials, concrete mix design, sampling and testing in the field shall be performed by a commercial testing laboratory which conforms to State DOT requirements.

Part 2 Products

2.1 Materials

- A. Cementitious Materials
 - 1. Cementitious materials in concrete mix shall be 20 to 50 percent non-portland cement pozzolanic materials by weight. Substitutions shall be in accordance with applicable state DOT requirements.
 - 2. Cement: AASHTO M 85, Type I or II, except that alkali content shall not exceed 0.60 percent.
 - 3. Fly Ash: AASHTO M 295 and complying with state DOT Standard Specifications.
 - 4. Slag: AASHTO M302, Ground Granulated Blast Furnace Slag, Grade 100 or 120 and conforming to state DOT Standard Specifications.
- B. Water: Potable water, complying with ASTM C1602.
- C. Aggregate:
 - 1. Coarse aggregate shall consist of crushed or uncrushed gravel, crushed stone, or a combination thereof. Aggregates, as delivered to the mixers, shall consist of clean, hard, uncoated particles. Coarse aggregate shall be washed. Washing shall be sufficient to remove dust and other coatings. Coarse aggregate shall conform to state DOT Standard Specifications.
 - 2. Fine aggregate shall consist of natural sand, manufactured sand, or a combination of the two, and shall be composed of clean, hard, durable particles. Fine aggregate shall conform to state DOT Standard Specifications.
 - 3. Both coarse and fine aggregates shall meet the requirements of ASTM C33.
- D. Admixtures: In accordance with state DOT Standard Specifications.
- E. Reinforcement
 - 1. Dowel Bars: Bars shall conform to AASHTO M 31 for Grade 40 or 60 for plain billet-steel bars of the size and length indicated. Remove all burrs and projections from the bars. The bars shall have a corrosion resistant coating conforming to the requirements of AASHTO M 254 for a Type A or Type B coating. One end of each dowel used in an expansion assembly shall be provided with an approved tight fitting non-collapsible expansion cap.

2. Tie Bars: Bars shall be billet or axle steel deformed bars and conform to AASHTO M 31 for Grade 40 or 60.

F. Curing Materials

1. White-Burlap-Polyethylene Sheet: AASHTO M 171, 0.004 inch thick white opaque polyethylene bonded to 10 oz./linear yard (40 inch) wide burlap.
2. Liquid Membrane-Forming Compound: AASHTO M 148, Class A, white pigmented, Type 2, Class B, free of paraffin or petroleum.

- G. Joint Fillers and Sealants: Provide as specified in state DOT Standard Specifications.

2.2 Concrete Pavement

A. Joint Layout Drawings

1. If jointing requirements on the project drawings are not compatible with the contractor's placement sequence, the contractor shall submit a joint layout plan shop drawing to the Engineer for approval. No work shall be allowed to start until the joint layout plan is approved. The joint layout plan shall indicate and describe in the detail the proposed jointing plan for contraction joints, expansion joints, and construction joints, in accordance with the following:
2. Indicate locations of contraction joints, construction joints, and expansion joints. Spacing between contraction joints shall not exceed 15 feet unless noted otherwise or approved by the Engineer.
3. The larger dimension of a panel shall not be greater than 125% of the smaller dimension.
4. The minimum angle between two intersecting joints shall be 80 degrees, unless noted otherwise or approved by the Engineer.
5. Joints shall intersect pavement-free edges at a 90 degree angle to the pavement edge and shall extend straight for a minimum of 1.5 feet from the pavement edge, where possible.
6. Align joints of adjacent panels.
7. Align joints in attached curbs with joints in pavement when possible. Ensure joint depth, widths, and dimensions are specified.
8. Minimum contraction joint depth shall be 1/4 of the pavement thickness. The minimum joint width shall be 1/8 inch.
9. Use expansion joints only where pavement abuts buildings, foundations, manholes, and other fixed objects.

2.3 Contractor-furnished Mix Design

- A. Contractor-furnished mix design concrete shall be designed in accordance with state DOT requirements except as modified herein, and the mix design shall be as specified herein. The concrete shall have a minimum compressive strength of 4000 pounds per square inch at 28 days. The concrete may be air entrained. If air entrainment is used the air content shall be between 2.5 and 6.0 percent. Maximum size aggregate for slip forming shall be 1.5 inches. The slump shall be 2 inches or less. For slip-formed pavement, at the start of the project, select a maximum allowable slump which will produce in-place pavement meeting the specified tolerances for control of edge slump.

Part 3 Execution

3.1 Forms

- A. Construction: Construct forms to be removable without damaging the concrete.
- B. Coating: Before placing the concrete, coat the contact surfaces of forms except existing pavement sections where bonding is required, with a non-staining mineral oil, non-staining form coating compound, or two coats of nitro-cellulose lacquer. When using existing pavement as a form, clean existing concrete and then coat with asphalt emulsion bondbreaker before concrete is placed.
- C. Grade and Alignment: Check and correct grade elevations and alignment of the forms immediately before placing the concrete.

3.2 Reinforcement

- A. Setting Slab Reinforcement
 - 1. Reinforcement shall be positioned on suitable chairs prior to concrete placement. At expansion, contraction and construction joints, place the reinforcement as indicated. Reinforcement, when placed in concrete, shall be free of mud, oil, scale or other foreign materials. Place reinforcement accurately and wire securely. The laps at splices shall be 12 inches minimum and the distances from ends and sides of slabs and joints shall be as indicated.

3.3 Measuring, Mixing, Conveying, and Placing Concrete

- A. Measuring: AASHTO M 157.
- B. Mixing: AASHTO M 157, except as modified herein. Begin mixing within 30 minutes after cement has been added to aggregates. When the air temperature is greater than 85 degrees F, place concrete within 60 minutes.
- C. Conveying: AASHTO M 157.

- D. Placing: Follow guidance of ACI 301, except as modified herein. Do not exceed a free vertical drop of 5 feet from the point of discharge. Deposit concrete either directly from the transporting equipment or by conveyor on to the pre-wetted subgrade or subbase, unless otherwise specified. Do not place concrete on frozen subgrade or subbase. Deposit the concrete between the forms to an approximately uniform height. Place concrete continuously at a uniform rate, with minimum amount of segregation, without damage to the grade and without unscheduled stops except for equipment failure or other emergencies. If this occurs within 10 feet of a previously placed expansion joint, remove concrete back to joint, repair any damage to grade, install a construction joint and continue placing concrete only after cause of the stop has been corrected.
- E. Vibration
1. Immediately after spreading concrete, consolidate concrete with internal type vibrating equipment along the boundaries of all slabs regardless of slab thickness, and interior of all concrete slabs 6 inches or more in thickness. Limit duration of vibration to that necessary to produce consolidation of concrete. Excessive vibration will not be permitted. Vibrators shall not be operated in concrete at one location for more than 15 seconds. At the option of the Contractor, vibrating equipment of a type approved by the Engineer may be used to consolidate concrete in unreinforced pavement slabs less than 6 inches thick.
 2. Vibrating Equipment: Operate equipment, except hand-manipulated equipment, ahead of the finishing machine. Select the number of vibrating units and power of each unit to properly consolidate the concrete. Mount units on a frame that is capable of vertical movement and, when necessary, radial movement, so vibrators may be operated at any desired depth within the slab or be completely withdrawn from the concrete. Clear distance between frame-mounted vibrating units that have spuds that extend into the slab at intervals across the paving lane shall not exceed 30 inches. Distance between end of vibrating tube and side form shall not exceed 2 inches. For pavements less than 10 inches thick, operate vibrators at mid-depth parallel with or at a slight angle to the subbase. For thicker pavements, angle vibrators toward the vertical, with vibrator tip preferably about 2 inches from subbase, and top of vibrator a few mm inches below pavement surface. Vibrators may be pneumatic, gas driven, or electric, and shall be operated at frequencies within the concrete of not less than 8,000 vibrations per minute. Amplitude of vibration shall be such that noticeable vibrations occur at 1.5 foot radius when the vibrator is inserted in the concrete to the depth specified.
- F. Cold Weather: Except with authorization, do not place concrete when ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 72 hours. When authorized, when concrete is likely to be subjected to freezing within 72 hours after placing, heat concrete materials so that temperature of concrete when deposited is between 65 and 80 degrees F. Methods of heating materials are subject to approval of the Engineer. Do not heat mixing water above 165 degrees F. Remove lumps of frozen material and ice from aggregates before placing aggregates in mixer. Follow practices found in ACI 306.1.

- G. Hot Weather: If there is a possibility that ambient temperatures will be above 90 degrees F during the placement of the concrete, conduct operations in accordance with state DOT Standard Specifications.

3.4 Paving

- A. Underlying layer shall be preconditioned prior to placement of concrete in accordance with state DOT Standard Specifications.
- B. Pavement shall be constructed with paving and finishing equipment utilizing fixed forms or slip-forms.
- C. Consolidation: The paver vibrators shall be inserted into the concrete not closer to the underlying material than 2 inches. The vibrators or any tamping units in front of the paver shall be automatically controlled so that they shall be stopped immediately as forward motion ceases. Excessive vibration shall not be permitted. Concrete in small, odd-shaped slabs or in locations inaccessible to the paver mounted vibration equipment shall be vibrated with a hand-operated immersion vibrator. Vibrators shall not be used to transport or spread the concrete.
- D. Operation: When the paver is operated between or adjacent to previously constructed pavement (fill-in lanes), provisions shall be made to prevent damage to the previously constructed pavement, including keeping the existing pavement surface free of any debris, and placing rubber mats beneath the paver tracks. Transversely oscillating screeds and extrusion plates shall overlap the existing pavement the minimum possible, but in no case more than 8 inches.
- E. Required Results: The paver-finisher shall be operated to produce a thoroughly consolidated slab throughout, true to line and grade within specified tolerances. The paver-finishing operation shall produce a surface finish free of irregularities, tears, voids of any kind, and any other discontinuities. It shall produce only a very minimum of paste at the surface. Multiple passes of the paver-finisher shall not be permitted. The equipment and its operation shall produce a finished surface requiring no hand finishing, other than the use of cutting straightedges, except in very infrequent instances. No water, other than true fog sprays (mist), shall be applied to the concrete surface during paving and finishing.
- F. Fixed Form Paving: Forms shall be steel, except that wood forms may be used for curves having a radius of 150 feet or less, and for fillets. Forms may be built up with metal or wood, added only to the base, to provide an increase in depth of not more than 25 percent. The base width of the form shall be not less than eight-tenths of the vertical height of the form, except that forms 8 inches or less in vertical height shall have a base width not less than the vertical height of the form. Wood forms for curves and fillets shall be adequate in strength and rigidly braced. Forms shall be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire base. Forms shall not be set on blocks or on built-up spots of underlying material. Forms shall remain in place at least 12 hours after the concrete has been placed. Forms shall be removed without injuring the concrete.

- G. Slip-form Paving: The slipform paver shall shape the concrete to the specified and indicated cross section in one pass and shall finish the surface and edges so that only a very minimum amount of hand finishing is required.
- H. Placing Reinforcing Steel: Reinforcement shall be positioned on suitable chairs securely fastened to the subgrade prior to concrete placement.

3.5 Finishing Concrete

- A. Start finishing operations immediately after placement and consolidation of concrete. Use finishing machine, except hand finishing may be used in emergencies and for concrete slabs in inaccessible locations or of such shapes or sizes that machine finishing is impracticable. Finish pavement surface on both sides of a joint to the same grade. Finish formed joints from a securely supported transverse bridge. Provide hand finishing equipment for use at all times. Transverse and longitudinal surface tolerances shall be 1/4 inch in 10 feet.
- B. Side Form Finishing: Strike off and screed concrete to the required slope and cross-section by a power-driven transverse finishing machine. Transverse rotating tube or pipe shall not be permitted unless approved by the Engineer. Elevation of concrete shall be such that, when consolidated and finished, pavement surface will be adequately consolidated and at the required grade. Equip finishing machine with two screeds which are readily and accurately adjustable for changes in pavement slope and compensation for wear and other causes. Make as many passes over each area of pavement and at such intervals as necessary to give proper compaction, retention of coarse aggregate near the finished surface, and a surface of uniform texture, true to grade and slope. Do not permit excessive operation over an area, which will result in an excess of mortar and water being brought to the surface.
 - 1. Equipment Operation: Maintain the travel of machine on the forms without lifting, wobbling, or other variation of the machine which tend to affect the precision of concrete finish. Keep the tops of the forms clean by a device attached to the machine. During the first pass of the finishing machine, maintain a uniform ridge of concrete ahead of the front screed for its entire length.
 - 2. Joint Finish: Before concrete is hardened, correct edge slump of pavement, exclusive of edge rounding, in excess of 1/4 inch. Finish concrete surface on each side of construction joints to the same plane, and correct deviations before newly placed concrete has hardened.
- C. Hand Finishing: Strike-off and screed surface of concrete to elevations slightly above finish grade so that when concrete is consolidated and finished pavement surface is at the indicated elevation. Vibrate entire surface until required compaction and reduction of surface voids is secured with a strike-off template.
- D. Longitudinal Floating: After initial finishing, further smooth and consolidate concrete by means of hand-operated longitudinal floats. Use floats that are not less than 12 feet long and 6 inches wide and stiffened to prevent flexing and warping.

- E. Texturing
 - 1. Burlap Drag Finish: Before concrete becomes non-plastic, finish the surface of the slab by dragging on the surface a strip of clean, wet burlap measuring from 3 to 10 feet long and 2 feet wider than the width of the pavement. Select dimension of burlap drag so that at least 3 feet of the material is in contact with the pavement. Drag the surface so as to produce a finished surface with a fine granular or sandy texture without leaving disfiguring marks.
- F. Edging: At the time the concrete has attained a degree of hardness suitable for edging, carefully finish slab edges, including edges at formed joints, with an edge having a maximum radius of one-eighth inch. Clean by removing loose fragments and soupy mortar from corners or edges of slabs which have crumbled and areas which lack sufficient mortar for proper finishing. Refill voids solidly with a mixture of suitable proportions and consistency and refinish. Remove unnecessary tool marks and edges. Remaining edges shall be smooth and true to line.
- G. Repair of Surface Defects Follow guidance of ACI 301.

3.6 Curing and Protection

- A. Protect concrete adequately from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks and oil stains, and do not allow it to dry out from the time it is placed until the expiration of the minimum curing periods specified herein. Use White-Burlap-Polyethylene Sheet or liquid membrane-forming compound, except as specified otherwise herein. Do not use membrane-forming compound on surfaces where its appearance would be objectionable, on surfaces to be painted, where coverings are to be bonded to concrete, or on concrete to which other concrete is to be bonded. Maintain temperature of air next to concrete above 40 degrees F for the full curing periods.
- B. White-Burlap-Polyethylene Sheet: Wet entire exposed surface thoroughly with a fine spray of water, saturate burlap but do not have excessive water dripping off the burlap and then cover concrete with White-Burlap-Polyethylene Sheet, burlap side down. Lay sheets directly on concrete surface and overlap 12 inches. Make sheeting not less than 18 inches wider than concrete surface to be cured, and weight down on the edges and over the transverse laps to form closed joints. Repair or replace sheets when damaged during curing. Check daily to assure burlap has not lost all moisture. If moisture evaporates, resaturate burlap and re-place on pavement (re-saturation and re-placing shall take no longer than 10 minutes per sheet). Leave sheeting on concrete surface to be cured for at least 7 days.
- C. Liquid Membrane-Forming Compound Curing: Apply compound immediately after surface loses its water sheen and has a dull appearance and before joints are sawed. Agitate curing compound continuously by mechanical means during use and apply uniformly in a two-coat continuous operation by suitable power-spraying equipment. Total coverage for the two coats shall be at least one gallon of undiluted compound per 100 square feet. Compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or

other imperfections. Apply an additional coat of compound immediately to areas where film is defective. Respray concrete surfaces that are subject to heavy rainfall within 3 hours after curing compound has been applied in the same manner.

- D. Protection of Treated Surfaces: Keep concrete surfaces to which liquid membrane-forming compounds have been applied free from vehicular traffic and other sources of abrasion for not less than 72 hours. Foot traffic is allowed after 24 hours for inspection purposes. Maintain continuity of coating for entire curing period and repair damage to coating immediately.

3.7 Field Quality Control

- A. Sampling: The Contractor's approved laboratory shall collect samples of fresh concrete in accordance with AASHTO T 141 during each working day as required to perform tests specified herein. Make test specimens in accordance with AASHTO T 23.
- B. Consistency Tests: The Contractor's approved laboratory shall perform concrete slump tests in accordance with AASHTO T 119. Take samples for slump determination from concrete during placement. Perform tests at the beginning of a concrete placement operation and for each batch (minimum) or every 50 cubic yards (maximum) of concrete to ensure that specification requirements are met. In addition, perform tests each time test beams and cylinders are made.
- C. Compressive Strength Tests: The Contractor's approved laboratory shall test for compressive strength in accordance with AASHTO T 22. Make four test specimens for each set of tests. Test two specimens at 7 days, and the other two at 28 days. Concrete strength will be considered satisfactory when the minimum of the 28-day test results equals or exceeds the specified 28-day compressive strength, and no individual strength test is less than 3000 pounds per square inch. Concrete which is determined to be defective, based on the strength acceptance criteria therein, shall be removed and replaced with acceptable concrete.
- D. Air Content Tests: Test air-entrained concrete for air content at the same frequency as specified for slump tests. Determine percentage of air in accordance with AASHTO T 152 on samples taken during placement of concrete in forms.
- E. Surface Testing
 - 1. Surface testing for surface smoothness and plan grade shall be performed as indicated below by the Testing Laboratory. The measurements shall be properly referenced in accordance with paving lane identification and stationing, and a report given to the Owner within 24 hours after measurement is made. A final report of surface testing, signed by a Registered Engineer, containing all surface measurements and a description of all actions taken to correct deficiencies, shall be provided to the Owner upon conclusion of surface testing.
 - 2. Surface Smoothness Requirements: Surface smoothness shall be measured every 120 square feet. The finished surfaces of the pavements shall have no

abrupt change of 1/8 inch or more, and all pavements shall be within the tolerances specified when checked as below:

- a. 1/4 inch longitudinal from a 16 foot straightedge.
- b. 1/4 inch with a 10 foot straightedge when measured perpendicular to the centerline.
- c. 3/8 inch in any 25 foot section from a taut string applied parallel to the surface.

3. Plan Grade Testing and Conformance:

- a. The surfaces shall vary not more than 1/2 inch in 100 feet from designated grade.
- b. The surfaces shall not vary by more than 0.20% from the required cross slope in any 10 foot distance.

- F. Test for Pavement Thickness: Full depth cores in accordance with AASHTO T 24 shall be taken a minimum of every 250 square feet to measure thickness.
- G. Reinforcement: Inspect reinforcement prior to installation to assure it is free of loose flaky rust, loose scale, oil, mud, or other objectionable material.
- H. Dowels: Inspect dowel placement prior to placing concrete to assure that dowels are of the size indicated, and are spaced, aligned and painted and oiled as specified. Dowels shall not deviate from vertical or horizontal alignment after concrete has been placed by more than 1/8 inch per foot.

END OF SECTION

Part 1 General

1.1 Work Included

- A. This Section includes the following:
 - 1. Chain-link fences.
 - 2. Gates: As shown on the plans.

1.2 Submittals

- A. Submit in accordance with Section 01 33 00.
- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates:
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.
- C. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.
- D. Samples for Verification: For each type of chain-link fence and gate indicated, provide sample of steel wire (for fabric) in 6-inch (150-mm) squares.
- E. Product Certificates: For each type of chain-link fence and gate, signed by product manufacturer.
 - 1. Strength test results for framing according to ASTM F 1083.

1.3 Quality Assurance

- A. Manufacturer: Company having manufacturing facilities in the United States with a minimum 5 years' experience specializing in manufacturing of chain link fence products.
- B. Fence contractor: Contractor having 5 years' experience installing similar projects in accordance with ASTM F567.
- C. Tolerances: ASTM current specification and tolerances apply and supersede any conflicting tolerance.

Chain Link Fences and Gates

- D. Substitutions: In accordance with Section 01 25 00.
- E. Single source: To ensure system integrity obtain the chain link system, framework, fabric, fittings, gates and accessories from a single source.
- F. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.4 Warranty

- A. Special Warranty: Manufacturer's standard form in which Contractor agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, finishes, and other materials beyond normal weathering.
 - b. Deflection of fence fabric beyond design limits.
 - 2. Products furnished in this section shall be guaranteed in writing by the manufacturer's standard warranty in addition to Contractor's one-year warranty.

Part 2 Products

2.1 General

- A. Provide fencing materials conforming to requirements of ASTM A116, ASTM A702, ASTM F626, and as specified.
- B. Provide galvanizing repair material that is cold-applied zinc-rich coating conforming to ASTM A780/ASTM A780M

2.2 Posts, Rails, and Braces

- A. Steel pipe Type I: ASTM F1043 Group IA, ASTM F1083 standard weight schedule 40 hot-dip galvanized pipe having a zinc coating of 1.8 oz./ft² (550 g/m²) on the outside surface and 1.8 oz./ft² (550 g/m²) on the inside surface.
 - 1. Regular Grade: Minimum steel yield strength of 30,000 psi.
- B. End, Corner, and Pull Post:
 - 1. For fence up to and including 6 feet 0 inches in height, 2.875 inch OD, Type I ASTM F1083 Regular Grade Pipe.

- C. Line Posts (10 feet 0 inches Maximum Spacing):
 - 1. Fabric Up To 8 feet 0 inches in Height: 2.875 inch OD Type I ASTM F1083 Regular Grade Pipe
- D. Bottom Rail and Braces:
 - 1. The bottom rail and braces shall be 1.660 inches outside diameter, Schedule 40 pipe.

2.3 Chain Link Fabric

- A. The fabric shall consist of 1 piece fabric widths for fences up to 12 feet 0 inches. Fabric shall be 2 inches mesh, 9 gauge, as indicated on the Drawings.
- B. Selvage Edges: Fabric in heights 60 inches and less shall be knuckled at both selvages. Fabric 72 inches and more shall be knuckled at the bottom selvage and be twisted and barbed at the top.
- C. Finishes: Heavy galvanized, 1.2 ounces of zinc per square foot, complying with ASTM A392, Class I, or aluminum coated with 0.40 ounces of aluminum per square foot, complying with ASTM A491, Class II.

2.4 Fittings

- A. Post caps: ASTM F626 galvanized pressed steel, malleable iron, or aluminum alloy weather tight closure cap for tubular posts. Provide one cap for each post.
- B. Rail ends: Galvanized pressed steel per ASTM F626, for connection of rails to post using a brace band.
- C. Bottom rail sleeves: 7" (178 mm) galvanized steel sleeve per ASTM F626.
- D. Wire ties: 9 gauge (0.148") (3.76 mm) galvanized steel wire for attachment of fabric to line posts and rails.
- E. Brace and tension (stretcher bar) bands: ASTM F626 galvanized 12 gauge (0.105") (2.67mm) pressed steel by 3/4" (19mm) formed to a minimum 300 degree profile curvature for post attachment. Secure bands using minimum 5/16" (7.94 mm) galvanized carriage bolt and nut.
- F. Tension (stretcher) bars: Galvanized steel one-piece length equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16" x 3/4" (4.76 mm x 19 mm) per ASTM F626. Provide tension (stretcher) bars where chain link fabric is secured to the terminal post.
- G. Truss rod assembly: Galvanized steel minimum 3/8" (9.5 mm) diameter truss rod with pressed steel tightener, in accordance with ASTM F626
- H. Barbed wire supporting arms: Galvanized pressed steel barb arm per ASTM F626 with provisions for attaching barbed wire. Arms shall withstand 250 lb. (113.5 kg)

downward pull at outermost end of arm without failure. Arms provide an additional 13 in. (330 mm) in height. Type I, 45° 3 strand single arm.

- I. Carriage bolts and nuts: Galvanized of commercial quality

2.5 Tension Wire

- A. Tension wire: ASTM A824 Type II, zinc coated (galvanized) Class 5 2.00 oz./ft² (610 g/m²) steel wire, 7 gauge, (0.177") (4.50 mm) diameter wire having a tensile strength of 75,000 psi (517 MPa).

2.6 Barbed Wire

- A. Barbed wire: ASTM A121 design number 12-4-5-14R, 12½ gauge, 0.099" (2.51 mm) Type Z Class 3, 0.80 oz./ft² (245 g/m²) zinc coated double-strand twisted line wire with 14 gauge, (0.080") (2.03 mm) Type Z Class 3, 0.70 oz./ft² (215g/m²) zinc coated 4 point barbs spaced an average of 5" (127 mm) on center.

2.7 Chain Link Swing Gate

- A. Swing gates double leaf 14'-0" opening by 6'-0" high plus 1' 0" (304.8 mm) 3 strands barbed wire. Fabricate chain link swing gates in accordance with ASTM F900. Gate frame to be of welded construction. Weld areas to be protected with zinc-rich paint per ASTM A780. The gate frame members are to be spaced no greater than 8' 0" (2.44 m) apart horizontally or vertically. Exterior members to be 1.900" (48.3 mm) OD pipe, interior members when required shall be 1.660" (42.2 mm) OD pipe. Pipe to be Grade 1 ASTM F1083 per section 2.2. Chain link fabric to match specification of fence system. Fabric to be stretched tightly and secured to vertical outer frame members using tension bar and tension bands spaced 12" (304.8 mm) on center and tied to the horizontal and interior members 12" (304.8 mm) on center using 9 gauge galvanized steel ties per section 2.3.
- B. Hinges, hot dip galvanized pressed steel or malleable iron, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° (3.14 rad)
- C. Latch: Galvanized forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
- D. Double gates: Provide galvanized drop rod with center gate stop pipe or receiver to secure inactive leaf in the closed position. Provide galvanized pressed steel locking latch, requiring one padlock for locking both gate leaves, accessible from either side.
- E. Gate holdback: Provide galvanized gate hold back keeper for each gate leaf over 5' (1524 mm) wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
- F. Gate posts: Grade 1 pipe ASTM F1083 per section 2.2, 2.375 OD.

2.8 Post Setting Materials

- A. Concrete: Minimum 28 day compressive strength of 3,000 psi (20 MPa).
- B. Drive Anchors: Galvanized ASTM A36 steel drive anchor angle blades, 1" x 1" (25 mm x 25 mm) x 30" (762 mm) long secured to post with a galvanized shoe clamp.

Part 3 Execution

3.1 Examination

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by Owner.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 100 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 Installation, General

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
 - 1. Install fencing on established boundary lines inside property line.

3.4 Chain-Link Fence Installation

- A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - 3. Trowel finish around post and slope to direct water away from posts.

Chain Link Fences and Gates

- C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- D. Line Posts: Space line posts uniformly at 10 feet on center, or less.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
 - 1. Locate horizontal braces at 2/3 fabric height on fences. Install so posts are plumb when diagonal rod is under proper tension.
- F. Tension Wire: Install according to ASTM F 567 and ASTM F 1916, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches on center. Install tension wire in locations indicated before stretching fabric.
 - 1. Top Tension Wire: Install tension wire through post cap loops.
- G. Bottom Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Attach bottom rail to terminal posts using either end rail clamps or rail end cups and brace bands. Attach bottom rail to line posts with chain link line rail clamps. Provide expansion couplings as recommended by fencing manufacturer.
- H. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
 - 1. Leave 1 inch between finish grade or surface and bottom selvage, unless otherwise indicated.
- I. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches on center.
- J. Tie Wires: Power-fastened or manually fastened ties configured to wrap a full 360 degrees around rail or post and a minimum of 1 complete diamond of fabric. Twist ends one and one-half machine twists or three full manual twists, and cut-off protruding ends to preclude untwisting by hand.
 - 1. Maximum Spacing: Tie fabric to line posts at 12 inches on center and to braces at 24 inches on center.
- K. Power-Driven Fasteners: Fasten 0.192- or 0.148-inch wire fabric with 2- or 1-inch mesh size. Fasten fabric to line posts 12 inches on center and to braces 24 inches on center.
- L. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

3.5 Gate Installation

- A. Installation of swing gates and gate posts shall be per ASTM F567. Direction of swing shall be inward. Gates shall be hung plumb in the closed position with minimal space from grade to bottom of gate leaf. Double gate drop bar receiver shall be set in a minimum concrete footing 6" (152 mm) diameter by 24" (610 mm) deep. Gate leaf holdbacks shall be installed on all double gates and all gate leaves greater than 5' (1524 mm) in width.

3.6 Field Quality Control

- A. Fabric Testing: Test fabric tension according to ASTM F 1916.
- B. Fence Post Rigidity Testing: Test line posts for rigidity according to ASTM F 1916.

3.7 Adjusting

- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

END OF SECTION

Part 1 General

1.1 Section Includes

- A. Seeding of disturbed areas.
- B. Fertilizing and soil amendments, as necessary.
- C. Maintenance.

1.2 References

- A. U.S. Department of Agriculture (USDA)
 - 1. AMS Seed Act (1940; R 1988; R 1998) Federal Seed Act.
 - 2. DOA SSIR 42 (1996) Soil Survey Investigation Report No. 42, Soil Survey Laboratory Methods Manual, Version 3.0.

1.3 Definitions

- A. Acceptable Stand of Turf: An area is considered acceptable if it is represented by a minimum of 100 seedlings per square foot of the permanent species of grass representative of the seed mixture.

1.4 Related Requirements

- A. Section 31 23 33 – Trenching and Backfilling.

1.5 Submittals

- A. The following shall be submitted in accordance with Section 01 33 00 - Submittal Procedures:
 - 1. Product Data:
 - a. Wood cellulose fiber mulch.
 - b. Fertilizer: Include physical characteristics, and recommendations.
 - 2. Certificates:
 - a. Contractor shall furnish labels or certified laboratory reports from an accredited commercial seed laboratory or a state seed laboratory showing the analysis and germination of the seed to be furnished. Acceptance of the seed test reports shall not relieve the Contractor of

any responsibility or liability for furnishing seed meeting the requirements of this section.

3. Test Results:

- a. The Contractor shall obtain representative samples and furnish soil test certificates including textural, pH, and organic ignition analysis from the State University Agricultural Extension Service or other certified testing laboratory.

1.6 System Description

- A. This work shall be performed in all disturbed areas not receiving such site improvements as buildings, roads, walks, sod, planting, etc., and shall include, but not necessarily be limited to, all seed bed preparation; the supplying and placing of soil additives, seed, and mulch wherever required by the Drawings or directed by the A/E; and maintenance.
- B. All existing lawns encountered shall be replaced with topsoil and seeding of the same type and quality as that existing prior to construction and shall be restored to original condition or better.
- C. Refer to other sections for items affecting seeding. Coordinate this work with that specified by other sections for timely execution.

1.7 Delivery, Storage, and Handling

- A. Delivery
 1. Seed Protection: Protect from drying out and from contamination during delivery, on-site storage, and handling.
 2. Fertilizer and Other Agricultural Chemicals Delivery: Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer and lime may be furnished in bulk with certificate indicating the above information.
- B. Storage
 1. Seed, Fertilizer and Lime Storage: Store in cool, dry locations away from contaminants.
 2. Topsoil: Prior to stockpiling topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide. Clear and grub existing vegetation three to four weeks prior to stockpiling topsoil.
- C. Handling: Do not drop or dump materials from vehicles.

Part 2 Products

2.1 Topsoil

- A. On-Site Topsoil: Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition." When available, topsoil shall be existing surface soil stripped and stockpiled on-site.
- B. Off-Site Topsoil: Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor.
- C. Composition: Containing from 5 to 20 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. The pH shall be tested in accordance with ASTM D4972. Topsoil shall be free of sticks, stones, roots, and other debris and objectionable materials. Other components shall conform to the following limits:

Silt	25-50 percent
Clay	10-30 percent
Sand	20-35 percent
pH	5.5 to 7.0
Soluble Salts	600 ppm maximum

2.2 Grass Seed

- A. Seed shall be delivered in new bags or bags that are sound and labeled in accordance with the U.S. Department of Agriculture Federal Seed Act.
- B. All seed shall be from the last crop available at time of purchase and shall not be moldy, wet, or otherwise damaged in transit or storage.
- C. Seed shall bear the growers analysis testing to 98% for purity and 90% for germination. At the discretion of the Engineer, samples of seed may be taken for check against the grower's analysis.
- D. Species, rate of seeding, fertilization, and other requirements are shown in the Seeding Requirements Table.

2.3 Fertilizer Materials

- A. Fertilizer materials shall comply with applicable state, local, and federal laws concerned with their production and use.
- B. Commercial fertilizer shall be a ready mixed material and shall be equivalent to the grade or grades specified in the Seeding Requirements Table. Container bags shall have the name and address of the manufacturer, the brand name, net weight, and chemical composition.

2.4 Agricultural Limestone

- A. Containing a minimum of 85 percent calcium carbonate and magnesium carbonate combined, 85 percent of which passes a No. 10 mesh sieve, and 40 percent passing a No. 40 mesh sieve.

2.5 Mulch

- A. Mulch shall be free from noxious weeds, mold, and other deleterious materials.
- B. Straw: Stalks from oats, wheat, rye, barley, or rice. Furnish in air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Straw shall contain no fertile seed.

2.6 Mulch Binder

- A. Mulch on slopes exceeding 3 to 1 ratio shall be held in place by the use of an approved mulch binder. The mulch binder shall be non-toxic to plant life and shall be acceptable to the Engineer.
- B. Emulsified asphalt binder shall be Grade SS-1, ASTM D 977. Cut-back asphalt binder shall be Grade RC 70 or RC 250.

2.7 Inoculants for Legumes

- A. All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen-fixing bacteria that is adapted to the particular seed involved.

2.8 Water

- A. Water shall be clean, clear water free from any objectionable or harmful chemical qualities or organisms and shall be furnished by the Contractor.

Part 3 Execution

3.1 Preparation

- A. Extent of Work: Provide soil preparation (including soil conditioners as required), fertilizing, seeding, and surface topdressing of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.
- B. Topsoil: Provide 4 inches of on-site topsoil to meet indicated finish grade. Over rock, provide minimum of 12 inches of topsoil. After areas have been brought to indicated finish grade, incorporate fertilizer into soil a minimum depth of 4 inches by disking, harrowing, tilling or other method approved by the Engineer. Remove debris and stones larger than 3/4 inch in any dimension remaining on the surface after finish grading. Correct irregularities in finish surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

- C. Before beginning seeding operations in any area, complete the placing of topsoil and final grading, and have the work approved by the Owner's Representative.

3.2 Seeding

A. Seed Application and Conditions

1. Immediately before seeding, restore soil to proper grade.
2. Do not seed when ground is muddy, frozen, snow covered or in an unsatisfactory condition for seeding.
3. Apply seed within twenty-four hours after seedbed preparation.
4. Sow seed by approved sowing equipment. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing.

- B. Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seeding shall be performed during the dates shown in the Seeding Requirements Table unless otherwise approved by the Engineer. Seed mixtures may be sown together provided they are kept in a thoroughly mixed condition during the seeding operation. Copies of all weight tickets shall be furnished to the Engineer.

- C. Seeds shall be uniformly sown by any approved mechanical method to suit the slope and size of the areas to be seeded, preferably with a broadcast type seeder, windmill hand seeder, or approved mechanical power drawn seed drills. Hydro-seeding and hydro-mulching may be used on steep embankments, provided full coverage is obtained. Care shall be taken to adjust the seeder for seeding at the proper rate before seeding operations are started and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in a seeding mixture.

- D. Immediately after sowing, the seeds shall be covered and compacted to a depth of 1/8 to 3/8 inch by a cultipacker or suitable roller.

- E. Leguminous seeds shall be inoculated prior to seeding with an approved and compatible nitrogen-fixing inoculated in accordance with the manufacturer's mixing instructions.

3.3 Mulching

- A. All seeded areas shall be uniformly mulched in a continuous blanket immediately after seeding. The mulch shall be applied so as to permit some sunlight to penetrate and the air to circulate and at the same time shade the ground, reduce erosion, and conserve soil moisture. Approximately 25 percent of the ground shall be visible through the mulch blanket.

Seeding

- B. One of the following mulches shall be spread evenly over the seeded areas at the following application rates:

- | | |
|-------------------------|-----------------|
| 1. Wood Cellulose Fiber | 1,400 lbs./acre |
| 2. Stalks | 4,000 lbs./acre |
| 3. Straw | 4,000 lbs./acre |

These rates may be adjusted at the discretion of the Engineer at no additional cost to the Owner, depending on the texture and condition of the mulch material and the characteristics of the seeded area.

- C. Mulch on slopes greater than 3 to 1 ratio shall be held in place by the use of an approved mulch binder. Binder shall be thoroughly mixed and applied with the mulch. Emulsified asphalt or cutback asphalt shall be applied at the approximate rate of 5 gallons per 1,000 square feet as required to hold the mulch in place.
- D. The Contractor shall cover structures, poles, fence, and appurtenances if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.
- E. Mulch and binder shall be applied by suitable blowing equipment at closely controlled application rates.

3.4 Watering

- A. Contractor shall be responsible for maintaining the proper moisture content of the soil to ensure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain adequate water content in the soil.
- B. Watering shall be accomplished by hoses, tank trucks, or sprinklers in such a way to prevent erosion, excessive runoff, and overwatered spots.

3.5 Maintenance and Bond

- A. Upon completion of seeding operations, the Contractor shall clear the area of all equipment, debris, and excess material and the premises shall be left in a neat and orderly condition.
- B. No equipment, material storage, construction traffic, etc., will be permitted on newly seeded ground.
- C. The Contractor shall maintain all seeded areas without additional payment until final acceptance of the work by the Owner. Seeding work shall be repeated on defective areas until a satisfactory uniform stand is accomplished. Damage resulting from erosion, gullies, washouts, or other causes shall be repaired by filling with topsoil, compacting, and repeating the seeding work at contractor's expense.

- D. A grassing bond will be required to cover all grassed area, solid sod areas, and erosion control for one year after the time of planting seed or placing sod.

3.6 Field Quality Control

- A. The Owner's Representative shall inspect the seeding within 60 days after planting and determine if an acceptable stand of grass has been produced.
- B. If an acceptable growth is not obtained on the first planting, reseeding and remulching will be required.
- C. If the planting is less than 50 percent successful, rework the ground, refertilize, reseed, and remulch.

END OF SECTION

Part 1 General

1.1 Section Includes

- A. This Section describes products to be incorporated into the water mains and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.
- B. Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), National Science Foundation (NSF) Standard 61, or other recognized standards. Latest revisions of all standards are applicable. Additionally, products shall meet the Federal lead-free requirements as stated in the Reduction of Lead in Drinking Water Act.

1.2 Qualifications

- A. If requested by the Engineer, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

1.3 Submittals

- A. Submit in accordance with Section 01 33 00 - Submittal Procedures.
- B. Submit to the Engineer shop drawings and product data for all products.
- C. Submit O&M manuals for valves.
- D. Manufacturer's written certification of compliance with NSF 61, NSF 372, and lead-free requirements of U.S. State and Federal laws.

1.4 Delivery and Handling

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.
- B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front-end loader. Do not use material damaged in handling. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe.

1.5 Storage and Protection

- A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas. Store PVC pipe away from non-solar heat and direct sunlight.
- B. Stored materials shall be kept safe from damage. Store materials on site in enclosures or under protective covering. The interior of all pipe, fittings, valves and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.
- C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.
- D. Stored gaskets shall be placed in a location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first in, first out basis.

Part 2 Products

2.1 Ductile Iron Pipe (DIP)

- A. Ductile iron pipe shall be manufactured in accordance with AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes shall be as shown on the Drawings. All pipe shall have a minimum pressure rating as indicated in the following table, and corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings:

Pipe Sizes (inches)	Pressure Class (psi)
4 - 12	350
14 - 20	250
24	200
30 - 64	150

- B. Flanged pipe minimum wall thickness shall be equal to Special Class 53.
- C. Pipe shall be cement lined in accordance with AWWA C104. Pipe shall be furnished with a bituminous outside coating. Seal coat over the cement lining is not required.
- D. Fittings shall be ductile iron and shall conform to AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi. Fittings shall be cement lined in accordance with AWWA C104 and shall be furnished with a bituminous outside

coating. Seal coat over the cement lining is not required. In lieu of cement lining and bituminous coating, fittings may be provided with a fusion bonded coating and lining meeting the requirements of AWWA C116.

E. Joints

1. Unless shown or specified otherwise, joints for buried service shall be push-on or restrained joint type for pipe and standard mechanical or restrained joints for fittings. Joints for exposed service shall be flanged for pipe and fittings, unless otherwise shown. Push-on and mechanical joints shall conform to AWWA C111.
2. Restrained joints: Where restrained joint pipe (RJP) is shown on the Drawings, restrained joints for pipe diameters 16-inch and less shall be manufactured restrained joint, mechanical joint fitting with retainer gland or restraining gasket joint as specified below. For pipe diameters 18-inch or greater restrained joints shall be manufactured restrained joint as specified below.
 - a. Manufactured restrained joints shall be American "Flex-Ring" or "Lok-Ring"; U.S. Pipe "TR FLEX" or "HP LOK"; or McWane Ductile "TR FLEX" or "THRUST-LOCK." No field welding of restrained joint pipe will be permitted.
 - b. Restraining gasket joints shall be assembled with American Fast-Grip gaskets or U.S. Pipe FIELD LOK gaskets but may only be used in lieu of manufactured restrained joints where approved by the Engineer.
 - c. Retainer glands on a mechanical joint may be used as a restrained joint only where retainer glands are specifically shown on the Drawings or where specifically specified.
 - d. Where retainer glands are allowed, in lieu of retainer glands specified elsewhere, the joint may be assembled with US Pipe MJ FIELD LOK gasket.
 - e. No field welding for manufactured restrained joint pipe assembly will be permitted. Where field cutting of restrained joint pipe is required, the joint may be assembled with American Field Flex-Rings or US Pipe TR FLEX GRIPPER Rings.
3. Flanged joints shall meet the requirements of AWWA C115, except that flanges shall be solid and not hollow-back type. Flanges shall be of ductile iron material. Flange adaptors shall not be allowed in lieu of manufactured flanged joints.
4. Provide the appropriate gaskets for mechanical and flange joints. Flange gaskets shall be bulb type and shall be ACIPCO Toruseal Flange Gasket or U.S. Pipe RING FLANGE-TYTE Gasket. Gaskets shall be plain rubber (styrene butadiene copolymer – SBR).

5. Bolts and Nuts

- a. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit.
- b. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low-alloy steel in accordance with ASTM A242 to the dimensions shown in AWWA C111/ANSI A21.11.
- c. Flanged joints shall be bolted with through, stud, or tap bolts of required size as directed. Bolt length and diameter shall conform to AWWA C115.
- d. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.
- e. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A 193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A 194, Grade 8.

6. Mechanical joint glands shall be ductile iron.

- F. Thrust collars shall be welded-on ductile iron body type designed to withstand thrust due to 250 psi internal pressure on a dead end.
- G. Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.
- H. Ductile iron pipe shall be manufactured by American Cast Iron Pipe Company, U.S. Pipe or McWane Ductile.

2.2 Detection Tape

- A. Warning Tape for Non-metallic Piping: Metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes	
Blue	Potable Water Systems

- B. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.3 Valves

- A. General: All external nuts, bolts, studs, fasteners or accessories shall be of stainless steel or other corrosion-resistant material.
- B. Gate Valves - 3-Inches in Diameter and Larger: Gate valves shall be resilient wedge type conforming to the requirements of AWWA C509 (sizes 3-inches to 12-inches) or AWWA C515 (sizes 3-inches to 48-inches) rated for 200 psi working pressure.
 1. Valves shall be provided with two O-ring stem seals with one O-ring located above and one O-ring below the stem collar. The area between the O-rings shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. At least one anti-friction washer shall be utilized to further minimize operating torque. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.
 2. The valve gate shall be made of cast or ductile iron having a vulcanized, synthetic rubber coating, or a seat ring attached to the disc with retaining screws. Sliding of the rubber on the seating surfaces to compress the rubber will not be allowed. The design shall be such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
 3. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to AWWA C550.
 4. Valves shall be mechanical joint type except where shown otherwise on the Drawings.
 5. Valves shall have 2-inch square operating nuts, be non-rising stem type except where shown otherwise on the Drawings. Valves shall open left.
 6. Gate valves shall be manufactured by American Flow Control, Mueller or M & H Valve.

2.4 Valve Boxes and Extension Stems

- A. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5.25 inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6 inches up or down from the nominal required cover over the

pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE" or "WATER" cast into them.

- B. All valves shall be furnished with extension stems, as necessary, to bring the operating nut to within 30 inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be equal to Mueller A 26441 or M & H Valve Style 3801.

2.5 Retainer Glands

- A. Retainer glands shall be provided at all mechanical joints, including fittings, valves, hydrants and other locations as shown on the Drawings.
- B. Retainer glands for ductile iron pipe shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400, as manufactured by Ford Meter Box Company, Star Pipe Products Star-Grip Series 3000, or Sigma One-Lok Series SLD.

2.6 Concrete

- A. Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5 inches. For job mixed concrete, submit the concrete mix design for approval by the Engineer. Ready mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

2.7 Flowable Fill

- A. Flowable fill shall meet the specifications of the Georgia Department of Transportation, Section 600 "Controlled Low Strength Flowable Fill" for non-excavatable minimum 125 psi mix design.

Part 3 Execution

3.1 Existing Utilities and Obstructions

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the Owner. The Contractor shall contact, by dialing 811, the Georgia Utilities Protection Center, as applicable, and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site at least 72 hours (three business days) prior to construction to verify the location of the existing utilities.
- B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.

1. Provide the required notice to the utility owners and allow them to locate their facilities according to applicable local and state law. Field utility locations are valid for only 10 days after original notice. The Contractor shall ensure, at the time of any excavation that a valid utility location exists at the point of excavation.
2. Expose the facility, for a distance of at least 200 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
3. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.
4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The Contractor shall provide the Engineer an updated copy of the log bi-weekly, or more frequently if required.

C. Conflict with Existing Utilities

1. **Horizontal Conflict:** Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit installation of the water main by the use of sheeting, shoring, tying back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right of way or easement, complies with regulatory agency requirements and after a written request to and subsequent approval by the Engineer. Where such relocation of the water main is denied by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.
2. **Vertical Conflict:** Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The Contractor may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the Engineer. Where such relocation of the water main is denied by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.

- D. **Electronic Locator:** Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Water and Sewer Separation

1. Water mains should maintain a minimum 10-foot edge to edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right of way and provide the 10-foot separation,

the separation may be reduced, provided the bottom of the water main is a minimum of 18 inches above the top of the sewer. Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of 18 inches.

2. The water main, when installed below the sewer, shall be encased in concrete with a minimum 6-inch concrete depth to the first joint in each direction. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.
3. No water main shall pass through, or come in contact with, any part of a sanitary sewer manhole.

3.2 Construction Along Highways, Streets and Roadways

- A. Install pipe lines and appurtenances along highways, streets and roadways in accordance with the applicable regulations of, and permits issued by the Georgia Department of Transportation (GDOT) and Henry County with reference to construction operations, safety, traffic control, road maintenance and repair.
- B. Traffic Control
 1. The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the work and the safety of the public. Flagmen shall be certified by a Georgia DOT (as applicable) approved flagman training program.
 2. Construction traffic control devices and their installation shall be in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways and permits issued for this Project.
 3. Placement and removal of construction traffic control devices shall be coordinated with the permitting agencies as required by the permitting agencies.
 4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right of way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as "Flagmen Ahead", shall be removed and replaced when needed.
 5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original location. Relocated traffic

control devices shall be reinstalled in their original locations as soon as practical following construction.

6. Construction traffic control devices shall be maintained in good repair and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.
7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of the permitting agencies. Sign panels shall be of durable materials capable of maintaining their color, reflective character and legibility during the period of construction.
8. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the Manual on Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to ensure that they are maintained in the proper position throughout their period of use.

C. Construction Operations

1. Perform all work along highways, streets and roadways to minimize interference with traffic.
2. Stripping: Where the pipe line is laid along road right of way, strip and stockpile all sod, topsoil and other material suitable for right of way restoration.
3. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.
4. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.

D. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep all scattered excavated material off of the pavement in a timely manner.

E. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

F. Landscaping Features: Landscaping features shall include but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right of way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.

G. Maintaining Highways, Streets, Roadways and Driveways

1. Maintain streets, highways, roadways and driveways in suitable condition for movement of traffic until completion and final acceptance of the work.
2. During the time period between pavement removal and completing permanent pavement replacement, maintain highways, streets and roadways by the use of steel running plates. Running plate edges shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.
3. Furnish a road grader or front-end loader for maintaining highways, streets, and roadways. The grader or front-end loader shall be available at all times.
4. Immediately repair all driveways that are cut or damaged. Maintain them in a suitable condition for use until completion and final acceptance of the work.

3.3 Pipe Distribution

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the Contractor is actually working without written permission from the Owner. The Owner reserves the right to reduce this distance to a maximum distance of 200 feet in residential, commercial or otherwise congested areas based on the effects of the distribution to the adjacent property owners.
- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge to edge.

3.4 Location and Grade

- A. The Drawings show the alignment of the water main and the location of valves, hydrants and other appurtenances.
- B. Prior to clearing and grubbing, construction staking shall conform to the requirements of Section 01 71 23.13 of these Specifications.

3.5 Laying and Jointing Pipe and Accessories

- A. Lay all pipe and fittings to accurately conform to the lines and grades established by the Engineer.

B. Pipe Installation

1. Proper implements, tools and facilities shall be provided for the safe performance of the work. All pipe, fittings, valves and hydrants shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.
2. All pipe, fittings, valves, hydrants and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.
3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.
4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
5. As each length of pipe is placed in the trench, the joint shall be assembled, and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
6. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.
7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.
8. Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.
9. Where pipes of dissimilar materials are joined together, provide adapters as shown on the Drawings.

C. Alignment and Gradient

1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
2. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.

- D. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact

the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push on, mechanical joint, restrained joint or as approved by the Engineer.

E. Joint Assembly

1. Push on, mechanical, flange and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.
2. The Contractor shall inspect each pipe joint within 1,000 feet on either side of main line valves to ensure 100 percent seating of the pipe spigot, except as noted otherwise.
3. Unless noted otherwise, each restrained joint shall be inspected by the Contractor to ensure that it has been "homed" 100 percent.
4. The Contractor shall internally inspect each pipe joint to ensure proper assembly for pipe 30 inches in diameter and larger after the pipe has been brought to final alignment.

F. Cutting Pipe: Cut ductile iron pipe using an abrasive wheel saw. Cut PVC pipe using a suitable saw; remove all burrs and smooth the end before jointing. The Contractor shall cut the pipe and bevel the end, as recommended by the manufacturer, to provide the correct length of pipe necessary for installing the fittings, valves, accessories and closure pieces in the correct location. Only push-on joint pipe shall be cut.

G. Valve and Fitting Installation

1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the Engineer. Valves shall be closed before being installed.
2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this section for cleaning, laying and joining pipe, except that 12 inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed plumb.
3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the

operating nut in excess of 30 inches beneath finished grade so as to set the top of the operating nut 30 inches below finished grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the Engineer.

4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

3.6 Connections to Water Mains

- A. Make connections to existing pipe lines with tapping sleeves and valves, unless specifically shown otherwise on the Drawings.
- B. Location: Before laying pipe, locate the points of connection to existing water mains and uncover as necessary for the Engineer to confirm the nature of the connection to be made.
- C. Interruption of Services: Make connections to existing water mains only when system operations permit. Operate existing valves only with the specific authorization and direct supervision of the Owner.
- D. Connections Using Solid Sleeves or Couplings: Where connections are shown on the Drawings using solid sleeves, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line.

3.7 Water Main and Accessory Abandonment

- A. Water mains and accessories shall be removed from the site where specifically indicated on the Drawings or as required for new water main and accessories to be installed.
- B. Pipelines 6-inches in diameter or greater that are shown on the Drawings or otherwise specified to be abandoned shall be filled completely with flowable fill and plugged at all ends by use of concrete, a plug, a cap or other suitable means approved by the Engineer, in order to prevent flowable fill from escaping the pipe during flowable fill installation.
- C. Pipelines less than 6-inches but 2-inches or greater in diameter that are shown on the Drawings or otherwise specified to be abandoned shall be plugged at all ends by use of a plug or cap suitable for the pipe material, as approved by the Engineer, but are not required to be filled with flowable fill.
- D. Pipelines less than 2-inches in diameter that are shown on the Drawings or otherwise specified to be abandoned shall not require any plugging of ends or filling with flowable fill.

3.8 Thrust Restraint

- A. Provide restraint at all points where hydraulic thrust may develop.
- B. Retainer Glands: Provide retainer glands where shown on the Drawings and on fire hydrants and all associated fittings, valves and related piping. Retainer glands shall be installed in accordance with the manufacturer's recommendations.
- C. Concrete Blocking
 - 1. Provide concrete blocking for all bends, tees, valves, and other points where thrust may develop, except where other exclusive means of thrust restraint are specifically shown on the Drawings.
 - 2. Concrete shall be as specified in this Section of these Specifications.
 - 3. Form and pour concrete blocking at fittings as shown on the Drawings and as directed by the Engineer. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.

3.9 Inspection and Testing

- A. Pressure and Leakage Test
 - 1. All sections of the water main shall be pressure tested in accordance with AWWA C600. A section of main will be considered ready for testing after completion of all thrust restraint and backfilling.
 - 2. Each segment of water main between main valves shall be tested individually.
 - 3. Test Preparation
 - a. For water mains less than 24 inches in diameter, flush sections thoroughly at flow velocities, greater than 3.0 feet per second, adequate to remove debris from pipe and valve seats. For water mains 24 inches in diameter and larger, the main shall be carefully swept clean, and mopped if directed by the Engineer. Partially open valves to allow the water to flush the valve seat. The Owner shall be notified and given the opportunity to be present during flushing operations.
 - b. Partially operate valves and hydrants to clean out seats.
 - c. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipe, valves, and appurtenances will be pressure tested.
 - d. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Insert corporation cocks at highpoints to expel air as main is filled with water as necessary to supplement automatic air valves.

4. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure.
5. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure. Where necessary, provide temporary backpressure to meet the differential pressure restrictions.
6. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
7. Test Pressure: Test the pipeline at 200 psi measured at the lowest point for at least two hours. Maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gage with graduation not greater than 5 psi.
8. Maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure.

B. Leakage

1. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
2. The Owner assumes no responsibility for leakage occurring through existing valves.
3. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

$$L = \frac{S * D \sqrt{P}}{148,000}$$

Where:

- | | | |
|---|---|--|
| L | = | allowable leakage, in gallons per hour |
| S | = | length of pipe tested, in feet |
| D | = | nominal diameter of the pipe, in inches |
| P | = | average test pressure during the leakage test, in pounds per square inch (gauge) |

As determined under Section 5 of AWWA C600.

4. If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.
- C. Completion: After a pipeline section has been accepted, relieve test pressure. Record the type, size and location of all outlets on record drawings.

3.10 Disinfecting Pipeline

- A. After successfully pressure testing each pipeline section, disinfect in accordance with AWWA C651 for the continuous feed method and these Specifications.
- B. Specialty Contractor: Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the Contractor shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water.
- C. Chlorination
1. Apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. Retain chlorinated water for 24 hours.
 2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24-hour period.
 3. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. Rechlorinate if required results are not obtained on all samples.
- D. Disposal of Chlorinated Water:
1. Dechlorination and disposal of heavily chlorinated water shall be in accordance with AWWA C655.
 2. Reduce chlorine residual of disinfection water to less than one milligram per liter if discharged directly to a body of water or to less than two milligrams per liter if discharged onto the ground prior to disposal. Treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. Flush all lines until residual is equal to existing system.
- E. Bacteriological Testing: After flushing of heavily chlorinated water and before the water main is placed in service, the Contractor shall collect samples from the main and have samples tested for bacteriological quality in accordance with the rules of the Georgia Department of Natural Resources, Environmental Protection Division and AWWA C651. The bacteriological samples shall be analyzed for both coliform and non-coliform growth. Testing shall be performed by a laboratory certified by the State of Georgia. Rechlorinate mains until required results are obtained.

3.11 Protection and Restoration of Work Area

- A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.
 - 1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
 - 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
 - 3. Handwork, including raking and smoothing, shall be required to ensure the removal of roots, sticks, rocks, and other debris in order to provide a neat and pleasing appearance.
- B. Man-Made Improvements: Protect, or remove and replace with the Engineer's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the work.
- C. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate county, state and federal regulatory agencies.

END OF SECTION

Packaged Pumping Systems for Water Utility Services**Part 1 General****1.1 Work Included**

- A. Work under this section includes, but is not limited to, furnishing and installing a factory- built pump station as indicated on the project drawings, herein specified and as necessary for proper and complete performance.

1.2 System Description

- A. Contractor shall furnish and install one factory-built above-ground, automatic pressure booster pump station for installation in the proposed pump station building. The station shall be complete with all equipment specified herein, factory assembled on a structural steel base. Contractor shall be responsible for coordinating provided equipment with the pump station building drawings and shall be responsible for all costs, both design and construction related, resulting from any change in the equipment shown and specified.
- B. In addition to the steel base, principle items of equipment shall include two pumps, motors, internal piping, valves, motor control panel and internal wiring.
- C. Factory built pump station design, including materials of construction, pump features, valves and piping, and motor controls shall be in accordance with requirements listed under Part 2 - Products of this section.

1.3 Performance Criteria

- A. The horizontal split-case pump(s) shall have a rated capacity of 3,200 GPM at 225 feet of head. Motor and pump speed shall not exceed 1800 RPM.
- B. Utility Power Requirements
 - 1. Site power furnished to pump station shall be 3 phase, 60 hertz, 460 volts, 4 wire, maintained within industry standards. Voltage tolerance shall be plus or minus 10 percent. Phase-to-phase unbalance shall not exceed 1% average voltage as set forth in NEMA Standard MG-1. Control voltage shall not exceed 132 volts.

1.4 Submittals

- A. Submittals shall be made in accordance with Section 01 33 00.
- B. Submittals shall include copies of all materials required to establish compliance with these specifications. At a minimum, they shall include the following:
 - 1. Shop drawings showing important details of construction and dimensions.
 - 2. Descriptive literature, bulletins, and/or catalogs of the equipment.

3. A detailed description of the system operation, including pressure and flow ranges, pump sequencing, and controller functionality.
 4. Guaranteed performance curves and data sheets for the pumps showing head, capacity, efficiency, NPSHR, and design and maximum horsepower.
 5. Total weight of the equipment.
 6. Complete Bill of Materials for the system.
 7. Electrical information, including control schematic and panel layout to scale.
 8. Manufacturer's UL 508A / NITW certificate for Industrial Control Panels.
 9. Manufacturer's UL QCZJ certificate for Packaged Pumping Systems.
 10. AWS D1.1 welding certificates for those employees working on the project.
 11. A complete list of all field service offices, complete with phone numbers and contact information, having the field service office closest to the site clearly indicated.
- C. Operation and Maintenance Manuals: Provide in accordance with Section 01 78 23. At a minimum, the manuals shall include:
1. Shop drawings showing important details of construction and dimensions.
 2. Descriptive literature, bulletins, and/or catalogs of the equipment.
 3. A detailed description of the system operation, including pressure and flow ranges, pump staging, and controller functionality.
 4. Guaranteed performance curves and data sheets for the pumps showing head, capacity, efficiency, NPSHR, and design and maximum horsepower.
 5. Total weight of the equipment.
 6. Complete Bill of Materials for the system.
 7. Electrical information, including control schematic and panel layout.
 8. Manufacturer's Operation and Maintenance Manuals with parts cross-sections.
 9. Recommended spare parts.
 10. Contact phone numbers for troubleshooting and service.
 11. Field Tests - Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall indicate the final position of the controls.

- D. Tools: Special tools necessary for maintenance and repair of the pumps shall be furnished as a part of the work hereunder; such tools shall be suitably stored in metal tool boxes and identified with the equipment number by means of stainless steel or solid plastic name tags attached to the box.
- E. Spare Parts: The Contractor shall obtain and submit from the manufacturer a list of recommended spare parts for each piece of equipment according to the provisions of Article 14.04 of the General Conditions. After approval, Contractor shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. Contractor shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the Owner, only, after expiration of the guaranty period. Any spare parts which the Engineer permits the Contractor to use for startup activities shall be replaced by the Contractor prior to the Owner's acceptance of beneficial use of the equipment.
 - 1. During the term of this Contract the Contractor shall notify the Engineer in writing about any manufacturer's modification of the approved spare parts, such as part number, interchangeability, model change or others. If the Engineer determines that the modified parts are no longer applicable to the supplied equipment, the Contractor at its expense shall provide applicable spare parts.
- F. Field Procedures: Instructions for field procedures for adjustments, inspection, and testing shall be provided prior to installation of the pumps.

1.5 Quality Assurance

A. Manufacturer's Qualifications

- 1. The pump station system integrator must be ISO 9001:2015 revision certified, with scope of registration including design control and service after sales activities.
- 2. Upon request from the Engineer, the pressure booster pump station manufacturer shall prove financial stability and ability to produce the station within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long term customer service and product support.
- 3. Bidding manufacturers shall have the necessary organization, experience, capital, and equipment to carry out the manufacturing and start-up of the equipment. Each bidder shall have produced similar packaged pumping systems for similar applications a minimum of five (5) times over the past five (5) years. The Owner and/or Engineer reserve the right to reject any bid that cannot satisfactorily demonstrate successful experience and competence with similar packaged pumping systems.

B. Factory Tests

- 1. Submit a description of the factory test setup and test procedure proposed. Submit sufficient data and drawings to demonstrate that testing is in compliance

with HI 11.6 and HI 14.6. Testing shall demonstrate that the pump complies with Acceptance Grade 1U.

2. Performance Test: Test the pump at the manufacturer's shop to demonstrate that the proposed pump operates without instability and complies with specified performance. Instability is defined when any point in usable range of the head-capacity curve cannot be repeated within 3 percent. When this occurs, the test shall be rerun. Compliance with specifications will be determined from curves required by the paragraph TEST RESULTS. Test procedures, except as herein specified, shall be in accordance with applicable provisions of HI 11.6. The temperature of the water used for testing shall be approximately the same for all tests run and shall be recorded during test runs.
3. Performance of the Pump: Performance of the pump shall be determined by a series of test points sufficient in number to develop a constant speed curve over the range of total heads. The lowest total head for testing shall be, as a minimum, the total head determined from the referenced paragraph. If the test setup permits testing at lower total heads, the range of total heads shall be extended 2 feet lower. Testing shall be inclusive for the speed involved. Test results with this sump elevation shall meet all specified conditions of capacity, head, and bhp. Head differentials between adjacent test points shall not exceed 3 ft, but in no case shall less than 10 points be plotted in the pumping range. If the plot of data indicates a possibility of instability or a dip in the head-capacity curve, a sufficient number of additional points on each side of the instability shall be made to clearly define the head-capacity characteristics.
4. Test Results: Test results shall be plotted to show the total head, static heads, bhp, and efficiency as ordinates. The results should be plotted against pump discharge in gpm as the abscissa. Curves shall be plotted showing pump performance to a scale that will permit reading the head directly to 0.5 ft, capacity to 500 gpm, efficiency to 1 percent, and power input to 25 bhp. It shall be established that the performance requirements of these specifications and the warranties under this contract have been fulfilled. The performance test shall be made with the pump and motor assembled as an operating unit to simulate field installation unless otherwise approved in writing by the Engineer. Readings shall include one point each within 2 percent of the rated total head, minimum expected head, and maximum expected head. The test shall be conducted in accordance with accepted practices at full speed; and, unless otherwise specified, the procedure and instruments used shall conform to HI 2.6.
5. Instrumentation and Procedures: Each instrument shall be described in detail, giving all data applicable, such as manufacturer's name, type, model number, certified accuracy, coefficient, ratios, specific gravity of manometer fluid to be used, and smallest scale division. When necessary for clarity, a sketch of the instrument or instrument arrangement shall be included. A fully detailed narrative description of each proposed method of instrumentation, procedures to be used, and a sample set of computation shall be included. The lowest equivalent static head that is obtainable with the testing when operating along the head-capacity curve of the proposed pump shall be stated.

- a. **Head Measurements:** Head measurements shall be made using a direct reading water column; mercury-air, mercury-water, or Meriam fluid manometer, or a pressure transducer. Vacuums shall be measured with a mercury-air manometer, a mercury-water manometer, or a pressure transducer. Fluctuations shall be dampened sufficiently to permit column gauges or a differential pressure transducer to be read to either the closest one one-hundredth (0.01) of 1 ft of water or Meriam fluid or one-tenth (0.1) of 1 inch of mercury. Manometers shall be used as indicated by ISA RP2.1. When pressure transducers are used, their accuracy shall be checked with a manometer.
 - b. **Pump Capacity:** Capacity shall be determined by a calibrated venturi flowmeter or a long-radius ASME flow nozzle. Orifice plates shall not be used. Venturi or nozzle taps shall be connected to column gauges equipped with dampening devices that will permit the differential head to be determined to either the closest one-hundredth (0.01) of 1 ft or water or one-tenth (0.1) of 1 inch of mercury. Magnetic flowmeters and flowmeters utilizing ultrasonic flow measurements will be acceptable if the calibration of the flowmeter has been completed within the last 6 months.
 - c. **Rotational Speed of Pump:** Rotational speed of the pump shall be measured in accordance with measurement of speed in HI 11.6, except that revolution counters shall not be used. The device used shall permit the speed to be determined to 1 rpm.
 - d. **Power Input:** Power input to the pump shall be measured in accordance with power measurements in HI 11.6. A method to permit bhp to be determined to the closest 0.5 bhp shall be used.
6. **Factory Test Report:** Submit, within 30 days of receipt of approval of the witnessed factory test, nine bound copies of a report covering test setup and performance tests. The factory test report shall include the specified information. Each factory test report shall include, as a minimum, the following:
- a. Statement of the purpose of test, name of project, contract number, and design conditions. Instances where guaranteed values differ from specified values should be given.
 - b. Résumé of preliminary studies, if such studies were made.
 - c. Description of pump and motor, including serial numbers, if available.
 - d. Description of test procedure used, including dates, test personnel, any retest events, and witness test data.
 - e. List of all test instruments with model numbers and serial numbers.
 - f. Sample computations (complete).
 - g. A discussion of test results.
 - h. Conclusions.

- i. Photographic evidence in the form of either 24 color photographs of test equipment, test setup and representative test segments, or a digital recording, at least 30 minutes in length, covering the same information as photographs. All photographic evidence should be labeled with contract number, location, date/time, and test activity. Videotape shall be voice annotated with the same information.
 - j. Copies of instrument calibration.
 - k. Copies of all recorded test data.
 - l. Curves required by the paragraph TESTS RESULTS.
 - m. Drawings of the test set-up showing all pertinent dimensions, elevations and cross section of the pump.
- C. Manufacturer's Start-Up Services
- 1. The packaged pumping system manufacturer shall provide factory service personnel for the set, start-up, preventative maintenance and general service of the system.
 - 2. Instruction of Owner's Personnel: The Contractor shall provide for the services of a factory service representative to instruct the Owner's personnel in the operation and maintenance of the equipment. This service shall consist of a one day's visit to the station for each type of similar pumps.

1.6 Manufacturer's Warranty

- A. The pump station manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.
- 1. All equipment, apparatus, and parts furnished shall be warranted for sixty (60) months, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O-rings, etc. The pump station manufacturer shall be solely responsible for warranty of the station and all components.
- B. Components failing to perform as specified by the Engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.
- C. It is not intended that the station manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design or delays in delivery are also beyond the manufacturer's scope of liability.
- D. Equipment supplied by others and incorporated into a pump station or enclosure is not covered by this limited warranty. Any warranty applicable to equipment selected

or supplied by others will be limited solely to the warranty, if any, provided by the manufacturer of the equipment.

- E. This limited warranty shall be valid only when installation is made and used and maintenance is performed in accordance with manufacturer recommendations. A start-up report completed by an authorized manufacturer's representative must be received by manufacturer within thirty (30) days of the initial date the unit is placed into service. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation whichever occurs first.

Part 2 Products

2.1 Unitary Responsibility

- A. In order to unify responsibility for proper operation of the complete pumping station, it is the intent of these Specifications that all system components be furnished by a single supplier (unitary source). The pumping station must be of standard catalog design, totally warranted by the manufacturer. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.

2.2 Manufacturer

- A. The specifications and project drawings depict equipment and materials manufactured by The Gorman-Rupp Company, as supplied by Templeton & Assoc. 4324 Borgdon Exchange, Suite 100, Suwanee, GA 30024; PH: 770.614.8550; which are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. The Contractor shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.
- B. After execution of the contract, the Contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be superior in construction and performance to that specified in the contract, and the higher quality must be demonstrated by a list of current users of the proposed equipment in similar installations.
- C. In event the Contractor obtains Engineer's approval for equipment substitution, the Contractor shall, at his own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the Engineer prior to acceptance.
- D. If the cost to the Contractor is less for the proposed substitution, then the contract price shall be reduced by an amount equal to the savings.

2.3 Unit Base

- A. Station base shall be constructed of structural grade steel. The design shall resist deformation of the structure during shipping, lifting, or handling. The base shall incorporate anchor bolt holes for securing the complete station to a concrete pad (supplied by the Contractor) in accordance with the project plans.

2.4 Pump Design

- A. The pump(s) shall be Horizontal Split-Case design. The pump(s) shall be Patterson 10" x 8" Model 8x10M. Performance criteria shall be in accordance with requirements listed under Part 1 - General of this section.
- B. Each pumping unit shall be provided with a stainless steel nameplate, which shall contain the following minimum information:
 - 1. Manufacturer's name, address and telephone number.
 - 2. Model Number.
 - 3. Serial Number.
 - 4. Head, Capacity, and RPM at the rated condition.
 - 5. Motor horsepower, rpm and frame size.
- C. Pump rotating assemblies shall be balanced in accordance with the requirements of ANSI S2.19, G6.3.
- D. Vibration when measured at the pump bearing housing shall not exceed the limitations set forth by the Hydraulic Institute Standard 9.6.4.
- E. All materials in contact with potable water shall be certified to NSF Standard 61.
- F. Materials and Construction Features
 - 1. Pump casing: Casing shall be close grain cast iron type ASTM 48, Class 40, designed for heavy duty service. Casing shall incorporate following features:
 - a. The casing shall be horizontally split; dual volute type with the suction and discharge flanges cast integrally with the lower half in order that the upper part may be removed for inspection of the rotating element without disturbing pipe connections.
 - b. The upper half-casing flange shall have tapped holes for jackscrews. The interior shall be smooth and free from surface defects.
 - c. Thickness, diameter, and drilling dimensions of suction flanges shall be Class 125 ANSI standard. Discharge flanges shall be Class 125 ANSI standard. Pump casings shall have a minimum 10" suction and an 8" discharge. Casings shall be drilled and tapped for vertical priming, gauge, and drain connections. Suitable lifting lugs or eyebolts shall be provided.

- d. Pump mounting feet shall be cast integrally with the lower half of the pump casing.
 - e. The joint between halves of the casing shall be heavily flanged and bolted and provided with dowel pins to insure accurate alignment.
2. Impeller
- a. Impeller shall be of the double suction enclosed type made entirely of ASTM B584-836 bronze, finished smooth all over and of ample strength and stiffness for maintaining the maximum capacity of the unit.
 - b. The impeller shall be statically and dynamically balanced. The impeller shall be keyed to the shaft and held in axial position on the shaft by means of ASTM B148-954 bronze sleeves extended through the stuffing box and locked at the outside of the stuffing box with a locking nut. There shall be an O-ring between the sleeve and the nut to prevent entrance of air or liquid between the shaft and sleeve.
3. Wear Rings:
- a. At the running joint between the suction and discharge chambers, there shall be provided wear rings on both the casing and the impeller.
 - b. The casing rings shall be of ASTM B505-927 bronze, positioned in the casing and locked against rotation by the upper half of the case.
 - c. The impeller rings shall be of ASTM B505-932 bronze, so fastened that they cannot rotate or become loose when the pump is subjected to reverse rotation. The rings shall be made to limit gauges, so that they may be renewed without fitting.
4. Pump Shaft:
- a. The shaft shall be made of alloy steel type AISI 1141 and of such dimensions that the maximum combined stress due to bending and torsion shall not exceed 8000 pounds per square inch under the most severe conditions of operation.
 - b. The shaft shall be accurately machined over its entire length. The first critical speed of the rotating assembly shall occur at not less than 150% of the rated speed.
5. Stuffing boxes (Mechanically Sealed):
- a. The stuffing boxes shall be provided with mechanical seals.
 - b. Stuffing boxes shall accept packing or mechanical seals without modification.
 - c. Mechanical seals shall be furnished with a carbon seal ring, ceramic mating ring, viton elastomers and 316 stainless steel metal parts.

- d. Mechanical seals shall be rated for 250 PSIG pressure. The elastomers shall be rated for temperatures ranging from -20 °F to 400°F.
 - e. Pump shaft sleeves shall be furnished with a pre-machined groove designed to accept a setting ring, which shall eliminate the need for set collars or stop collars. Seals requiring stop or set collars are not acceptable.
 - f. The rotating seal ring shall be provided with a 360-degree rubber encasement to provide a positive drive for the seal face without the need for metal drive notches which may cause face distortion or notch wear. The seal rings shall be permanently fixed in place and full flatness maintained by a precision crimp in the outer seal case.
 - g. The mechanical seal shall be of a convoluted design which permits free movement, providing constant adjustment for shaft endplay and seal face wear. Positive face contact with the stationary seat shall be maintained at all times.
 - h. To insure positive sealing by free movement of the seal head, the seal shall feature a hex style outer shell and drive band which shall absorb start-up and running torque and shall eliminate stress on the diaphragm. Metal components shall freely engage and shall not be subject to lock down due to friction wear.
 - i. Suitably valved connecting lines or passages shall be provided on the upper half casing leading from the discharge volute to the stuffing box for lubricating the stuffing boxes with the liquid being pumped.
6. Bearings:
- a. Bearings shall be of the anti-friction and grease lubricated type.
 - b. The bearing configuration shall consist of one single row deep grooved anti-friction bearing on the inboard side and two single row angular contact anti-friction bearings mounted back to back on the outboard side. The inboard bearing shall be designed to take the radial thrust loads. The two single row angular contact anti-friction bearings mounted back to back on the outboard side. The inboard bearing shall be designed to take radial thrust loads. The two single row angular contact bearings shall be designed to take a combination of loads, both radial and axial; and hold the rotor in axial alignment.
 - c. Bearings shall have a minimum rated service life of 40,000 hours in accordance with standards of the Bearings Manufacturers Association throughout the specified operating range. Bearing housings shall be rigidly supported by suitable brackets, which shall be cast integrally with the lower half of the pump casing.

7. Baseplates

- a. The pump and motor shall be mounted on a common base of fabricated ASTM A36 galvanized steel. Bent metal or formed bases are not acceptable.
- b. The base shall be provided with an OSHA-compliant coupling guard, and ample grout holes.

8. Couplings

- a. The coupling shall be Martin Quadra-flex or approved equal with type S flanges and elastomeric sleeves of Hytrel, EPDM or similar material.
- b. Sized to transmit the maximum required horsepower with a 1.5 service factor.

9. Motors

- a. Pump: Each electric motor-driven pump shall be driven by a totally enclosed, fan-cooled continuous duty electric motor. Motor shall have a 1.15 service factor. Motors shall be squirrel-cage induction motors having a normal starting torque and low starting current characteristics and shall be of sufficient size so that the nameplate horsepower rating will not be exceeded throughout the entire published pump characteristic curve. Integral size motors shall be the premium efficiency type in accordance with NEMA MG 1.
- b. Motor bearings shall provide smooth operations under the conditions encountered for the life of the motor. Adequate thrust bearing shall be provided in the motor to carry the weight of all rotating parts plus the hydraulic thrust and shall be capable of withstanding upthrust imposed during pump starting and under various pump head conditions specified.
- c. Motors shall be rated for inverter duty, 460 volts, 3 phase, 60 Hz and such rating shall be stamped on the nameplate. Motors shall conform to NEMA MG1 and IEEE 841, with Class F insulation and Class B temperature rise.
- d. Motor Thermostats. Each motor shall be equipped with a thermostat to detect high motor temperature. Contact shall be normally closed, opening on rising temperature. Circuit shall require a manual reset.
- e. Approved manufacturers are: Baldor, Reliance, US Electric, GE or approved equal.

G. Serviceability

1. The pump manufacturer shall demonstrate to the Engineer's satisfaction that consideration has been given to reducing maintenance costs.
2. No special tools shall be required for replacement of any components within the pump.

2.5 Valves and Piping

- A. Check valves shall be of the silent operating type, as manufactured by Val-Matic Valve and Manufacturing Corporation, that begin to close as the forward flow diminishes and are fully closed at zero velocity preventing flow reversal and resultant water hammer or shock.
1. Wafer style valves shall be provided in sizes 2 inch through 10 inch for installation between ANSI B16.1 Class 125 or Class 250 iron flanges or ANSI B16.5 Class 150 or Class 300 steel flanges.
 2. The valve design shall incorporate a center guided, spring loaded disc, guided at opposite ends and having a short linear stroke that generates a flow area equal to the pipe size.
 3. The operation of the valve shall not be affected by the position of installation. The valve shall be capable of operating in the horizontal or vertical positions with the flow up or down.
 4. All component parts shall be field replaceable without the need of special tools. A replaceable guide bushing shall be provided and held in position by the spring. The spring shall be designed to withstand 100,000 cycles without failure and provide a cracking pressure of 0.5 psi and to fully open at a flow velocity of 4 ft/sec.
 5. The valve disc shall be concave to the flow direction providing for disc stabilization, maximum strength, and a minimum flow velocity to open the valve.
 6. The valve disc and seat shall have a seating surface finish of 32 micro-inch or better to ensure positive seating at all pressures. The leakage rate shall not exceed one-half of the allowable rate for metal seated valves allowed by AWWA Standard C508 or 0.5 oz. per hour per inch of valve diameter.
 7. The valve flow way shall be contoured and unrestricted to provide full flow areas at all locations within the valve.
- B. Isolation Valves: A lug style butterfly valve shall be installed at the suction & discharge of the station to isolate the station from the supply & system. Valves shall be manufactured in accordance with the latest revisions of AWWA C504, Class 150B. The valve shall have an ASTM A126 cast iron body with 316 stainless steel edge, lens shaped design, and be rated for 200 psi. Shaft shall be of the one-piece style made of 416 stainless steel. Bushings shall be made of PTFE, disc shall be 316 stainless steel and seat shall be EPDM. Valves 10" and smaller shall have a ten position lever handle, valves 12" and larger shall have a hand wheel operator. Butterfly valves shall be Crane Centerline Series 200 or approved equal.
- C. The suction and discharge manifolds shall be equipped with 1" air release valves and isolating ball valves. Air release valve discharge line shall be piped to the edge of the skid with 1/2" copper tubing. Valve shall include a stainless steel float and compound lever. Valve shall be rated at 150 psi working pressure, shall incorporate a 23/64" diameter orifice, and shall be capable of expelling air at a rate greater than 125 SCFM at 100 psi line pressure. Valves shall be mounted at the downstream end of each

manifold, past the last pipe branch. Air release valve on the suction manifold shall have a check valve mounted on its discharge to prevent air entry under vacuum.

- D. Gauge Kit: Two gauges shall be installed on each pump with ball valves for shut-off and piping so that each gauge is clearly visible from the suction side of the station. Pressure gauges shall be stem mounted, with stainless steel cases equipped with safety pressure blowout backs and glycerine dials. The gauge sensors shall be C-Type Bourdon tube actuated and constructed of stainless steel. The gauges shall be equipped with TP316L stainless steel threaded 0.25 inch male connections. The dials of the gauges shall be 4.5 inch in diameter with scale readings in psig and inches of mercury. Suction Pressure gauge shall be graduated 0 to 100 PSI. Discharge Pressure gauge to be graduated 0 to 200 PSI. A slotted adjustable pointer shall be provided with accuracy to conform to ASME B40.100, Grade A. A lever handled gauge cock and filter type snubber shall be provided. Manufacturer shall be Terrice, Ashcroft or Wika.
- E. Piping
1. Piping shall be steel and conform to material specification ASTM A-53 (CW) for nominal pipe size four (4) inches and smaller, and ASTM A-53 (ERW) Grade B for nominal pipe size five (5) inches and larger. Steel butt-welding fittings shall conform to material specification ASTM A-234 Grade WPB and to the dimensions and tolerances of ANSI Standards B16.9 and B16.28 respectively.
 2. Forged steel flanges shall conform to material specification ASTM A-105 Class 60 and/or ASTM A-181 for carbon steel forgings and to the dimensions and tolerances of ANSI Standards B16.5 as amended in 1992 for Class 150 and Class 300 flanges.
 3. The piping sizes shall be as shown on the drawing.
 - a. Size 10" and below – Schedule 40
 - b. Size 12" and above – Standard weight (.375" wall)
 4. Certified welders employed by the pump station manufacturer shall perform all pipe welds. As part of the equipment submittal, the pump station manufacturer shall provide copies of the welding certificates of the employees who are to perform the pipe welds.
 5. Piping six 6-inches diameter and larger shall require a minimum of two- (2) weld passes to complete each weld. The first pass, or root pass, shall be applied at the bottom of the bevel cut using the short circuit transfer-welding mode. The second pass, or cap pass, shall be applied over the root pass using the spray or pulse arc transfer welding modes to ensure that at a minimum the total weld thickness shall be equal to thinnest of the two pieces being welded together.
 6. Steel piping shall have applied to it a fusion bonded epoxy coating on the interior pipe surface that conforms to AWWA C-213-91 for steel water pipelines. The powder-coating product shall be National Sanitation Foundation (NSF) Standard 61 certified material. The final product shall be capable of meeting salt spray resistance ASTM B117 (1000 hour) with no blistering, undercutting,

or rust bleed; humidity resistance ASTM D2247 (1000 hour) with no blistering, undercutting, or rust bleed; and impact resistance of ASTM G14-72 (160 in. lbs.) The fusion-bonded epoxy coating shall provide a total dry thickness of 12.0 to 14.0 mils.

7. Pipe Supports: Pipe supports shall be designed and sized as follows:
 - a. Supports shall be sized to provide adequate support for the piping system;
 - b. All rectangular tubing shall have capped ends;
 - c. Pipe supports are to be fully welded at the base. Pipe shall be supported by a saddle and shall not be welded to the support;
 - d. Simple pipe stands made of pipe welded only at the floor and upholding a bracket with or without a threaded hack bolt or a U-bolt are not acceptable.

2.6 Magnetic Flowmeter and Accessories

- A. Magnetic Flowmeter. The magnetic flowmeter shall be a completely obstructionless, in-line flowmeter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings or grounding electrodes as required by the application. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME 816.5 for line sizes from one-half inch to 24 inches or AWWA C207 for line sizes larger than 24 inches. Flange class ratings and meter maximum pressure ratings shall be compatible with the adjoining piping.
 1. The meter shall be capable of standing empty for extended periods of time without damage to any components.
 2. The meter housing shall be of a splash-proof and drip-proof design.
- B. Electrode and liner materials shall be fully compatible with the process fluid as approved by the Engineer.
- C. Each meter shall be factory wet flow calibrated to the sensor's full flow capacity, at a facility, which is traceable to NIST or other standard acceptable to Engineer, and a copy of the calibration report shall be submitted as part of the operation and maintenance manual submittal.
- D. Magnetic Flowmeter Signal Converters. Separately mounted, microprocessor-based signal converters shall be provided for the magnetic flowmeters. The signal converters shall include output damping, self-testing, built-in calibration capability, and an "empty pipe" zero contact input. The overall accuracy of the magnetic flowmeter transmitter and signal converter shall be ± 0.5 percent of actual flow rate for full-scale settings of 3 to 30 fps. The meter manufacturer shall furnish the signal cable between the converter and the magnetic flowmeter. Signal cable shall be continuous and not spliced between the meter and the signal converter. The signal converter shall be housed in a corrosion-resistant, weatherproof NEMA

Type 4X housing and shall be suitable for operation over an ambient temperature range of -30 to +140°F, and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA dc, with superimposed digital HART protocol. Transmitters shall contain a local indicator with a minimum four-digit LCD type display, scaled to read in engineering units of flow.

1. Magnetic flowmeter systems shall provide zero flow stability by means of automatic zero adjustment of a DC excited metering circuit. Converters shall be capable of bi-directional flow measurement. Signal converters shall be of the same brand as the magnetic flowmeters.
2. The signal converter shall have a non-reset seven-digit totalizer on the face of the enclosure.
3. The signal converter shall be diagnosed and recalibrated with the use of a hand-held communicator/calibrator device. One device shall be furnished for all converters provided by a single manufacturer.

E. Manufacturers and Models

1. Endress & Hauser, Inc., Promag 50/53W
2. Or Equal

2.7 Finish

- A. Pumps, piping, and exposed steel framework shall be cleaned prior to coating using an approved solvent wipe or phosphatizing cleaner. The part must thoroughly dry before paint application. Open joints shall be caulked with an approved polyurethane sealant. Exposed surfaces shall be applied with one coat of Tnemec Series 69 Polyimide Epoxy Primer and one finish coat of Series 73 Aliphatic Acrylic Polyurethane for a total dry film thickness of 4-6 mils. Finish coat shall be semi-gloss white for optimum illumination and enhancement. The coating shall be corrosion, moisture, oil, and solvent resistant when completely dry. The factory finish shall allow for over-coating and touch-up for 6 months after coating.

2.8 Electrical – General

A. Electrical Design

1. Electrical service to the pump station will be 480 volt, 3 phase, 60 hertz by others. Electrical scope within this Section includes supplying configured variable frequency drives in a single motor control center (MCC) assembly and a separate pump control panel (containing a PLC pressure controller) for field installation by others. Power to the MCC and pump control panel will be provided by others. Local safety switches for pump motors are provided by others. Field power wiring from pump skid to MCC is by others. Field control wiring from pump skid and MCC to pump control panel is by others.

B. Conduit

1. Any conduit installed by the manufacturer on the pump skid shall comply with Section 26 05 01 of these Specifications. Rigid conduit shall be galvanized steel. Flexible conduit shall be nonmetallic liquidtight and shall be used for all connections to vibrating equipment.

C. Wiring

1. Any wiring installed by the manufacturer on the pump skid shall comply with Section 26 05 01 of these Specifications. Motor circuit wiring shall be sized for load. All branch circuit conductors which supply a single motor shall have an ampacity of not less than 125 percent of the motor full load current. Control and accessory wiring shall be sized for load.

2.9 Electrical Control Components**A. Pump Control Panel Enclosure**

1. Electrical control equipment shall be mounted within a NEMA 1 Painted Steel control enclosure. Door shall be hinged and sealed with a neoprene gasket and equipped with captive closing hardware. Control components shall be mounted on a removable steel back panel secured to enclosure with collar studs.
2. All control devices and instruments shall be mounted using threaded fasteners and shall be clearly labeled to indicate function.

B. Branch Components

1. Branch components to be of highest industrial quality, secured to the sub-plate with machine screws and lockwashers. Mounting holes shall be drilled and tapped; self-tapping screws shall not be used to mount any component.
2. A duplex ground fault receptacle providing 115 VAC, 60 Hz, single-phase current, will be mounted on the side of the control enclosure. Receptacle circuit shall be protected by a 15-ampere thermal-magnetic circuit breaker.
3. UL Label Requirement: Pump station controls shall conform to third party safety certification. The panel shall bear a serialized UL label listed for "Enclosed Industrial Control Panels". The enclosure and all components mounted on the sub-panel or control cover shall conform to UL descriptions and procedures.
4. Panel Heater: The control panels shall be equipped with a panel heater to minimize the effects of humidity and condensation. The heater shall include a thermostat.

C. Wiring

1. All wiring, workmanship, and schematic wiring diagrams shall comply with applicable standards and specifications of the National Electrical Code (NEC).

2. All user serviceable wiring shall be type MTW or THW, 600 volts, color coded as follows:
 - a. Line and Load Circuits, AC or DC power Black
 - b. AC Control Circuit Less Than Line Voltage Red
 - c. DC Control Circuit Blue
 - d. Interlock Control Circuit from External Source. Yellow
 - e. Equipment Grounding Conductor Green
 - f. Current Carrying Ground White
 - g. Hot With Circuit Breaker Open Orange
 - i. Control circuit wiring inside the panel, with exception of internal wiring of individual components, shall be 16-gauge minimum, type MTW or THW, 600 volts. Power wiring to be 14-gauge minimum.
 - ii. Control wires connected to door mounted components must be tied and bundled in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall allow the door to swing full open without undue stress or abrasion. Bundles shall be held on each side of hinge by mechanical fastening devices.

D. Grounding

1. All electrical equipment within the pumping control system shall be grounded to the control panel back plate. All paint must be removed from the grounding-mounting surface before making final connection.

E. Equipment Marking

1. Permanent corrosion resistant name plate(s) shall be attached to the control and include the following information:
 - a. Equipment Serial Number.
 - b. Supply Voltage, Phase and Frequency.
 - c. Current Rating of the Minimum Main Conductor.
 - d. Electrical Wiring Diagram Number.
 - e. Name and Location of Equipment Manufacturer.
2. Control components shall be permanently marked using the same identification keys shown on the electrical diagram. Labels shall be mounted adjacent to device being identified.

3. Switches, indicators and instruments mounted through the control panel door shall be labeled to indicate function, position, etc. Labels shall be mounted adjacent to, or above the device.

2.10 PLC Pressure Control

- A. The PLC pressure controller shall start and stop the pump motors in response to changes in system pressure, as set forth herein.
- B. The PLC pressure controller shall operate with a suction pressure transducer and a system pressure transducer.
- C. The PLC pressure controller shall be capable of pump alternation. The controller shall select which pump to be lead pump, with alternation occurring at the end of each pumping cycle.
- D. The PLC pressure controller shall utilize a suction pressure transducer that shall continuously monitor the suction pressure and a system pressure transducer that shall continuously monitor the system pressure, permitting the operator to read pressures (and system pressure) at any time. Upon operator selection of station automatic operation, the PLC pressure controller shall start the motor for one pump when the system pressure drops to the lead pump start setting. When the system pressure has met the lead pump stop setting, the digital pressure controller shall stop this pump. These actions shall constitute one pumping cycle. Should the system pressure continue to drop or stay low, the PLC pressure controller shall start a second (or third) pump, provided these are available in this station as described in other sections of this specification. These pressures shall be adjustable as described below.
 1. The PLC shall be an Allen-Bradley CompactLogix 5370 L2 Control System. The PLC shall be equipped with a CPU with 750KB 1769-L24ER-QBFC1B of user memory, and two EtherNet/IP communication ports supporting ring topologies and 1 USB port for firmware download and programming. The Controller shall utilize the small applications 1769 I/O modules. The Controller shall be designed to implement consumed tag, event instruction, embedded inputs, remote I/O, axis, and motion event triggers. The controller shall be equipped to handle up to 32 Controller Tasks and 100 programs/task.
 2. The PLC shall operate on 24VDC power and be equipped with a 24VDC embedded power supply. A 1784-SD1 (1GB) Memory Module shall be shipped with the controller. The controller will contain, at least but not limited to, embedded digital I/O [16DC Inputs, 16DC Outputs]. The controller shall accept all digital and analog I/O necessary to accomplish the specified operation. A minimum of 10% spare of the I/O used shall be supplied.
 3. The program logic shall be stored on the processor as well as on a programmable, read only 1 GB SD card [shipped with controller]. The memory module shall auto load and run when installed in the programmable control processor and is included to facilitate field repair or replacement of the programmable control hardware without the use of programming terminals or personal computers.

4. The PLC shall communicate with the drive using an EtherNet/IP but can also support other communication protocols such as ControlNet, or DeviceNet networks. The PLC shall issue drive start/stop and speed commands. Drive status shall also be communicated to the PLC using EtherNet/IP. The drive shall be configured to operate manually without the use of the PLC.
5. An Allen-Bradley PanelView Plus 7 1000 electronic operator interface shall be provided for data entry and display. The Operator Interface Display size will be at least 10 inches with Color active matrix, thin film transistor (TFT), liquid crystal display (LCD). The operator interface shall have an 18-Bit color graphic resolution with backlight CCFL of 50,000 hours minimum. The operator interface shall be mounted on the front of the control panel with other operator controls and shall be compatible with the PLC communication protocol. The operator interface shall be a backlit, touch-screen terminal. The operator interface program shall be stored externally on a Secure Digital (SD) card.
6. Electromechanical relays and timers, when used shall be equipped with 120vac coils and contacts rated NEMA A-300 minimum. Timers shall be pneumatic or synchronous motor driven.
7. The control circuit shall be fused and shall be provided with a disconnect switch connected in such a manner as to allow control power to be disconnected from all control circuits.
8. Pump mode selector switches shall be connected to permit manual start and manual stop of each pump motor individually. Manual operation shall override shutdown systems supplied with the level control system except motor overload.
9. Pump alternation shall be integral to the PLC. Provisions for automatic alternation or manual selection shall also be integral to the PLC.
10. The digital pressure controller shall be equipped with two (2) scalable 4-20mA analog inputs and one (1) 4-20mA output that reflects system pressure. Load resistance for the 4-20mA output can be up to and including 500 ohms.
11. The PLC pressure controller shall be equipped with an electronic comparator and output relay to alert maintenance personnel to a low suction pressure situation. An output-energized indicator, visible on the front of the operator interface, shall indicate that a low suction situation exists. The alarm on and off pressure setpoints is set in PSI. The output and its associated indicator shall be maintained until the suction pressure has increased above the alarm off setpoint for a preset amount of time, at which time the output will automatically drop out. The low suction pressure alarm circuitry includes settable on and off delay timers.
12. The PLC pressure controller shall be equipped with an electronic comparator and output relay that can be used to alert maintenance personnel to a low system pressure. An indicator, visible on the front of the controller, shall indicate that a low system pressure exists. The output and its associated indicator shall be maintained until the system pressure has increased above the alarm off setpoint for a preset amount of time, at which time the output will automatically

drop out. All pressure setpoints are set in PSI. The low system pressure alarm circuitry includes settable on and off delay timers.

13. The PLC pressure controller shall be equipped with an electronic comparator and output relay that can be used to alert maintenance personnel to a high system pressure. An indicator, visible on the front of the controller, shall indicate that a high system pressure exists. The output and its associated indicator shall be maintained until the system pressure has decreased below the alarm off setpoint for a preset amount of time, at which time the output will automatically drop out.
14. All pressure setpoints are set in PSI. The high system pressure alarm circuitry includes settable on and off delay timers.
15. An alarm silence soft key shall be provided to permit maintenance personnel to de-energize the audible alarm device while corrective actions are under way. After silencing the alarm device, manual reset of the alarm condition shall clear the alarm silence.
16. The control panel shall be manufactured at the same facility the pressure booster station is manufactured. The control panel shall be manufactured by The Gorman-Rupp Company.

2.11 Motor Control Center

- A. MCCs shall be equal to Allen-Bradley® CENTERLINE® 2100 motor control centers.

2.12 MCC Ratings

- A. The MCC shall be rated for the system voltage as indicated on the contract drawings.
- B. The MCC horizontal and vertical power bus bracing shall be rated to meet or exceed the available fault current as shown on the contract drawings but shall not be less than 42,000 A rms symmetrical.
- C. All MCC units shall have a full rated short-circuit rating that meets or exceeds the available fault current as shown on the contract drawings.
 1. The use of series short-circuit ratings shall be permitted only for panelboards; series short-circuit ratings for other types of units is not acceptable
- D. All circuit breakers used in the motor control center shall have full-rated short-circuit interrupting ratings based on the applied MCC voltage.
 1. Slash rated short-circuit interrupting ratings for circuit breakers are not acceptable except for branch circuit breakers in panelboards, and then only if the power system specified in the contract drawings is a Wye with a solidly grounded neutral

2.13 MCC Enclosure

- A. The MCC enclosure shall be NEMA Type 1 with gasket around perimeter of doors
- B. Each section shall be equipped with two full-metal side sheets to isolate each vertical section and to help reduce the likelihood of fault propagation between sections.
- C. All interior and exterior surfaces shall be painted ANSI 49 medium-light gray. The vertical wireways and unit back plates shall be painted high-visibility gloss white.
- D. All unpainted parts shall be plated for corrosion resistance.
- E. Removable closing plates on each end of the MCC shall cover all horizontal bus and horizontal wireway openings.

2.14 Structure

- A. The MCC shall be of dead front construction and shall consist of one or more vertical sections bolted together to form a rigid, free-standing assembly. The systems shall be designed to allow for the addition of future sections at either end and to permit the interchanging of units.
- B. Vertical sections shall be rigid, free-standing structures.
 - 1. Vertical sections shall have internal mounting angles running continuously within the shipping block.
 - 2. An external mounting channel that is required to maintain structure integrity is not acceptable.
 - 3. Vertical sections shall be 90 in. high, 20 in. deep and 20 in. Wide, except where larger dimensions are required.
 - 4. Vertical sections shall be provided with a removable steel lifting angle on all shipping blocks. The angle shall run the length of the shipping block.
 - 5. Lifting eyes are not acceptable.
 - 6. Each standard section shall be capable of being subdivided into 12 usable, unit spaces.
 - 7. Two unit spaces shall constitute one space factor and shall be 13 in. in height.
 - 8. One unit space shall constitute one-half space factor and shall be 6.5 in. in height.
- C. Horizontal wireways.
 - 1. Horizontal wireways shall be located at the top and bottom of the MCC.

2. Horizontal wireways shall be 6 in. in height and extend the full depth of the vertical section to allow maximum flexibility in locating conduit for MCC feeds and loads.
 3. Horizontal wireways shall be continuous across the length of the MCC, except where access needs to be denied due to electrical isolation requirements.
 4. The horizontal wireways shall be isolated from the power bus.
 5. The horizontal wireways shall have removable covers held in place by captive screws.
- D. Provide a full height vertical wireway, independent of the plug-in units, in each standard vertical section.
1. The vertical wireway shall be isolated from the vertical and horizontal buses.
 2. The vertical wireway shall be covered with a hinged and secured door.
 3. Wireway tie bars shall be provided.
 4. Isolation between the wireway and units shall be provided.

2.15 Bus Bars

- A. Horizontal Power Bus.
1. The horizontal bus shall be rated as shown on the drawings.
 2. The horizontal bus material shall be copper with tin plating.
 3. The horizontal bus shall be supported, braced and isolated from the vertical bus with a high strength, non-conductive, non-tracking, glass polyester material.
 4. For standard sections, the horizontal bus shall be continuous within each shipping block and shall be braced within each section.
 5. Horizontal bus splices shall have at least two bolts on each side.
- B. Vertical Bus.
1. The vertical power bus shall have an effective rating of 600 A. If a center horizontal bus construction is utilized, then the rating shall be 300 A above and below the horizontal bus for an effective rating of 600 A. If a top or bottom mounted horizontal bus is utilized, then the full bus must be rated for 600 A.
 2. The vertical bus material shall be copper with tin plating.
 3. The vertical bus shall attach to the horizontal bus with at least two bolts.

4. The vertical bus shall be continuously braced by a high strength, non-conductive, non-tracking, glass-filled polyester material and isolated from the unit spaces by a non-conductive, polycarbonate molded cover.
5. The vertical bus shall be isolated from the horizontal power bus except where necessary to connect the vertical power bus to the horizontal power bus.
6. Automatic shutters shall cover plug-in stab openings when units are removed.

C. Ground Bus

1. Provide a ground bus system consisting of a horizontal ground bus connected to vertical ground buses mounted in each section.
2. Provide a tin-plated copper 0.25 x 2 in. horizontal ground bus mounted in the bottom of the MCC unless otherwise specified in the drawings.
3. Provide a pressure-type mechanical lug mounted on the ground bus in the incoming line section.
4. Provide a unit ground stab on all unit inserts. The ground stab shall establish unit insert grounding to the vertical ground bus before the plug-in power stabs engage the power bus. The grounding shall be maintained until after the plug-in power stabs are disengaged.
5. Provide a unit load connector on all units that require load wire connections. The load connector shall provide a termination point for the load ground conductor at the unit.

D. Neutral Bus

1. In a 4-wire system with a main incoming device rated 400 A or less, if there are no neutral loads in the MCC, an incoming neutral termination plate in the MCC main device unit is acceptable in lieu of a horizontal neutral bus.
2. In a 4-wire system with a main incoming device rated more than 400 A, if there are no neutral loads in the MCC, an incoming neutral termination plate in the MCC main device unit that is connected to horizontal neutral bus in the section with the main is acceptable.
3. If neutral loads are specified within the MCC, provide neutral connection plates in sections with horizontal neutral bus as indicated on the contract drawings.
4. Horizontal neutral bus shall be provided in main incoming section only.
5. Neutral bus rating shall be same as the horizontal power bus rating.

2.16 Ethernet/IP Communication

- A. The MCC shall have Ethernet wiring incorporated into its design.
 - 1. The MCC shall have factory installed industrial Ethernet cabling incorporated throughout the vertical section across the entire lineup.
 - 2. Each electronic overload relay, power monitor, and AC drive unit in the MCC shall be supplied with a means to communicate via EtherNet/IP network.
 - 3. Plug-in units should be able to move around without impacting the network.
 - 4. Maintenance activities should be able to be performed without impacting the network.
- B. EtherNet/IP Interface for Variable Frequency AC Drives.
 - 1. The EtherNet/IP communication interface shall be supplied to allow for communication between the solid-state component and the Ethernet network.
- C. EtherNet/IP Interface for Other Units.
 - 1. Provide an EtherNet/IP interface for other units as indicated on the contract drawings.
 - 2. Refer to the contract drawing wiring diagrams for points to be monitored.
- D. Programming and Testing.
 - 1. The MCC manufacturer shall load the IP Address and Subnet Mask into each unit.
 - 2. The IP Address shall be as indicated on the contract drawings or as provided by the Contractor.
 - 3. The MCC manufacturer shall test the MCC to ensure that each unit communicates properly prior to shipment.
 - 4. Each unit shall have a label showing the IP Address for the devices within it.
 - 5. The IP Address shall not be visible on the unit Nameplate for any units containing an EtherNet/IP enabled device.

2.17 Unit Information

- A. The minimum compartment height shall be 6.5 in. and this shall be considered one-half space factor.
- B. NEMA Size 5 FVNR starters and below shall be provided as plug-in units.

C. Plug-in units.

1. Plug-in units shall consist of a unit assembly, unit support pan, and unit door assembly.
2. Units shall be supplied with removable doors. The unit doors shall be fastened to the structure so that the doors can be closed when the unit is removed.
3. A unit support pan shall be provided for support and guiding units. Unit support pans shall remain in the structure when units are removed to provide isolation between units.
4. A service position shall be provided for plug-in units that allows for the unit to be supported but disengaged from the bus. The unit shall be capable of being padlocked in the service position. This position is to be used to isolate a unit from the bus to allow service to be performed on the connected load equipment.

D. Power Stabs.

1. Unit stabs for engaging the power bus shall be tin-plated copper and provided with stainless back-up springs to provide and maintain a high pressure 4-point connection to the vertical bus.
2. Wiring from the unit disconnecting means to the plug-in stabs shall not be exposed on the rear of the unit. A separate isolated pathway shall be provided for each phase to minimize the possibility of unit fault conditions reaching the power bus system.
3. Power cable termination at the plug-in stab shall be a maintenance-free crimp type connection.

E. Withdrawable Power Stabs.

1. Plug-in units shall have the capacity of withdrawing the power stabs, allowing the primary voltage to be disconnected with the unit door closed.
2. The withdrawable assembly shall accept a standard 1/4' hex-style drive socket.
 - a. A complete power engagement shall occur when turning the mechanism $\frac{1}{4}$ turn in clockwise direction.
 - b. Complete power disengagement shall occur when turning the mechanism $\frac{1}{4}$ turn in counter-clockwise direction.
3. The withdrawable stabs design shall include a set of stab assembly-mounted shutters.
 - a. shutters shall automatically open before the power stabs can extend and connect to the vertical bus.
 - b. shutters shall close as soon as the power stabs are disconnected from the vertical bus and are completely inside the stab housing.

4. The withdrawable stabs design shall include interlock mechanisms.
 - a. A through-the-door mechanism shall allow the unit to be locked in the 'Power Stabs Disconnected' position.
 - i. This mechanism shall be such that it can be padlocked to prevent the connection of the stabs to the vertical bus even when the unit is inserted into the vertical section.
 - ii. Unit door shall be capable of opening with the padlock and lockout engaged.
 - b. Unit disconnect handle must be in the OFF position (load side of the disconnect device removed from line power) before the stabs can be disconnected from the vertical bus.
 - i. Mechanism shall also allow the removal of the unit from the vertical section but only after the disconnect handle has been turned OFF and the power stabs have been disconnected from the vertical bus.
 - ii. Unit stabs have to be disconnected (withdrawn) before the unit can be re- inserted into the vertical section.
5. The withdrawable stabs design shall include feedback mechanisms that are verifiable with the unit door closed.
 - a. A two-position indication system shall be provided (Power Stabs Connected/Disconnected) and shall be visible from the door.
 - i. Connected with Red Indication—Primary voltage stabs fully engaged and connected to the vertical bus.
 - ii. Disconnected with Green Indication—Primary voltage stabs fully disconnected from the vertical bus.
 - b. A set of test points shall be located on the front of the unit for identification of:
 - i. Power stabs position: a positive continuity check between these probes shall verify that all three power stabs have been disconnected from the vertical bus and completely withdrawn inside the stabs housing.
 - ii. Stab-mounted shutters position: a positive continuity check between these probes shall verify that the shutters are closed, meaning that all three power stabs have been disconnected and withdrawn inside the stab housing.
6. Withdrawable power stabs with door closed mechanism shall not increase the original unit height design so total space in the motor control center is optimized

7. A remote operating device shall be supplied to allow the connection and disconnection of the power stabs with the door closed.
 - a. The minimum distance shall be not less than three times the minimum default value recommended by the NFPA 70E (Arc Flash Protection Boundary–Annex D).

F. Disconnect Handle.

1. Plug-in units shall be provided with a heavy-duty, non-conductive, industrial duty, flange mounted handle mechanism for control of each disconnect switch or circuit breaker.
2. Use of rotary operators is not acceptable.
3. Disconnect handles may pivot in the vertical or horizontal plane.
4. On-off condition shall be indicated by the handle position, red and green color indicators with the words ON and OFF, and the international symbols 1 and 0 along with a pictorial indication of the handle position.
5. Handles shall be capable of being locked in the OFF position with up to three padlocks.
6. Plug-in units shall be provided with interlocks per NEMA and UL requirements. Interlocks shall be provided for the following:
 - a. Prevention of unit insertion or withdrawal with the disconnect in the ON position.
 - b. Prevention of the unit door from being opened when the disconnect is in the ON position.
 - i. A feature for intentionally defeating this interlock by qualified personnel shall be provided.
 - c. Prevention of the disconnect switch from being moved to the ON position if the unit door is open.
 - i. A feature for intentionally defeating this interlock by qualified personnel shall be provided.

G. Pilot Devices

1. Where specified, units shall be furnished with pushbuttons, selector switches, or pilot lights as shown on the contract drawings.
2. Pilot devices shall be rated NEMA Type 4/13 water tight/oil tight.

3. For units with vertically operated disconnect handles:
 - a. When more than three devices are required, the use of Allen-Bradley Bulletin 800F 22.5mm devices (or approved equal) is permitted.
4. For units with horizontally operated disconnect handles:
 - a. The devices shall be Allen-Bradley Bulletin 800F.

H. Terminal Blocks

1. Control terminal blocks shall be provided on all contactor and starter units.
 - a. Control terminal blocks shall be a pull-apart design on all plug-in units for easy removal of the unit from the structure.
2. Control terminal blocks on non-plug-in contactor and starter units shall be fixed type.
3. Power terminal blocks shall be provided on all contactor and starter units, rated NEMA size 3 (100 A) and below that utilize vertically operated disconnects.
 - a. Power terminal blocks shall be pull-apart for NEMA size 1 and 2 (30 A and 60 A contactors).
 - b. Power terminal blocks for NEMA size 3 starters (100 A contactors) shall be non-pull-apart.
4. Terminal blocks shall not be located adjacent to or inside the vertical wireway.

I. Doors

1. Each unit shall be provided with a removable door mounted on removable pin-type hinges.
2. The unit doors shall be capable of being opened at least 110 degrees.
3. The unit doors shall be removable from any location in the MCC without disturbing any other unit doors.
4. The unit door shall be fastened to the structure, so it can be closed to cover the unit space when the unit is removed.
5. The unit doors shall be held closed with quarter-turn latches.

2.18 Metering Compartment

- A. MCCs shall include a plug-in metering unit.

B. Units shall include the following:

1. Fusible disconnect with fuses
 - a. The disconnect must be operable with the unit door closed.
2. Fused control circuit transformer.
3. Current transformers shipped loose to be installed by the Contractor onto incoming power conductors.
4. Solid-state power monitor with door mounted display.

C. Power Monitor

1. Power monitors shall be capable of displaying the following:
 - a. Line current for all three phases with plus or minus 0.2 percent full-scale accuracy.
 - b. Average three phase current with plus or minus 0.2 percent full-scale accuracy.
 - c. Line-to-neutral and line-to-line voltage with plus or minus 0.2 percent of full- scale accuracy.
 - d. Current and voltage unbalance.
 - e. Real, reactive, apparent, and true power with plus or minus 0.4 percent full- scale accuracy.
 - f. KWh, KVARh, and kVAHnet.
 - g. True RMS to the 45th harmonic.
 - h. Frequency at plus or minus 0.5%.
 - i. Power factor at plus or minus 0.4%.
2. Power monitors shall include min/max logs and trend logs with up to 45,867 data points.
3. Power monitors shall be capable of performing distortion analysis with THD, Crest Factor (I, V) and Distortion power factor.
4. The power monitor shall include an EtherNet/IP communication port as standard and shall include communication capability.
5. Power monitors shall include two form-C relays.
6. Power monitors shall be Allen-Bradley PowerMonitor™ 5000 unit or approved equal.

2.19 Disconnects

A. Main Disconnect

1. Provide a main incoming-line lug compartment
 - a. Lugs to accommodate the incoming power conductors as indicated on the contract drawings shall be provided.

B. Feeder Disconnects

1. Disconnecting means for feeders shall be circuit breakers with thermal-magnetic trip units for 250 A and smaller frames; provide an electronic trip unit for 400 A and larger frames.
2. Interrupting capacity rating shall meet or exceed the available fault current as shown on the contract drawings.
 - a. Interrupting capacity based on a slash rating is not acceptable.
3. Minimum frame size shall be 125 A.
4. Provide one normally open and one normally closed-circuit breaker auxiliary contact which follows the position of the circuit breaker main contacts for indication of 'On' or 'Off/Tripped'.

2.20 Variable Frequency Drives

A. The Variable Frequency Drive (VFD) system shall contain all components required to meet the performance, protection, safety and certification criteria of this specification.

B. Manufacturers

1. Allen-Bradley – PowerFlex 753 VFD (No substitutions).

C. Variable Frequency Drive Unit

1. Certifications
 - a. Listed to UL508C and CAN/CSA-C22.2 No. 14-05
 - b. In conformity with EMC Directive (2004/108/EC) and Low Voltage Directive (2006/95/EC). Standards applied; EN 61800-3:2004, EN 61800-5-1:2007
 - c. TÜV Rheinland - standards applied: EN 61800-3:2004, EN 61800-5-1:2007, EN ISO 13849-1:2008, EN ISO 13849-2:2003, EN 61800-5-2:2007, EN 61508 PARTS 1-7:2000, EN 62061:2005, and EN 60204-1:2006
 - d. Australian Communications and Media Authority. In conformity with Radiocommunications Act: 1992, Radiocommunications Standard: 2008,

and Radiocommunications Labeling Notice: 2008. Standards applied: EN 61800-3:2004

- e. Electric Power Research Institute. Certified compliant with standards SEMI F47 and IEC 61000-4-34
- f. Russian GOST-R Certificate No. POCC US.ME92.H00040
- g. Compliant with the European "Restriction of Hazardous Substances" Directive.

2. Hardware

- a. Utilize diode bridge or SCR bridge on the input rectifier.
- b. Utilize DC bus inductor on all six-pulse VFDs only.
- c. Utilize switching logic power supply operating from the DC bus.
- d. Incorporate phase to phase and phase to ground MOV protection on the AC input line.
- e. Microprocessor based inverter logic shall be isolated from power circuits.
- f. Utilize latest generation IGBT inverter section.
- g. Battery receptacle for Lithium battery power to the Real Time Clock.
- h. Additional DPI port for handheld and remote HIM options.
- i. Dedicated Digital Input for hardware enable.
- j. Conformal coated printed circuit boards.
- k. Optional onboard 24V DC Auxiliary Control Power Supply.

3. Control Logic

- a. Ability to operate with motor disconnected.
- b. Provide a controlled shut down, when properly protected, with no component failure in the event of an output phase to phase or phase to ground short circuit. Provide annunciation of the fault condition.
- c. Provide multiple programmable stop modes including Ramp, Coast, DC-Brake, Ramp-to-Hold, Fast Braking, and Current Limit Stop.
- d. Provide multiple acceleration and deceleration rates.
- e. Adjustable output frequency up to 650Hz.

4. Device Logix Control
 - a. Ability to control outputs and manage status information locally within the VFD.
 - b. Ability to function stand-alone or complimentary to supervisory control.
 - c. Ability to speed reaction time by processing in the VFD.
 - d. Ability to provide scaling, selector switches, or other data manipulations not already built into the VFD.
 - e. Ability to read inputs/write outputs and exclusively control the VFD.
 - f. Ability to provide an option for decision making if communication is lost with main controller.
 - g. Ability to control other VFDs via a peer-to-peer EtherNet/IP network.
 - h. Ability to write programs off-line.
5. Motor Control Modes
 - a. Selectable Sensorless Vector, Flux Vector, V/Hz, and Adjustable Voltage Control modes selectable through programming.
 - b. The drive shall be supplied with a Start-up and Auto-tune mode.
 - c. The V/Hz mode shall be programmable for fan curve or full custom patterns.
 - d. Capable of Open Loop V/Hz.
6. Current Limit
 - a. Programmable current limit from 20 to 160% of rated output current.
 - b. Current limit shall be active for all drive states: accelerating, constant speed and decelerating.
 - c. The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.
7. Acceleration / Deceleration
 - a. Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 to 3600 seconds.
 - b. A second set of remotely selectable accel/decel settings shall be accessible through digital inputs.

8. Speed Profiles
 - a. Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or "S Curve" profiles that provide changing accel/decel rates.
 - b. S Curve profiles shall be adjustable.
9. Adjustments
 - a. A digital interface can be used for all set-up, operation and adjustment settings.
 - b. All adjustments shall be stored in nonvolatile memory (EEPROM).
 - c. No potentiometer adjustments shall be required.
 - d. EEPROM memory for factory default values shall be provided.
 - e. Software must be available for trending and diagnostics, as well as online and offline programming functionality.
10. Process PID Control
 - a. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.
 - b. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the set-point, the regulator shall adjust the drive output until the feedback equals the reference.
 - c. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
 - d. Protection shall be provided for a loss of feedback or reference signal.
11. Skip Frequencies
 - a. Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.
 - b. The set points shall have a bandwidth adjustable from Maximum Reverse Speed to Maximum Forward Speed.
12. Fault Reset / Run
 - a. The drive shall provide up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart.

- b. The automatic mode shall not be applicable to a ground fault, shorted output faults and other internal microprocessor faults.
 - c. The time between restarts shall be adjustable from 0.5 seconds to 30 seconds.
- 13. Run on Power Up
 - a. A user programmable restart function shall be provided to allow restart of the equipment after restoration of power after long duration power outages. Restart time dependent on presence of incoming signal.
- 14. Fault Memory
 - a. The last 32 fault codes shall be stored, and time stamped in a fault buffer.
 - b. Information about the drive's condition at the time of the last fault such as operating frequency, output current, dc bus voltage and twenty-seven other status conditions shall be stored.
 - c. A power-up marker shall be provided at each power-up time to aid in analyzing fault data.
 - d. The last 32 alarm codes shall be stored, and time stamped for additional troubleshooting reference.
- 15. Overload Protection
 - a. The drive shall provide internal class 10 adjustable overload protection.
 - b. Overload protection shall be speed sensitive and adjustable.
 - c. A viewable parameter shall store the overload usage.
- 16. Auto Economizer
 - a. An auto economizer feature shall be available to automatically reduce the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage.
 - b. When the load increases, the drive shall automatically return to normal operation.
- 17. Terminal Blocks
 - a. Separate terminal blocks shall be provided for control and power wiring.
 - b. I/O terminal blocks shall be removable with wiring in place.

18. Flying Start

- a. The drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to "pick-up" the motor at the rotating speed. This feature is disabled by default.

19. Inputs and Outputs

- a. The Input / Output option modules shall consist of both analog and digital I/O.
- b. No jumpers or switches shall be required to configure digital inputs and outputs.
- c. All digital input and output functions shall be fully programmable.
- d. The control terminal blocks shall be rated for 115V AC.
- e. Inputs shall be optically isolated from the drive control logic.
- f. The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.
- g. The VFD shall be capable of supporting up to 7 analog inputs, 7 analog outputs, 21 digital inputs, 7 relay outputs, 7 transistor outputs, and 3 positive temperature coefficient (PTC) inputs.
- h. The Input / Output option modules shall have the following features:
 - i. Analog Inputs:
 - a) Quantity two (2) differentially isolated, $\pm 10V$ (bi-polar), 88k ohm input impedance, 11 bit plus sign.
 - b) Analog inputs shall be user programmable for a variety of uses including frequency command and process loop input. Analog inputs shall be user programmable for function scaling (including invert), offset, signal loss detect and square root.
 - ii. Analog Outputs:
 - a) Quantity two (2) $\pm 10V$ (bi-polar) / 11 bit & sign, 2 k Ω minimum load, 4-20 mA, 11 bit plus sign, 400 Ω maximum load.
 - b) The analog output shall be user programmable to be proportional to one of fourteen process parameters including output frequency, output current, encoder feedback, output power.
 - c) Programming shall be available to select either absolute or signed values of these parameters.

iii. Digital Inputs:

- a) Quantity of six (6) digital inputs rated 24V DC/115V AC.
- b) All inputs shall be individually programmable for multiple functions including: Start, Run, Stop, Auxiliary Fault, Speed Select, Jog and Process PI functions.

iv. Digital Outputs:

- a) At least one (1) relay output (N.O. or N.C.).
- b) For 240V AC or 24V DC, N.O. contact output ratings shall be 2 amp max., general purpose (inductive)/resistive. N.C. contact output ratings shall be 2 amp max., resistive only.
- c) Relays shall be programmable to multiple conditions including: Fault, Alarm, At Speed, Drive Ready and PI Excess Error.
- d) Timers shall be available for each output to control the amount of time, after the occurring event, that the output relay actually changes state.
- e) At least one (1) transistor output.
- f) For 24V DC, transistor output rating shall be 1 amp max, Resistive.

20. Reference Signals

- a. The drive shall be capable of using the following input reference signals:
 - i. Analog inputs.
 - ii. Preset speeds.
 - iii. Remote potentiometer.
 - iv. Digital MOP.
 - v. Human Interface Module.
 - vi. Communication modules.

21. Loss of Reference

- a. The drive shall be capable of sensing reference loss conditions.
- b. In the event of loss of the reference signal, the drive shall be user programmable to the following:

- i. Fault the drive and coast to stop.
 - ii. Issue a minor fault - allows the drive to continue running while some types of faults are present.
 - iii. Alarm and maintain last reference.
- c. When using a communications network to control the drive, the communications adapter shall have these configurable responses to network disruptions and controller idle (fault or program) conditions:
 - i. Fault.
 - ii. Stop.
 - iii. Zero Data.
 - iv. Hold Last State.
 - v. Send Fault Configuration.

22. Metering

- a. At a minimum, the following parameters shall be accessible through the Human Interface Module, if installed:
 - i. Output Current in Amps.
 - ii. Output Voltage in Volts.
 - iii. Output Power in kW.
 - iv. Elapsed MWh.
 - v. DC Bus Voltage.
 - vi. Frequency.
 - vii. Heatsink Temperature.
 - viii. Last eight (32) faults.
 - ix. Elapsed Run Time.
 - x. IGBT Temperature.

23. Faults

- a. At a minimum, the following faults shall be accessible through the Human Interface Module:
 - i. Power Loss.

- ii. Undervoltage.
 - iii. Overvoltage.
 - iv. Motor Overload.
 - v. Heat Sink Over-temperature.
 - vi. Maximum Retries.
 - vii. Phase to Phase and Phase to Ground Faults.
24. Predictive Diagnostics
- a. At a minimum, the following predictive diagnostic features shall be provided:
 - i. Relay Output Life Cycles based on load type and amps.
 - ii. Hours of Fan Life based on load and ambient temperature.
 - iii. Motor Bearing life based on expected hours of use.
 - iv. Motor Lubrication schedule based on hours of use.
 - v. Machine Bearing life based on expected hours of use.
25. Real-Time Clock
- a. Shall be capable of providing time stamped events.
 - b. Shall have the ability to be set locally or via a remote controller.
 - c. Shall provide the ability to be programmable for month, day, year and local time zones in HH:MM:SS.
26. Ratings
- a. Voltage
 - i. Capable of accepting nominal plant power of 480V AC at 60Hz.
 - ii. The supply input voltage tolerance shall be $\pm 10\%$ of nominal line voltage.
 - b. Displacement Power Factor
 - i. Six-pulse VFD shall be capable of maintaining a minimum true power factor (Displacement P.F. X Distortion P.F.) of 0.95 or better at rated load and nominal line voltage, over the entire speed range.

- ii. Eighteen-pulse VFD shall be capable of maintaining a minimum true power factor (Displacement P.F. X Distortion P.F.) of 0.98 or better at rated load and nominal line voltage, over the entire speed range.
 - c. Efficiency
 - i. A minimum of 96.5% (+/- 1%) at 100% speed and 100% motor load at nominal line voltage.
 - ii. Control power supplies, control circuits, and cooling fans shall be included in all loss calculations.
 - d. Operating ambient temperature range without derating: 0 °C to 40 °C (32 °F to 104 °F).
 - e. Operating relative humidity range shall be 5% to 95% non-condensing.
 - f. Operating elevation shall be up to 1000 Meters (3,300 ft) without derating.
- 27. Sizing
 - a. Systems rated at Normal Duty loads shall provide 110% overload capability for up to one minute and 150% for up to 3 seconds.
 - b. Systems rated at Heavy Duty loads shall provide 150% overload capability for up to one minute and 180% for up to 3 seconds.
- 28. Auto Reset/Run
 - a. For faults other than those caused by a loss of power or any other non-critical fault, the drive system shall provide a means to automatically clear the fault and resume operation.
- 29. Ride-Through
 - a. The VFD system shall attempt to ride through power dips up to 20% of nominal. The duration of ride-through shall be inversely proportional to load. For outages greater than 20%, the drive shall stop the motor and issue a power loss alarm signal to a process controller, which may be forwarded to an external alarm signaling device.
- 30. Run on Power Up
 - a. The VFD system shall provide circuitry to allow for remote restart of equipment after a power outage as required.
- 31. Communications
 - a. VFD shall be capable of communicating on multiple networks.
 - b. VFD shall be capable of supporting the following network options:

- i. DeviceNet.
 - ii. EtherNet/IP.
 - iii. ControlNet Coax.
 - iv. ControlNet Fiber.
 - v. Interbus.
 - vi. CANopen.
 - vii. Modbus/TCP.
 - viii. Modbus RTU.
 - ix. Profibus DP.
 - x. RS-485 DF1.
 - xi. RS-485 HVAC.
 - xii. Remote I/O.
32. Enclosure Door Mounted or VFD-mounted Human Interface Module (HIM)
- a. VFD shall provide a HIM with integral LCD display, operating keys and programming keys.
 - b. The HIM shall have the following features:
 - i. A seven (7) line by twenty-one (21) character backlit LCD display with graphics capability.
 - ii. Shall indicate drive operating conditions, adjustments and fault indications.
 - iii. Shall be configured to display in the following three distinct zones:
 - a) The top zone shall display the status of direction, drive condition, fault / alarm conditions and Auto / Manual mode.
 - b) The middle zone shall display drive output frequency.
 - c) The bottom zone shall be configurable as a display for either programming menus / information or as a two-line user display for two additional values utilizing scaled units.
 - iv. Shall provide digital speed control.

- v. The keypad shall include programming keys, drive operating keys (Start, Stop, Direction, Jog and Speed Control), and numeric keys for direct entry.
33. Auxiliary Relays
- a. Provide relays for Drive Alarm, Drive Fault, Drive Run, and System Status Faults (as required).
34. Control Interface
- a. The control terminals shall be rated for 115V AC.
 - b. The control interface shall provide input terminals for access to VFD functions that include start, stop, external fault, speed select, and enable, as required.

Part 3 Execution

3.1 Examination

- A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Station manufacture shall provide written instruction for proper handling. Immediately after off-loading, Contractor shall inspect complete pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all station serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.2 Installation

- A. Install, level, align, and lubricate pump skid as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacture at time of delivery.
- B. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump station piping.
- C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.
- D. Prior to applying electrical power to any motors, MCC or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.
- E. Contractor shall install MCC on concrete housekeeping pad in accordance with manufacturer's instructions.

- F. Contractor shall install pump control panel to building wall with a minimum of four anchors.
- G. Contractor shall tighten accessible bus connections and mechanical fasteners to the manufacturer's torque requirements.
- H. Contractor shall select and install fuses in fusible switches based upon field requirements.
- I. Contractor shall adjust circuit breaker settings based upon field requirements.
- J. Contractor shall adjust solid state overloads to match the installed motor characteristics.

3.3 Field Quality Control

- A. A minimum of two eight-hour days of start-up service shall be provided. One day of service shall be provided at initial commission with the second day being provided approximately one month after initial start-up. The second day shall be used to fine-tune the system operation and to provide follow-up training. Field tests will not be conducted until such time as the entire installation is complete and ready for operation. This includes the completion of all piping, electrical connections and inspections, and availability of supply water. During start-up the system supplier shall run the pumps through normal start and stop and full load conditions. The pump supplier shall make any adjustments and correct any defects at no cost to the owner. Tests shall be performed until satisfactory results are obtained. A training session shall be performed at the time of start-up.
- B. Alignment and Vibration Analysis:
 - 1. The Contractor shall laser align the pumps and motors. The laser alignment shall be completed to verify the angular and offset tolerances specified by the manufacturer. A laser alignment report shall be provided showing the results of the recorded data.
 - 2. The Contractor shall provide a full vibration analysis of the high service pumping units including the pumps and motors. The measurement locations for the motor shall be recorded at a minimum of five points and the locations for the pump shall be recorded at a minimum of the specified measurement locations called out by the Hydraulic Institute. The frequency spectrum is to be recorded to at least 192,000 CPM with the lines of resolution set at a minimum of 6,400 lines. The vibration analysis shall also include a determination of the natural frequency. If the natural frequency is within a possible operating envelope of the equipment, the System Integrator shall lockout operation in the VFD at that frequency. The margin of safety to be used shall be agreed upon by the Engineer and System Integrator. A full report showing the frequency response up to a minimum of 25,000 CPM shall be provided, and the analysis must show that the vibration in the preferred operating range of the pumping units is within the latest edition of the standards held by the Hydraulic Institute.
 - 3. Any corrective action required to bring the pumping units into compliance shall be the responsibility of the Contractor.

3.4 Cleaning

- A. Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

3.5 Protection

- A. The pump station should be placed into service immediately. If operation is delayed, drain liquid from pumps and piping. Open motor circuit breakers and protect station controls and interior equipment from cold and moisture.

END OF SECTION

Part 1 General

1.1 Section Includes

- A. Floor Pipes.

1.2 Submittals

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide data on materials, operational components, and accessories. Submit manufacturer's descriptive and technical literature for each component, including design recommendations; pressure and temperature ratings; and dimensions.
- C. Operations and Maintenance Data: Submit under provisions of Section 01 78 23. Provide manuals for all operational devices.

Part 2 Products

2.1 Materials and Equipment

- A. Piping specialties, appurtenances, and equipment supplied as part of this contract shall be of equal material and ratings as the connecting pipe, new and unused except for testing equipment.
- B. Components that serve the same function and are the same size shall be identical products of the same manufacturer.
- C. Pipe fittings shall be compatible with the applicable pipe materials.
- D. Standard Products
 - 1. Provide material and equipment which are the standard products of a manufacturer regularly engaged in the manufacturing of the products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.
- E. All materials in contact with potable water shall be certified to NSF Standard 61 and shall comply with Federal lead-free requirements.

2.2 Floor Pipes

- A. Floor pipes shall be manufactured of ductile iron, grade 60-42-10, (minimum tensile strength: 60,000 psi; minimum yield strength: 42,000 psi; minimum elongation: 10%) in accordance with AWWA C151.

- B. Ends shall be as shown on the drawings. Where required, flanges and MJ bells can be tapped for studs.
- C. Floor pipe shall be fabricated of Special Class 53 thickness ductile iron pipe, unless otherwise noted.
- D. Floor pipe shall be furnished with one fabricated thrust/water stop collar design with 360° fillet welds on both sides of the collar.
- E. Unless otherwise noted, all cast-on flanges shall comply with AWWA C110 or C153, and all threaded-on flanges shall comply with AWWA C115.
- F. All mechanical joints shall comply with AWWA C111. Threaded-on or otherwise fabricated MJ bells shall be per applicable portions of AWWA C115 and C153.
- G. All floor pipes shall be provided with manufacturer's standard asphaltic coating.

Part 3 Execution

3.1 Examination

- A. After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Engineer of any discrepancy before performing the work.

3.2 Preparation

- A. Protection: Pipe and equipment openings shall be closed with caps or plugs during installation. Equipment shall be protected from dirt, water, and chemical or mechanical damage.
- B. System Preparation
 - 1. Provide accessibility to piping specialties for control and maintenance.

END OF SECTION

APPENDIX A

Gorman-Rupp Pump Skid
Owner Furnished
Bill of Materials



The Gorman-Rupp Company
 600 South Airport Road
 Mansfield, OH 44903
 Phone: (419) 755-1011

PROPOSAL/CONTRACT

Purchaser: Henry County Water Authority
 1695 Hwy 20 W
 McDonough, Ga. 30253

For: Southeastern Booster Pump Station

Revised Proposal

Note: Our Contract includes the provisions set forth below and the Terms and Conditions on the final page hereof, including without limitation the reservation of security interest and warranty liability and price escalation clause. The information or data contained in the Proposal/Contract is proprietary to The Gorman-Rupp Company and should not be copied, reproduced, duplicated, or disclosed to any third party, in whole or in part, without the prior written consent of The Gorman-Rupp Company. The Gorman-Rupp Company will not be bound by any Terms and Conditions other than those identified in this Proposal/Contract, nor shall The Gorman-Rupp Company be liable for any liquidated damages or be a party to or bound by the terms and conditions of any other contract documents.

One (1) – Gorman-Rupp Water Booster Station Package to include two (2) Patterson 10x8 Horizontal Split Case pumps each rated for 3200 GPM At 225' TDH. Pumps will be supplied with 250 HP, TEFC, Premium Efficiency Motors with thermostats. Power to station is 460v, 3 phase, 60 Hz. Common Suction header will be 16" and common discharge header piping will be 16". Branch connection from common suction header to individual pump suction connection will have 12" gear operated butterfly valves. Branch connection to common discharge header will be supplied with 12" silent check valves and 12" isolation butterfly valves. Pressure gauges will be supplied as shown on the drawing. A 12" Endress Hauser Pro-Mag W-400 flow meter will be supplied on the discharge header. All pumps and motors and interconnecting piping will be mounted on a common base. The Base will be built for a triplex station with only two pumps being supplied at this time. Space for a third pump and isolation valves and blind flanges will be installed for the future pump. The future check valve will not be supplied at this time. Common discharge header will be supplied with an 8" PRV. Discharge header will be supplied with a 2" ARV.

MOTOR CONTROL CENTER

Voltage Available at Site.....	3/60/460
Main Incoming Customer Connection	Top Mounted Main Lugs w/ Ground
UL / CSA Listing	UL Motor Control Center
Control Voltage Transformer [404]	3kVA XFMR Section w/ Prim CB & Sec Fuses
MCC transformer mounting	Inside MCC Section
MCC SCCR Rating	10 kA rms sym
Top Mount Feeder Circuit Breaker	15A Thermal Magnetic Heater Breaker
Primary Motor Starter	VFD
Motor Circuit Protection	Thermal Magnetic Circuit Breakers
VFD speed reference via	Ethernet
Motor starter manufacturer	Allen-Bradley PowerFlex 753
Input line reactors.....	3% Line Reactor
Input Output Module.....	120VAC IO Control w/ Transformer
HOA Selector Switch	Included
LED Pilot Lights [22.5mm]	Pump Running [Green]
Human Machine Interface	Door Mounted
Ethernet Communications	750-ENET-R Module
Thermal Management.....	Forced Air Circulation Fans
Wire Labels	Brady Printed Wire Labels

Control Panel Enclosure

Dimensions.....	90"H x 110"W x 20"D
NEMA Rating	NEMA 1G
Material	Steel
Mounting.....	Shipped loose

Metering Unit PowerMonitor5000.....	Included
Motor Control Center SPD.....	Included
Diameter of selector switches.....	22.5 mm (Standard)
Diameter of indicating lights.....	22.5 mm (Standard)

MCC NOTES:

Controls to include equipment for two pumps. The third pump motor starter and ancillary equipment will be installed at a future date in a separate MCC section. Future Section 90H x 35W x 20D

LEVEL CONTROL SECTION

Control Panel Enclosure

Dimensions.....	36"H x 30"W x 12"D
NEMA Rating	NEMA 1
Material	Steel
Mounting	shipped Loose mounted on floor stands.
High Pump Temp Shutdown Protection.....	Included
Control Panel Heater 60w [420].....	Included
Elapsed Time Meters.....	Display ETM of each Pump on controller OIT
Duplex Receptacle(s) In Control Panel	Qty[1] 15A w/ Programming Port
Uninterruptable Power Supply	PULS 24VDC UBC10.241 5Amps
Primary Level Controller [405]	PLC
Primary PLC Model.....	A-B CompactLogix L2
Primary Operator Interface	A-B PanelView Plus 7 1000 (10" Color Screen)
Primary Level Sensor	Common Discharge Pressure XDCR 0-400 psi (Rosemount model 2088G3522A)
Secondary Level Sensor	Common Suction Pressure XDCR 0-100 psi (Rosemount model 2088G3522A)

Primary Sequence of Operation:
CUSTOM SEQUENCE OF OPERATION:

Primary Sequence of Operation:
The PLC Shall start the motor for one pump when the pressure in the control system is lowered to the "Lead Pump Start Level". When the pressure is raised to the "Lead Pump Stop Level", the PLC shall stop this pump. These actions shall constitute one pumping cycle. Should the pressure continue to lower, the PLC shall start additional pumps when their respective "ON" set points are reached.

When a pump or pumps are running at this point the PLC shall have a control logic routine in which a Process Integral Derivative instruction (PID) will be utilized to maintain a user set point of constant pressure adjustable in the Operator Interface [OIT].

PLC INFORMATION

External Source Wired to Terminal Blocks.....	External Source Output Name
	Pump #1 Fault
	Pump #2 Fault
	High Discharge Pressure
	Low Suction Pressure

Low Discharge Pressure

Analog Outputs Wired to Terminal Blocks.....

Analog Output Name	Analog Signal
Suction Pressure	4-20 mA
Discharge Pressure	4-20 mA

Analog Inputs

Analog Input Name	Analog Signal
Suction Pressure	4-20 mA
Discharge Pressure	4-20 mA

PLC Communication Method

EtherNet/ IP w/ produce and consume tags

Remote Communication (Troubleshooting).....

No hardware will be provided to facilitate remote communications for troubleshooting and diagnostic assistance.

SCADA Notes:

Pumps to be called to run via standard booster operation on loss of discharge pressure. SCADA to be able to call a pump to run and/or stop on emergency.

This quotation includes only equipment specifically mentioned herein and does not include, or infer inclusion of any additional piping, valves, wiring, etc., regardless of its relation to the quoted equipment. Discounts or commissions normally applied to the appropriate type of equipment also apply to these prices. Prices and estimated delivery dates are subject to change without notice in the event that vendors fail to maintain their quoted price and time of delivery to The Gorman-Rupp Company.

Change Add:

1. HMS Anybus X Gateway for Modbus communication with Emerson
2. Programming for Emerson Communication Protocol

Notes:

- 1). Price includes freight to job site.
- 2). Price includes initial 2 days of start-up assistance and training and two future site visits.
- 3). Shop drawings will take 14 weeks. Estimated delivery for station after approval of shop drawings is 18-20 weeks.
- 4). Testing will be per Gorman-Rupp standard Hydraulic Institute Standards. Witness test for pumps in Toccoa, Ga. at the Patterson Facility is available.
- 5). Gorman-Rupp has been informed by Allen-Bradley that their controls pricing is good through end of March 2019. After that, they reserve the right to pass along any price increases that may impact the equipment on this Booster Station.

Emerson - SCADA Integration

Owner Furnished
Bill of Materials
and
Integration



Emerson Process Management
Power & Water Solutions, Inc.
200 Beta Drive
Pittsburgh, PA 15238
Tel 1 (412) 963-4000

May 14, 2020

**Henry County Water Authority
100 Westridge Industrial Boulevard
McDonough, Georgia 30253**

Attention: Patrick Kelley

Subject: Southeastern Booster Pump Station
Emerson Process Management Power & Water Solutions, Inc.
Offer No. WAS012378

Dear Mr. Kelley,

Emerson Process Management Power & Water Solutions, Inc., part of the Emerson Automation Solutions family of business units (Emerson), is pleased to submit this offer for a ControlWave Micro assembly, radio installation ancillary equipment and startup services. This offer is in response to the subject inquiry and consists of the contents of this letter (including attachments) and any reference made herein.

Thank you for the opportunity to submit this offer. Should you have any questions or require additional information, please feel free to contact your local representative, Roger Labrecque at 860-778-3672, or me at (412) 963-4202.

Sincerely,

Diego Mora | Roger Labrecque

Proposal Specialist / Account Executive
Emerson Process Management
Power & Water Solutions, Inc.

Attachment(s):

Emerson's Terms of Quotation and Sale – Goods & Services Form TQS-GIS/USA-Edn. 10/18

Scope of Supply

Emerson will provide a ControlWave Micro RTU as depicted on the Southeastern Booster Pump Station drawing DI101. This is a standard RTU design for Henry County as defined below in the bill of material along with the radio installation ancillary equipment. We will also implement the Modbus TCP/IP communication interface with the Gorman-Rupp PLC.

Emerson will provide the following services:

1. Project Management
2. Hardware Submittal
3. Software Submittal
4. Procurement
5. ControlWave Micro PAC Application programming
6. SCADA HMI Process Graphical Displays
7. Field Application Startup & SCADA Integration (2 days)
8. Field verification of the Emerson PAC & the Gorman-Rupp AB-PLC Modbus TCP/IP communication interface
9. As-Built Set of RTU Drawings & RTU I/O Point Termination Drawings (PTD)

Refer to the Bill of Material for specific details regarding the hardware included in this scope.

Bill of Material

RTU Panel Assembly Hardware

- (1) Enclosure, NEMA 4, steel, dimensions approx. 30”h x 24”w x 10”d
- AC Power Distribution Assembly, Includes Surge Protector, Circuit Breaker, Fuses, & Distribution Blocks
- DC Power Distribution Assembly, Includes Fuses & Distribution Blocks
- (1) CW Micro 4 Slot Chassis
- (1) CW Micro 12-24V System Controller
- (1) CW Micro CPU, 1-Ethernet, 2-RS232, 1-RS485 Ports
- (1) CW Micro I/O module, Local - 16 DI with LEDs (24 VDC Input) Isolated.
- (1) CW Micro I/O module, Local - 8 AI Isolated.
- (1) CalAmp Viper Radio – 450 – 470 MHz
- (1) Bulkhead lightning arrestor
- (1) Power Supply (Phoenix Contact QUINT-PS/1AC/24DC/5); 120 Vac input, 24Vdc @ 5A out
- (1) UPS (Phoenix Contact 2320212); 24 Vdc input, 24Vdc nominal @ 5A output
- (1) 12Vdc-18Ah battery backup, (Phoenix Contact 2320319)
- (1) Ethernet switch, 5 ports with Ethernet patch cable

Radio Installation Ancillary Equipment

- (1) 450 – 470 MHz Yagi antenna.
- (1) Heliac cable ½”, 50ft
- (2) Heliac connectors – ½”
- (2) Heliac ground kits – ½”
- (1) telescoping mast

Note: A radio site survey had not been done prior to the bid date and development of this offer. The material listed will accommodate a fifty (50) foot antenna installation.

General Clarifications and Exclusions

A. Materials not included:

- Any wire or cable (power, fiber optic, patch cables, signal, communications, grounding or other), conduit, junction boxes, and/or other material and hardware pertaining to the installation of equipment, including but not limited to, ground wires, ground lugs, ground rods, wire labels, wire lugs and/or connectors, except as indicated in this proposal.
- Any mounting, fastening and support hardware and materials (such as nuts, bolts, washers, unistrut, channels, antenna mounting hardware, cable hanging kits, etc.), custom installation hardware, special brackets and U-bolts/V-bolts, lightning rods, antenna towers, poles, and masts of any kind, mounting stands, pipe stands, etc. for instruments and/or other equipment, and concrete bases that may be required to mount panels, instruments and/or other equipment unless otherwise indicated in this proposal.
- Except for the materials and services specifically defined in Emerson's bill of material, all materials and services are excluded from Emerson's scope of supply.

B. Services

- Emerson's scope is exclusive of any interdisciplinary site coordination for all scheduling and planning of site activities as well as third party material and services scope related RFI resolution.
- Services as part of this proposal are to be provided during normal business hours (8:00 AM to 5:00 PM Monday through Friday Holidays Excluded).
- All physical installation and electrical installation (including but not limited to moving, mounting and fastening of equipment, signal wiring and terminations, communication wiring and terminations, power wiring and terminations, and ground wiring and terminations), will be by others unless otherwise indicated herein.
- Field support schedule is subject to availability of field resources. Project schedule will be as mutually agreed.

C. Others

- Power and signal wiring and grounding of all equipment supplied hereunder must be completed in full accordance with the manufacturer's requirements and in compliance with applicable specifications, codes standards, including but not limited to, NEC.
- Duties and taxes are excluded from Emerson's offer.
- Bonds, fees and licenses are not included in our offer.
- Emerson's warranty liability will not be extended due to failure by others to complete the designated work in a timely fashion.
- Start-up and operational testing services will require personnel to use services equipment such as hand tools, test equipment, etc. This will, in certain instances, involve removing wires from terminals to perform loop checkout, testing and calibration. In no circumstance will Emerson accept any responsibility for additional cost incurred by the use of union personnel as a result of jurisdictional labor requirements due to service personnel start-up activity on this project. Union fees and Union Labor are not included.
- All on site shipments, receiving, handling, safe storage and local transportation will be by others.
- Emerson's standard warranty, as defined in its standard terms and conditions, shall apply.
- Emerson reserves the option to issue a change order for additional site visits or time to complete that are caused by delays beyond Emerson's scope or control.
- Radio equipment (Mast, Antenna, Feedline, Ground kits and Lightning Protection) will be installed by others.
- All installation is by others.

D. Ordering

- Our ControlWave Storefront customer service will accept, and process purchase orders for these items. If you would like to place an order for the items listed in this offer, address them as follows and email your purchase order referencing the offer and its terms to PWS.WAS_Storefront@Emerson.com
Emerson Process Management, Power & Water Solutions Inc.

Attn: Water Group

200 Beta Drive | Pittsburgh | PA 15238

