



**CONTRACT DOCUMENTS &  
TECHNICAL SPECIFICATIONS**

**FOR THE**

**WEST LAUREL WATER ASSOCIATION**

**CONTRACT 1**

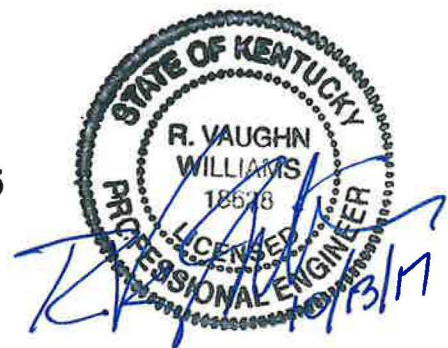
**COUNTY FARM PUMP STATION**

**Prepared By:**

**KENVIRONS, INC.**  
**452 VERSAILLES ROAD**  
**FRANKFORT, KENTUCKY 40601**

**PROJECT No. 2015045**

**AUGUST 2017**



**Kenvirons, Inc.**

*Civil & Environmental Engineering and Laboratory Services*

**ADDENDUM No. 1  
OCTOBER 25, 2017**

**WEST LAUREL WATER ASSOCIATION**

**CONTRACT 1-NEW COUNTY FARM PUMP STATION, CONTRACT 2-WATERLINE  
IMPROVEMENTS, CONTRACT 3-KY 363 WATER STORAGE TANK  
REHABILITATION**

The following items shall become a part of the contract documents and technical specifications for which they are noted and shall supersede in the event of any conflicts:

1. Section 00200, Instructions to Bidders, Article 5.01 is hereby revised to state;

"A pre-Bid conference will be held at 1:30 P.M. local time on October 30, 2017 at the West Laurel Water Association's office, 1670 E Hal Rogers Parkway, London, KY 40741. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective."



R. Vaughn Williams, P.E.  
Kenvirons, Inc.  
452 Versailles Road  
Frankfort, Kentucky 40601  
(502) 695-4357

# **WEST LAUREL WATER ASSOCIATION**

## **CONTRACT 1 NEW COUNTY FARM ROAD PUMP STATION**

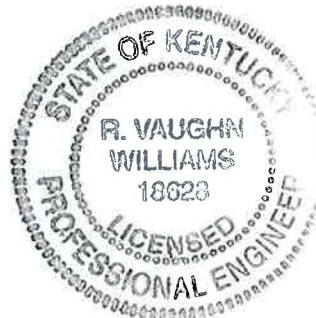
### **ADDENDUM NO. 2 NOVEMBER 6, 2017**

The following items shall become a part of the contract documents and technical specifications for which they are noted and shall supersede in the event of any conflicts:

1. Section 01001.9, Section 02200.1.3, and Section 03310.3.15 - General Clarification on Special Inspections and Testing. The General Contractor will only be responsible for testing the concrete's air entrainment, slump, and compressive strength. The Owner, or Owner's Representative, will be responsible for the soil bearing capacity, rebar inspection, and masonry inspection.
2. Section 01000.2.5 list the components being supplied as part of the Telemetry Equipment Allowance.
3. Section 11007, Electromagnetic Flowmeters shall supersede the requirements of Section 16020.2.02.P.
4. Section 11014.2.1 – The minimum operating efficiencies for the pumps shall be as indicated in the Operating Conditions Table. No exceptions will be allowed.
5. Section 11014.2.2.B.Impeller - Impellers shall be constructed of nickel aluminum bronze to provide a long life when pumping chlorinated water. All other impeller requirements shall remain the same.
6. Section 11014.2.2.C.Renewable Casing Wear Rings – Wear rings shall be Series 300 stainless steel. All other requirements shall remain the same.
7. Pressure gages shall be provided for the suction and discharge headers at the location shown on Sheet PS-2. Sheet PS-3 shows a mounting details for the pressure gages and pressure transmitters. The pressure transmitters are part of the Telemetry Equipment Allowance.
8. The General Contractor shall provide and install the pressure switches located on the outlet side of the suction diffusers.
9. The pump speed will be controlled through the SCADA System as indicated on Sheet E-4.



R. Vaughn Williams, P.E.  
Kenvirons, Inc.  
452 Versailles Road  
Frankfort, Kentucky 40601  
(502) 695-4357



**CONTRACT DOCUMENTS &  
TECHNICAL SPECIFICATIONS**

**FOR THE  
WEST LAUREL WATER ASSOCIATION**

**CONTRACT 1  
COUNTY FARM PUMP STATION**

**Prepared By:**

**KENVIRONS, INC.  
452 VERSAILLES ROAD  
FRANKFORT, KENTUCKY 40601**

**PROJECT No. 2015045**

**AUGUST 2017**



## TABLE OF CONTENTS

Section/ <u>Form</u>		<u>Pages</u>
00100	Advertisement for Bids	1
00200	Instructions to Bidders	8
00410	Bid Form	4
00430	Bid Bond	2
	Certification for Contracts, Grants and Loans	1
	Certification Regarding Debarment, Suspension, Ineligibility & Voluntary Exclusion	2
	Compliance Statement (RD 400-6)	2
00510	Notice of Award	1
00521	Agreement	6
00550	Notice to Proceed	1
00610	Performance Bond	2
00615	Payment Bond	2
00625	Certificate of Substantial Completion	1
00710	General Conditions	59
00800	Supplementary Conditions	3
00941	Change Order (Form RD 1924-7)	1
	Partial Payment Estimate (Form RD 1924-18)	2
	Project Sign Detail	1

## TECHNICAL SPECIFICATIONS

01000	Summary of Work and Bid Item Descriptions	2
01001	Special Conditions	8
02200	Earthwork	10
03251	Expansion, Construction, and Control Joints	9
03310	Concrete Work	20
03600	Grout	6
04230	Reinforced Unit Masonry	12
05003	Miscellaneous Metals	3
05120	Structural Steel	10
07610	Standing Seam Metal Roofing	10
08110	Hollow Metal Doors, Frames and Finish Hardware	15
09901	High Performance Coatings	10
11002	Miscellaneous Equipment	2
11007	Electromagnetic Flowmeters	3
11014	Horizontal Split Case Pumps	8

## TABLE OF CONTENTS (CONTINUED)

13100	Pump Station Piping	6
13103	Water Lines	20
13500	Valves	13
14001	Hoist and Trolley	3
15784	Packaged Wallmount Heat Pump Units	4
16020	Pumping Station Electrical	25
16483	Adjustable Frequency Drives	7
16900	Pump Control Panel	7

## **SECTION 00100 ADVERTISEMENT FOR BIDS**

### **West Laurel Water Association Contract 1: New County Farm Pump Station, Contract 2: Waterline Improvements, Contract 3: KY 363 Water Storage Tank Rehabilitation**

Separate Sealed BIDS for the construction of Contract 1: New County Farm Pump Station, Contract 2: Waterline Improvements, and Contract 3: KY 363 Water Storage Tank Rehabilitation will be received by the West Laurel Water Association, 1670 E. Hal Rogers Parkway, P.O. Box 726, London, KY 40741 until November 9, 2017 at 1:30 P.M. local time and then publicly opened and read aloud at the Association's Office.

Contract 1 consists of the construction of the new County Farm Pump Station, and all necessary appurtenances. Contract 2 consists of installing approximately 4,850 L.F. of 8" PVC waterline, approximately 6,700 L.F. of 6" PVC waterline, and all necessary appurtenances. Contract 3 consists of painting and rehabilitating the KY 363 water storage tank, and all necessary appurtenances.

The CONTRACT DOCUMENTS may be examined at the following locations:  
WEST LAUREL WATER ASSOCIATION, 1670 E. HAL ROGERS PARKWAY, LONDON, KY 40741  
KENVIRONS, INC., 452 VERSAILLES ROAD, FRANKFORT, KY 40601

Copies of the CONTRACT DOCUMENTS may be obtained from Lynn Imaging, 328 Old Vine Street, Lexington, KY 40507 (859-226-5850) and [www.lynnimaging.com](http://www.lynnimaging.com) upon payment of a nonrefundable price of \$300.00 for each set plus any shipping charges.

All bidders shall submit with their bid a Bid Bond in amount of not less than five (5) percent of the base bid. No Bidder may withdraw his bid for a period of ninety (90) days after the scheduled Bid Opening Date. The Bidder awarded the contract shall execute a 100% Performance Bond and a 100% Payment Bond and shall furnish insurance as required, in the General Conditions. The Bidder awarded Contract 1 shall complete the project within 120 calendar days after date of authorization to start work. The Bidder awarded Contract 2 shall complete the project within 75 calendar days after date of authorization to start work. The Bidder awarded Contract 3 shall complete the project within 60 calendar days after date of authorization to start work. Liquidated damages will be assessed at \$800 per calendar day.

Bidders must comply with the President's Executive Order Nos. 11246 and 11375, which prohibit discrimination in employment regarding race, creed, color, sex, or national origin. Bidders must comply with Section 3, Section 109, and Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act and the contract Work Hours Standard Act. Bidders must certify that they do not, and will not, maintain or provide for their employees any facilities that are segregated on a basis of race, color, creed, or national origin.

Any bid that is obviously unbalanced may be rejected. The West Laurel Water Association reserves the right to reject any and all bids and waive informalities.

Small, minority and women's businesses and labor surplus area firms are encouraged to bid this project.

By: Otis Williams, President  
West Laurel Water Association

## SECTION 00200

### INSTRUCTIONS TO BIDDERS

#### TABLE OF ARTICLES

	Page
Article 1 - Defined Terms	1
Article 2 - Copies of Bidding Documents	1
Article 3 - Qualifications of Bidders	1
Article 4 - Examination of Bidding Documents, Other Related Data, and Site	2
Article 5 - Pre-Bid Conference	4
Article 6 - Site and Other Areas	4
Article 7 - Interpretations and Addenda	4
Article 8 - Bid Security	4
Article 9 - Contract Times	5
Article 10 - Liquidated Damages	5
Article 11 - Substitute and "Or-Equal" Items	5
Article 12 - Subcontractors, Suppliers, and Others	5
Article 13 - Preparation of Bid	6
Article 14 - Basis of Bid; Comparison of Bids	7
Article 15 - Submittal of Bid	7
Article 16 - Modification and Withdrawal of Bid	7
Article 17 - Opening of Bids	7
Article 18 - Bids to Remain Subject to Acceptance	7
Article 19 - Evaluation of Bids and Award of Contract	8
Article 20 - Contract Security and Insurance	8
Article 21 - Signing of Agreement	8

#### ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will 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.

#### ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents in the number and for the non-refundable deposit sum, if any, stated in the Advertisement for Bids may be obtained from the Issuing Office.
- 2.02 Complete sets of Bidding Documents must 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 confer a license or grant for any other use.

#### ARTICLE 3 - QUALIFICATIONS OF BIDDERS

- 3.01 To demonstrate Bidder's qualifications to perform the Work, within five days of Owner's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below.
  - A. Bidder and any subcontractors the bidder uses must be acceptable to the Owner and have current eligibility for federal programs.

- B. Approval of any proposed subcontract award can not be given by the Owner unless and until the proposed subcontractor has submitted the Certifications and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject.

#### **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 of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents.
  - 2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Bidding Documents.
- B. Copies of reports and drawings referenced 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 those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that Engineer has used in preparing the Bidding Documents.
- B. Copies of reports and drawings referenced in 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 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 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 responsibility of each Bidder before submitting a Bid to:
- A. Examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda;
  - B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
  - C. Become familiar with and satisfy Bidder as to all Federal, State, and local Laws and Regulations that may affect cost, progress, or performance of the Work;
  - D. Carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions at the Site which have been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions;
  - E. Obtain and carefully study (or accept consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;
  - F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;
  - G. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
  - H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

- I. Promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and
  - J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 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 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 at \_\_\_\_\_ local time on \_\_\_\_\_, 2017 at the West Laurel Water Association's office. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. 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. Easement 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 or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than five days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. 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.

#### **ARTICLE 8 - BID SECURITY**

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 % of Bidder's maximum Bid price and in the form of a certified check or a Bid bond (EJCDC No. C-430, 2002 Edition) issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions.

- 8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 10 days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 91 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.
- 8.03 Bid security of other Bidders whom OWNER believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

#### **ARTICLE 9 - CONTRACT TIMES**

- 9.01 The number of days within which, or the date by which, the Work is to be substantially completed. Upon substantial completion, if necessary, a date for final completion and payment should be determined between the Owner, Contractor and Engineer based on remaining work, market and weather conditions.

#### **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, or "or-equal" materials and equipment as defined in paragraph 6.05 of the General Conditions, or those substitute materials and equipment approved by the Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or "or-equal" item. No item of material or equipment will be considered by Engineer as a substitute or equal until after the bids have been opened and the contract has been awarded. The burden of proof of the merit of the proposed item, and cost for review of a proposed substitute item, is upon the Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. Bidders shall not rely upon approvals made in any other manner. Any reduction made in contract price due to approval of a substitute item or equal, will be subtracted from the bidder's contract and placed into contingency funds for the project.

#### **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 responsible Bidder that proposes to use acceptable

Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner and 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.

12.04 The Contractor shall not award work to Subcontractor(s) in excess of the limits stated in SC 6.06.

### **ARTICLE 13 - PREPARATION OF BID**

13.01 The Bid form is included with the Bidding Documents. Additional copies may be obtained from Engineer.

13.02 All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid 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 listed therein, or the words "No Bid," "No Change," or "Not Applicable" 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. If required by State where work is to be performed, the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporation business address and state of incorporation shall be provided on the Bid Form.

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 business address of the partnership shall be provided on the Bid Form.

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 business address of the firm must be provided on the Bid Form.

13.06 A Bid by an individual shall show the Bidder's name and business 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 business address of the joint venture must be provided on the Bid Form.

13.08 All names shall be typed or printed in ink below the signatures.

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers and dates of which shall be filled in on the Bid form.

13.10 The address and telephone number for communication regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number for the state of the Project, if any, shall also be shown on the Bid Form.

## **ARTICLE 14 - BASIS OF BID; COMPARSION OF BIDS**

### **14.01 Unit Price**

- A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.
- B. The total of all bid 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. Discrepancies between words and figures will be resolved in favor of the words.

## **ARTICLE 15 - SUBMITTAL OF BID**

15.01 Bid Form is to be completed and submitted with all the attachments required.

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 an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by 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 envelope plainly marked on the outside with the notation "BID ENCLOSED." When using the mail or other delivery system, the Bidder is totally responsible for the mail or other delivery system delivering the Bid at the place and prior to the time indicated in the Advertisement for Bid. A mailed Bid shall be addressed to Owner at address in Article 1.01 of Bid Form.

## **ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID**

- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.
- 16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid or negotiated, that Bidder will be disqualified from further bidding on the Work. This provision to withdraw a Bid without forfeiting the Bid security does not apply to Bidder's errors in judgment in preparing the Bid.

## **ARTICLE 17 - OPENING OF BIDS**

17.01 Bids will be opened at the time and place indicated in the Advertisement for Bids and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the 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 90 days.

## **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 be non-responsible. 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 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.
- 19.05 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 to perform the Work in accordance with the contract Documents.
- 19.06 If the Contract is to be awarded, Owner will award the Contract to the responsible Bidder whose Bid, conforming with all the material terms and conditions of the Instructions to Bidders, is lowest in price and in the best interest of the Owner by considering other factors such as work history, recommendations, etc.

## **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 must be accompanied by such bonds.

## **ARTICLE 21 - SIGNING OF AGREEMENT**

- 21.01 When Owner gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within 10 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 This Contract is expected to be funded in part with funds provided by the United States Department of Agriculture, Rural Development (RD). Refer to Article 18 of the General Conditions for information on the Federal Requirements.
- 21.03 Concurrence by RD in the award of the Contract is required before the Contract is effective.

## SECTION 00410

### BID FORM

Project Identification: West Laurel Water Association: New County Farm Pump Station

Contract Identification Number: 1

#### ARTICLE 1 - BID RECIPIENT

1.01 This Bid Is Submitted To: West Laurel Water Association, 1670 E. Hal Rogers Parkway, P.O. Box 726, London, KY 40741.

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 the Bid and in accordance with the other terms and conditions of the Bidding Documents.

#### ARTICLE 2 - BIDDER'S ACKNOWLEDGMENTS

2.01 Bidder accepts all of the terms and conditions of the Advertisement and Instructions to Bidders, including without limitations those dealing with the dispositions of Bid security. The Bid will remain subject to acceptance for 90 days after the Bid opening, 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.

Addendum No.	Addendum Date
<u>1</u>	<u>10-25-17</u>
<u>2</u>	<u>11-6-17</u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>
<u> </u>	<u> </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 in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in SC-4.02, and (2) reports and drawings of a Hazard Environmental Condition, if any, which has been identified in SC-4.06.

E. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground

00410-1

Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by the Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

- F. Bidder does not consider that any 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 and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is 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. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
- I. 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.
- J. 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.
- K. Bidder will submit written evidence of its authority to do business in the State where the Project is located not later than the date of its execution of the Agreement.

#### **ARTICLE 4 - FURTHER REPRESENTATIONS**

##### **4.01 Bidder further represents that:**

- A. This Bid is genuine and not made in the interest of or on the behalf of any undisclosed individual or entity and is not submitted in conformity with any 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 sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

#### **ARTICLE 5 - BASIS OF BID**

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

Note: Bids shall include sales tax and all other applicable taxes.

The contractor shall complete the Bid Schedules for the Base Project.

**BID FORM**

**West Laurel Water Association  
New County Farm Pump Station**

**Contract # 1**

No.	Item Description	Unit	Quantity	Unit Price	Item Price
1.	County Farm Pump Station	LS	1	<u>420,325</u>	<u>420,325</u>
2.	Yard Piping	LS	1	<u>41,400</u>	<u>41,400</u>
3.	Bituminous Concrete Paving	LS	1	<u>3,500</u>	<u>3,500</u>
4.	Structural Fill	TON	140	<u>100</u>	<u>14,000</u>
5.	Telemetry Equipment Allowance	LS	1	<u>\$18,500</u>	<u>\$18,500</u>
<b>Total Contract No. 1</b>				<b>\$</b>	<u><b>497,725</b></u>

- A. See Specification Section 01000 for Bid Item descriptions.
- B. Unit Prices have been computed in accordance with paragraph 11.03.A of the General Conditions.
- C. 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 in accordance with paragraph 14.04 of the General Conditions on or before the date, or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the work within the Contract Times.

**ARTICLE 7 - ATTACHEMENTS TO THIS BID**

- 7.01 The following documents are attached to and made a condition of the Bid:
  - A. Required Bid security in the form of a Bid Bond (EJCDC No. C-430) or Certified Check (circle type of security provided);
  - B. If Bid amount exceeds \$10,000, signed Compliance Statement (RD 400-6). Refer to specific equal opportunity requirements set forth in paragraph 18.10 of the General Conditions;
  - C. If Bid amount exceeds \$25,000, signed Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions (AD-1048);

00410-3

- D. If Bid amount exceeds \$100,000, signed RD Instruction 1940-Q, Exhibit A-1, Certification for Contracts, Grants and Loans. Refer to paragraph 18.11 of the General Conditions;

**ARTICLE 8 - DEFINED TERMS**

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

**ARTICLE 9 - BID SUBMITTAL**

- 9.01 This Bid submitted by:

If Bidder is:

Name (typed or printed): HERRICK COMPANY, INC.

By: Donna S Herrick  
(Individual's signature) DONNA S. HERRICK, CEO

SEAL,  
if required  
by State

Doing business as: A CORPORATION

Bidder's Business address: 1385 TRACY RD

LAWRENCEBURG, KY 40342

Business Phone No. (502) 839-3484

Business FAX No. (502) 839-0939

Business E-Mail Address HCI@DCR.NET

State Contractor License No. NA (If applicable)

Employer's Tax ID No. \_\_\_\_\_

Phone and FAX Numbers, and Address for receipt of official communications, if different from Business contact information:

- 9.02 Bid submitted on NOVEMBER 9, 2017.

COMPLIANCE STATEMENT

This statement relates to a proposed contract with West Laurel Water Association  
Contract 1 - New County Farm Pump Station  
(Name of borrower or grantee)

who expects to finance the contract with assistance from either the Rural Housing Service (RHS), Rural Business-Cooperative Service (RBS), or the Rural Utilities Service (RUS) or their successor agencies, United States Department of Agriculture (whether by a loan, grant, loan insurance, guarantee, or other form of financial assistance). I am the undersigned bidder or prospective contractor, I represent that:

1. ☒ I have ☐ have not, participated in a previous contract or subcontract subject to Executive Order 11246 (regarding equal employment opportunity) or a preceding similar Executive Order.
2. If I have participated in such a contract or subcontract, ☒ I have, ☐ have not, filed all compliance reports that have been required to file in connection with the contract or subcontract.

If the proposed contract is for \$50,000 or more and I have 50 or more employees, I also represent that:

3. ☒ I have, ☐ have not previously had contracts subject to the written affirmative action programs requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, ☒ I have, ☐ have not developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to either the RHS, RBS or RUS, or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and wash rooms, restaurants and other eating areas time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods): (See Reverse).

---

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays the valid OMB control number. The valid OMB control number for this information collection is 0575-0018. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

---

*Donna S Herrick, CEO*

## U.S. DEPARTMENT OF AGRICULTURE

### Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 7 CFR Part 3017, Section 3017.510, Participants' responsibilities. The regulations were published as Part IV of the January 30, 1989, **Federal Register** (pages 4722-4733). Copies of the regulations may be obtained by contacting the Department of Agriculture agency with which this transaction originated.

#### (BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

- (1) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.
- (2) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

HERRICK COMPANY, INC.

Organization Name

Contract 1- New County Farm Pump Station

PR/Award Number or Project Name

Donna S. Herrick

Name(s) and Title(s) of Authorized Representative(s)

CEO

Donna S Herrick

Signature(s)

11-9-17

Date

## Instructions for Certification

1. By signing and submitting this form, the prospective lower tier participant is providing the certification set out on the reverse side in accordance with these instructions.
2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
5. The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
6. The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.
8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR  
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$ 10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Date

11/9/17

Donna S. Herrick

(Signature of Bidder or Prospective Contractor)

DONNA S. HERRICK, CEO

1305 TRACY RD, LAWRENCEBURG, KY 40342

Address (including Zip Code)

CERTIFICATION FOR CONTRACTS, GRANTS AND LOANS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or Federal loan, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant or loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant or loan, the undersigned shall complete and submit Standard Form - LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including contracts, subcontracts, and subgrants under grants and loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Donna S Herrick

(name) DONNA S. HERRICK

11/9/17

(date)

CHIEF EXECUTIVE OFFICER

(title)

oOo

HERRICK COMPANY, INC.  
RESOLUTION OF THE BOARD  
AUGUST 15, 2009

RESOLVED, the Board of Directors has voted to name Donna S. Herrick as Chief Executive Officer. The Board has amended Article IV, Section Five of the Bylaws to define the duties of Chief Executive Officer and the President.

In addition to other duties as named in Article IV, Section Five, the Chief Executive Officer or President shall have authority to sign any Deeds, Mortgages, Bonds, Contracts, or other instruments which the Board of Directors has authorized to be executed in the course of doing business.

DATED this 15<sup>th</sup> day of August, 2009.



Donna S. Herrick



H. Douglas Herrick

**Attest:**



Sabrina K. Gabbard

**Commonwealth of Kentucky**  
**Alison Lundergan Grimes, Secretary of State**

Alison Lundergan Grimes  
Secretary of State  
P. O. Box 718  
Frankfort, KY 40602-0718  
(502) 564-3490  
<http://www.sos.ky.gov>

**Certificate of Existence**

Authentication number: 194119

Visit <https://app.sos.ky.gov/ftshow/certvalidate.aspx> to authenticate this certificate.

I, Alison Lundergan Grimes, Secretary of State of the Commonwealth of Kentucky, do hereby certify that according to the records in the Office of the Secretary of State,

**HERRICK COMPANY, INC.**

is a corporation duly incorporated and existing under KRS Chapter 14A and KRS Chapter 271B, whose date of incorporation is January 26, 1996 and whose period of duration is perpetual.

I further certify that all fees and penalties owed to the Secretary of State have been paid; that Articles of Dissolution have not been filed; and that the most recent annual report required by KRS 14A.6-010 has been delivered to the Secretary of State.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Official Seal at Frankfort, Kentucky, this 28<sup>th</sup> day of September, 2017, in the 226<sup>th</sup> year of the Commonwealth.



*Alison Lundergan Grimes*  
Alison Lundergan Grimes  
Secretary of State  
Commonwealth of Kentucky  
194119/0411048

## SECTION 00430

## BID BOND

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

BIDDER (Name and Address): Herrick Company, Inc.  
1385 Tracy Road  
Lawrenceburg, KY 40342

SURETY (Name and Address of Principal Place of Business): United Fire & Casualty Company  
118 Second Avenue SE  
Cedar Rapids, IA 52401

OWNER (Name and Address): West Laurel Water Association  
1670 E. Hal Rogers Parkway  
P.O. Box 726  
London, Kentucky 40741

## BID

Bid Due Date: November 9, 2017

Project (Brief Description Including Location): Contract 1: New County Farm Pump Station  
Laurel County, Kentucky

## BOND

Bond Number: N/A

Date (Not later than Bid due date):

Penal sum Five Percent of Amount Bid (5% of Amount Bid)  
(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

## BIDDER

Herrick Company, Inc. (Seal)  
Bidder's Name and Corporate Seal

By: Donna S. Herrick  
Signature and Title DONNA S. HERRICK, CEO

Attest: H. Douglas Herrick  
Signature and Title H. DOUGLAS HERRICK  
PRESIDENT

## SURETY

United Fire & Casualty Company (Seal)  
Surety's Name and Corporate Seal

By: Leigh McCarthy  
Signature and Title Leigh McCarthy, Attorney-in-Fact  
(Attach Power of Attorney)

Attest: Jill Kemp  
Signature and Title Jill Kemp, Underwriting Assistant

Note: Above addresses are to be used for giving required notice.

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



UNITED FIRE & CASUALTY COMPANY, CEDAR RAPIDS, IA  
UNITED FIRE & INDEMNITY COMPANY, WEBSTER, TX  
FINANCIAL PACIFIC INSURANCE COMPANY, ROCKLIN, CA  
**CERTIFIED COPY OF POWER OF ATTORNEY**

Inquiries: Surety Department  
118 Second Ave SE  
Cedar Rapids, IA 52401

(original on file at Home Office of Company - See Certification)

KNOW ALL PERSONS BY THESE PRESENTS, That UNITED FIRE & CASUALTY COMPANY, a corporation duly organized and existing under the laws of the State of Iowa; UNITED FIRE & INDEMNITY COMPANY, a corporation duly organized and existing under the laws of the State of Texas; and FINANCIAL PACIFIC INSURANCE COMPANY, a corporation duly organized and existing under the laws of the State of California (herein collectively called the Companies), and having their corporate headquarters in Cedar Rapids, State of Iowa, does make, constitute and appoint JAMES T. SMITH, OR JAMES H. MARTIN, OR BROOK T. SMITH, OR RAYMOND M. HUNDLEY, OR DEBORAH NEICHTER, OR BONNIE J ROWE, OR MICHELE LACROSSE, OR SUMMER BETTING, OR JASON CROMWELL, OR LEIGH MCCARTHY, ALL INDIVIDUALLY of LOUISVILLE KY

their true and lawful Attorney(s)-in-Fact with power and authority hereby conferred to sign, seal and execute in its behalf all lawful bonds, undertakings and other obligatory instruments of similar nature provided that no single obligation shall exceed \$75,000,000.00 and to bind the Companies thereby as fully and to the same extent as if such instruments were signed by the duly authorized officers of the Companies and all of the acts of said Attorney, pursuant to the authority hereby given and hereby ratified and confirmed.

The Authority hereby granted shall expire the 1st day of August, 2018 unless sooner revoked by UNITED FIRE & CASUALTY COMPANY, UNITED FIRE & INDEMNITY COMPANY, AND FINANCIAL PACIFIC INSURANCE COMPANY.

This Power of Attorney is made and executed pursuant to and by authority of the following bylaw duly adopted on May 15, 2013, by the Boards of Directors of UNITED FIRE & CASUALTY COMPANY, UNITED FIRE & INDEMNITY COMPANY, and FINANCIAL PACIFIC INSURANCE COMPANY.

**"Article VI - Surety Bonds and Undertakings"**

Section 2, Appointment of Attorney-in-Fact. "The President or any Vice President, or any other officer of the Companies may, from time to time, appoint by written certificates attorneys-in-fact to act in behalf of the Companies in the execution of policies of insurance, bonds, undertakings and other obligatory instruments of like nature. The signature of any officer authorized hereby, and the Corporate seal, may be affixed by facsimile to any power of attorney or special power of attorney or certification of either authorized hereby; such signature and seal, when so used, being adopted by the Companies as the original signature of such officer and the original seal of the Companies, to be valid and binding upon the Companies with the same force and effect as though manually affixed. Such attorneys-in-fact, subject to the limitations set forth in their respective certificates of authority shall have full power to bind the Companies by their signature and execution of any such instruments and to attach the seal of the Companies thereto. The President or any Vice President, the Board of Directors or any other officer of the Companies may at any time revoke all power and authority previously given to any attorney-in-fact.

IN WITNESS WHEREOF, the COMPANIES have each caused these presents to be signed by its vice president and its corporate seal to be hereto affixed this 1st day of August, 2016

UNITED FIRE & CASUALTY COMPANY  
UNITED FIRE & INDEMNITY COMPANY  
FINANCIAL PACIFIC INSURANCE COMPANY

By:

*Dennis J. Richmann* Vice President

State of Iowa, County of Linn, ss:

On 1st day of August, 2016, before me personally came Dennis J. Richmann

to me known, who being by me duly sworn, did depose and say; that he resides in Cedar Rapids, State of Iowa; that he is a Vice President of UNITED FIRE & CASUALTY COMPANY, a Vice President of UNITED FIRE & INDEMNITY COMPANY, and a Vice President of FINANCIAL PACIFIC INSURANCE COMPANY the corporations described in and which executed the above instrument; that he knows the seal of said corporations; that the seal affixed to the said instrument is such corporate seal; that it was so affixed pursuant to authority given by the Board of Directors of said corporations and that he signed his name thereto pursuant to like authority, and acknowledges same to be the act and deed of said corporations.



*Judith A. Davis* Notary Public  
My commission expires: 04/23/2018

I, David A. Lange, Secretary of UNITED FIRE & CASUALTY COMPANY and Assistant Secretary of UNITED FIRE & INDEMNITY COMPANY, and Assistant Secretary of FINANCIAL PACIFIC INSURANCE COMPANY, do hereby certify that I have compared the foregoing copy of the Power of Attorney and affidavit, and the copy of the Section of the bylaws and resolutions of said Corporations as set forth in said Power of Attorney, with the ORIGINALS ON FILE IN THE HOME OFFICE OF SAID CORPORATIONS, and that the same are correct transcripts thereof, and of the whole of the said originals, and that the said Power of Attorney has not been revoked and is now in full force and effect.

In testimony whereof I have hereunto subscribed my name and affixed the corporate seal of the said Corporations this 9th day of November, 2017.



By:

*David A. Lange*

Secretary, UF&C  
Assistant Secretary, UF&I/FPIC

**SECTION 00510**

**NOTICE OF AWARD**

To: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PROJECT Description: Contract 1: New County Farm Pump Station

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated \_\_\_\_\_ and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of \$ \_\_\_\_\_.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 2017.

\_\_\_\_\_  
West Laurel Water Association  
Owner

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

Title: President

**ACCEPTANCE OF NOTICE**

Receipt of the above NOTICE OF AWARD is hereby acknowledged by \_\_\_\_\_ this the \_\_\_\_\_ day of \_\_\_\_\_, 2017.

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

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

00510-1

THIS AGREEMENT is by and between West Laurel Water Association (“Owner”) and  
 (“Contractor”).

2015045\SPECIFICATIONS\Sec00521-Agreement

\$800 for each day that expires after the time specified in Paragraph 4.02 until the Work is substantially complete. After substantial completion, retainage may be reduced to an amount agreed upon by Owner, Contractor, and Engineer. It should be no less than 150% of the amount required for completion and ready for final payment. Liquidated damages may not be assessed after substantial completion has been achieved.

## **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 in Section 00410.

## **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 on or about the 25<sup>th</sup> day of each month during performance of the Work as provided in Paragraphs 6.02.A.1 and 6.02.A.2 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. 95 percent of Work completed (with the balance being retainage); and
- b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 percent of the Work completed, plus any reduction in retainage that has been agreed upon by Owner, Contractor, and Engineer.

### **6.03 *Final Payment***

A. Upon receipt of the final Application for Payment accompanied by Engineer's recommendation of payment in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay Contractor as provided in Paragraph 14.07 of the General Conditions the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages.

## 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 maximum legal rate.

## 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 obtained and carefully studied (or assumes responsibility for doing so) all examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.
  - E. Contractor does not consider that any 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.
  - F. 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.
  - G. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with 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 6, inclusive).
  - 2. Performance bond (pages 1 to 2, inclusive).
  - 3. Payment bond (pages 1 to 2, inclusive).

4. Other bonds (pages \_\_\_\_ to \_\_\_\_, inclusive).
    - a. \_\_\_\_ (pages \_\_\_\_ to \_\_\_\_, inclusive).
    - b. \_\_\_\_ (pages \_\_\_\_ to \_\_\_\_, inclusive).
    - c. \_\_\_\_ (pages \_\_\_\_ to \_\_\_\_, inclusive).
  5. General Conditions (pages 1 to 59, inclusive).
  6. Supplementary Conditions (pages 1 to 3, inclusive).
  7. Specifications as listed in the table of contents of the Project Manual.
  8. Addenda (numbers \_\_, inclusive).
  9. Exhibits to this Agreement (enumerated as follows):
    - a. Contractor's Bid (pages 1 to \_\_, inclusive and included in Section 00410).
    - b. Documentation submitted by Contractor prior to Notice of Award (pages \_\_\_\_ to \_\_\_\_, inclusive).
    - c. \_\_\_\_\_.
  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 (pages 1 to 1, inclusive).
    - b. Work Change Directives.
    - c. Change Order(s).
- 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.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in four copies. One counterpart each has been delivered to Owner, Contractor, Engineer, and Agency. All portions of the Contract Documents have been signed, initialed, or identified by Owner and Contractor or identified by Engineer on their behalf.

This Agreement is dated \_\_\_\_\_, 2017. This Agreement shall not be effective unless and until Agency's designated representative concurs.

OWNER:

\_\_\_\_\_  
West Laurel Water Association

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

Title: President

[CORPORATE SEAL]

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

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

Address for giving notices:

\_\_\_\_\_  
West Laurel Water Association

\_\_\_\_\_  
P.O. Box 726

\_\_\_\_\_  
London, KY 40741

CONTRACTOR:

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

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

[CORPORATE SEAL]

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

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

Address for giving notices:

\_\_\_\_\_  
Agent for service of process:

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

Agency Concurrence:

As lender or insurer of funds to defray the costs of this Contract, and without liability for any payments thereunder, the Agency hereby concurs in the form, content, and execution of this Agreement.

Agency: USDA Rural Development

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

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

Title: State Engineer

**SECTION 00550  
NOTICE TO PROCEED**

TO: \_\_\_\_\_ DATE: \_\_\_\_\_  
\_\_\_\_\_  
Project: Contract 1: New County Farm  
\_\_\_\_\_  
Pump Station  
\_\_\_\_\_

You are hereby notified to commence WORK in accordance with the Agreement dated \_\_\_\_\_, 2017, on or before \_\_\_\_\_, 2017, and you are to complete the WORK within 120 consecutive calendar days thereafter. The date of completion of all WORK is therefore \_\_\_\_\_, 2018.

West Laurel Water Association  
Owner

By: \_\_\_\_\_  
Title: President

**ACCEPTANCE OF NOTICE**

Receipt of the above NOTICE TO PROCEED

is hereby acknowledged by \_\_\_\_\_

\_\_\_\_\_ this the \_\_\_\_\_ of \_\_\_\_\_, 2017.

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

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

Employer Identification

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

**SECTION 00610  
PERFORMANCE BOND**

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

CONTRACTOR (Name and Address):

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

OWNER (Name and Address):

West Laurel Water Association  
1670 E. Hal Rogers Parkway, P.O. Box 726  
London, KY 40741

**CONTRACT**

Date:

Amount:

Description (Name and Location):

Contract 1: New County Farm Pump Station  
Laurel County, Kentucky

**BOND**

Bond Number:

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

**CONTRACTOR AS PRINCIPAL**

Company:

Signature: \_\_\_\_\_ (Seal)

Name and Title:

**SURETY**

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

Surety's Name and Corporate Seal

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

Signature and Title:

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

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

Signature and Title:

**CONTRACTOR AS PRINCIPAL**

Company:

Signature: \_\_\_\_\_ (Seal)

Name and Title:

**SURETY**

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

Surety's Name and Corporate Seal

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

Signature and Title:

(Attach Power of Attorney)

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

Signature and Title:

EJCDC No. C-610 (2002 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.
2. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 3.1.
3. If there is no Owner Default, Surety's obligation under this Bond shall arise after:
  - 3.1. Owner has notified Contractor and Surety, at the addresses described in Paragraph 10 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and
  - 3.2. Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 3.1; and
  - 3.3. Owner has agreed to pay the Balance of the Contract Price to:
    1. Surety in accordance with the terms of the Contract;
    2. Another contractor selected pursuant to Paragraph 4.3 to perform the Contract.
4. When Owner has satisfied the conditions of Paragraph 3, Surety shall promptly and at Surety's expense take one of the following actions:
  - 4.1. Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or
  - 4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
  - 4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and Contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or
  - 4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:
    1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
    2. Deny liability in whole or in part and notify Owner citing reasons therefor.
5. If Surety does not proceed as provided in Paragraph 4 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 4.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

6. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To a limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

- 6.1. The responsibilities of Contractor for correction of defective Work and completion of the Contract;
  - 6.2. Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions or failure to act of Surety under Paragraph 4; and
  - 6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.
7. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.
8. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.
9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
10. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.
11. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
12. Definitions.
- 12.1. Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
  - 12.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
  - 12.3. Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
  - 12.4. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

FOR INFORMATION ONLY – Name, Address and Telephone  
Surety Agency or Broker  
Owner's Representative (engineer or other party)

**SECTION 00615  
PAYMENT BOND**

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

CONTRACTOR (Name and Address):

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

OWNER (Name and Address):

West Laurel Water Association  
1670 E. Hal Rogers Parkway, P.O. Box 726  
London, KY 40741

**CONTRACT**

Date:

Amount:

Description (Name and Location):

Contract 1: New County Farm Pump Station  
Laurel County, Kentucky

**BOND**

Bond Number:

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

**CONTRACTOR AS PRINCIPAL**

Company:

Signature: \_\_\_\_\_ (Seal)

Name and Title:

**SURETY**

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

By:

Signature and Title:

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

Attest:

Signature and Title:

**CONTRACTOR AS PRINCIPAL**

Company:

Signature: \_\_\_\_\_ (Seal)

Name and Title:

**SURETY**

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

By:

Signature and Title:

(Attach Power of Attorney)

Attest:

Signature and Title:

EJCDC No. C-615 (2002 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
  - 2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and
  - 2.2. Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
  - 4.1. Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the addresses described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
  - 4.2. Claimants who do not have a direct contract with Contractor:
    1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
    2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
    3. Not having been paid within the above 30 days, have sent a written notice to Surety and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. When a Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at Surety's expense take the following actions:
  - 6.1. Send an answer to that Claimant, with a copy to Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
  - 6.2. Pay or arrange for payment of any undisputed amounts.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.
9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.
11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.
13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.
14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
15. DEFINITIONS
  - 15.1. Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
  - 15.2. Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
  - 15.3. Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or comply with the other terms thereof.

**FOR INFORMATION ONLY – Name, Address and Telephone**  
**Surety Agency or Broker:**  
**Owner's Representative (engineer or other party):**

**SECTION 00625**  
**CERTIFICATE OF SUBSTANTIAL COMPLETION**

Project: Contract 1: New County Farm Pump Station	Owner: West Laurel Water Association	Owner's Contract No.: 1
Contract:		Date of Contract:
Contractor:		Engineer's Project No.: 2015045

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

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

---

---

---

---

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

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

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

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

- ☐ Amended Responsibilities                      ☐ Not Amended

**Owner's Amended Responsibilities:**

---

---

---

**Contractor's Amended Responsibilities:**

---

---

---

**The following documents are attached to and made part of this Certificate:**

---

---

---

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

\_\_\_\_\_  
Executed by Engineer

\_\_\_\_\_  
Date

\_\_\_\_\_  
Accepted by Contractor

\_\_\_\_\_  
Date

\_\_\_\_\_  
Accepted by Owner

\_\_\_\_\_  
Date

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

# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT FUNDING AGENCY EDITION

*Prepared by*

**ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE**

and

Issued and Published Jointly By



AMERICAN COUNCIL OF ENGINEERING COMPANIES



**National Society of  
Professional Engineers**  
*Professional Engineers in Private Practice*



PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE  
*a practice division of the*  
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

---

AMERICAN COUNCIL OF ENGINEERING COMPANIES

---

AMERICAN SOCIETY OF CIVIL ENGINEERS

---

This document has been approved and endorsed by

The Associated General Contractors of America



and the

Construction Specification Institute



Knowledge for Creating  
and Sustaining  
the Built Environment

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor Funding Agency Edition No. C-521 (2002 Edition). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the EJCDC Construction Documents, General and Instructions (No. C-001, 2002 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (No. C-800, 2002 Edition).

Copyright © 2002 National Society of Professional Engineers  
1420 King Street, Alexandria, VA 22314-2794  
(703) 684-2882

American Council of Engineering Companies  
1015 15th Street N.W., Washington, DC 20005  
(202) 347-7474

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

## TABLE OF CONTENTS

	Page
Article 1 – Definitions and Terminology .....	6
1.01 Defined Terms .....	6
1.02 Terminology .....	9
Article 2 – Preliminary Matters .....	10
2.01 Delivery of Bonds and Evidence of Insurance .....	10
2.02 Copies of Documents .....	11
2.03 Commencement of Contract Times; Notice to Proceed .....	11
2.04 Starting the Work .....	11
2.05 Before Starting Construction .....	11
2.06 Preconstruction Conference .....	11
2.07 Initial Acceptance of Schedules .....	11
Article 3 – Contract Documents: Intent, Amending, Reuse .....	12
3.01 Intent .....	12
3.02 Reference Standards .....	12
3.03 Reporting and Resolving Discrepancies .....	12
3.04 Amending and Supplementing Contract Documents .....	13
3.05 Reuse of Documents .....	13
3.06 Electronic Data .....	13
Article 4 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions; Reference Points .....	14
4.01 Availability of Lands .....	14
4.02 Subsurface and Physical Conditions .....	14
4.03 Differing Subsurface or Physical Conditions .....	15
4.04 Underground Facilities .....	16
4.05 Reference Points .....	16
4.06 Hazardous Environmental Condition at Site .....	17
Article 5 – Bonds and Insurance .....	18
5.01 Performance, Payment, and Other Bonds .....	18
5.02 Licensed Sureties and Insurers .....	18
5.03 Certificates of Insurance .....	19
5.04 Contractor's Liability Insurance .....	19
5.05 Owner's Liability Insurance .....	20
5.06 Property Insurance .....	20
5.07 Waiver of Rights .....	21
5.08 Receipt and Application of Insurance Proceeds .....	22
5.09 Acceptance of Bonds and Insurance; Option to Replace .....	22
5.10 Partial Utilization, Acknowledgment of Property Insurer .....	22
Article 6 – Contractor's Responsibilities .....	23
6.01 Supervision and Superintendence .....	23
6.02 Labor; Working Hours .....	23
6.03 Services, Materials, and Equipment .....	23
6.04 Progress Schedule .....	23
6.05 Substitutes and "Or-Equals" .....	24
6.06 Concerning Subcontractors, Suppliers, and Others .....	26
6.07 Patent Fees and Royalties .....	27
6.08 Permits .....	27
6.09 Laws and Regulations .....	27
6.10 Taxes .....	28
6.11 Use of Site and Other Areas .....	28

6.12	Record Documents .....	28
6.13	Safety and Protection .....	29
6.14	Safety Representative .....	29
6.15	Hazard Communication Programs .....	29
6.16	Emergencies .....	29
6.17	Shop Drawings and Samples .....	30
6.18	Continuing the Work .....	31
6.19	Contractor's General Warranty and Guarantee .....	31
6.20	Indemnification .....	32
6.21	Delegation of Professional Design Services .....	32
Article 7 – Other Work at the Site .....		33
7.01	Related Work at Site .....	33
7.02	Coordination .....	34
7.03	Legal Relationships .....	34
Article 8 – Owner's Responsibilities .....		34
8.01	Communications to Contractor .....	34
8.02	Replacement of Engineer .....	34
8.03	Furnish Data .....	34
8.04	Pay When Due .....	34
8.05	Lands and Easements; Reports and Tests .....	34
8.06	Insurance .....	35
8.07	Change Orders .....	35
8.08	Inspections, Tests, and Approvals .....	35
8.09	Limitations on Owner's Responsibilities .....	35
8.10	Undisclosed Hazardous Environmental Condition .....	35
8.11	Evidence of Financial Arrangements .....	35
Article 9 – Engineer's Status During Construction .....		35
9.01	Owner's Representative .....	35
9.02	Visits to Site .....	35
9.03	Project Representative .....	36
9.04	Authorized Variations in Work .....	36
9.05	Rejecting Defective Work .....	36
9.06	Shop Drawings, Change Orders and Payments .....	36
9.07	Determinations for Unit Price Work .....	36
9.08	Decisions on Requirements of Contract Documents and Acceptability of Work .....	37
9.09	Limitations on Engineer's Authority and Responsibilities .....	37
Article 10 – Changes in the Work; Claims .....		37
10.01	Authorized Changes in the Work .....	37
10.02	Unauthorized Changes in the Work .....	38
10.03	Execution of Change Orders .....	38
10.04	Notification to Surety .....	38
10.05	Claims .....	38
Article 11 – Cost of the Work; Allowances; Unit Price Work .....		39
11.01	Cost of the Work .....	39
11.02	Allowances .....	41
11.03	Unit Price Work .....	42
Article 12 – Change of Contract Price; Change of Contract Times .....		42
12.01	Change of Contract Price .....	42
12.02	Change of Contract Times .....	43
12.03	Delays .....	43

Article 13 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work .....	44
13.01 Notice of Defects .....	44
13.02 Access to Work .....	44
13.03 Tests and Inspections .....	44
13.04 Uncovering Work .....	45
13.05 Owner May Stop the Work .....	45
13.06 Correction or Removal of Defective Work .....	45
13.07 Correction Period .....	46
13.08 Acceptance of Defective Work .....	46
13.09 Owner May Correct Defective Work .....	47
Article 14 – Payments to Contractor and Completion .....	47
14.01 Schedule of Values .....	47
14.02 Progress Payments .....	47
14.03 Contractor's Warranty of Title .....	50
14.04 Substantial Completion .....	50
14.05 Partial Utilization .....	50
14.06 Final Inspection .....	51
14.07 Final Payment .....	51
14.08 Final Completion Delayed .....	52
14.09 Waiver of Claims .....	52
Article 15 – Suspension of Work and Termination .....	52
15.01 Owner May Suspend Work .....	52
15.02 Owner May Terminate for Cause .....	53
15.03 Owner May Terminate For Convenience .....	53
15.04 Contractor May Stop Work or Terminate .....	54
Article 16 – Dispute Resolution .....	54
16.01 Methods and Procedures .....	54
Article 17 – Miscellaneous .....	55
17.01 Giving Notice .....	55
17.02 Computation of Times .....	55
17.03 Cumulative Remedies .....	55
17.04 Survival of Obligations .....	55
17.05 Controlling Law .....	55
17.06 Headings .....	55
Article 18 – Federal Requirements .....	56
18.01 Agency Not a Party .....	56
18.02 Contract Approval .....	56
18.03 Conflict of Interest .....	56
18.04 Gratuities .....	56
18.05 Audit and Access to Records .....	56
18.06 Small, Minority and Women's Businesses .....	57
18.07 Anti-Kickback .....	57
18.08 Clean Air and Pollution Control Acts .....	57
18.09 State Energy Policy .....	57
18.10 Equal Opportunity Requirements .....	57
18.11 Restrictions on Lobbying .....	58
18.12 Environmental Requirements .....	58

# GENERAL CONDITIONS

## 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. *Agency* – The Federal or state agency named as such in the Agreement.
  3. *Agreement* – The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
  4. *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.
  5. *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.
  6. *Bid* – The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  7. *Bidder* – The individual or entity who submits a Bid directly to Owner.
  8. *Bidding Documents* – The Bidding Requirements and the proposed Contract Documents (including all Addenda).
  9. *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.
  10. *Change Order* – A document recommended by Engineer which is signed by Contractor and Owner and Agency 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.
  11. *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.
  12. *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.
  13. *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's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

14. *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).
15. *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.
16. *Contractor* – The individual or entity with whom Owner has entered into the Agreement.
17. *Cost of the Work* – See Paragraph 11.01.A for definition.
18. *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.
19. *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.
20. *Engineer* – The individual or entity named as such in the Agreement.
21. *Field Order* – A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
22. *General Requirements* – Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.
23. *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 in connection with the Work.
24. *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.
25. *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.
26. *Liens* – Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
27. *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.
28. *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.
29. *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.

30. *Owner* – The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
31. *PCBs* – Polychlorinated biphenyls.
32. *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.
33. *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.
34. *Project* – The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
35. *Project Manual* – The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
36. *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.
37. *Related Entity* – An officer, director, partner, employee, agent, consultant, or subcontractor.
38. *Resident Project Representative* – The authorized representative of Engineer who may be assigned to the Site or any part thereof.
39. *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.
40. *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.
41. *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.
42. *Shop Drawings* – All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
43. *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.
44. *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.
45. *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.

46. *Substantial Completion* – The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
47. *Successful Bidder* – The Bidder submitting a responsive Bid to whom Owner makes an award.
48. *Supplementary Conditions* – That part of the Contract Documents which amends or supplements these General Conditions.
49. *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 any Subcontractor.
50. *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.
51. *Unit Price Work* – Work to be paid for on the basis of unit prices.
52. *Work* – The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
53. *Work Change Directive* – A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and Agency upon recommendation of the 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 following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following 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 requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of

the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day*

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

D. *Defective*

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

E. *Furnish, Install, Perform, Provide*

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

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

## **ARTICLE 2 – PRELIMINARY MATTERS**

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

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

## 2.02 *Copies of Documents*

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

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

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement.

## 2.04 *Starting the Work*

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

## 2.05 *Before Starting Construction*

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

## 2.06 *Preconstruction Conference*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, Agency, 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.

## 2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
  - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
  - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
  - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

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

### 3.01 *Intent*

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

### 3.02 *Reference Standards*

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

### 3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies*
  - 1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover 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 any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, 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 knew 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, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
  - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

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

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
  1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or
  2. reuse any of 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 adaption by Engineer.
- B. The prohibition 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. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have

accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

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

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

##### **4.01    *Availability of Lands***

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

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

- A. *Reports and Drawings:* The Supplementary Conditions identify:
  - 1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and
  - 2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general 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 Related Entities 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 at or contiguous to the Site that is uncovered or revealed either:

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

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

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

C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
  - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
  - b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
  - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
  - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
  - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities 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.

#### 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; and
  2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
    - a. reviewing and checking all such information and data,
    - b. locating all Underground Facilities shown or indicated in the Contract Documents,
    - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
    - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.
- B. *Not Shown or Indicated*
1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
  2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

#### 4.05 *Reference Points*

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

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

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

- A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general 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 Related Entities 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.
- 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 to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have

such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

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

## **ARTICLE 5 – BONDS AND INSURANCE**

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

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current 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 must be accompanied by a certified copy of the agent's authority to act.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

### **5.02    *Licensed Sureties and Insurers***

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and

coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

#### 5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured 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 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.

#### 5.04 *Contractor's Liability Insurance*

- A. Contractor shall purchase and maintain such liability and other 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, 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, 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 completed operations insurance;
4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
5. 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);
6. 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
7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.
  - a. 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, Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (Contractor shall be responsible for any deductible or self-insured retention.). This insurance shall:
  1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
  2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss 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 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 additional insured to whom a certificate of insurance has been issued.
- B. Contractor shall purchase and maintain such boiler and machinery 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, 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 an insured or additional insured.
- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with 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 additional insured 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.

#### 5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, 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 additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, 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 to be listed as insured or additional insured (and the officers, directors, 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 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, 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, 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 Contractor and made payable to Contractor as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Contractor 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.
- B. Contractor 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 Contractor's exercise of this power. If such objection be made, Contractor 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, Contractor as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Contractor as fiduciary shall give bond for the proper performance of such duties.

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

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

#### 5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

## ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

### 6.01 *Supervision and Superintendence*

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

### 6.02 *Labor; Working Hours*

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

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

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

### 6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
  - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

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

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

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

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

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

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 that 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 procedure requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in 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) will 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 or not 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 or not 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;
- 4) and 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 either a Change Order for a substitute or 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 item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the

provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

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

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor
  2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured 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, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

#### 6.07 *Patent Fees and Royalties*

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

#### 6.08 *Permits*

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

#### 6.09 *Laws and Regulations*

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

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

#### 6.10 Taxes

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

#### 6.11 Use of Site and Other Areas

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

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

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

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

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

#### 6.12 Record Documents

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

#### 6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
  - 1. all persons on the Site or who may be affected by the Work;
  - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. 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 , 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).
- D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

#### 6.14 *Safety Representative*

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

#### 6.15 *Hazard Communication Programs*

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

#### 6.16 *Emergencies*

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

by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### 6.17 *Shop Drawings and Samples*

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

##### 1. *Shop Drawings*

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

##### 2. *Samples*

- a. Submit number of Samples specified in the Specifications.
- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

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

##### C. *Submittal Procedures*

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

in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

**D. *Engineer's Review***

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

**E. *Resubmittal Procedures***

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

**6.18 *Continuing the Work***

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

**6.19 *Contractor's General Warranty and Guarantee***

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

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

#### 6.20 *Indemnification*

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

#### 6.21 *Delegation of Professional Design Services*

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

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

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

### **7.01 *Related Work at Site***

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
  - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
  - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall 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 their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

## 7.02 *Coordination*

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

## 7.03 *Legal Relationships*

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

# ARTICLE 8 – OWNER'S RESPONSIBILITIES

## 8.01 *Communications to Contractor*

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

## 8.02 *Replacement of Engineer*

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

## 8.03 *Furnish Data*

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

## 8.04 *Pay When Due*

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

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

- A. Owner's duties in respect of 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 in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 *Insurance*

- A. Owner's responsibilities, if any, in 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 in 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. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

**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 and will not be changed without written consent of Owner and Engineer.

9.02 *Visits to Site*

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

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

9.03 *Project Representative*

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

9.04 *Authorized Variations in Work*

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

9.05 *Rejecting Defective Work*

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

9.06 *Shop Drawings, Change Orders and Payments*

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

9.07 *Determinations for Unit Price Work*

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

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

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

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

**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, subject to written approval by Agency at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall

promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

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

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

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

#### 10.03 *Execution of Change Orders*

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

#### 10.04 *Notification to Surety*

- A. If notice 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) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

#### 10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that

the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part,
  2. approve the Claim, or
  3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

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

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

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.
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 at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
  2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
  - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
  - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.
  - e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
  - f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
  - g. The cost of utilities, fuel, and sanitary facilities at the Site.
  - h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressages, 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 and 11.01.B.
- 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 Bid price of a particular item of Unit Price Work amounts to more than 5 percent of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and
  - 2. there is no corresponding adjustment with respect to any other item of Work; and
  - 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

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

#### 12.01 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
  - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
  - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
  - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. Contractor's Fee: The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
  - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
  - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
  - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
  - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
  - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
  - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

#### 12.02 *Change of Contract Times*

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

#### 12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.B.
1. delays caused by or within the control of Contractor; or
- D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

### **13.01 *Notice of Defects***

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All 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, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

### **13.03 *Tests and Inspections***

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
  2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said 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, it must, if requested by Engineer, be uncovered for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

#### 13.04 *Uncovering Work*

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

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

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

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

- A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

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

#### 13.07 *Correction Period*

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

#### 13.08 *Acceptance of Defective Work*

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

the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

#### **13.09 Owner May Correct Defective Work**

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

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

#### **14.01 Schedule of Values**

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

#### **14.02 Progress Payments**

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

- 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and

evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

**B. Review of Applications**

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site 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, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to 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. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
  - a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

- d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
  - b. the Contract Price has been reduced by Change Orders;
  - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
  - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

*C. Payment Becomes Due*

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

*D. Reduction in Payment*

- 1. Owner may refuse to make payment of the full amount recommended by Engineer because:
  - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
  - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
  - c. the Contractor's performance or furnishing of the Work is inconsistent with funding Agency requirements;
  - d. there are other items entitling Owner to a set-off against the amount recommended; or
  - e. 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 corrects to Owner's satisfaction the reasons for such action.
- 3. If it is subsequently determined 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.

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

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

#### 14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Agency, Contractor, and Engineer shall make a prefinal 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 complete or correct items on the tentative list.

#### 14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.
  - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

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

#### 14.06 *Final Inspection*

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

#### 14.07 *Final Payment*

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

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;
  - b. consent of the surety, if any, to final payment;
  - c. a list of all Claims against Owner that Contractor believes are unsettled; and
  - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

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

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

**C. *Payment Becomes Due***

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

**14.08 *Final Completion Delayed***

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

**14.09 *Waiver of Claims***

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

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

**15.01 *Owner May Suspend Work***

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

## 15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
  2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
  3. Contractor's disregard of the authority of Engineer; or
  4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),
  2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and
  3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

## 15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
  2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
  3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
  4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

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

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

### ARTICLE 16 – DISPUTE RESOLUTION

#### 16.01 *Methods and Procedures*

- A. Owner and Contractor may mutually 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. 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 their intent to submit the Claim to a court of competent jurisdiction.

## **ARTICLE 17 – MISCELLANEOUS**

### **17.01 *Giving Notice***

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

### **17.02 *Computation of Times***

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

### **17.03 *Cumulative Remedies***

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

### **17.04 *Survival of Obligations***

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

### **17.05 *Controlling Law***

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

### **17.06 *Headings***

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

## ARTICLE 18 – FEDERAL REQUIREMENTS

### 18.01 *Agency Not a Party*

- A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.

### 18.02 *Contract Approval*

- A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the following "Certificate of Owner's Attorney" (Exhibit GC-A) before Owner submits the executed Contract Documents to Agency for approval.
- B. Concurrence by Agency in the award of the Contract is required before the Contract is effective.

### 18.03 *Conflict of Interest*

- A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer.
- B. Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

### 18.04 *Gratuities*

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.
- B. In the event this Contract is terminated as provided in paragraph 18.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

### 18.05 *Audit and Access to Records*

- A. For all negotiated contracts and negotiated modifications (except those of \$10,000 or less), Owner, Agency, the Comptroller General, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor, which are pertinent to the Contract, for the purpose of making audits, examinations, excerpts and transcriptions. Contractor shall maintain all required records for three years after final payment is made and all other pending matters are closed.

18.06 *Small, Minority and Women's Businesses*

- A. If Contractor intends to let any subcontracts for a portion of the work, Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services. Affirmative steps shall consist of: (1) including qualified small, minority and women's businesses on solicitation lists; (2) assuring that small, minority and women's businesses are solicited whenever they are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women's businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women's businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.

18.07 *Anti-Kickback*

- A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

18.08 *Clean Air and Pollution Control Acts*

- A. If this Contract exceeds \$100,000, Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 USC 7401 *et seq.*) and the Federal Water Pollution Control Act as amended (33 USC 1251 *et seq.*). Contractor will report violations to the Agency and the Regional Office of the EPA.

18.09 *State Energy Policy*

- A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

18.10 *Equal Opportunity Requirements*

- A. If this Contract exceeds \$10,000, Contractor shall comply with Executive Order 11246, "Equal Employment Opportunity," as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."
- B. Contractor's compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting Contractor's goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

- C. Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

#### 18.11 *Restrictions on Lobbying*

- A. Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 USC 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

#### 18.12 *Environmental Requirements*

- A. When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:
1. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
  2. Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey Maps.
  3. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).
  4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

## EXHIBIT GC-A

### Certificate of Owner's Attorney

I, the undersigned, \_\_\_\_\_, the duly authorized and acting legal representative of West Laurel Water Association, do hereby certify as follows:

I have examined the attached Contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements is adequate and has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

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

## SECTION 00800 SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract Funding Agency Edition (No. C-710, 2002 Edition) and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

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

### TABLE OF CONTENTS

	Page
SC-1.01.A.2 Project Financing	1
SC-1.01.A.4 Application for Payment	1
SC-1.01.A.10 Change Order	1
SC-1.01.A.15 Contract Times	1
SC-2.03.A Commencement of Contract Times; Notice to Proceed	1
SC-4.02 Subsurface and Physical Conditions	2
SC-4.06 Hazardous Environmental Condition at Site	2
SC-5.03 Certificates of Insurance	2
SC-5.04 Contractor's Liability Insurance	2
SC-6.06 Concerning Subcontractors, Suppliers, and Others	3
SC-9.03 Project Representative	3
SC-14.02.A.3 Applications for Payment	3
SC-14.02.C.1 Payment Becomes Due	3
SC-18.08 Clean Air and Pollution Control Acts	3

**SC-1.01.A.2. Add the following language to the end of Paragraph 1.01.A.2:**

The Project is financed in whole or in part by USDA Rural Development.

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

The Application for Payment form to be used on this Project is Form RD 1924-18. The Agency must approve all Applications for Payment before payment is made.

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

The Change Order form to be used on this Project is Form RD 1927-7. Agency approval is required before Change Orders are effective.

**SC-1.01.A.15. Delete in it's entirety and replace with the following:**

Contract Times: The number of days or date stated in the Agreement to achieve substantial completion. Final completion date will be determined by Contractor, Owner and Engineer, after substantial completion, based on remaining work, weather and market conditions.

**SC-2.03.A. Delete Paragraph 2.03.A in its entirety and insert the following in its place:**

- A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 10 days after the Effective Date of the Agreement.

**SC-4.02. Delete Paragraphs 4.02.A and 4.02.B in their entirety and insert the following:**

- A. No reports or explorations or tests of subsurface conditions at or contiguous to the Site are known to the Owner or Engineer.

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

- A. No reports or explorations or tests of subsurface conditions at or contiguous to the Site are known to the Owner or Engineer.
- B. Not used.

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

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

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

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

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

- a. State: Statutory
- b. Applicable Federal (e.g., Longshoremen's) Statutory
- c. Employer's Liability \$ 500,000

- 2. Contractor's General Liability under Paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody, and control of the Contractor:

- a. General Aggregate \$ 2,000,000
- b. Products - Completed Operations Aggregate \$ 1,000,000
- c. Personal and Advertising Injury \$ 1,000,000
- d. Each Occurrence (Bodily Injury and Property Damage) \$ 1,000,000
- e. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.
- f. Excess or Umbrella Liability
  - 1) General Aggregate \$ 5,000,000
  - 2) Each Occurrence \$ 5,000,000

3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions:

- a. Bodily Injury:
  - Each Person \$ 1,000,000
  - Each Accident \$ 1,000,000
- b. Property Damage:
  - Each Accident \$ 1,000,000
- c. Combined Single Limit of \$ 1,000,000

4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:

- a. Bodily Injury:
  - Each Person \$ 2,000,000
  - Each Accident \$ 2,000,000
- b. Property Damage:
  - Each Accident \$ 2,000,000
  - Annual Aggregate \$ 2,000,000

**SC-6.06 Add a new paragraph immediately after Paragraph 6.06.G:**

- H. The Contractor shall not award work valued at more than fifty (50%) percent of the Contract Price to Subcontractor(s), without prior written approval of the Owner.

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

The Engineer will provide Resident Project Representative services for this project. The Duties, Responsibilities, and Limitations of Authority of the Resident Project Representative will be as stated in Exhibit D of the Agreement Between Owner and Engineer, E-510, 2002 Edition, as amended and executed for this specific Project.

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

No payments will be made that would deplete the retainage prior to substantial completion, nor place in escrow any funds that are required for retainage, or invest the retainage for benefit.

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

- 1. The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 14.02.D will become due ten days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

**SC-18.08 Delete paragraph 18.08.A in its entirety and insert the following in its place:**

- A. If this Contract exceeds \$100,000, the Contractor shall comply with all applicable standards, orders, or requirements issued under Section 306 of the Clean Air Act (42 USC §1857(h)), Section 508 of the Clean Water Act (33 USC §1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR Part 15).

Project No.	2015045
Change Order No.	

Contract For:	Contract 1: New County Farm Pump Station
Owner:	West Laurel Water Association

County  
Laurel

**You are hereby requested to comply with the following changes from the contract plans and specifications:**

Description of Changes (Supplemental Plans and Specifications Attached)	DECREASE Contract Price	INCREASE Contract Price
TOTALS	\$ _____	\$ _____
NET CHANGE IN CONTRACT PRICE	\$ _____ _____	\$ _____ _____

**JUSTIFICATION:**

The amount of the Contract will be (Decreased) (Increased) by the sum of:

Dollars (\$)

The Contract Total including this and previous Change Orders will be:

Dollars (\$)

The Contract Period provided for completion will be (Increased) (Decreased) (Unchanged):

This document will become a supplement to the contract and all provisions will apply hereto.

Requested \_\_\_\_\_ (Owner) \_\_\_\_\_ (Date)

Recommended \_\_\_\_\_  
(Owner's Architect/Engineer) \_\_\_\_\_ (Date)

Accepted \_\_\_\_\_ (Contractor) \_\_\_\_\_ (Date)

Approved \_\_\_\_\_ (Name and Title) \_\_\_\_\_ (Date)

<b>PARTIAL PAYMENT ESTIMATE</b>				CONTRACT NO. <b>1</b>	
				ESTIMATE NO. <b>1</b>	
				PAGE <b>1 of 2</b>	
OWNER: <b>West Laurel Water Association</b>			CONTRACTOR:		PERIOD OF ESTIMATE From                      To

CONTRACT CHANGE ORDER SUMMARY				ESTIMATE	
No.	Approval Date	Amount			
		Additions	Deductions		
				1. Original Contract.....	\$0.00
				2. Change Orders .....	0.00
				3. Revised Contract (1+2) .....	0.00
				4. Work Completed * .....	0.00
				5. Stored Materials * .....	0.00
				6. Subtotal (4+5) .....	0.00
				7. Retainage * .....	0.00
				8. Previous Payments .....	0.00
				9. Amount Due (6-7-8) .....	0.00
TOTALS				* Detailed breakdown attached	
NET CHANGE					

CONTRACT TIME					
Original Days.....	160	On Schedule	<input type="checkbox"/> Yes <input type="checkbox"/> No	Starting Date .....	
Revised .....	0			Days (Original + Revised) ....	160
Remaining Days .....	0			Ending Date .....	

CONTRACTOR'S CERTIFICATION	ENGINEER'S CERTIFICATION
<p>The undersigned Contractor certifies that to the best of their knowledge, information, and belief the work covered by this estimate has been completed in accordance with the contract documents, that all amounts have been paid by the contractor for work for which previous payment estimates was issued and payments received from the owner, and that current payment shown herein is now due.</p> <p>Contractor:</p> <p>By: _____</p> <p>Date: _____</p>	<p>The undersigned certifies that the work has been carefully inspected and to the best of their knowledge and belief, the quantities shown in this estimate are correct and the work has been performed in accordance with the contract documents.</p> <p>Engineer: Kenvirons, Inc.</p> <p>By: _____</p> <p style="text-align: right;">R. Vaughn Williams, P.E.</p> <p>Date: _____</p>

APPROVED BY OWNER	ACCEPTED BY AGENCY
<p>Owner: West Laurel Water Association</p> <p>By: _____</p> <p style="text-align: right;">Jay Williams, General Manager</p> <p>Date: _____</p>	<p>The review and acceptance of this estimate does not attest to the correctness of the quantities shown or that the work has been performed in accordance with the contract documents.</p> <p>Rural Development:</p> <p>By: _____</p> <p>Date: _____</p>

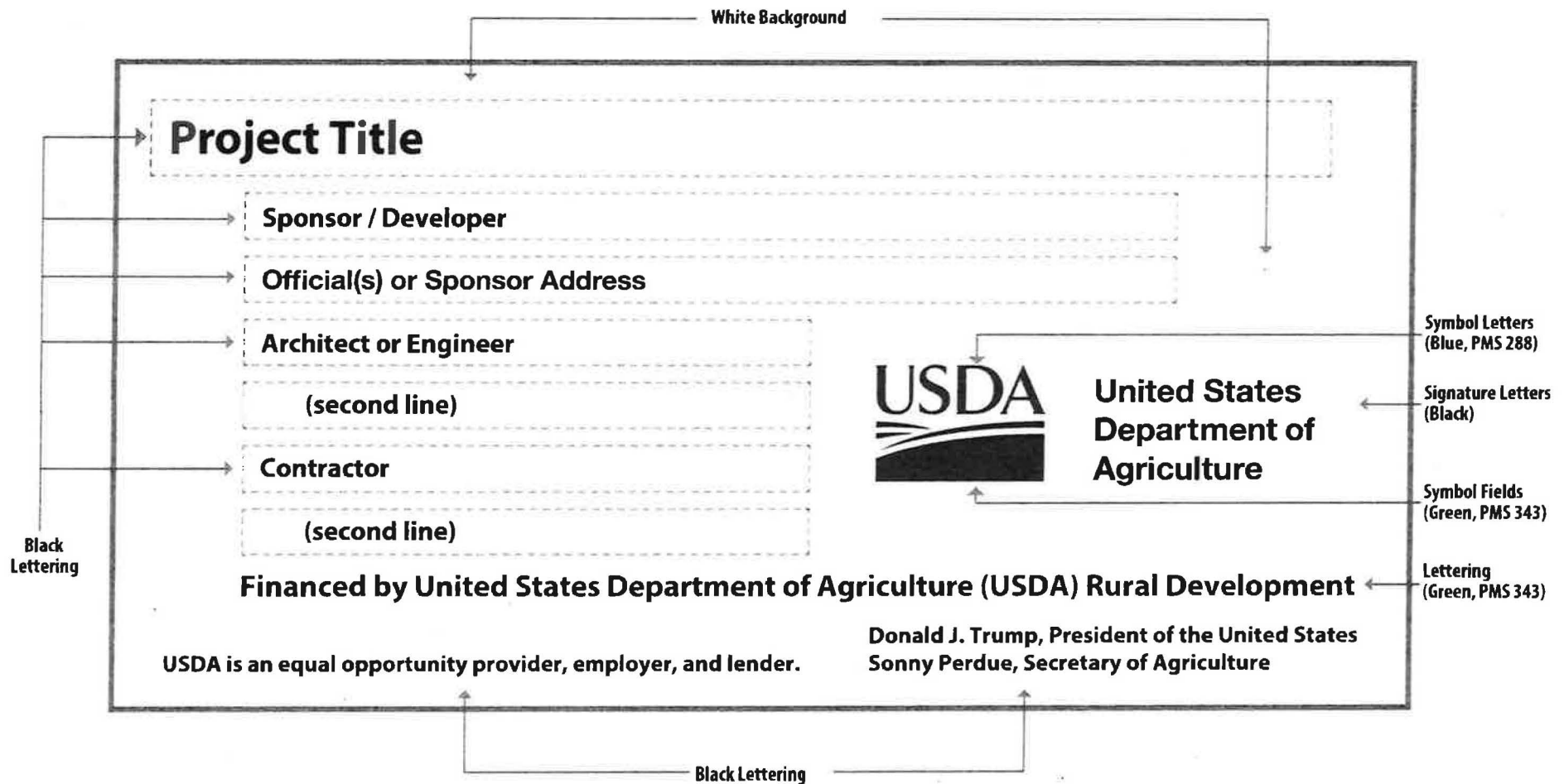
OWNER: <b>West Laurel Water Association</b>	CONTRACTOR:	PAY ESTIMATE NO. <b>1</b>
		PAGE <b>2 of 2</b>

CONTRACT ESTIMATE						PAY QUANTITIES				
Item No.	Item	Unit	Quantity	Unit Price	Total Contract Price	Previous Estimate	Current Estimate	Total to Date	Total To Date Amount	
1								0	\$0.00	
2								0	0.00	
3								0	0.00	
4								0	0.00	
5								0	0.00	
6								0	0.00	
7								0	0.00	
8								0	0.00	
9								0	0.00	
10								0	0.00	
11								0	0.00	
12								0	0.00	
13								0	0.00	
14								0	0.00	
15								0	0.00	
16								0	0.00	
17								0	0.00	
18								0	0.00	
19								0	0.00	
20								0	0.00	
21								0	0.00	
22								0	0.00	
23								0	0.00	
TOTAL PROJECT					\$0.00	TOTAL TO DATE				0.00

STORED MATERIALS									
Item No.	Item	Unit	Quantity	Purchase Price	Purchase Quantity	Purchase Amount	Quantity Used	Quantity on Hand	Total Stored Materials
1						\$0.00	0	0	\$0.00
2						0.00	0	0	\$0.00
3						0.00	0	0	\$0.00
4						0.00	0	0	\$0.00
5						0.00	0	0	\$0.00
6						0.00	0	0	\$0.00
7						0.00	0	0	\$0.00
8						0.00	0	0	\$0.00
9						0.00	0	0	\$0.00
10						0.00	0	0	\$0.00
11						0.00	0	0	\$0.00
12						0.00	0	0	\$0.00
13						0.00	0	0	\$0.00
14						0.00	0	0	\$0.00
Total Materials Purchased						0.00	Total Materials Stored		\$0.00
							Sales Tax @ 6%		\$0.00
							Total Materials and Tax		\$0.00

# TEMPORARY CONSTRUCTION SIGN FOR RURAL DEVELOPMENT PROJECTS

Recommended Fonts: Helvetica, Arial, or Myriad Pro



**SIGN DIMENSIONS** : 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")  
**PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)**

## SECTION 01000

### SUMMARY OF WORK AND BID ITEM DESCRIPTIONS

#### 1. SCOPE OF WORK PERFORMED UNDER THIS CONTRACT

This contract provides for the construction of a 2 MGD booster pump station.

#### 2. BID ITEM DESCRIPTIONS

The following Bid Item Descriptions are general in nature and may not be all inclusive. The intent is to provide broad categories of the work for bidding purposes. It is understood that the Bidder has included costs for all equipment, materials and work as shown on the Drawings and described in the Specifications and categorized those costs in one or more of the indicated Bid Items.

1. **Pump Station, complete and operable** – Construction of the new County Farm Pump Station including excavation, concrete slab foundation, foundation drains, building, pumps, all electrical and mechanical equipment, pump station piping, painting and finishing, and all other pertinent items for a complete and operable pump station.
2. **Yard Piping** – Installation of suction and discharge piping from tie-in points to pump station, including valves, fire hydrant and all necessary appurtenances. This Bid Item also includes the relocation of the London Utility Commission Sewer Force Main, as shown on the plans.
3. **Bituminous Concrete Paving** – Construction of all bituminous concrete paving per plan dimensions. Bid Item also includes 12" CMP and corresponding headwalls, as shown on plans.
4. **Crushed Stone Structural Fill (KDOT No. 9's)** – The Crushed Stone Structural Fill Unit Price shall include all Crushed Stone Structural Fill required under any structural elements. This Unit Price does not include any aggregate associated with trenching, pavements, access roads or contractor errors. This item does not apply to aggregate base under bituminous paving, sidewalks or gravel areas. There will be no compensation for over excavation beyond the plan limits. The intent of this item is to establish a unit price for crushed stone fill in the event unforeseen subsurface conditions necessitate additional foundation stabilization beyond the plan limits. The unit price shall include all costs associated with removing and disposing of unsuitable foundation material on the project site and filling with crushed stone aggregate. Aggregate shall be compacted in 6 inch lifts. Copies of the purchase tickets, indicating the rock weight, shall

be delivered to the Engineer's representative the day of the rock shipment. The tickets will be used for payment to the Contractor. No stockpiling of rock for structural fill purposes will be allowed. The cost associated with this item shall be included in the Base Bid. Upon completion of the Project, a Final Adjusting Change Order will be executed to reflect the actual quantity and cost of the structural rock fill.

5. **Telemetry Equipment Allowance** – This bid item stipulates an established cost of \$18,500 for the purchase of Telemetry (SCADA/RTU) Equipment and shall be included in the Total Base Bid. The Owner shall obtain cost quotations for the equipment and deliver the quotations to the Contractor for the purchase of the Telemetry Equipment. The Contractor shall be responsible for installing the items and all related field wiring as indicated in the plans and specifications. A contract cost adjustment will be made by Change Order to reflect the actual equipment cost. The following list of equipment will be provided by the Telemetry Equipment manufacturer. All other equipment required for a complete and operable telemetry system shall be provided by the contractor.

Equipment provided by Telemetry manufacturer:

Complete Telemetry Panel  
Antenna with mounting U-bolts  
Coaxial cable with connectors as needed  
Pressure Transmitters  
Door/Hatch Switches  
Temperature Switch

Telemetry manufacturer shall cover freight cost to jobsite. Manufacturer will make a single trip to provide startup services. A two week notice and full payment (less retainage) will be required prior to arranging startup services. Verification of installation shall be confirmed by the Contractor prior to startup.

**END OF SECTION**

## **SECTION 01001**

### **SPECIAL CONDITIONS**

#### **1.0 DAMAGE TO EQUIPMENT STORED AND/OR IN PLACE PRIOR TO INITIAL OPERATION**

A. Any equipment damaged or which has been subjected to possible damage by reason of inundation, improper storage and/or protection during the construction period of project, shall be corrected only as follows:

- i. Be replaced with new equipment.
- ii. With approval of the Engineer, be returned to the manufacturer of the equipment, or his authorized repair agency, for inspection and repair provided, however, that such repair after inspection will place the equipment in new condition, and restore the manufacturer's guarantee the same as for new equipment.

#### **2.0 SALVAGED MATERIALS AND EQUIPMENT**

A. All materials and/or equipment to be removed from existing structures and not specifically specified to be re-used shall remain the property of the Owner. Such materials and/or equipment shall be stored on sites by the Contractor as directed by the Engineer acting on the Owners behalf.

B. The use of second hand and/or salvaged materials will not be permitted, unless specifically provided for in the detailed specifications. Materials and equipment shall be new when turned over to the Owner.

#### **3.0 TEMPORARY FACILITIES**

A. Build and maintain temporary offices and storage sheds as necessary for the work. Location of temporary buildings shall be subject to the approval of the Engineer.

B. Provide temporary heat, light and power required for the work. Temporary telephone service shall be provided in the job office paid for by the General Contractor, except that the party placing a long distance call shall pay the toll charge.

C. Each Contractor shall construct and maintain, in a sanitary condition, sanitary facilities for his employees and also employees of his subcontractors. At completion of the contract work these sanitary facilities shall be properly disposed of as directed by the Engineer.

D. Temporary construction for safety measures, hoists and scaffolds shall be erected in accordance with the General Conditions.

E. Construction yard shall be located on job site. Provide security and safety protection.

F. The obtaining of all utilities for construction, including power and water, shall be the responsibility of the Contractor, and the Contractor shall bear the cost of all utilities used during construction. Cost of all connections and facilities for use of utilities shall be borne by the Contractor.

#### **4.0 PROPERTY PROTECTION**

A. Care is to be exercised by the Contractor in all phases of construction to prevent damage and injury to the property of others.

B. In connection with work performed on "private property" (property other than that belonging to the Owner), the Contractor shall confine his equipment, the storage of materials, and the operation of his workmen to the limits indicated on the plans, or to lands and right-of-way provided for the project by the Owner, and shall take every precaution to avoid damage to the private property Owner's buildings, grounds and facilities.

C. Fences, hedges, shrubs, etc. within the construction limits shall be carefully removed, preserved, and replaced when the construction is completed. Where ditches or excavations cross lawns, the sod shall be removed carefully and replaced when the backfilling has been completed. If sod is damaged or not handled properly, it shall be replaced with new sod equal to existing sod at the Contractor's expense. Grassed areas, other than lawns, shall be graded; fertilized and seeded when construction is completed. When construction is completed the private property Owner's facilities and grounds shall be restored to as good or better condition than found as quickly as possible at the Contractor's expense.

#### **5.0 CONFLICT WITH OR DAMAGE TO EXISTING UTILITIES AND FACILITIES**

A. Insofar as location data is available to the Engineers, existing underground utilities (such as waterlines, sewer lines, gas lines, telephone conduits, etc.) are accurately located on the drawings. Due, however, to the approximate nature of much of this data, the location of any particular facility cannot be certified to be correct. In general, locations and elevations shown are approximate only.

B. Before proceeding with the work, the Contractor shall confer with all public or private companies, agencies, or departments that own and operate utilities in the vicinity of the construction work. The purpose of the conference is to verify the location of, and possible interference with, the existing utilities that are shown on the Plans, arrange for necessary suspension of service, and make arrangements to locate and avoid interference with all utilities that are not shown on the Plans.

01001-2

## **6.0 CONTROL OF EROSION**

A. The Contractor shall be responsible for control of siltation and erosion from the project work. Control shall include all necessary ditching, check dams, mulching, etc. to prevent deposition of materials in roadside ditches. The Owner shall incur no extra costs from such work.

B. For construction projects disturbing an area in excess of 1.0 acre, the Contractor will be required to obtain, administer, and terminate a KPDES Storm Water Discharge Permit. Copies of the permit shall be forward to the Engineer prior to the issuance of the contract Notice to Proceed.

## **7.0 MEASUREMENT AND PAYMENT**

### **7.1 MEASUREMENT OF QUANTITIES**

All Work completed under the Agreement will be measured by the Contractor according to United States standard measure units.

Unless otherwise specified, measurement of concrete quantities will include only that volume within the neat lines as shown on the Plans or as altered by the Engineer to fit field conditions. The prismatic formula will be used in computing the volumes of structures, or portions of structures, having end sections of unequal areas.

All items which are measured by the linear foot, such as pipe, will be measured along the centerline distance of the installed item with no allowance for connections, fittings or laps at connections.

In computing volumes of excavation, borrow and embankments, the average end-area method will be used. For the purpose of ascertaining quantities, it is agreed that the planimeter shall be considered an instrument of precision adapted to the measurement of areas.

### **7.2 LUMP SUM**

When a complete structure or structural unit (in effect, "lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

### **7.3 ACTUAL QUANTITIES**

When actual quantities for a specific portion of the Work are designated as the pay quantities in the Contract Documents, they shall be the final quantities for which payment for such specific portion of the Work will be made. The actual quantities will be determined by field measurements during construction.

#### **7.4 SCOPE OF PAYMENT**

The contract unit prices whether based on lump sum, actual quantities for the various bid items of the Contract Documents shall be considered full compensation for all labor, materials, supplies, equipment, tools, and all things of whatever nature required for the complete incorporation of the item into the Work.

#### **7.5 PAYMENTS**

Estimates for payment, partial payments and final payments shall be in accordance with and follow procedures set forth in the General Conditions and Supplementary Conditions.

#### **8.0 ACCESS ROADS**

A. The Contractor, Contractor's employees and all trucks delivering equipment, supplies or materials to the project shall use the access roads shown in the Plans for entering and leaving the project sites.

#### **9.0 TESTING LABORATORY SERVICES**

##### **A. GENERAL**

Periodic testing shall be performed to determine that materials provided comply with the specified requirements; such testing includes, but is not necessarily limited to:

- i. Material Compaction
- ii. Cast-In-Place Concrete
- iii. Grout

##### **B. RELATED WORK DESCRIBED ELSEWHERE**

Requirements for testing may be described in various Sections of these Specifications; where no testing requirements are described, but the Owner decides that testing is needed, the OWNER may require testing be performed under current pertinent standards for testing.

##### **C. SELECTION OF TESTING LABORATORY**

The Contractor shall submit the credentials of the testing laboratory to the Engineers for review. Laboratories not qualified to perform the tests will not be approved.

**D. CODES AND STANDARDS**

Testing shall be conducted in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

**E. TEST RESULTS HANDLING**

The Contractor shall promptly process and distribute all required copies of test reports to ensure all necessary retesting and/or replacement of materials may be accomplished with the least possible delay in progress of the Work.

**F PAYMENT FOR TESTING SERVICES**

The Contractor will pay for all testing services required by the specifications. All additional testing beyond the requirements of the specifications and as requested by the Owner will be paid by the Owner.

- i. **RETESTING.** When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting shall be paid by the Contractor.
- ii. **CONTRACTOR'S CONVENIENCE TESTING.** Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

**G. COOPERATION WITH TESTING LABORATORY**

Representatives of the testing laboratory shall have access to the Work at all times. The Contractor shall provide facilities for such access in order that the laboratory may properly perform its functions.

**10.0 SUBMITTALS AND SUBSTITUTIONS**

**A. GENERAL**

The minimum acceptable quality of workmanship and materials may be defined either by manufacturer's name and catalog number or by reference to recognized industry standards. To insure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for its review and approval, or rejection, by the Engineer.

Contractual requirements for submittals are described in the General Conditions and Supplementary Conditions.

All shop drawings shall be submitted, reviewed, and returned digitally using Portable Document Format (pdf).

## B. SUBSTITUTIONS

ENGINEER'S APPROVAL REQUIRED. The Agreement is based on the materials, equipment, and methods described in the Contract Documents. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer to evaluate the proposed substitution. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this Work by the Engineer.

"OR EQUAL". Where the phrase "or equal" occurs in the Contract Documents, do not assume that material, equipment, or methods will be approved as equal by the Engineer unless the item has been specifically approved for this Work. The decision of the Engineer shall be final.

## C. AVAILABILITY OF SPECIFIED ITEMS

The Contractor shall verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the Work. In the event the specified item or items will not be so available, the Contractor shall notify the Engineer prior to receipt of Bids.

## D. IDENTIFICATION OF SUBMITTALS

The Contractor shall completely identify each submittal and resubmittal by showing at least the following information:

- i. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
- ii. Name of project as it appears in these Specifications.
- iii. Drawing number and Specifications Section number to which the submittal applies.
- iv. Whether this is an original submittal or resubmittal.

## E. COORDINATION OF SUBMITTALS

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

- i. Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
- ii. Coordinate as required with all trades and with all public agencies involved.

- iii. Secure all necessary approvals from public agencies and others and signify by stamp, or other means, that they have been secured.
- iv. Clearly indicate all deviations from the Contract Documents.

**F. GROUPING OF SUBMITTALS**

Unless otherwise specifically permitted by the Engineer, the Contractor shall make all submittals in groups containing all associated items; the Engineer may reject partial submittals as not complying with the provisions of the Contract Documents.

**G. TIMING OF SUBMITTALS**

The Contractor shall make all submittals far enough in advance of schedule dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery. In scheduling, allow at least five full working days for the Engineer's review following his receipt of the submittal.

**11.0 INSTALLATION REQUIREMENTS**

A. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise specified.

**12.0 PROJECT RECORD DOCUMENTS**

A. As the Work progress, the Contractor shall keep a complete and accurate record of changes or deviations from the Contract Documents and the Shop Drawings, indicating the Work as actually installed. Changes shall be neatly and correctly shown on the respective portion of the affected document, using black line prints of the Drawings affected, or the Specifications, with appropriate supplementary notes. This record set of Drawings, Shop Drawings, and Specifications shall be kept at the job site for inspection by the Engineer.

B. The records above shall be arranged in order, in accordance with the various sections of the Specifications, and properly indexed. Prior to application for final payment, and as a condition to its approval by the Engineer, deliver the Record Drawings and Shop Drawings, arranged in proper order, indexed, and endorsed as hereinbefore specified.

C. No review or receipt of such records by the Engineer or Owner shall be a waiver of any deviation from the Contract Documents or the Shop Drawings or in any way relieve the Contractor from his responsibility to perform the Work in accordance

with the Contract Documents and the Shop Drawings to the extent they are in accordance with the Contract Documents.

### **13.0 PROJECT MEETINGS**

A. The Contractor's Superintendent for the Work shall attend monthly project meetings.

## **SECTION 02200**

### **EARTHWORK**

#### **PART 1 - GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### **1.2 DEFINITIONS**

- A. Excavation consists of removal of material encountered to subgrade elevations indicated and approved, and subsequent disposal of materials removed.
- B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of ENGINEER. Unauthorized excavation shall be at Contractor's expense.
  - 1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to ENGINEER.
  - 2. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by ENGINEER.
- C. Additional Excavation: When excavation has reached required subgrade elevations, notify Engineer, who will make an inspection of conditions. If Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer.
  - 1. Removal of unsuitable material and its replacement as directed will be paid on basis of conditions of the Contract relative to changes in work.
- D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular sub-base, drainage fill, or topsoil materials.
- E. Structure: Buildings, foundations, slabs, bins, curbs, or other man-made stationary features occurring above or below ground.

### **1.3 SUBMITTALS**

- A. Submit manufacturer's standard literature and drawings for materials proposed for use on the Project.

### **QUALITY ASSURANCE**

- A. Special Inspection (Kentucky Building Code 2002, Section 1704):

1. Special Inspections to be performed under this contract is listed under General Provisions of Structural Drawings. If special inspection is required, Owner will retain the services of a Special Inspector of Record at His/Her cost to inspect all applicable work under this contract and this Contractor is responsible for providing safe access to all areas of work under this contract to be inspected at no additional cost to the Owner or His/Her Agents. No concreting shall take place without written approval of the Special Inspector of Record (SIR). Any progression of work without the approval of the SIR will be subject to demolition at this contractor's expense.
2. The extent of special inspection to be performed is listed in Table 1704.4 of the Kentucky Building Code 2002 (KBC 2002).
3. The Contractor shall retain the services of an Independent Testing Laboratory and pay for their services to execute all the testing required under this section. Four copies of the test reports shall be sent directly by the Testing Laboratory to the ENGINEER within five working days after performing the tests. All reports submitted shall be signed and stamped by a Professional Engineer registered to practice in the State of Kentucky. The Engineer shall carry professional liability insurance to a minimum limit of \$1,000,000 per occurrence and submit Certificate of Insurance with ENGINEER as "Additional Insured" along with the test reports.

### **1.4 PROJECT CONDITIONS**

- A. Site Information: The condition and/or characteristics of the soils and rock on the project are unclassified. Contractor may perform test borings and other exploratory operations, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.

- B. Protection of existing lines and utility structures.

The Contractor shall be responsible for notifying all utilities and have the utility companies locate their facilities within the project limits. Existing utility lines shall be protected from damage during excavation and filling, and if damaged, shall be repaired by the Contractor at his expense.

Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility.

- C. Place protective fencing around all excavations.
- D. Cover holes and trenches when work is not in progress.
- E. Use of Explosives: Use of explosives is permitted at Contractors option. Any resulting damages from blasting to the adjacent buildings, Structures, Utility services, Loss of Life or Limb shall be at the Contractor's expense.

## **PART 2 - PRODUCTS**

### **2.1 SOIL MATERIALS**

- A. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.
- B. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- C. Sub-base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, and natural or crushed sand.
- D. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1 - 1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.
- E. 1. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
  - 2. Suitable materials for fill shall be on site materials from excavation or borrow approved by the Engineer. The location of the borrow will be at the Contractor's option based on the recommendations of the Engineer.

## **PART 3 - EXECUTION**

### **3.1 EXCAVATION**

- A. Excavation consists of removal and disposal of materials encountered when establishing required sub-grade elevations.

### **3.2 STABILITY OF EXCAVATIONS**

- A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.

### **3.3 DEWATERING**

- A. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
  - 1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
  - 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.

### **3.4 STORAGE OF EXCAVATED MATERIALS**

- A. Stockpile excavated materials acceptable for backfill and fill where directed. Place, grade, shape and protect stockpiles for proper drainage and control of moisture content.
  - 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
  - 2. Dispose of excess excavated soil material and materials not acceptable for use as backfill or fill.

### **3.5 EXCAVATION FOR STRUCTURES**

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, and other construction and for inspection.
  - 1. Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

### **3.6 COLD WEATHER PROTECTION**

- A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.

### **3.7 BACKFILL AND FILL**

- A. General: Place soil material in layers to required subgrade elevations, for each area classification listed below, using materials specified in Part 2 of this Section.
  - 1. Under building pad and grassed areas, use satisfactory excavated, imported or borrow material.
  - 2. Under walks and pavements, use sub-base material on satisfactory excavated, imported or borrow material.
  - 3. Directly under building slabs and steps use drainage and sub-base fill materials.
- B. Backfill excavations as promptly as work permits, but not until completion of the following:
  - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
  - 2. Inspection, testing, approval, and recording locations of underground utilities have been performed and recorded.
  - 3. Removal of concrete formwork.
  - 4. Removal of trash and debris from excavation.
  - 5. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

### **3.8 PLACEMENT AND COMPACTION**

- A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
  - 1. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.
- B. Place backfill and fill materials in layer not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand operated tampers.
- C. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of

maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

D. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

E. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Geotechnical Engineer if soil density tests indicate inadequate compaction.

1. Percentage of Maximum Density Requirements: Compact soil to less than the following percentages of maximum density, in accordance with ASTM D 1557:

a. Under structures, building slabs and steps, and pavements, compact top 12 inches of subgrade and each layer of backfill or fill material at 98 percent maximum density.

b. Under lawn or unpaved areas, compact top 6 inches of subgrade and each layer of backfill or fill material at 90 percent maximum density.

c. Under walkways, compact top 6 inches of subgrade and each layer of backfill or fill material at 95 percent maximum density.

2. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade or layer of soil material. Apply water in minimum quantity as necessary to prevent free water from appearing on surface during or subsequent to compaction operations.

a. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

b. Stockpile or spread soil material that has been removed because it is too wet to permit compaction. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value.

F. Remove all abandoned existing utilities and replace with compacted backfill. Plugging of pipes is acceptable as an alternate.

### **3.9 GRADING**

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within

specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:
  - 1. Lawn or Unpaved Areas: Finish surface of areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
  - 2. Walks: Finish surface of areas under walks to line, grade and cross-section, and to within not more than 0.10 foot above or below required subgrade elevation.
  - 3. Pavements: Shape surface of areas under pavement to line, grade and cross-section, and to within not more than 0.05 foot above or below required subgrade elevation.
- C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

### **3.10 BUILDING SLAB DRAINAGE COURSE**

- A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.
- B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.
  - 1. When a compacted drainage course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

### **3.11 FIELD QUALITY CONTROL**

- A. Quality Control Testing During Construction: Allow Testing Laboratory retained by the Contractor to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.

- a. Field density tests may also be performed by the nuclear method in accordance with ASTM D 2922, providing that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. In conjunction with each density calibration check, check the calibration curves furnished with the moisture gages in accordance with ASTM D 3017.
  - b. If field tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Geotechnical Engineer.
1. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata when acceptable to Geotechnical Engineer.
  2. Paved Areas and Building Slab Subgrade: Perform at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case fewer than three tests.
  3. If in opinion of Geotechnical Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, perform additional compaction and testing until specified density is obtained.

### **3.12 EROSION CONTROL**

- A. Provide erosion control methods in accordance with the requirements of authorities having jurisdiction.
- B. Silt and erosion control for the project shall be achieved by placing barrier(s), as necessary, to prevent, or substantially impede, eroded soils from washing away from the project site. The barriers shall utilize porous filter-fabric, 36" wide, 25 mils thick, weighing at least 5.5 oz. per sq. yard, E.O.S: U.S. Sieve 20, Mullen Burst: 540 psi, Tensile Grab: 220 pounds, UV Resistance: 90% after 500 weatherometer hours, as Manufactured by American Excelsior Company, or approved equivalent. Silt-fences for tempoary control at other areas of the site shall utilize porous filter-fabric, 36" wide, 6 mils thick, weighing at least 2.5 oz. per sq. yard, E.O.S: U.S. Sieve 70-100, Mullen Burst: 200 psi, Tensile Grab: 120 pounds, UV Resistance: 90% after 500 weatherometer hours, as Manufactured by American Excelsior Company, or approved equivalent.

Silt check dams shall be constructed from rip-rap sized, durable, rock material. At the conclusion of construction, this rock shall be removed and the areas regraded and vegetated.

### **3.13 MAINTENANCE**

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

### **3.14 DISPOSAL OF EXCESS AND WASTE MATERIALS**

- A. Removal from Owner's Property: Remove waste materials, including unacceptable excavated material, trash, and debris, and dispose of it off Owner's property.

### **3.15 SEEDING AND SODDING**

- A. Upon completion of the installation of the work, the Contractor shall remove all debris and surplus construction materials resulting from the work. The Contractor shall fine grade all the disturbed surfaces around the area of the work in a uniform and neat manner leaving the construction area in a condition as near as possible to the original ground line or to the lines as directed by the Engineer.
- B. All graded areas shall be left smooth and thickly sown with a mixture of grasses. The mixture of grasses shall consist of one-third (1/3) Rye grass, one-third (1/3) Kentucky Fescue and one-third (1/3) Kentucky Bluegrass by weight, and shall be applied to the graded areas at a rate of not less than 1 pound of seed per one thousand square feet of area. When the final grading has been completed, the entire graded area to be seeded shall be fertilized with 12-12-12 fertilizer, applied at the rate of 6 pounds per one thousand square feet of area. After the seed and fertilizer have both been applied, the Contractor shall then lightly cover the seed by use of a drag or other approved device. The seeded area shall then be covered with straw to a depth of approximately one inch (1").
- C. Where existing lawns have been disturbed, the existing sod will be removed and stored and replaced to its original position once the work is in place. If the Contractor damages or destroys the original sod, it shall be replaced with a sod having at least 60% good quality Kentucky Bluegrass, strongly rooted and free of pernicious weeds and shall be so laid that no voids occur between strips. When placing sod, it shall be tamped or rolled immediately after it is laid and the finished surface shall be true to grade, even and equally firm at all points. Well screened top soil shall be lightly sprinkled over the sodded areas and shall be raked to insure sealing the sod joints. The sodded areas shall be thoroughly watered. Sod damaged by the Contractor shall be replaced with new sod by the Contractor at no cost to the Owner.

- D. The fine grading, seeding, sodding and clean-up shall be considered as incidental expense and shall not be separate pay items.
- E. Meadows and hay fields will require replacement in kind unless the Contractor secures a release from the property Owner agreeing to no replacement or alternate replacement.

END OF SECTION

## **SECTION 03251**

### **EXPANSION, CONSTRUCTION, AND CONTROL JOINTS**

#### **1.0 GENERAL**

##### **1.1 REFERENCES**

A. The following is a list of standards which may be referenced in this section:

1. American Society for Testing and Materials (ASTM):
  - a. A36, Standard Specification for Structural Steel.
  - b. A525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
  - c. D226, Standard Specification for Asphalt- Saturated Organic Felt Used in Roofing and Waterproofing.
  - d. D227, Standard Specification for Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing.
  - e. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type) (AASHTO M33).
  - f. D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
  - g. D 175 1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
2. Corps of Engineers (COE): CRD-C-572, Corps of Engineers Specifications for Polyvinylchloride Water stop.
3. American National Standards Institute (ANSI): ANSI/NSF 61, Drinking Water System Components, Health Effects.

##### **1.2 SUBMITTALS**

A. Shop Drawings-

1. Plastic Type Water Stops: Details of splices to be used and method of securing water stop in the forms and supporting water stop so as to maintain proper orientation and location during concrete placement.
2. Construction Joints: Layout and location indicating type to be used.
3. Joint fillers for horizontal joints.
4. Preformed control joints.
5. Water stop.

B. Samples: Splice, joint, and fabricated cross of each size, shape, and fitting of water stop(s) proposed for use.

C. Quality Control Submittals:

1. Joint Filler for Potable Water Structures: Copy of applicable NSF listing.
2. Water stop manufacturer's written instructions for product shipment, storage, handling, installation field splices, and repair.
3. Joint Filler and Primer: Manufacturer's written instructions for product shipment, storage, handling, application, and repair.
4. Preformed Control Joint: Manufacturer's written instructions for product shipment, storage, handling, application, and repair.

### 1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Acceptance of pourable joint filler for potable water structures by federal EPA or by a state health agency.

1. Pourable Joint Filler: Certified as meeting NSF 61.

B. Special Inspection (Kentucky Building Code 2007, Section 1704) :

1. Special Inspections to be performed under this contract is listed under General Provisions of Structural Drawings. If special inspection is required, Owner will retain the services of a Special Inspector of Record to inspect all applicable work under this contract and this Contractor is responsible for providing safe access to all areas of work under this contract to be inspected at no additional cost to the Owner or His/Her Agents. No reinforcing steel erection or concreting shall take place without written approval of the Special Inspector of Record (SIR). Any progression of work without the approval of the SIR will be subject to demolition at this contractor's expense. At the completion of the Special Inspection secure a written approval from the SIR for placing concrete in the forms that were approved for concreting.
2. The extent of special inspection to be performed is listed in the Kentucky Building Code, latest edition.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site: Verify that water stops delivered are in accordance with cross-section dimensions as shown and manufacturer's product data prior to unloading and storing onsite.

## **2.0 PRODUCTS**

### **2.1 LABYRINTH WATER STOP**

- A. Extruded from polyvinyl chloride (PVC) in conformance with Corps of Engineers' Specification CRD-C-572.
- B. Size and configuration as shown.

### **2.2 PLASTIC WATER STOP**

- A. Extruded from an elastomeric plastic compound of which the basic resin shall be polyvinyl chloride (PVC). Reclaimed PVC in the compound is not acceptable.
- B. Specific Gravity: Approximately 1.37.
- C. Shore Durometer Type A Hardness: Approximately 80.
- D. Performance Requirements: Corps of Engineers' Specification CRD-C-572.
- E. Type: Center bulb with a number of parallel ribs or protrusions on each side of strip center.
- F. Corrugated or tapered type water stops are not acceptable.
- G. Thickness: Constant from bulb edge to the outside stop edge.
- H. Minimum Weight per Foot of Water Stop:
  - 1. 1.62 pounds for 3/8-inch by 6-inch.
  - 2. 2.30 pounds for 3/8-inch by 9-inch.
- I. Manufacturers and Catalog Numbers:
  - 1. Vulcan Metal Products, Inc., Construction Materials Division, Birmingham, AL; Catalog No. 3/81-15M: Type 8069 (6-inch by 3/8-inch).
  - 2. Vinylex Corp., Knoxville, TN; Catalog No. 03250/VIN: No. RB6-38H (6-inch by 3/8-inch).
  - 3. Greenstreak Plastic Products, St. Louis, MO; Catalog No. 03250/GRD: Style 732 (6-inch by 3/8-inch).
  - 4. A. C. Horn, Inc., Beltsville, MD; Catalog No. CSP-162: Type 9 (6-inch by 3/8-inch).

## 2.4 WIRE LOOPED PLASTIC WATER STOP

- A. Furnish as an alternative to plastic water stops.
- B. Same material and geometry as plastic water stops.
- C. Furnish with continuous galvanized wire looping at edge for convenience in positioning and securing stop in place in the forms.
- D. Manufacturers and Catalog Numbers: Paul Murphy Plastics, Roseville, MI; "Wire Stop Water Stop", - geometry numbers ACR 6380, ACR 9380, as shown on Paul Murphy Plastics Co. Drawing No. CCP-120-12M.

## 2.5 BOND BREAKER

- A. Tape for Expansion Joints: Adhesive-backed glazed butyl or polyethylene tape same width as the joint that will adhere to the premolded joint material or concrete surface.
- B. Use either bond breaker tape or a bond prevention material as specified in Section 03310, CONCRETE WORK, except where a tape is specifically called for.

## 2.6 PREMOLDED JOINT FELLER

- A. Bituminous Type: ASTM D994 or D1751
- B. Sponge Rubber: Neoprene, closed-cell, expanded; ASTM D1056, Type 2C5, with a compression deflection, 25 percent deflection (limits), 119 to 168 kPa (17 to 24 psi) minimum.
  - 1. Manufacturer and Product: Rubatex Corp.; R45 IN.

## 2.7 PREFORMED CONTROL JOINT

- A. One-Piece, Flexible, Polyvinyl Chloride Joint Former:
  - 1. Manufacturer and Product: Vinylex Corp., Knoxville, TN- Kold-Seal Zip-Per Strip KSF-150-50-50.
- B. One-Piece Steel Strip with Preformed Groove:
  - 1. Manufacturer and Product: Burke Concrete Accessories, Inc., San Mateo, CA; Keyed Kold Retained Kap.
- C. Furnish in full-length, un-spliced pieces.

## 2.8 POURABLE JOINT FILLERS

### A. Filler for Potable Water Structures:

1. Meet requirements of ANSI/NSF 61
2. Multicomponent sealant, self-leveling or non-sag as required for level, sloping, or vertical joints.
3. Color: White.
4. Manufacturers and Products:
  - a. Sika Chemical Co., Lyndhurst, NJ; Sikaflex-2C or Sikaflex-1A.
  - b. Product Research Chemical Corp., Gloucester City, NJ; Permapol RC-270SL Reservoir Sealant or RC-270 Gun Grade Reservoir Sealant, with PRC Primer No. 57.

## 2.9 STEEL EXPANSION JOINT DOWELS

- A. Dowels: ASTM A36 round smooth steel bars.
- B. Bar Coating: Two-coat System No. 29A, FUSION BONDED, STEEL DOWEL COATING, as specified in Section 09901, HIGH PERFORMANCE COATINGS with a factory-applied lubricating coating.

## 2.10 ACCESSORIES

- A. Joint Sealants: As specified in Section 07900, JOINT SEALANTS.
- B. Non-shrink Grout:
  1. As specified in Section 03600, GROUT.
  2. Compatible with joint sealant.
- C. Roofing Felt: ASTM D226, Type II, 30-pound asphalt-saturated or equal weight of ASTM D227 coal-tar saturated felt.
- D. Reinforcing Steel: As specified in Section 05120, STRUCTURAL STEEL.
- E. Nails: As required for securing bituminous type premolded joint filler.
- F. Masking Tape: As required to temporarily adhere to concrete at each side of joint to receive filler.

### 3.0 EXECUTION

#### 3.1 GENERAL

- A. Construct straight joints; make vertical or horizontal, except where walls intersect sloping floors.
- B. Commence concrete placement after the joint preparation is complete.
- C. Time Between Concrete Pours: As specified in Section 03310, CONCRETE WORK.

#### 3.2 SURFACE PREPARATION

- A. Construction Joints: Prior to placement of abutting concrete, clean contact surface:
  - 1. Remove laitance and spillage from reinforcing steel and dowels.
  - 2. Roughen surface to a minimum of 1/4-inch amplitude:
    - a. Sandblast after the concrete has fully cured.
    - b. Water blast after the concrete has partially cured
    - c. Green cut fresh concrete with high pressure water and hand tools.
  - 3. Perform cleaning so as not to damage water stop, if one is present.
- B. Expansion Joint with Pourable Filler:
  - 1. Use motorized wire brush or other motorized device to mechanically roughen and thoroughly clean concrete surfaces on each side of joint from plastic water stop to the top of the joint.
  - 2. Use clean and dry high pressure air to remove dust and foreign material, and dry joint.
  - 3. Prime surfaces before placing joint filler.
  - 4. Avoid damage to water stop.
- C. Expansion Joint without Pourable Filler:
  - 1. Coat concrete surfaces above and below plastic water stop with bond breaker.
  - 2. Do not damage water stop.
- D. Control Joint:
  - 1. Join water stops at intersections to provide continuous seal.
  - 2. Center water stop on joint.
  - 3. Secure water stop in correct position to avoid displacement during concrete placement.

4. Repair or replace damaged water stop.
5. Place concrete and vibrate to obtain impervious concrete in the vicinity of all joints.
6. Joints in Footings and Slabs:
  - a. Ensure that space beneath plastic water stop is completely filled with concrete.
  - b. During concrete placement, make a visual inspection of the entire water stop area.
  - c. Limit concrete placement to elevation of water stop in first pass, vibrate the concrete under the water stop, lift the water stop to confirm full consolidation without voids, then place remaining concrete to full height of slab.
  - d. Apply procedure to full length of plastic water stops.

### 3.3 INSTALLATION OF WATER STOPS

#### A. General:

1. Join water stops at intersections to provide continuous seal.
2. Center water stop on joint.
3. Secure water stop in correct position to avoid displacement during concrete placement.
4. Repair or replace damaged water stop.
5. Place concrete and vibrate to obtain impervious concrete in the vicinity of all joints.
6. Joints in Footings and Slabs:
  - a. Ensure that space beneath plastic water stop is completely filled with concrete.
  - b. During concrete placement, make a visual inspection of the entire water stop area.
  - c. Limit concrete placement to elevation of water stop in first pass, vibrate the concrete under the water stop, lift the water stop to confirm full consolidation without voids, then placing remaining concrete to full height of slab.
  - d. Apply procedure to full length of plastic water stops.

#### B. Labyrinth Water Stops: Install in accordance with the manufacturer's written instructions. Use heat butt weld splices only.

#### C. Plastic Water Stop:

1. Install in accordance with manufacturer's written instructions.
2. Splice in accordance with the water stop manufacturer's written instructions using a thermostatically controlled heating iron. Butt splice unless specifically detailed otherwise.
  - a. Allow at least 10 minutes before the new splice is pulled or strained in any way.

- a. Finished splices shall provide a cross-section that is dense and free of porosity with tensile strength of not less than 80 percent of the un-spliced materials.
3. Wire looped plastic water stop may be substituted for plastic water stop.

### 3.4 EXPANSION JOINT INSTALLATION

#### A. General:

1. Place bond breaker above and below water stop when premolded joint filler and pourable joint filler is not used.
2. Premolded Joint Filler:
  - a. Sufficient in width to completely fill the joint space where shown.
  - b. If a water stop is in the joint, cut premolded joint filler to but tightly against the water stop and the side forms.
3. Precut premolded joint filler to the required depth at locations where joint filler or sealant is to be applied.
4. Form cavities for joint filler with either precut, premolded joint filler, or smooth removable accurately shaped material. Entire joint above water stop, in slabs, shall be formed and removed so that entire space down to water stop can be filled with the pourable joint filler.
5. Vibrate concrete thoroughly along the joint form to produce a dense, smooth surface.

#### B. Bituminous Type Premolded Joint Filler:

1. Drive nails approximately 1-foot 6 inches on center through the filler, prior to installing, to provide anchorage embedment into the concrete during concrete placement.
2. Secure premolded joint filler in forms before concrete is placed.
3. Install in walkways, at changes in direction, at intersections, at each side of driveway entrances, and at 45-foot intervals, maximum.

#### C. Pourable Joint Filler:

1. General: Install in accordance with the manufacturer's written instructions, except as specified below:
  - a. Apply primer prior to pouring joint filler.
  - b. Fill entire joint above the water stop with joint filler as shown.
  - c. Use masking tape on top of slabs at sides of joints; clean spillage. Remove masking tape afterwards.
2. Rubber Asphalt Type, Hot-Applied:
  - a. Heat filler material in a double-walled boiler.
  - b. Place filler in the joint by means of a nozzle from a portable pouring type container to prevent spillage outside of the joint.

- c. Begin pouring joint filler at the bottom of the horizontal joint and proceed upwards in a manner that will preclude the possibility of trapping air in the joint.
3. Rubber Asphalt Type, Cold-Applied: Place cold-applied, two-component fillers in accordance with manufacturer's written instructions.
4. Multicomponent Type for Potable Water Structures: Install in accordance with manufacturer's written instructions.

D. Steel Expansion Joint Dowels:

1. Install coated and lubricated bars parallel to wall or slab surface and in true horizontal position perpendicular to the joint in both plan and section view, so as to permit joint to expand or contract without bending the dowels.
2. Secure dowels tightly in forms with rigid ties.
3. Install reinforcing steel in the concrete as shown to protect the concrete on each side of the dowels and to resist any forces created by joint movement.

### 3.5 CONTROL JOINT INSTALLATION

- A. Locate reinforcing and dowels as shown.
- B. Install PVC water stop.
- C. Concrete surfaces shall be dense and smooth.
- D. Install bond breaker to concrete surfaces above and below water stop.

### 3.6 PREFORMED CONTROL JOINTS

- A. Use only where specifically shown; do not use in water-holding basins.
- B. Locate flush, or slightly below the top of slab.
- C. Install in accordance with manufacturer's written instructions in straight, full length un-spliced pieces.
- D. Steel Strip Type with Preformed Groove: Brace to withstand pressure of concrete during and after placement.

END OF SECTION

## **SECTION 03310**

### **CONCRETE WORK**

#### **1.0 GENERAL**

##### **1.1 DESCRIPTION**

- A. Work Included: Extent of concrete work is shown on drawings.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not limited to, General Conditions, Supplementary Conditions, and Division 1 of these Specifications.
  - 2. Section 02220: Earthwork.
  - 3. Section 03251: Expansion, Construction and Control Joints
  - 4. Section 03600: Grout

##### **1.2 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified:
  - 1. ACI 301 "Specifications for Structural Concrete for Buildings"
  - 2. ACI 318 "Building Code Requirements for Reinforced Concrete"
  - 3. ACI 350 R – "Environmental Engineering Concrete Structures"
  - 4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
- B. Concrete Testing Services
  - 1. Engage a testing laboratory acceptable to ENGINEER to perform material evaluation tests and to design concrete mixes.
  - 2. Contractor will engage testing laboratory to perform sampling and testing during placement of concrete.
  - 3. Contractor will engage a testing laboratory to conduct tests of compression test specimens.
  - 4. Materials and installed work may require testing and retesting as directed by ENGINEER, at any time during progress of work. Allow free access to material stockpiles and facilities. Retesting of rejected materials and installed work shall be done at Subcontractor's expense.

### **1.3 SUBMITTALS**

- A. **Product Data:** Submit data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by ENGINEER.
- B. **Shop Drawings - Reinforcement:** Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.
- C. **Laboratory Test Reports:** Submit laboratory test reports for concrete materials and mix design test as specified.
- D. **Material Certificates:** Provide materials certificates in lieu of materials laboratory test reports when permitted by ENGINEER. Material certificates shall be signed by manufacturer and Subcontractor, certifying that each material item complies with, or exceeds, specified requirements.

## **2.0 PRODUCTS**

### **2.1 FORM MATERIALS:**

- A. **Forms for Exposed Finish Concrete:** Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection. Use plywood complying with U. S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. **Forms for Unexposed Finish Concrete:** Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
- D. Forms for Textured Finish Concrete: Form textured finish concrete surfaces with units of face design, size, arrangement and configuration as shown on drawings or as required to match ENGINEER's control sample. Provide solid backing and form supports to ensure stability of textured form liners.
- E. Cylindrical Columns and Supports: Form round-section members with fiberglass reinforced plastic, or paper or fiber tubes. Construct paper or fiber tubes of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.

## 2.2 REINFORCING MATERIALS:

- A. Reinforcing Bars: ASTM A615, Grade 60, deformed.
- B. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications, unless otherwise acceptable.
  - 1. For slabs-on-grade: Use supports with sand plates or horizontal runners where base material will not support chair legs.
  - 2. For exposed-to-view concrete surfaces: Where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

## 2.3 CONCRETE MATERIALS:

- A. Portland Cement: ASTM C150, Type II, unless otherwise acceptable to ENGINEER. Use one brand of cement throughout project, unless otherwise acceptable to ENGINEER.
- B. Fly Ash: ASTM C618, Type C or Type F. Loss on ignition shall not exceed 3 1/2%. Limit use of fly ash to not exceed 25% of cement content by weight.

- C. Normal Weight Aggregates: ASTM C33, and as herein specified. Provide aggregates from a single source for exposed concrete.
  - 1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
  - 2. For interior slabs-on-grade coarse aggregates shall be graded such that not more than 18 percent nor less than 8 percent of the total aggregate is retained on the 3/4", 1/2", 3/8" and number 4 sieves.
- D. Water: Drinkable.
- E. Admixtures: The amount of water soluble chloride ions added to the mix by the admixtures shall not exceed 0.3% by weight of cement. Provide admixture manufacturer's written certification of weight of added chloride ions per ounce for each admixture.
  - 1. Air-Entraining Admixture: ASTM C260.
  - 2. Water-Reducing Admixture: ASTM C494, Type A
  - 3. High-Range Water-Reducing Admixture (SuperPlasticizer): ASTM C494, Type F or Type G
  - 4. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C494 Type E
  - 5. Water-Reducing, Retarding Admixture: ASTM C494, Type D

## 2.4 RELATED MATERIALS

- A. Waterstops: Provide waterstops at construction joints as indicated. Size to suit joints.
  - 1. Polyvinyl Chloride Waterstops
- B. Joint Filler: ANSI/ASTM D994, bituminous impregnated fiberboard; closed cell neoprene; self-expanding cork; of the size detailed and in locations indicated on the Drawings. Bituminous impregnated fiberboard shall not be used to fill joints in liquid retaining structures.
- C. Joint Covers: ANSI/ASTM B221; alloy extruded aluminum retainers with resilient neoprene fill strip; extruded aluminum cover plate; 25 shore hardness; to permit plus or minus 50 percent joint movement; of longest manufactured length; mounted as detailed or per manufacturer's recommendations.

- D. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ASTM E154, as follows:
  - 1. Polyethylene sheet not less than 8 mils thick.
- E. Non-Shrink Grout: CRD-C 621, factory pre-mixed grout.
- F. Smooth Dowels: Provide smooth dowels fabricated from plain steel bars conforming to ASTM A-615 or approved equal.
- G. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C309, Type I, Class A with % solids not less than 25%. Moisture loss not more than 0.03 gr./sq. cm. when applied at 300 square ft./gal.
- H. Impervious sheet conforming to ASTM C-171, polyethylene film shall be white opaque.
- I. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.

## 2.5 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete as follows:
  - 1. Prepare concrete mixes, other than slab on grade concrete in accordance with ACI 301 Section 4.2.3
  - 2. Prepare slab on grade concrete mixes in accordance with ACI 302 Section 5.2.4 (Method B).
- B. Submit written reports to ENGINEER of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by ENGINEER.
- C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:
  - 1. 4500 psi 28-day compressive strength.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Subcontractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner, and as accepted by ENGINEER. Laboratory

test data for revised mix design and strength results must be submitted to and accepted by ENGINEER before using in work.

E. Admixtures:

1. Use water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability. The use of a water-reducing admixture is required for slabs on grade.
2. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F. (10 degrees C.).
3. Use air-entraining admixture in exterior exposed concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2% within following limits:
  - a. Concrete structures and slabs exposed to freezing and thawing or de-icer chemicals
    - 5.5% 1-1/2" maximum aggregate.
    - 6.0% 1" maximum aggregate.
    - 6.0% 3/4" maximum aggregate.
  - b. Other Concrete: 2% to 4% air.
4. Use admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

F. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (WC) ratios as follows:  
Subjected to freezing and thawing: WC 0.42.

G. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps, slabs, and sloping surfaces: 4 inches.
2. Concrete containing HRWR admixture (super-plasticizer): Not more than 8 inches after addition of HRWR to site verified 2 inch to 3 inch slump concrete.
3. Other Concrete: 4 inches.

H. Concrete Mixes:

1. Ready-Mix Concrete: Comply with requirements of ASTM C94 and as herein specified. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required.

### 3.0 EXECUTION

#### 3.1 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
- E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- G. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.

- H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

### 3.2 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

### 3.3 JOINTS

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to ENGINEER.
- B. Provide keyways at least 1 1/2" deep in construction joints in walls; keyways in construction joints in slabs to follow ACI recommendations for keyed construction joints.

- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise noted.
- D. Place dowels perpendicular to construction and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during concrete placement. One end of the dowels shall be oiled or coated with high density polyethylene having a minimum thickness of 14 mils.
- E. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Fabricate field joints in waterstops in accordance with manufacturer's printed instructions.
- F. Isolation (Expansion) Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs on grade and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.
- G. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown.
  - 1. Contraction joints shall be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
- H. Install joint covers in accordance with manufacturer's instructions.

### 3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

### 3.5 PREPARATION OF FORM SURFACES

- A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition.

- B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- C. Thin form-coating compounds only with thinning agent of type and in amount and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

### 3.6 CONCRETE PLACEMENT

- A. **Preplacement Inspection:** Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
- B. Coordinate the installation of joint materials, perimeter insulation and moisture barriers with placement of forms and reinforcing steel.
- C. **General:** Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete" and as herein specified.
- D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- E. **Placing Concrete in Forms:** Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with recommended practices.

- G. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- H. Maintain reinforcing in proper position during concrete placement operations.
- I. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C.), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 degrees F. (27 degrees C) at point of placement.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- J. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F (32 degrees C). Mixing water may be chilled or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Subcontractor's option.
  2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
  3. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.

4. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

### 3.7 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Smooth Rubbed Finish: Unless noted otherwise, all formed exposed surfaces exposed to view (Limited to one foot below grade and one foot below the minimum liquid level for open structures that are to contain liquids) shall have a finish conforming to ACI 301. Provide smooth rubbed finish to exposed concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal.
  1. Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strikeoff smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.8 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.
1. After placing slabs, plane surface so that depressions between high spots do not exceed 1/2" under a 10' straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified.
1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.
1. After floating, begin first trowel finish operation using a power-driven trowel.
  2. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.
  3. Consolidate concrete surface by final troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to a tolerance of Ff 23, FI 17.
  4. Grind smooth surface defects which would telegraph through applied floor covering system.
- D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with ENGINEER before application.
- F. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floors where indicated. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water (parts of hardener/water as follows), and apply in three coats: first coat, 1/3 strength; second coat, 1/2 strength; third coat, 2/3 strength. Evenly apply each coat and allow 24 hours for drying between coats.
1. Apply proprietary chemical hardeners in accordance with manufacturer's printed instructions.
  2. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

### 3.9 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
  2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
  3. Maintain ambient temperature at 70 degrees F for three days after placing concrete.
- B. Curing Methods: Perform curing of concrete by moist curing, moisture-retaining cover curing, or curing and sealing compound as herein specified.
1. Moist curing: Provide moist curing by covering concrete surface with absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent covers.
  2. Moisture-retaining cover curing: Provide moisture-retaining cover curing by covering concrete surfaces and edges with moisture-retaining cover for curing concrete, placed in widest

practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing and sealing compound: Provide curing and sealing compound to interior slabs and to exterior slabs, walks, and curbs, as follows: Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
  4. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting and other coatings and finish materials, unless otherwise acceptable to ENGINEER.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing methods specified above, as applicable.
- D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of curing and sealing compound unless otherwise noted.
1. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover unless otherwise directed.

### 3.10 SHORES AND SUPPORTS

- A. Comply with ACI 347 for shoring and re-shoring in multistory construction, and as herein specified.
- B. Extend shoring from ground to roof for structures 4 stories or less, unless otherwise permitted.
- C. Extend shoring at least 3 floors under floor or roof being placed for structures over 4 stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a

manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.

- D. Remove shores and re-shore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate re-shoring to safely support work without excessive stress or deflection.
  - 1. Keep re-shores in place a minimum of 15 days after placing upper tier, and longer if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

### 3.11 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F. (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28-days. Determine potential compressive strength of in place concrete by testing field-cured specimens representative of concrete location or members.
- C. Form facing material may be removed 4 days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

### 3.12 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use

"patched" forms for exposed concrete surfaces, except as acceptable to ENGINEER.

### 3.13 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
- D. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

### 3.14 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to ENGINEER.
  - 1. Cut out honeycomb, rock pockets, and voids over 1/4" in any dimension, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
- B. For exposed to view surfaces: Blend white portland cement and pigmented portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

- C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of ENGINEER. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.
- D. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.
- F. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.015" wide, spalling, pop-outs, honeycomb, rock pockets and other objectionable conditions.
- G. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
- H. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Fill areas with concrete repair mortar. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- I. Repair isolated random cracks and single holes not over 1" in diameter with concrete repair mortar. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix repair mortar in accordance with manufacturers printed instructions. Place repair mortar after bonding compound has dried. Finish to match existing concrete. Keep patched area continuously moist for not less than 72 hours.

- J. Perform structural repairs with prior approval of ENGINEER for method and procedure, using specified epoxy adhesive and mortar.
- K. Repair methods not specified above may be used, subject to acceptance of ENGINEER.

### 3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The contractor will engage a testing laboratory to perform and report compressive strength tests. All concrete sampling and testing shall be performed by an ACI certified level 1 technician.
- B. The contractor will engage an ACI certified level 1 technician to inspect reinforcement placement and soil/rock bearing conditions prior to placing concrete. Notify testing agency at least 24 hours prior to concrete placement.
- B. Sampling and testing for quality control during placement of concrete will include the following:
  - 1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
  - 2. Slump: ASTM C143: one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
  - 3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of concrete.
  - 4. Concrete Temperature: Test hourly when air temperature is 40 degrees F (4 degrees C) and below, and when 80 degrees F (27 degrees C) and above; and each time a set of compression test specimens made.
  - 5. Compression Test Specimen: ASTM C31; one set of 3 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
  - 6. Compressive Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cubic yards plus additional sets for each 100 cubic yards over and above the first 50 cubic yards of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

- C. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.
- D. Test results will be reported in writing to ENGINEER and Contractor within 24 hours that tests are made. Reports of compressive strength tests will contain the project identification name and number, date of concrete placement, slump and temperature at time of sampling, name of concrete testing service, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but will not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the ENGINEER. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Subcontractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

## **SECTION 03600**

### **GROUT**

#### **1.0 GENERAL**

##### **1.1 REFERENCES**

A. The following is a list of standards, which may be referenced in this section:

1. American Society for Testing and Materials (ASTM):
  - a. C230, Standard Specification for Flow Table for Use in Tests of Hydraulic Cement.
  - b. C 10 18, Standard Test Method for Flexural Toughness and First-Crack Strength of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading).
  - c. C 1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
  - d. C 1116, Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
  - e. D4580, Measuring Delaminations in Concrete Bridge Decks by Sounding, Practice for.
2. Corps of Engineers (COE):
  - a. CRD-C61 1, Flow of Grout for Preplaced Aggregate Concrete.
  - b. CRD-C621, Specification for Non-shrink Grout

##### **1.2 SUBMITTALS**

A. Shop Drawings:

1. Product data of grouts.
2. Proposed method for keeping existing concrete surfaces wet prior to placing grout.
3. Forming method for fluid grout placements.
4. Curing method for grout.

B. Quality Control Submittals:

1. Manufacturer's Written Instructions:
  - a. Adding fiber reinforcing to batching.
  - b. Cement-water ratio of grout topping.
  - c. Mixing of grout.
2. Manufacturer's proposed training schedule for grout work.
3. Manufacturer's Certificate of Compliance:
  - a. Grout free from chlorides and other corrosion-causing chemicals.

- b. Non-shrink grout properties of Categories H and III, verifying expansion at 3 or 14 days will not exceed the 28 day expansion and non-shrink properties are not based on gas or gypsum expansion.
- 4. Manufacturer's Certificate of Proper Installation.
- 5. Statements of Qualification: Non-shrink grout manufacturer's representative.
- 6. Test Reports:
  - a. Test report for 24-hour evaluation of non-shrink grout. Independent testing laboratory to certify that testing was conducted within the past 18 months.
  - b. Test results and service report from the demonstration and training session, and from field tests.
  - c. Field test reports and laboratory test results for field-drawn samples.

### 1.3 QUALIFICATIONS

- A. Non-shrink Grout Manufacturer's Representative: Authorized and trained representative of grout manufacturer. Minimum of 1 year experience that has resulted in successful installation of grouts similar to those for this Project.

### 1.4 GUARANTEE

- A. Manufacturer's guarantee shall not contain disclaimer on the product data sheet, grout bag, or container limiting responsibility to only the purchase price of products and materials furnished.
- B. Manufacturer guarantees participation with CONTRACTOR in replacing or repairing grout found defective due to faulty materials, as determined by industry standard test methods.

## 2.0 PRODUCTS

### 2.1 NONSHRINK GROUT SCHEDULE

A. Furnish non-shrink grout for applications in grout category in the following schedule:

Application	Temperature Range	Maximum Placing Time	
	40 to 100 deg F	20 min	Greater Than 20 min
Filing Tie Holes	I	I	I
Blockouts for Gate Guides	I or II		II
Precast Joints	I or II		II
Through-bolt openings	II	II	II
Machine bases 25 hp or less	II	II	II
Patching concrete walls	II	II	II
Machine bases 26 hp and up	III	III	III
Baseplates and/or soleplates with vibration, thermal movement, etc.	III	III	III

### 2.2 NONSHRINK GROUT

A. Category I:

1. Nonmetallic and nongas-liberating flowable fluid.
2. Prepackaged natural aggregate grout requiring only the addition of water.
3. Test in accordance with AS TM C 1107:
  - a. Flowable consistency 140 percent, five drops in 30 seconds, in accordance with ASTM C230.
  - b. Flowable for 15 minutes.
4. Grout shall not bleed at maximum allowed water.
5. Minimum strength of grout, 3,000 psi at 3 days, 5,000 psi at 7 days, and 7,000 psi at 28 days.
6. Manufacturers and Products:
  - a. Master Builders Co., Cleveland, OH; SET GROUT.
  - b. Euclid Chemical Co., Cleveland, OH; NS Grout.
  - c. Dayton Superior Corp., Miamisburg, OH; Sure-Grip High Performance Grout.

B. Category II

1. Nonmetallic, nongas-liberating flowable fluid.
2. Prepackaged natural aggregate grout requiring only the addition of water.

3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
4. Test in accordance with COE CRD-C621 and ASTM C 1107, Grade B:
  - a. Fluid consistency 20 to 30 seconds in accordance with COE CRD-C61 1.
  - b. Temperatures of 40, 80, and 100 degrees F.
5. 1 hour after mixing, pass fluid grout through flow cone with continuous flow.
6. Minimum strength of grout, 2,500 psi at 1 day, 4,500 psi at 3 days, and 7,000 psi at 28 days.
7. Maintain fluid consistency when mixed in 1 to 9 yard loads in ready-mix truck.
8. Manufacturers and Products:
  - a. Master Builders Co., Cleveland, OH; Master Flow 928.
  - b. Five Star Products Inc., Fairfield, CT; Five Star 100.
  - c. Euclid Chemical Co., Cleveland, OH; Hi Flow Grout.

C. Category III:

1. Metallic and nongas-liberating flowable fluid.
2. Prepackaged aggregate grout requiring only the addition of water.
3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.
4. Test in accordance with COE CRD-C621 and ASTM C 1107, Grade B:
  - a. Fluid consistency 20 to 30 seconds in accordance with COE CRD-C61 1.
  - b. Temperatures of 40 and 100 degrees F.
5. 1 hour after mixing, pass fluid grout through flow cone with continuous flow.
6. Minimum strength of grout, 4,000 psi at 1 day, 5,000 psi at 3 days, and 9,000 psi at 28 days.
7. Maintain fluid consistency when mixed in 1 to 9 yard loads in ready-mix truck.
8. Manufacturers and Products: Master Builders Co., Cleveland, OH; EMBECO 885.

### **3.0 EXECUTION**

#### **3.1 NONSHRINK GROUT**

- A. General: Mix, place, and cure non-shrink grout in accordance with grout manufacturer's representative training instructions.
- B. Form Tie or Through-Bolt Holes: Provide non-shrink grout, Category I and II, Fill space with dry pack dense grout hammered in with steel tool and

hammer. Through-bolt holes, coordinate dry pack dense grout application with vinyl plug in Section 03310, CONCRETE WORK.

C. Grouting Machinery Foundations:

1. Block out original concrete or finish off at distance shown below bottom of machinery base with grout. Prepare concrete surface by sandblasting, chipping, or by mechanical means to remove any soft material.
2. Set machinery in position and wedge to elevation with steel wedges, or use cast-in leveling bolts.
3. Form with watertight forms at least 2 inches higher than bottom of plate.
4. Fill space between bottom of machinery base and original concrete in accordance with manufacturer's representative training instructions.

### 3.2 FIELD QUALITY CONTROL

A. Evaluation and Acceptance of Non-shrink Grout:

1. Provide a flow cone and cube molds with restraining plates onsite. Continue tests during Project as demonstrated by grout manufacturer's representative.
2. Perform flow cone and bleed tests, and make three 2-inch by 2-inch cubes for each 25 cubic feet of each type of non-shrink grout used. Restraining caps for cube molds in accordance with COE CRD-C621.
3. For large grout applications make three more cubes, one more flow cone test, including bleed test for each additional 25 cubic feet of non-shrink grout placed.
4. Consistency: As specified in Article NONSHRINK GROUTS. Reject grout with consistencies outside range requirements.
5. Segregation: As specified in Article NONSHRINK GROUTS. Reject grout when aggregate separates.
6. Non-shrink grout cubes shall test equal to or greater than minimum strength.
7. Strength Test Failures: Reject non-shrink grout work failing strength tests, remove and replace grout.
8. Perform bleeding test to demonstrate grout will not bleed.
9. Store cubes at 70 degrees F.
10. Independent testing laboratory shall prepare, store, cure, and test cubes in accordance with COE CRD-C62 1.

### 3.3 MANUFACTURER'S SERVICES

A. General:

1. Coordinate demonstrations, training sessions, and applicable site visits with grout manufacturer's representative.

2. Provide and conduct onsite, demonstration and training sessions for leech tests, mixing, flow cone measurement, cube testing, application, and curing for each category and type of non-shrink grout.
3. Coordinate necessary equipment and materials are available for demonstration.

B, Training:

1. Grout manufacturer's representative shall train CONTRACTOR to perform grout work.
2. Establish location at site and schedule time for grout manufacturer's demonstration and training session of proposed non-shrink grouts. Mix non-shrink grouts to required consistency, test, place, and cure on actual Project, e.g., baseplates and tie holes to provide actual on-the-job training.
3. Use minimum of five bags for each grout Category H and Category III. Mix grout to fluid consistency and conduct flow cone and two bleed tests, make a minimum of six cubes for testing of two cubes at 1, 3, and 28 days. Use remaining grout for final Work. Training includes methods for curing grout.
4. Mix sufficient grout Category I for minimum of 15 tie holes.
5. Patching through-bolt holes and blockouts for gate guides, and similar items.
6. Transport test cubes to an independent test laboratory and obtain test reports.

3.4 SUPPLEMENTS

- A. The supplement listed below, following "END OF SECTION 03600" is part of this Specification.
1. 24-hour Evaluation of Non-shrink Grout Test Form and Grout Testing Procedures.

END OF SECTION

## **SECTION 04230**

### **REINFORCED UNIT MASONRY**

#### **PART 1 - GENERAL**

##### **1.1 REFERENCES**

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI): ACI 530/ASCE 5/TMS 405, Building Code Requirements for Masonry Structures.
2. American Society for Testing and Materials (ASTM):
  - a. A82, Standard Specification for Steel Wire, Plain, for concrete Reinforcement.
  - b. A 153, Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
  - c. C90, Standard Specification for Load-Bearing Concrete Masonry Units.
  - d. C140, Standard Methods of Sampling and Testing Concrete Masonry Units.
  - e. C144, Standard Specification for Aggregate for Masonry Mortar.
  - f. C150, Standard Specification for Portland Cement.
  - g. C207, Standard Specification for Hydrated Lime for Masonry Purposes.
  - h. C270, Standard Specification for Mortar for Unit Masonry.
  - i. C404, Standard Specification for Aggregates for Masonry Grout.
  - j. C476, Standard Specification for Grout for Masonry.
  - k. C652, Standard Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale).
  - l. C744, Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
3. International Conference of Building Officials (ICBO):
  - a. UBC Structural Engineering Design Provisions, Volume 2, Chapter 21.
  - b. UBC Standard 21-16, Field Test Specimens for Mortar.
  - c. UBC Standard 21-17, Test Method for Compressive Strength of Masonry Prisms (ASTM E447)
  - d. UBC Standard 21-18, Method of Sampling and Testing Grout (ASTM C 10 19).

##### **1.2 SUBMITTALS**

A. Shop Drawings:

1. Information illustrating horizontal joint reinforcement and preformed control joint materials proposed.

2. Grout mix design proposed.
3. Mortar mix design proposed.

B. Samples, when solicited:

1. Individual Samples of each type of masonry unit to be used on Project.
2. Two each, Samples of textured, glazed, sound absorbing, and brick units for selection of color and texture.

C. Quality Control Submittals:

1. Method of placing grout.
2. Certified field test results within 5 days of performing specified tests.

### 1.3 QUALITY ASSURANCE

A. Mockups:

1. Lay up Sample panel for each type of masonry at the site.
2. Dimensions: Minimum 4 feet high by 4 feet long.
3. Leave intact after approval until acceptance of permanent masonry work and then remove.
4. Approved panels shall serve as basis of color, texture, bond, quality of finished joints, and for acceptance of permanent construction.
5. Demonstrate ability to keep insulation and grout isolated and in certain cells in any sequence of placement, and to demonstrate materials will be restricted to cells and bond beams intended to receive each material.
6. Construction shall show areas required to receive mortar, including webs on each side of each cell to prevent insulation from entering cells to receive grout or to prevent grout from entering cells to receive insulation.
7. Where bond beams are to be used, demonstrate proper placement of both insulation and grout to bond beam level, and proper placement of bond beam prior to placement of insulation and grout above bond beam level.
8. Demonstrate proper use of running bond or stacked bond.

B. Fog Spray: Provide demonstration, prior to starting Work, of fog spray nozzles for curing mortar.

C. Special Inspection (Kentucky Building Code, Section 1704):

1. Special Inspections to be performed under this contract are listed in the General Provisions of the Structural Drawings. If special inspection is required, Owner will retain the services of a Special Inspector of Record at His/Her cost to inspect all applicable work under this contract and this Contractor is responsible for providing safe access to all areas of

work under this contract to be inspected at no additional cost to the Owner or His/Her Agents. No concreting shall take place without written approval of the Special Inspector of Record (SIR). Any progression of work without the approval of the SIR will be subject to demolition at this contractor's expense.

2. The extent of special inspection to be performed is listed in Table 1704.4 of the Kentucky Building Code.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Storage and Protection: Keep lime and other ingredients dry.

#### **1.5 ENVIRONMENTAL REQUIREMENTS**

- A. Temperature: Do not lay masonry when ambient temperature is below 32 degrees F on a rising temperature or below 40 degrees F on a falling temperature, or when there is a probability of such conditions occurring within 48 hours, unless written approval of procedures for protection from freezing is obtained.
- B. Moisture Protection: Protect masonry construction from loss of moisture during curing period of 7 days when ambient air temperature is 90 degrees F or greater and when relative humidity is less than 50 percent.

### **PART 2 - PRODUCTS**

#### **2.1 COMPRESSIVE STRENGTH OF MASONRY**

- A. Minimum 28-Day Compressive Field Strength,  $F_m$ , of the Completed Assemblage: 1,500 psi.

#### **2.2 MASONRY UNITS**

- A. General:
  1. Furnish or cut special shapes for corners, jambs, lintels, and other areas shown or required.
  2. Special units shall match color and texture of standard units.
  3. Where units are placed so end of a unit is exposed, such as at a corner or intersection, the exposed end of that block shall have surface to match color and texture of sides of other units.
  4. Furnish sound, dry, clean units free of cracks, prior to placing in structure.
  5. Vertical Cells to be Grouted: Capable of alignment sufficient to maintain clear, unobstructed continuous vertical cell measuring minimum 2-inch by 3 -inch.6.

6. Masonry unit size and shape shall allow for all placement patterns to prevent materials such as grout or poured insulation from escaping from cell being filled to adjacent cells where material is not intended to be placed.

**B. Concrete Masonry Units (CMU):**

1. ASTM C90.
2. Nominal Size: 16 inches long by 8 inches high by thickness shown on Drawings.
3. Color of Units: Natural.
4. Surface Texture on Exposed Surfaces: As shown on Drawings.
5. Surface Texture on Interior, Concealed Exterior, and Surfaces below a point 1 foot 0 inch Below Finished Grade: Smooth.
6. Coordinate bond patterns, unit textures and colors with Architectural drawings

**B. Facing Brick:**

1. Facing brick shall be standard modular face brick (3 cr = 8": 7-5/8" x 3-5/8" x 2-1/4") Grade SW, Type FBS.
2. Texture and color shall be selected by Owner using Carolina Ceramics as reference standard.
3. At sills, caps, and similar applications indicated to be brick, provide uncured, or frogged, units with all exposed surfaces finished.
4. An allowance of \$600 per 1,000 brick shall be included in the Bid, quantities determined by the Bidder. Adjustment in cost for the brick will be made upon final selection and actual cost for the modular brick.

## **2.3 MORTAR AND GROUT MATERIALS**

**A. Cement:** ASTM C150, I or II Portland cement.

**B. Lime:** ASTM C207, Type S hydrated.

**C. Aggregates:**

1. Mortar: ASTM C144, sand.
2. Grout: ASTM C404.

**D. Water:** Fresh, clean, potable.

## **2.4 REINFORCEMENT**

### **A. Horizontal Joint Reinforcement:**

1. Two parallel, ASTM A82, No. 9 wires, galvanized in accordance with ASTM A 1531, weld connected to No. 9 perpendicular cross wires at 15 inches on center.
2. Reinforcement: Clean and free from loose rust, scale, and coatings that reduce bond.
3. Furnish special manufactured corner and wall intersection pieces.
4. Manufacturers:
  - a. Dur-O-Wall National, Inc., Arlington Heights, IL.
  - b. AA Wire Products Co., Chicago, IL.
  - c. Other manufacturers who can establish product equivalency to the satisfaction of the Engineer.

### **B. Deformed Bars: As specified in Section 05120, STRUCTURAL STEEL.**

## **2.5 PREFORMED CONTROL JOINTS**

### **A. Solid rubber extrusions as manufactured by:**

1. Dur-O-Wall National, Inc., Arlington Heights, IL; Regular Rapid Control Joint.
2. Sonneborn-Contech Co., Oakland, CA; Sonneborn Control Joint.
3. Other manufacturers who can establish product equivalency to the satisfaction of the Engineer.

## **2.6 MORTAR MIXES**

### **A. Minimum average mortar 28-day compressive strength 1,800 psi.**

### **B. Proportions:**

1. In accordance with ASTM C270, Type S.

### **C. Mixing:**

1. Machine mix in approved mixers.
2. Keep mixer drums clean and free of debris and dried mortar.
3. Mix by placing 1/2 water and 1/2 aggregate in operating mixer.
4. Add cement.
5. Add remaining aggregate and water and mix for at least 2 minutes.
6. Add lime and continue mixing as long as needed to secure a uniform mass, but no less than 3 minutes after addition of lime.
7. Time addition of admixture in accordance with manufacturer's instructions. Procedure used for adding it to mix shall provide good dispersion.
8. Follow manufacturer's instructions for mortar plasticizer admixture.

- D. Where colored masonry units are used, color mortar to match. Inert coloring pigments may be added but shall not exceed 6 percent by weight of cement.

## **2.7 GROUT MIXES**

- A. Proportions: Conform to ASTM C476 for coarse grout except as follows:

- 1. Compressive Strength: Minimum 3,000 psi at 28 days.
- 2. For Pouring: Fluid consistency (suitable for pouring without segregation) meeting requirements of ASTM C476.
- 3. For Pumping:
  - a. Fluid consistency with minimum seven sacks of cement in each cubic yard.
  - b. Self-consolidating concrete.

- B. Mixing:

- 1. Onsite: Follow procedure specified in Article MORTAR MIXES.
- 2. Transit-Mixed Grout: Meet requirements of ASTM C476.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Prepare surface contact area on foundation concrete for initial mortar placement by one of following methods:

- 1. Sandblasting foundation and reinforcing dowels after concrete has fully cured to remove laitance and spillage and to expose sound aggregate.
- 2. Water blasting foundation and reinforcing dowels after concrete has partially cured to remove laitance and spillage and to expose sound aggregate.
- 3. Green cutting fresh concrete with high pressure water and hand tools to remove laitance and spillage from foundation and reinforcing dowels and to expose sound aggregate.

- B. Clean surfaces of loose material prior to initial mortar placement.

- C. Prevent surface damage to foundation concrete that will be exposed to view outside of contact area.

## 3.2 LAYING REINFORCED MASONRY UNITS

### A. General:

1. Conform to the Building Code applicable to this Project as supplemented by these Specifications.
2. Do not start laying masonry units unless foundation wall is plumb within 1/4 inch in 10 feet or not straight within 5/16 inch in 10 feet.
3. Finish Tolerances (Measured on Interior Surfaces):
  - a. Maximum Permissible Variation From Plumb of Masonry Wall or of Line of Joints in Masonry Wall: 1/ 16 inch per foot of height, and 1/4 inch in the total height of the wall.
  - b. Maximum Permissible Variation From Horizontal Line Along Base of Wall or for Lines of Horizontal Joints: 1/ 16 inch per block, 1/4 inch per 50 feet of wall with proportionately greater tolerance for longer walls up to 1/2 inch in total length of wall.
4. Place units with chipped edges or corners within permissible ASTM limits in wall such that chipped area is not exposed to view.

### B. Wall Units:

1. General:
  - a. If necessary to move a unit after once set in place, remove from wall, clean, and set in fresh mortar.
  - b. Toothing of masonry units is not permitted.
2. Running Bond:
  - a. Unless otherwise shown, lay up walls in straight, level, uniform courses using a running bond pattern.
  - b. Place units for continuous vertical cells and mortar joints to prevent materials such as grout or poured insulation from escaping from cell being filled to adjacent cells where material is not intended to be placed.
3. Glazed Concrete Masonry Units:
  - a. Single-faced units may be installed through the wall where walls or partitions are shown to have glazed masonry unit finish on one side only.
  - b. Use facing for dimensional and plane reference in installation.
  - c. Where glazed masonry unit finish is indicated on both sides of a wall or partition, install coved bases of two-unit construction or two-faced units through the wall.
  - d. Install coved bases flush with finished surfaces above, except as otherwise specified.
4. Stack Bond: Lay up walls in straight, uniform courses with vertical joints aligned and plumb.
5. Corners: Lay standard masonry bond for overlapping units and grout solid.
6. Intersecting Walls: Comply with ACI 530 and 530.1

**C. Special Shapes:**

1. Provide and place such special units as corner block, door jamb block, lintel block fillers, and similar blocks as may be required.
2. Use required shapes and sizes to work to corners and openings, maintaining proper bond throughout wall.

**3.3 BUILT-IN ITEMS**

- A. Position door frames, windows, vents, louvers, and other items to be built in the wall, and construct wall around them.
- B. Install masonry anchors to secure items to wall.
- C. Fill spaces around items with mortar or grout.
- D. Do not place electrical, instrumentation, or water conduits in a cell containing reinforcement unless approved in writing by ENGINEER.

**3.4 MORTAR JOINTS**

**A. General:**

1. Straight, clean, with uniform thickness of 3/8 inch.
2. Horizontal and vertical mortar joints shall have full mortar coverage on face shells.
3. Vertical Head Joints:
  - a. Butter well on each unit for a width equal to face shell of unit, shove tightly so mortar bonds well to both units.
  - b. Solidly fill joints from face of block to at least the depth of face shell.
4. As units are laid, remove excess mortar from grout space of cells to be filled.
5. Place mortar before initial setting of cement takes place. Do not retemper mortar that has started to set.

**B. Exposed Joints:**

1. Tool joints exposed to view after final construction, unless otherwise noted or shown.
2. Cut joints flush and, as mortar takes its initial set, tool to provide a concave joint.
3. Perform tooling when mortar is partially set but still sufficiently plastic to bond.
4. Perform tooling with a tool which compacts mortar, pressing excess mortar out rather than dragging it out.

5. Rake out joints which are not tight at time of tooling, point, and then tool.
6. Rake and tool joints at split-face surfaces, interior and exterior.

C. Concealed Joints: Strike flush with no further treatment required.

### **3.5 CONTROL JOINTS**

A. Preformed Control Joints:

1. Omit mortar from vertical joints.
2. Place rubber control joint material as wall is built.
3. After wall is grouted, cured, and cleaned, install backing rod and sealant as specified.
4. Place and tool sealant to match depth of typical joint.

### **3.6 REINFORCING**

A. Foundation Dowels:

1. Size, number, and location of foundation dowels shall match vertical wall reinforcing, unless otherwise noted.
2. When foundation dowel does not line up as intended, with vertical core, do not slope more than 1 horizontal to 6 vertical to bring it into alignment.

B. Vertical Reinforcing:

1. Use deformed bars.
2. Hold in position by wire ties or by reinforcing positioners.
3. Hold in position at each end at maximum intervals of 160 bar-diameters.

C. Horizontal Reinforcing:

1. Use deformed bars.
2. Lay on webs of bond beam units, and place as wall is built.
3. Lap reinforcing bars 48 bar-diameters minimum where spliced and wire tie together.
4. Minimum Bar Clearance: 1 bar-diameter from masonry and from additional parallel bars in same grout space.

D. Horizontal Joint Reinforcement:

1. Provide in addition to typical wall reinforcing steel.
2. Space maximum 16 inches apart, vertically.
3. Lap ends 6 inches minimum.

4. At control joints make reinforcement discontinuous.
5. Use manufactured corner and other wall intersection pieces.

### **3.7 GROUTING**

#### **A. General:**

1. Do not mix, convey, or place with equipment constructed of aluminum.
2. Secure vertical and horizontal reinforcement, ties, bolts, anchors, and other required embedments in place, inspect and verify before placing grout.
3. Grout beams over openings in one continuous operation.
4. Maintain vertical alignment in cells to provide a clear, unobstructed, continuous vertical cell measuring not less than 2 inches by 3 inches.
5. Place grout as soon as possible after mortar has set to reduce shrinkage cracking of vertical joints.
6. Vertical Reinforcement:
  - a. First wire tie to foundation dowels, then build wall around it.
  - b. Provide reinforcing positioners or approved cross-bracing to secure top of steel in place.
  - c. Do not drop in vertical steel after block is laid unless reinforcing positioners are provided in the course above previously grouted course.

#### **B. Grouting Requirements:**

1. Solid Grouting Requirements: Solid grout all vertically reinforced walls.
2. Form horizontal construction joints between pours by stopping the grout pour 1- 1/2 inches below a mortar joint.
4. Partial Grouting with Insulation Fill:
  - a. Where cells of masonry units are to receive masonry fill insulation in some cells and to receive grout in some cells, provide continuous mortar on block webs on each side of cells to be filled with grout to ensure that insulation will not enter grout cells.
  - b. Where bond beams are required together with both masonry fill insulation and grout, limit pours to less than 6 feet in height.
5. Fully embed horizontal steel by grout in an uninterrupted pour.
6. Do not construct wall more than one course above top of grout pour prior to placing grout.
7. Vibration:
  - a. Use internal "pencil" type vibrator as necessary to thoroughly consolidate grout and reduce amount of air voids.
  - b. After waiting sufficient time to permit the grout to become plastic, but before it has taken any set, reconsolidate grout.
  - c. Waiting period will vary depending upon weather conditions and block absorption rates, but under "normal" weather conditions with average masonry units the waiting period should be between 30 to 60 minutes.

8. Cleanouts:
  - a. Provide for grout pours over 5 feet in height.
  - b. Provide of sufficient size to permit cleaning of cell, positioning of reinforcing and inspection at bottom of every vertical cell containing reinforcing.
  - c. Location: Concealed from view after final construction unless otherwise approved by ENGINEER.
  - d. After wall has been inspected and approved and prior to grouting, cap cleanouts in a manner that will seal them from grout leakage and provide a flush finish.

### **3.8 FIELD QUALITY CONTROL**

- A. Masonry shall be tested by an independent testing agency, retained by CONTRACTOR and approved by ENGINEER.
- B. Masonry test prisms shall be constructed onsite with the same materials and workmanship to be used for the Project.
- C. Provide adequate facilities for safe storage and proper curing of masonry prisms, mortar samples, and grout samples, as applicable, onsite for first 24 hours, and for additional time as may be required before transporting to test lab.
- D. Masonry Testing:
  1. Prism Testing:
    - a. Method and frequency of sampling and testing in accordance with ACI/530.1/ASCE 6/TMS 602.
    - b. Prior to start of construction, construct and test a set of three prisms.
    - c. During construction, construct and test an additional set of three prisms for each 5,000 square feet of wall area.
    - d. Prepare and submit a test report for each set of prisms which includes name of testing lab and individual, dimensions, descriptions of materials, age of prism, maximum test load, net area, and compressive strength for each prism and for the set.
  2. Unit Strength Method:
    - a. Method and frequency for mortar, grout, and masonry unit sampling and testing in accordance with ACI 530.1/ASCE 6/TMS 602, Section 1.6.2.
    - b. Provide masonry units for test samples required.

### **3.9 CLEANING**

- A. Immediately after completion of grouting, clean masonry surfaces, using clean water and fiber brushes, of excess mortar, grout spillage, scum, stains, dirt, and other foreign substances.

- B. Clean walls not requiring painting or sealing such that there are no visible stains.

### **3.10 PROTECTION OF INSTALLED WORK**

- A. Do not allow grout and mortar stains to dry on face of exposed masonry.
- B. When moisture protection is required, use light fog spray nozzles to cure mortar.
- C. Protect tops of walls at all times. Cover tops of walls with waterproof paper when rain or snow is imminent and when Work is discontinued.
- D. Adequately brace walls until walls and roof are completed.
- E. Provide sufficient bracing to protect walls against damage from elements, including wind and snow.
- F. Protect masonry against freezing for minimum 72 hours after being laid.
- G. Protect masonry from damage until final acceptance of Work. Damaged units will not be accepted.

END OF SECTION

## **SECTION 05003**

### **MISCELLANEOUS METALS**

#### **1.0 GENERAL**

The Contractor shall furnish all labor, materials, equipment and services necessary for fabrication and erection of all miscellaneous steel angles, beams, plates and channels as shown on the Drawings and specified herein and not specifically included under other sections of these Specifications.

#### **2.0 QUALITY ASSURANCE STANDARDS**

A. Codes and Standards: All work shall comply with provisions of following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
2. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."
3. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.
4. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
5. AWS D1.1 "Structural Welding Code".
6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
  - a) If recertification of welders is required, retesting will be Contractor's responsibility.

### **3.0 SUBMITTALS**

Shop drawings, giving complete information necessary for fabrication, layout and installation of all metal work, shall be submitted to the Engineer for approval prior to fabrication.

The preparation of shop drawings for fabricated metal items shall be coordinated by the Contractor with the manufacturers of various equipment in order to comply with details, locations, openings, etc. required by the manufacturers.

Field measurements shall be made to verify all dimensions in the field, which may affect installation of work before shop drawings are made and/or fabrication is performed.

### **4.0 STRUCTURAL METALS**

4.1 Steel wide flange shapes shall conform to the requirements of ASTM A 992, grade 50. All other shapes, plates and bars shall be ASTM A36, or ASTM A 572, grade 50. (Non-exposed and interior)

4.2 Aluminum shall conform to the requirements of ASTM B209, alloy 6061-T6.

### **5.0 ANCHORAGE ITEMS**

The Contractor shall furnish all bolts, nuts, shims, pins, screws, straps, nails and other anchors, which may be required by the Drawings or job conditions, to secure all items permanently in place, whether or not specifically called for or shown on the Drawings.

### **6.0 FABRICATION AND INSTALLATION OF METAL WORK**

All metal items shall be accurately fabricated and erected with exposed joints close fitting. All joints shall be of such character and so assembled that they will be as strong and rigid as adjoining sections. Joints shall be located where least conspicuous. Items shall have smooth finished surfaces except where otherwise shown or specified.

Where welding is required or permitted, it shall conform to the requirements for shielding metal arc welding of the Standard Code for Arc and Gas Welding in Building Construction of the American Welding Society. Shop drawings shall show welding and shall indicate the size, length, spacing and type of welds. Joints required to be welded shall be continuously welded or spot-welded as specified and face of welds dressed flush and smooth where exposed to view.

Members or parts to be built in with masonry or concrete shall be in a form affording a suitable anchorage or shall be provided with approved anchors, expansion shields or other approved means of securing members.

Ferrous and non-ferrous metals shall be insulated at all contacts with felt washers, strips or sheets, bitumastic paints, or other approved means.

6.1 All required anchors, couplings, bolts, and nuts required to support miscellaneous metal work shall be furnished and installed as required.

6.2 Weights of connections and accessories shall be adequate to safely sustain and withstand stresses and strains to which they will be normally subjected.

6.3 Connections shall be bolted except where welding is called for in the Drawings. Bolts shall have a minimum of 1/2-inch diameter unless noted or required otherwise.

6.4 Accurately place all miscellaneous metal items in the locations and to the required elevations.

6.5 Adequately brace any items which are cast in concrete masonry work.

6.6 Use concealed anchors wherever possible.

## **7.0 CLEANING**

Remove and properly dispose of all debris and litter; leave the work area in a clean condition.

END OF SECTION



## **SECTION 05120**

### **STRUCTURAL STEEL**

#### **1.0 GENERAL**

##### **1.1 REFERENCES**

A. The following is a list of standards, which may be referenced in this Section:

1. American Institute of Steel Construction (AISC):
  - a. Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design.
  - b. Allowable Stress Design Specification for Structural Joints using ASTM A325 or A490 Bolts.
  - c. Code of Standard Practice for Steel Buildings and Bridges.
  - d. AISC Quality Certification Program.
2. American Society for Testing and Materials (ASTM):
  - a. A36 or A992, Standard Specification for Structural Steel.
  - b. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - c. A242, High-strength Low-alloy Structural Steel.
  - d. A325, Standard Specification for High-Strength Bolts for Structural Steel Joints.
  - e. A490, Standard Specification for Heat-Treated Steel Structural bolts, 150 ksi Minimum Tensile Strength.
  - f. A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - g. A501, Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  - h. A563, Standard Specification for Carbon and Alloy Steel Nuts.
  - i. F436, Standard Specification for Hardened Steel Washers.
  - j. F959, Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
3. American Society of Nondestructive Testing (ASNT): SNT-TC- I A, Recommended Practice.
4. American Welding Society (AWS):
  - a. B2.1, Standard for Welding Procedure and Performance Qualification.
  - b. D1.1, Structural Welding Code-Steel.
  - c. QC I, Standard and Guide for Qualification and Certification of Welding Inspectors.

##### **1.2 SUBMITTALS**

A. Shop Drawings:

1. Provide details showing:

- a. Erection plans.
- b. Members and their connections.
- c. Anchor bolt layouts.
- d. Hardened washer details.
- e. Joint details for complete penetration welds.
- f. Schedules for fabrication procedures.
2. Name and address of manufacturer(s).
3. Product specifications.
4. Manufacturers' testing procedures and standards.
5. Preparation and installation or application instructions, as appropriate.

**B. Quality Control Submittals:**

1. Mill Certificates.
2. High-Strength Bolts ( Zinc-Coated):
  - a. Certificates of Compliance that products meet chemical and mechanical requirements of standards specified.
  - b. Manufacturer's inspection test report results for production lot(s) furnished, to include:
    1. Tensile strength.
    2. Yield strength.
    3. Reduction of area.
    4. Elongation and hardness.
  - c. Certified Mill Test Reports for Bolts and Nuts:
    1. Name and address of manufacturer.
    2. Bolts correctly marked.
    3. Marked bolts and nuts used in required mill tests and manufacturer's inspection tests.
3. Direct Tension Indicators: Furnish manufacturer's test report meeting requirements of ASTM F959.
4. Methods proposed to resolve misalignment between anchor bolts and bolt holes in steel members.

**C. Fabricator Certification:**

1. The structural steel fabrication shop shall be certified by the American Institute of Steel Construction in the categories of Conventional Steel Structures and Complex Steel Structures as minimum and endorsed for Sophisticated Paint Category. Submit a copy of the current certification for ENGINEER's review and approval. At the completion of fabrication, the fabricator shall submit to the ENGINEER a certificate of compliance addressed to the building official stating that the work was performed in accordance with the approved construction documents and Change/Field Orders.

D. Erector Certification:

1. The structural steel erector shall be certified by the American Institute of Steel Construction in the categories of Certified Steel Erector as minimum. Submit a copy of the current certification for ENGINEER's review and approval. At the completion of erection of structural steel, the erector shall submit to the ENGINEER, a certificate of compliance addressed to the building official stating that the work was performed in accordance with the approved construction documents and Change/Field Orders.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Welder/Welding Operator: In accordance with AWS D1.1.1

B. Special Inspection (Kentucky Building Code 2007, Section 1704):

1. Special Inspections to be performed under this contract is listed under General Provisions of Structural Drawings. If special inspection is required, Owner will retain the services of a Special Inspector and this Contractor is responsible for providing safe access to all areas of His/Her work for inspection at no additional cost to the Owner or His/Her Agents.
2. The extent of special inspection to be performed is listed in Table 1704.3 of the Kentucky Building Code 2007 (KBC 2007).

C. Fabricator Certification:

1. The structural steel fabrication shop shall be certified by the American Institute of Steel Construction (AISC) in the categories of Conventional Steel Structures and Complex Steel Structures as minimum and endorsed for Sophisticated Paint Category. At the completion of fabrication, the fabricator shall submit a certificate of compliance addressed to the building official stating that the work was performed in accordance with the approved construction documents and Change/Field Orders.
2. If the Fabricator is not certified by the AISC, Special Inspection of the fabrication of the structural steel shall be performed, by the ENGINEER approved Special Inspector according to Article 1704.2 of the KBC 2007 and the cost of Special Inspection shall be back-charged to the Steel Fabricator.

D. Erector Certification:

1. The structural steel erector shall be certified by the American Institute of Steel Construction in the categories of Certified Steel Erector as minimum. At the completion of erection of the structural steel, the erector shall

submit a certificate of compliance addressed to the building official stating that the work was performed in accordance with the approved construction documents and Change/Field Orders.

2. If the Erector is not certified by the AISC, Special Inspection of the erection of the structural steel shall be performed, by the ENGINEER approved Special Inspector according to Article 1704.3 of the KBC 2007 and the cost of Special Inspection shall be back-charged to the Steel Erector.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

A. Delivery: Load structural members in such a manner that they will be transported and unloaded without damage to coatings and without being excessively stressed, deformed, or otherwise damaged.

B. Storage:

1. Protect structural steel members and packaged materials from corrosion and deterioration.
2. Store in dry area and not in direct contact with ground.
3. Protect fasteners from dirt and moisture. Do not remove lubricant from bolts and nuts.

C. Handle materials to avoid distortion or damage to members or supporting structures.

### **2.0 PRODUCTS**

#### **2.1 MATERIALS**

A. Steel wide flange shapes: ASTM A992, Grade 50, unless otherwise shown.

B. Rolled Plates, Shapes, and Bars: ASTM A36, Grade 36, unless otherwise shown.

C. Structural Steel Pipe: ASTM A501 or ASTM A53, Type E or S, Grade B.

D. Structural Tubing: ASTM A500, Grade B (fy equals 46 ksi); provide full-length members without splices unless otherwise noted or approved.

E. Welding Materials: AWS D1.1.1, E70XX

#### **2.2 FASTENERS**

A. Anchor Bolts: ASTM A-36 or ASTM A-307

- B. High-Strength Bolts: ASTM A325 or ASTM A490, bolt type 1, zinc coated. Bolt length and thread length shall be as required for the connection type shown, with hardened washers as required.
- C. Direction Tension Indicators (DTIs or Load Indicator Washers):
  - 1. ASTM F959, coating type to match bolt finish.
  - 2. Manufacturer: J&M Turner, Southampton, PA.
- D. Tension-Control Bolts:
  - 1. High-strength, ASTM A325 or ASTM 490.
  - 2. Manufacturers:
    - a. LeJeune Bolt Company, Lakeville, MN.
    - b. Nucor Fasteners, Saint Joe, IN.
    - c. Bristol Machine Co., Walnut, CA.
- E. Nuts: ASTM A563, type to match bolt type and finish.
- F. Hardened Washers: ASTM F436, type to match bolt finish.
- G. Welded Anchor Studs:
  - 1. Headed concrete anchor studs (HAS), deformed bar anchors (DBA), or threaded anchor studs (TAS), as shown.
  - 2. Manufacturer: Nelson Stud Welding Co., Loraine, OH.

## 2.3 ANCILLARY MATERIALS

- A. Surface Preparation and Primer: As specified in Section 09900, PAINTING
- B. Grout: Non-shrink grout as specified in Section 03600.

## 2.4 FABRICATION

- A. General:
  - 1. Fabricate as shown and in accordance with AISC Specifications.
  - 2. Mark and match mark materials for field assembly.
  - 3. Complete assembly, including bolting and welding of units, before start of finishing operations.
  - 4. Fabricate to agree with field measurements.
- B. Connections:
  - 1. Shop Connections: Weld or bolt, as shown.

2. Develop full strength of members joined and meet requirements of AISC Manual of Steel Construction tables for bolted double-angle shear connections, unless otherwise shown.

C. Welded Construction:

1. Comply with AWS D1.1 for procedures, appearance, and quality of welds, and methods used in correcting welding.
2. Groove and Butt Welds: Complete penetration unless otherwise specified.

D. Interface With Other Work:

1. Holes:
  - a. As necessary or as indicated for securing other Work to structural steel framing, and for passage of other Work through steel framing members.
  - b. No flame-cut holes will be permitted without prior approval of the ENGINEER.
2. Weld threaded nuts to framing, and other specialty items as shown to receive other Work.

E. Shop Paint Primer:

1. Surface Preparation: Clean and remove slag from welds before painting.
2. Coat members with primer except at future field welds, bolt-ups, and concrete embedment.
3. Apply primer in accordance with Section 9, PAINTING within 8 hours after surface preparation.

F. Slip-Critical Bolted Connections:

1. Mask faying surfaces of slip-critical bolted connections to be shop painted, or blast clean and coat with a Class A paint as specified in Section 9, PAINTING.
2. Roughen galvanized faying surfaces with hand wire brushing.

### **3.0 EXECUTION**

#### **3.1 ERECTION**

- A. Meet requirements of AISC Code of Standard Practice for Steel Buildings and Bridges.
- B. Install CONTRACTOR-designed temporary construction bracing to provide necessary support until all components are in place and construction is complete.

### C. High-Strength Bolted Connections:

1. Tighten in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts.
2. Hardened Washers:
  - a. Provide at locations required by Washer Requirements section of AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts, to include all slip-critical connections using slotted or oversized holes or A490 bolts.
  - b. Use beveled style and extra thickness where required by AISC Specification.
  - c. Do not substitute Direct Tension Indicators (DTI) for hardened flat washers required at slotted and oversize holes.
3. For bearing-type connections not fully tensioned, tighten to snug-tight condition. Use a hardened washer over slotted or oversize holes in outer plies.
4. Tension-control bolts may be used in snug-tight bearing connections only.

### D. Fully Tensioned Bolted Connections:

1. Use DTIs at all slip-critical and fully tensioned bearing-type connections.
2. Position within bolted assembly in accordance with ASTM F959.
3. Install bolts, with DTIs plus hardened washers as required, in all holes of an assembly and tighten until all plies are in firm contact and fasteners are uniformly snug tight.
4. Final tighten all bolts, beginning at the most rigid part of the bolted connection and progressing toward the free edges, until the DTI's have been compressed to an average gap equal to or less than shown in Table 2, ASTM F959.

## 3.2 ANCHOR BOLTS

- A. Coordinate installation of anchor bolts and other connectors required for securing structural steel to in-place work.
- B. Provide templates and other devices for presetting bolts and other anchors to accurate locations.

## 3.3 SETTING BASES AND BEARING PLATES

- A. Clean concrete and masonry bearing surfaces of bond reducing materials and roughen to improve bond to surfaces.
- B. Clean bottom surface of base and bearing plates.
- C. Set loose and attached baseplates and bearing plates for structural members on wedges, leveling nuts, or other adjustable devices.

- D. Tighten anchor bolts after supported members have been positioned and plumbed.
- E. Grout Under Baseplates: As specified in Section 03310, prior to placing loads on structure.

### 3.4 FIELD ASSEMBLY

- A. Set structural frames accurately to lines and elevations shown.
- B. Align and adjust various members forming a part of a complete frame or structure before permanently fastening.
- C. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly.
- D. Perform necessary adjustments to compensate for minor discrepancies in elevations and alignment.
- E. Level and plumb individual members of structure within tolerances shown in AISC Code of Standard Practice for Steel Buildings and Bridges.
- F. Establish required leveling and plumbing measurements on mean operating temperature of structure.
- G. Provide additional field connection material as required by AISC Code of Standard Practice for Steel and Bridges.

### 3.5 MISFITS AT BOLTED CONNECTIONS

- A. Where misfits in erection bolting are encountered, immediately notify ENGINEER for approval of one of the following methods of correction:
  - 1. Ream holes that must be enlarged to admit bolts and use oversized bolts.
  - 2. Plug weld misaligned holes and re-drill holes to admit standard size bolts.
  - 3. Drill additional holes in the connection, conforming to AISC Standards for bolt spacing and end and edge distances, and add additional bolts.
  - 4. Reject members containing misfit, incorrect sized or misaligned holes and fabricate a new member to ensure proper fit.
  - 5. Do not enlarge incorrectly sized or misaligned holes in members by burning or by use of drift pins.

### 3.6 MISFITS AT ANCHOR BOLTS

- A. Resolve misalignments between anchor bolts and bolt holes in steel members in accordance with approved submittal.

- B. Do not flame cut to enlarge holes.

### 3.7 GAS CUTTING

- A. Do not use gas cutting torches in field for correcting fabrication errors in structural framing.
- B. Secondary members not under stress and concealed in finished structure may be corrected by gas cutting torches, if approved by ENGINEER.
- C. Finish flame-cut sections equivalent to sheared and punched appearance.

### 3.8 PAINTING TOUCHUP

- A. Immediately after erection, clean field welds, bolted connections, and abraded areas of slag and shop paint primer.
- B. Apply touchup paint primer by brush or spray of same thickness and material as that used in shop application and as specified in Section 9, PAINTING.

### 3.9 FIELD QUALITY CONTROL-BOLTED CONNECTIONS

- A. High-Strength Bolted Connections: All high-strength bolted connections will be inspected by an independent testing agency, retained by the Owner in accordance with the AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts and per KBC 2007 and 2003 Supplements as follows:
  - 1. Marking identification and conformance to ASTM standards.
  - 2. Alignment of bolt holes.
  - 3. Placement, type, and thickness of hardened washers.
  - 4. Tightening of bolts.
- B. Bearing-Type Connections Not Fully Tensioned: Snug-tight condition with all plies of the joint in firm contact.
- C. Fully Tensioned Bearing and Slip-Critical Connections:
  - 1. Conduct Pre-Installation Test.
  - 2. Monitor installation and tightening of DTI's.
  - 3. Monitor condition of faying surfaces for slip-critical connections.
- D. Pre-Installation Test:
  - 1. Conduct jobsite test prior to start of work using a bolt tension measuring device.
  - 2. Select representative sample of not less than three bolts of each diameter, length, and grade.

2. Include DTI's and flat hardened washers as required to match actual connection assembly.
  3. Conduct test in accordance with the Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- E. Nondestructive Testing (NDT) Report: Prepare and submit a written NDT report identifying location of inspected bolted connections and summary of corrections as required to meet code acceptance criteria.
- F. Defective Connections: All defective and improperly tightened high-strength bolted connections shall be corrected.

### 3.10 FIELD QUALITY CONTROL -- WELDED CONNECTIONS

- A. All welded connections for structural steel shall be inspected and tested by an independent testing agency, retained by the Owner in accordance with the AWS D1.1 Structural Welding Code.
- B. Selection of Welds to be Tested: As per Special Inspection requirements of the KBC 2007.
- C. Unless otherwise specified, the Special Inspector retained by the Owner will perform nondestructive testing (NDT) of welds in accordance with Chapter 6 of AWS D1.1 and per the Section 1704 of the Kentucky Building Code 2007.
1. Butt Joint Welds: 10 percent randomly radiographically tested and repaired.
  2. Groove Welds: 10 percent randomly ultrasonically tested and repaired.
  3. Fillet Welds: 10 percent randomly examined and repaired, using either dye penetrant or magnetic particle inspection methods.
  4. All Welds: 100 percent visually inspected.
- D. The certified welding Special Inspector shall be present whenever field welding is performed and shall:
1. Verify conformance of specified job material and proper storage.
  2. Monitor conformance with approved welding procedure specifications.
  3. Monitor conformance of welder/welding operator qualification.
  4. Provide 100 percent visual inspection of all welds.
  5. Supervise nondestructive testing personnel and evaluate test results.
  6. Maintain records and prepare report confirming results of inspection and testing.
- E. Defective Connections: All defective welds shall be repaired and retested until certified acceptable in accordance with AWS D1.1.1

**END OF SECTION**

05120-10

## **SECTION 07610**

### **STANDING SEAM METAL ROOFING**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

###### **A. General:**

1. Furnish all labor, material, tools, equipment and services for all preformed roofing as indicated, in accord with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

##### **1.02 QUALITY ASSURANCE**

###### **A. Applicable Standards:**

1. SMACNA: "Architectural Sheet Metal Manual" Sheet Metal and Air Conditioning Contractors National Association, Inc.
2. LGSI: "Light Gage Structural Institute"
3. AISC: "Steel Construction Manual" American Institute of Steel Construction.
4. AISI: "Cold Form Steel Design Manual," American Iron and Steel Institute (1996 Edition).
5. ASTM A792-83-AZ50 (Painted) & ASTM A792-83-AZ55 (Bare Galvalume Plus®): Specifications for steel sheet, aluminum-zinc alloy coated by the hot dip process, general requirements (Galvalume®).
6. ASTM E 1514-93: "Standard Specification for Structural Standing Seam Steel Roof Panel Systems", American Society for Testing and Materials.
7. UL580: "Tests for Uplift Resistance of Roof Assemblies", Underwriters Laboratories, Inc.
8. UL2218: "Test Standard for Impact Resistance", Underwriters Laboratories, Inc.
9. ICBO: Evaluation Report No. ER-5409, ICBO Evaluation Service, Inc.

10. ASTM E 1592-95: "Standard Test for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference", American Society for Testing and Materials.
11. ASTM E 1680-95: "Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems", American Society for Testing and Materials.
12. ASTM E 1646-95: "Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference", American Society for Testing and Materials.
13. ASTM E 408-71: Standard Test Method for Total Normal Emittance of Surfaces Using Inspection- Meter Techniques. (Energy Star® for Roof Products).
14. ASTM E 903-96 Standard Test Method for Solar Absorptance, Using Integrating Spheres. (Energy Star® for Roof Products)

**B. Manufacturer's Qualifications:**

1. Manufacturer has a minimum of five years experience in manufacturing metal roof systems of this nature. Panels specified in this section shall be produced in a factory environment (not with a portable roll former with fixed-base roll forming equipment) and in line leveling assuring the highest level of quality control. A letter from the manufacturer certifying compliance will accompany the product material submittals.

**C. Installation Contractor's Qualifications:**

1. Installer of the system shall be an approved installer, certified by the manufacturer, before beginning of installation of the metal roof system and meet the following minimum criteria:
  - a. Maintain \$250,000 general liability coverage for each loss.
  - b. Maintain sufficient worker's compensation coverage as mandated by law.
  - c. Have no viable claims pending regarding negligent acts or defective workmanship on previously performed or current projects.
  - d. Has not filed for protection from creditors under any state or federal insolvency or debtor relief statutes or codes.

- e. Provide certification letter that installer has a minimum of three years' of metal product installation experience immediately preceding the date upon which work is to commence.

### **1.03 SYSTEM PERFORMANCE REQUIREMENTS**

#### **A. Performance Testing:**

1. Metal roof system must be tested in accordance with Underwriters Laboratories, Inc. (UL) Test Method 580 "Tests for Uplift Resistance of Roof Assemblies".
2. Metal roof system must be installed in accordance with UL Construction Method #286, min. 5/8," plywood deck with fixed/articulating clips at 5'-0" on center max.
3. Metal roof system must meet the air infiltration requirements of ASTM E 1680-95 when tested with a 6.24 PSF pressure differential. The resulting air infiltration leakage rate will be a minimum of 0.251 cfm/sq. ft.
4. Metal roof system must meet the water penetration requirements of ASTM E 1646-95 when tested with a 12.00 PSF pressure differential with no uncontrollable water leakage when five gallons per hour of water is sprayed per square foot of roof area.
5. Metal Roof Panels shall be high reflectance and high emittance in accordance with Energy Star®. Initial Reflectance (Galvalume Only) shall be at least 0.68 when tested with ASTM E- 903. The three year aged reflectance shall be at least 0.57, when tested in accordance with ASTM E-1918 (Measured as Solar Reflectivity, Not Visible Reflectance).

### **1.04 DESIGN REQUIREMENTS**

#### **A. Roof Design Loads:**

1. Design criteria shall be in accordance with the most current version of the IBC and/or local building code.
2. Dead Loads
  - a. The dead load shall be the weight of the SSMR system. Collateral loads, such as sprinklers, mechanical and electrical systems, and ceilings shall not be attached to the panels.
3. Live Loads
  - a. The panels and concealed anchor clips shall be capable of supporting a minimum uniform live load of 20 psf.
4. Roof Snow Loads
  - a. The design roof snow loads shall be as shown on the contract drawings.
5. Wind Loads

- a. The design wind uplift for the roof system shall be as shown on the contract drawings. The design uplift force for each connection assembly shall be that pressure given for the area under consideration, multiplied by the tributary load area of the connection assembly. The safety factor listed below shall be applied to the design force and compared against the ultimate capacity. Prying shall be considered when calculating fastener design loads.

aa. Single fastener in each connection:	3.0
bb. Two or more fasteners in each connection:	2.25

6. Thermal Loads

- a. Roof panels shall be free to move in response to the expansion and contraction forces resulting from temperature fluctuations during the life of the structure.

## 1.05 SUBMITTALS

A. Shop Drawings:

1. Submit complete shop drawings and erection details, approved by the metal roofing manufacturer, for review. Do not proceed with manufacture of roofing materials prior to review of shop drawings and field verification of all dimensions.
2. Shop drawings show methods of erection, elevations and plans of roof and wall panels, sections and details, anticipated loads, flashings, roof curbs, vents, sealants, interfaces with all materials not supplied and proposed identification of component parts and their finishes.

B. Performance Tests:

1. Submit certified test results by a recognized testing laboratory or manufacturer's lab (witnessed by a professional engineer) in accordance with specified test methods for each panel system.

C. Calculations:

1. Submit engineering calculations defining all cladding loads for all roof areas based on design criteria listed in Section 1.04 Design Requirements, allowable clip loads and required number of fasteners to secure the panel clips to the designated substructure.
2. Compute uplift loads on clip fasteners with full recognition of prying forces and eccentric clip loading.

3. Calculate holding strength of fasteners in accordance with submitted test data provided by Fastener Manufacturer based on length of embedment and properties of materials.
4. Submit thermal calculations and details of floating clip, flashing attachments, and accessories certifying the free movement in response to the expansion/contraction forces resulting from a total temperature differential of 110 degrees F.

**D. Samples:**

1. Submit samples and color chips for all proposed finishes.
  - a. Submit one 8-inch long sample of panel, including clips.
  - b. Submit two 3 inch x 5 inch color chip samples in color selected by the architect (owner).

**E. Warranties:**

Metal roof system manufacturer, upon final acceptance for project, furnish a warranty.

**1. Finish:**

Metal roof system manufacturer shall submit a specimen copy of the warranty upon final acceptance of the project. Finish Warranty shall warrant the panel finish against cracking, checking, blistering, peeling, flaking, chipping, chalking and fading for a period of twenty (20) years.

**2. Weathertightness:**

Metal roof system manufacturer shall submit a specimen copy of manufacturer's Weathertightness Warranty, including evidence of application for warranty and manufacturer's acceptance of the applicator and warranty conditions.

**F. Installation Contractor's Qualifications:**

1. Submit certificate from manufacturer certifying that installer of the metal roof system has met all of the criteria outlined in "1.02 C. Installer's qualifications" and is an authorized installer certified by the manufacturer within one year of the beginning of installation of the metal roof system.
2. Submit five references from five different architects or building owners for projects that have been in service for a minimum of two years, stating satisfactory performance by the installation contractor.

## **1.06 PRODUCT DELIVERY, STORAGE AND HANDLING**

**A. Delivery:**

1. Deliver metal roof system to job site properly packaged to provide protection against transportation damage.

**B. Handling:**

1. Exercise extreme care in unloading, storing and erecting metal roof system to prevent bending, warping, twisting and surface damage.

**C. Storage:**

1. Store all material and accessories above ground on well skidded platforms. Store under waterproof covering. Provide proper ventilation of metal roof system to prevent condensation build-up between each panel or trim/flashing component.

## **1.07 WEATHERTIGHTNESS WARRANTY**

**A. The Contractor shall provide to the Owner, a warranty signed by the roofing manufacturer of the Standing Seam Roof System as outlined below:**

1. For a period of twenty (20) years from the date of substantial completion, the roofing manufacturer WARRANTS to the "Owner": that the roofing manufacturer's furnished roof panels, flashing, and related items used to fasten the roof panels and flashing to the roof structure ("Roof System") will not allow intrusion of water from the exterior of the roofing manufacturer's Roof System into the building envelope, when exposed to ordinary weather conditions and ordinary wear and usage. The Date of substantial completion is the date that is certified by the Architect, Owner, or Owner's Representative, when the roofing manufacturer's Roofing System is completed and accepted by or on behalf of the Owner.
2. The Roofing Installer shall have the sole and exclusive obligation for all warranty work commencing on the date of substantial completion up to and until the roof system has performed leak free for (24) consecutive months.
3. The total liability of the roofing manufacturer under limited solely to the Invoice Amount for the roof system (panels, fasteners, trim and accessories) to its customer.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

**A. Metal Roof System Profile:**

1. 3-inch high rib x 24 inch wide panel.

**B. Metal Roof System Style:**

1. Trapezoidal rib, positive snap together, standing seam, utilizing male and female rib configurations, with factory applied hot melt mastic in female rib.
2. Minimum allowable roof slope; 1/2" : 12"

- C. Gauge:
  - 1. 24 gauge (UL90 rated)
- D. Substrate:
  - 1. Galvalume® steel sheet, minimum yield of 50,000 PSI.
- E. Clip:
  - 1. Two-piece floating clip providing thermal expansion or contraction (UL 90 rated).
  - 2. Articulating clip, providing thermal expansion or contraction, correcting for out-of-plane sub-framing alignment to a maximum of 7 degrees (UL 90 rated).
  - 3. One piece fixed clip 22 gauge with factory applied mastic (UL 90 rated).
- F. Texture:
  - 1. Smooth
- G. Finish:
  - 1. Premium fluorocarbon coating produced with Kynar 500 or Hylar 5000 resin (20 year warranty).
- H. Color:
  - 1. Selected from metal roof system manufacturer's standard offering.

## **2.02 MISCELLANEOUS MATERIALS**

- A. All self-tapping/self-drilling fasteners, bolts, nuts, self-locking rivets and other suitable fasteners shall be designed to withstand specified design loads shall be designed to withstand specified design loads.
  - 1. Use long life fasteners for all exposed fastener applications.
  - 2. Provide fasteners with a factory applied coating in a color to match metal roof system application.
  - 3. Provide neoprene washers under heads of exposed fasteners.
  - 4. Locate and space all exposed fasteners in a true vertical and horizontal alignment. Use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the neoprene washer.
- B. Accessories:
  - 1. Provide all components required per the metal roof system manufacturer's approved shop drawings for a complete metal roof system to include panels, panel clips, trim/flashing, fascias, ridge, closures, gutter, downspouts, sealants, fillers and any other required items.

- a. All outside closures will be fabricated from Galvalume Plus® or Pre-Painted Galvalume® sheet steel of the same gauge, finish and color as the panels.
- b. All tape seal is to be a pressure sensitive, 100 percent solids, polyisobutylene compound sealing tape with a release paper backing. Provide permanently elastic, non-sagging, non-toxic, non-staining tape seal approved by the metal roof system manufacturer.
- c. All joint sealant is to be a one-part elastomeric polyurethane sealant approved by the metal roof system manufacturer.

## **2.03 FABRICATION**

- A. Material shall be in-line tension leveled prior to roll forming panel profile.
- B. Where possible, roll form panels in continuous lengths, full length of detailed runs.
- C. Standard panel length shall be no more than 45 feet long (for longer length availability, contact manufacturer).
- D. Fabricate trim, flashing and accessories to detailed profiles.
- E. Fabricate trim and flashing from same material as panel.

## **2.04 PREFABRICATED CURBS AND EQUIPMENT SUPPORTS**

- A. Comply with loading and strength requirements as indicated where units support other work. Coordinate dimensions of curbs and supports with equipment supplier/manufacturer
- B. Fabricate curbs of structural aluminum (Min. .080 in. thickness for mechanical gear up to 1,000 lbs.; .125 in. thickness for mechanical gear between 1,000 lbs. and 2,000 lbs.; use a two curb system per the manufacturer above 2,000 lbs.), factory primed and prepared for painting with mitered and welded corner joints. Provide integral base plates and water diverter crickets. The upper flange of the curb must be a minimum of 15" above the water diverter. Curbs shall be designed to install under metal roof systems on the high side and over the metal roof system on the low side.
- C. Minimum height of curb shall be 8" above finished metal roof system.
- D. Curbs shall be constructed to match slope of roof and provide a level top surface for mounting equipment.
- E. Curb flanges shall be constructed to match configuration of roof panels.
- F. Curb manufacturer will provide their own curb structural support system that can be installed between the purlins that will allow proper thermal movement of the curb with the roofing system.

- G. Submit roof curb manufacturer's shop drawings to metal roof system manufacturer for approval before fabrication of curbs.

## **2.05 PREFABRICATED ROOF JACKS**

- A. Pipe flashings shall be a one piece EPDM (ethylene propylene diene monomer) molded rubber boot having a serviceable temperature range of - 65°F to 212°F and shall be resistant to ozone and ultraviolet rays. Units shall have an aluminum flanged base ring. Do not install pipe flashings through any panel seams - install ONLY in the flat portion of the panel.

## **PART 3 - EXECUTION**

### **3.01 SURFACE CONDITIONS**

- A. Examination:
  - 1. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions. This specifically includes verifying that secondary structural and/or decking is installed to meet UL and building code requirements. Coordinate with metal roof system manufacturer to insure that reduced clip spacing at eave, rake, ridge and corner areas are accommodated.
- B. Discrepancies:
  - 1. In event of discrepancy, notify the architect (owner).
  - 2. Do not proceed with installation until discrepancies have been resolved.

### **3.02 INSTALLATION**

- A. Install metal roof system so that it is weathertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
- B. Install metal roof system in accordance with manufacturer's instructions and shop drawings.
- C. Provide concealed anchors at all panel attachment locations.
- D. Install panels plumb, level and straight with seams and ribs parallel, conforming to design as indicated.

### **3.03 ROOF CURB INSTALLATION**

- A. Comply with metal roof system manufacturer's approved shop drawings, instructions and recommendations for installation of roof curbs. Refer to metal

roof system manufacturer's standard installation details. Anchor curbs securely in place with provisions for thermal and structural movement.

### **3.04 CLEANING, PROTECTION**

- A. Dispose of excess materials and remove debris from site.
- B. Clean work in accordance with manufacturer's recommendations.
- C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the architect (owner), any work that becomes damaged prior to final acceptance.
- D. Touch up minor scratches and abrasions.
- E. Do not allow panels or trim to come into contact with dissimilar metals such as copper, lead, graphite or cast iron. Water run-off from these materials is also prohibited. This specifically includes condensate from roof top A/C units.

END OF SECTION

## **SECTION 08110**

### **HOLLOW METAL DOORS, FRAMES AND FINISH HARDWARE**

#### **1.0 GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this Section. Water booster pump station shall be complete with all necessary equipment under this Section.

##### **1.2 SUMMARY**

###### **A. Section Includes:**

1. Standard hollow metal doors and frames.
2. Finish hardware.

###### **B. Related Sections**

1. Division 4 Section "Unit Masonry Assemblies" for embedding anchors for hollow metal work into masonry construction.
2. Division 8 Section "Door Hardware" for door hardware for hollow metal doors.
3. Division 9 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

##### **1.3 DEFINITIONS**

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

##### **1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions and finishes.
- B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thickness.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices and connections.
7. Details of accessories.
8. Details of moldings, removable stops and glazing.

C. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver hollow metal work palletized, wrapped or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by

blocking, on minimum 4-inch (102 mm) high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum ¼ inch (6 mm) space between each stacked door to permit air circulation.

## **1.7 PROJECT CONDITIONS**

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## **1.8 COORDINATION**

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts and items with integral anchors. Deliver such items to Project site in time for installation.

## **2.0 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. Ceco Door Products; an Assa Abloy Group company.
  2. Curries Company; an Assa Abloy Group company.
  3. Security Metal Products Corp.
  4. Steelcraft; an Ingersoll-Rand company.

### **2.2 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; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) 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. Powder Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143.
- H. Mineral Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6 to 12 lb./cu ft. (96 to 192 kg/cu m) density; with maximum flame spread and smoke development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 8 Section "Glazing".
- J. Bituminous Coating: Cold applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4 mm) dry film thickness per coat. Provide inert type noncorrosive compound free of asbestos fibers, sulfur components and other deleterious impurities.

### 2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
1. Design: Flush panel.
  2. Core Construction: Manufacturer's standard Kraft power honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral board or vertical steel stiffener core.
  3. Vertical Edges for Single Acting Doors: Beveled edge.
    - a. Beveled Edge: 1/8 inch in 2 inches (3 mm in 50 mm).

4. Top and Bottom Edges: Closed with flush or inverted 0.042 inch (1.0 mm) thick, end closures or channels of same material as face sheets.
  5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames".
- B. Exterior Doors: Face sheets fabricated from metallic coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
    - a. Width: 1 ¾ inches (44.5 mm).
- C. Interior Doors: Face sheets fabricated from cold rolled steel sheet unless metallic coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
    - a. Width: 1 ¾ inches (44.5 mm).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold or hot rolled steel sheet.

## 2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic coated steel sheet.
1. Fabricate frames with mitered or coped corners.
  2. Fabricate frames as full profiled welded unless otherwise indicated.
  3. Frames for Level 3 Steel Doors: 0.053 inch (1.3 mm) thick steel sheet.

C. Interior Frames: Fabricated from cold rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Fabricate knocked down, drywall slip-on frames for in place gypsum board partitions.
4. Frames for Level 3 Steel Doors: 0.053 inch (1.3 mm) thick steel sheet.
5. Frames for Wood Doors: 0.053 inch (1.3 mm) thick steel sheet.
6. Frames for Borrowed Lights: 0.053 inch (1.3 mm) thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforced plates from same material as frames.

## 2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap and stirrup or T shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Compression Type for Drywall Slip-On Frames: Adjustable compression anchors.
4. Post-installed Expansion Type for In Place Concrete or Masonry: Minimum 3/8 inch (9.5 mm) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip type anchors, with two holes to receive fasteners.

2. Separate Topping Concrete Slabs: Adjustable type anchors with extension clips, allowing not less than 2-inch (50 mm) height adjustment. Terminate bottom of frames at finish floor surface.

## 2.6 HOLLOW METAL PANELS

- A. Provide hollow metal panels of same materials, construction and finish as specified for adjoining hollow metal work.

## 2.7 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

## 2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4 inch thick by 1 inch (6.4 mm thick by 25.4 mm) wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

## 2.9 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Glazed Lites: Factory cut openings in doors.

D. 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. Welded Frames: Weld flush face joints continuously; grind, fill, dress and make smooth, flush and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat or oval head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:
  - a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
    1. Two anchors per jamb up to 60 inches (1524 mm) high.
    2. Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
    3. Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
    4. Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

- b. Stud Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
  - 1. Three anchors per jamb up to 60 inches (1524 mm) high.
  - 2. Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
  - 3. Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
  - 4. Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
  - 5. Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal stud partitions.
- c. Compression Type: Not less than two anchors in each jamb.
- d. Post-installed Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
- 7. Door Silencers: Except on weather stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
  - a. Single Door Frames: Drill stop in strike jamb to receive three door silencers.
  - b. Double Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels and hardware reinforcement from either cold or hot rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware".
  - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with buttered or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field applied coatings despite prolonged exposure.

## 2.11 FINISH HARDWARE

A. Finish Hardware includes items known commercially which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and frame. Extent of finish hardware required is indicated in drawings and in schedules.

B. A recognized supplier who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or who employs an experienced architectural hardware consultant who is available for consultation at reasonable times during the course of the work.

C. Submit manufacturer's technical data for each item of hardware. Include all information necessary to show compliance with requirements and include instructions for installation and for maintenance of operating parts.

D. Hardware supplier shall receive and check all hardware at his warehouse. All hardware shall be delivered to the job site by the supplier in one shipment. All hardware shall be properly wrapped in separate packages complete with trimmings, screws, etc., each plainly labeled and numbered to agree with the door numbers and Contractor's typewritten schedule.

E. Work shall be done by a craftsman skilled and experienced in the installation of finish hardware. Mortised items shall be neatly set in and made flush with the door or frame surface. Manufacturer's instructions and recommendations shall be strictly followed. Mortised items shall be installed at frame manufacturer's standard locations.

F. Surface mounted items shall be installed at heights recommended by the Door and Hardware Institute, Arlington, Virginia. Hinges, pivots, locks and exit devices shall be installed with proper sex bolts supplied by the manufacturer. Door pulls shall be installed on doors with thru-bolts as supplied by manufacturer. All removable mullion to be installed with mullion stabilizers.

G. Hardware Set:

Item Description	Quantity	Brand	Model
Hinge	6	Hager	BB119 NRP
Lockset*	1	Yale	PBR8822FL
Exit Device	1	Yale	7100 x M0626F
Kick plate	2	Hager	193S 8"
Closer (Corrosion Resistant)	2	Norton	PA1601SS
Cast Aluminum Threshold	2	Hager	727S
Astragal	1	Hager	837S-MIL-N
Weather strip	2	Hager	726S
Sweep	2	Hager	750S-CLR-N

\* Coordinate with Owner to determine key preferences.

**Note: Items of equal quality will be accepted from other manufacturers.**

### **3.0 EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates, areas and conditions with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing in for embedded and built in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling and dressing, as required to make repaired area smooth, flush and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist and plumbness to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated, mortised and surface mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
  - 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. 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.
    - b. Install frames with removable glazing stops located on secure side of opening.
    - c. Install door silencers in frames before grouting.
    - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - e. Check plumbness, squareness and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - f. Field apply bituminous coating to backs of frames that are filled with grout containing anti-freezing agents.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
    - a. Floor anchors may be set with powder actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Metal Stud Partitions: Solidly pack mineral fiber insulation behind frames.
  - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
  6. In Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors and fill and make smooth, flush and invisible on exposed faces.
  7. In Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors and fill and make smooth, flush and invisible on exposed faces.
  8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
  9. 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 (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non Fire Rated Standard Steel Doors:
    - a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).

- b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
  - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
  - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).
- D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and 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 (230 mm) o.c. and not more than 2-inches (50 mm) o.c. from each corner.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime Coat 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 Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

**END OF SECTION**

## **SECTION 09901**

### **HIGH PERFORMANCE COATINGS**

#### **1.0 GENERAL**

##### **1.1 DESCRIPTION**

A. Scope. Furnish and apply coatings and do related work necessary to complete work shown or specified.

B. Codes, Specifications, and Standards. Codes, specifications, and standards referred to by number or title shall form a part of this specification to the extent required by the reference thereto. Latest revisions shall apply, unless otherwise shown or specified.

C. Definitions

1. Abbreviations

NSF - National Sanitation Foundation, STD 61

OSHA - Occupational Safety & Health Admin.

SSPC - Steel Structures Painting Council

2. Coating. The term coating includes emulsions, enamels, paints, stains, varnishes, sealers, emulsion filler, and other coating materials whether used as prime, intermediate, or finish coats.

3. Spatter. Drops and droplets of coating and spilled or splashed coatings on surfaces not specified to be coated or surfaces previously finish coated.

##### **1.2 QUALITY ASSURANCE**

A. Minimum requirements for materials are included in this Section. These requirements are intended to establish standards of quality. Products of manufacturers which meet all minimum requirements as herein established shall be acceptable. Written acceptance of the materials to be used shall be obtained prior to surface preparation or application.

B. No request for substitution will be considered which decreases the film thickness designated, or which offers a change from the generic type of coating specified. Requests for substitution shall contain the full name of each product, descriptive literature, directions for use, generic type, nonvolatile content by volume.

C. All materials shall be brought to the job site in the original sealed and labeled containers of the manufacturer and shall be subject to inspection by the resident representative of the job.

D. All materials shall be the product of or recommended by the coating manufacturer.

E. All materials shall be compatible with the service intended. No products shall be used that may have ingredients which might react detrimentally with adjacent fluids or gases.

### 1.3 SUBMITTALS

A. Submittals shall be as specified in the General Conditions.

B. Submit the following:

1. Shop drawings with performance data and physical characteristics.
2. Color charts.
3. List of surfaces indicating coating system and colors.
4. Manufacturer's Certificate specified in Article 3.6.
5. Manufacturer's application instructions.

### 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The Contractor shall be responsible for the delivery, storage and handling of products.

B. Promptly remove damaged or deteriorated products from the job site. Replace damaged products with undamaged and non-deteriorated products.

### 1.5 JOB CONDITIONS

A. Environmental Requirements

1. Perform coating work in strict conformance with manufacturer's printed recommendations as to environmental conditions under which coating and coating systems can be applied.
2. Do not apply finish in areas where dust is being generated.
3. During the course of the coating work, adequately ventilate the coated spaces to ensure there will be no concentration of noxious odors, hazardous fumes, or flammable vapors.
4. Do not apply coatings in damp weather or when the temperature is below 50°F or above 95°F.
5. Provide heating and enclosure when necessary to maintain specified temperature during application and cure.

6. Provide forced air circulation of recommended temperature and pH in enclosed areas during the curing period.
7. All costs associated with providing and/or maintaining the required environmental conditions shall be borne by the coating subcontractor.

#### B. Protection

1. Protect all finish work of other trades and surfaces not being coated. Furnish suitable coverings as required. Remove coating spatter from all finished surfaces, and restore finishes of affected items to their original conditions at no additional cost to the Owner.
2. Post "Wet Paint" notices, as required, to protect newly coated surfaces.
3. Keep oily rags and waste in Underwriters' Laboratories labeled metal containers. Do not allow oily rags and waste to accumulate in building.

C. Job Site Conference. The Contractor shall arrange and conduct a job site conference between the coating manufacturer's representative, the Engineer's representative, and the personnel assigned this work prior to any field surface preparation or coating application.

## 2.0 PRODUCTS

### 2.1 MANUFACTURERS

A. Except as otherwise specified, materials shall be the products of the following manufacturers or equal:

1. Tnemec Company, Inc.
2. Rust-Oleum
3. Sherwin-Williams Co.

B. Materials selected for coating systems for each type surface shall be the product of a single manufacturer, unless otherwise acceptable to the Engineer.

### 2.2 MATERIALS

A. All field applied primers and undercoats shall be provided to ensure compatibility of total coating systems and of the same manufacturer as the finish coats for each system as specified hereafter. Provide barrier coats over incompatible primers or remove and reprime as required. No thinner or solvents other than those approved by the Coating Manufacturer shall be used.

B. All materials shall herein be assigned a designation number for ease of reference. The minimum material requirements shall be as listed.

### PAINT COATINGS

DESIGNATION	GENERIC COMPOSITION	NO. OF COATS	DFT PER COAT	MANUFACTURER'S NAME
Primer P-1	Titanium-Pigmented Alcohol-Soluble Resin	2	2.0-3.0	Tnemec 707 Tar Bar SW: Pro Block Latex Primer
Primer P-3	Polyamide Cured Epoxy	1	3.0-4.0	Tnemec 66-1211 SW: Epoxy Primer, B67 Series
Primer P-4	High Build Epoxy Primer	*	*	Tnemec Series 54-561 SW: Epoxy Ester Filler/Sealer
Primer P-5	Synthetic Resin or Modified Polyester	*	*	Tnemec #54-561 Masonry Filler SW: Epoxy Ester Filler/Sealer
Primer P-6	PVA Sealer	1	1.5-2.5	Tnemec 51-792 SW: PrepRite 200, B28W200
Primer P-7	Nonpenetrating Oil Based Primer	1	1.0-2.0	Tnemec 36-603 SW: A-100 Alkyd Primer, Y24W20
Finish F-1 (Non-Sub.)	Polyamide Epoxy	2	3.0-4.0	Tnemec 66 HB Epoxoline SW: Heavy Duty Epoxy, B67 Series
Finish F-1 (Submerged)	Polyamide Epoxy	2	4.0-6.0	Tnemec 66 HB Epoxoline SW: Hi-Solids Epoxy, B62 Series
Finish F-2	Aliphatic Polyurethane	2	1.5-2.5	Tnemec Series 70-Endura Shield SW: Corothane II, B65 Series
Finish F-3	High Build Epoxy	2	10.0-12.0	Tnemec Series 83 SW: Sher-Tile, B67 Series
Finish F-4	Modified Epoxy	2	8.0-10.0	Tnemec Series 52 SW: Sher-Crete, B61WW400
Finish F-5	Medium to Long Oil Alkyd Semi-Gloss	2	1.5-2.5	Tnemec 23 SW: DTM Alkyd, B55 Series
Finish F-6	Coal Tar Epoxy	2	8.0-10.0	Tnemec 46-413 Tnemec Tar SW: C-200 CTE, B69B50/B69V50
Finish F-7	Clear High Content Acrylic Finish	2	0.5	KURE-N-SEAL by Sonneborn CURECRETE by Tnemec SW: Concrete Sealer, B44V22

\*Masonry porosity shall be completely filled to seal all surface voids (possibly a minimum of two coats).

**2.3 COATING SYSTEMS** Surfaces shall be coated with the following systems:

TYPE OF SURFACE	PRIME COAT	FINISH COAT	MIN. TOTAL DFT
Pipe with Bituminous Coating	P-3	F-2	6.0
Pipe without Bituminous Coating	P-3	F-2	8.0
Manhole Frames & Covers	P-3	F-1	11.0
Non-submerged Metals	P-3	F-2	8.0
Submerged Metals	P-3	F-1	11.0
Concrete Walls & Ceiling	P-4	F-1	8.0
Submerged Concrete	P-4	F-1	10.0
Concrete Floors	F-7	F-7	1.0
Interior Masonry	P-5	F-3	20.0
Exterior Masonry	P-5	F-4	12.0
Interior Walls & Ceiling (Drywall)	P-6	F-1	9
Wood	P-7	F-5	5

**2.4 COLORS**

A. Comply with OSHA requirements concerning color coding and safety markers.

B. Color code exposed piping. Color code equipment associated with piping, unless otherwise shown or specified.

C. Color coding shall be as follows, unless otherwise specified or directed by the Engineer:

APPLICATION	COLOR	
	TNEMEC	SW
Dangerous Machine Parts and Energized Equipment	Safety Orange	Safety Orange
Traffic Operations and Housekeeping Markings	White	White
Fire Protection Equipment and Flammable Materials	Safety Red	Safety Red
Radiation Hazards	Yellow w/ Black Bands	Yellow w/Black Bands
Water Lines		
Finished or Potable	2042 Victorian Blue	5169 R Strong Blue
Non-Potable	2041 Venice Blue w/ Safety Red Bands	5179T Windsor Blue w/ Safety Red Bands
Chemical Lines	Safety Yellow	Safety Yellow

D. Surfaces to be coated which are not listed in the color coding schedule shall have colors selected by the Engineer.

## **2.5 MIXING AND TINTING**

A. Coating, except two part epoxies, shall be delivered to the job site premixed.

B. Job tinting will not be acceptable, except as approved by the Engineer.

C. All mixing shall be done in mixing pails placed in suitably sized non-ferrous or oxide resistant metal pans.

## **3.0 EXECUTION**

### **3.1 INSPECTION**

A. Inspect all surfaces on which paint is to be applied, and notify the Engineer of any defects considered detrimental to the application of materials specified.

B. If any dirty, rusty, scaly, greasy, damp, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film are painted over, both the removal of paint and repainting the affected area shall be done by the Contractor without additional cost to the Owner.

C. Provide all scaffolding, staging, and other temporary facilities required for the proper execution of the work. Scaffolding shall be placed so as not to interfere with the work of others. Should it be necessary for the progress of the work on the building in general, the Contractor shall, if so directed and without extra cost to the Owner, move, relocate, or arrange his scaffolds, ladders, or coverings to permit the Engineer or other crafts to proceed with their work without delay.

### **3.2 SURFACE PREPARATION**

#### **A. General**

1. All surfaces to be coated shall be prepared in a workmanlike manner with the objective of obtaining a clean and dry surface. No coating shall be applied before the prepared surfaces are approved by the Engineer.
2. All preparation and cleaning procedures shall be in strict accordance with the coating manufacturer's printed instructions and as specified in this Section for each particular substrate condition.

3. Remove or otherwise protect hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not be painted prior to surface preparation and painting operations. Remove items, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space, reinstall removed items. Such removal and reinstalling shall be done by workmen skilled in the trades involved.
4. Clean surfaces to be coated before applying coating or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be low toxicity and shall have a flash point in excess of 115°F. Program cleaning and painting so dust and other contaminants from the cleaning process do not fall in wet, newly coat surfaces.

#### B. Metals

1. All ferrous metal to be primed in the shop shall have all rust, dust, and scale, as well as all other foreign substances, removed by sandblasting in accordance with SSPC No. 6 or 10. Immersion (submerged metals) exposure shall receive surface preparation SSPC SP10 near-white blast. Non-immersion (non-submerged metals) exposure shall receive surface preparation SSPC SP6 commercial blast. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting. Abraded or corroded spots on shop coated surfaces shall be wire brushed and touched up with primer specified in this Section. Sandblasted surface will be certified in accordance with SSPC VIS-1-89.
2. Store shop coated ferrous surfaces out of contact with the ground in such manner and location as will minimize the formation of water-holding pockets, soiling, contamination, and deterioration of the coating film.
3. All ferrous metals not primed in the shop shall be sandblasted in the field prior to application of the primer pretreatment in accordance with criteria specified above.
4. All non-ferrous metals and galvanized surfaces, whether to be shop or field primed, shall be solvent cleaned prior to the application of a vinyl-phosphoric wash and/or primer.
5. Any piping scheduled for a coating which is supplied with a bituminous coating shall receive two coats of titanium pigmented

alcohol-soluble resin before applying primer and colored finished coat.

#### C. Concrete and Masonry

1. Surfaces to be coated shall be prepared by removing efflorescence, chalk, dust, dirt, grease, oil, asphalt, tar, excessive mortar and mortar droppings, and by roughing to remove glaze, per ASTM D4259. Surface deposits of free iron shall be removed prior to painting. Fill holes and imperfections in finish surfaces with cement mortar. Do not coat over surfaces where the moisture content exceeds that permitted in the coating manufacturer's written instructions.
2. Where concrete cannot be roughened by rubbing, concrete shall be roughened by sandblasting, per ASTM D4259.

#### D. Wood

Wood surfaces to be coated shall be cleaned of all dirt, oil, and other foreign substances with mineral spirits, scrapers, and sandpapers as required. Finished surfaces exposed to view shall be made smooth by sandpapering and free of dust. Scrape and clean small, dry, seasoned knots and these shall be given a thin coat of knot sealer before application or priming coat. Fill holes and imperfections in finish surfaces with putty or plastic wood filler, colored to match the finish coat, if natural finish is required, allow to dry, and sandpaper smooth. Coating shall proceed only when the moisture content of the wood does not exceed 12%.

### 3.3 APPLICATION

#### A. Coating Thickness

1. Each coat of material shall be applied at the rate specified by the manufacturer to achieve the minimum dry mil thickness required and measured in accordance with SSPC PA-2. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of un-thinned material as originally furnished by the manufacturer must not cover a greater square foot area when applied by spray gun than when applied un-thinned by brush.
2. Deficiencies and excesses in film thickness shall be corrected by the application/removal of an additional coat (s) of material.

## B. Application to Masonry

1. Application rates will vary on masonry according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded.
2. It shall be the Contractor's responsibility to achieve a protective and decorative and pinhole free finish on porous surfaces either by decreasing the coverage rate or by applying additional coats of material.

## C. Application to Concrete Floors

After floor is clear and dry, apply one coat of sealer using lambs wool applicator. Let dry overnight, then burnish first coat and sweep surface thoroughly before applying second coat. Apply second coat and let dry overnight before opening to traffic.

D. Drying Time. Drying time shall be construed to mean "under normal conditions". Where conditions are other than normal because of the weather or because coating must be done in confined spaces, longer drying times will be necessary. Additional coats of material shall not be applied, nor shall units be returned to service until coatings are thoroughly dry.

## 3.4 PROTECTIVE COATING OF NON-FERROUS METALS

A. Where non-ferrous metals such as aluminum, copper, and galvanized metal comes in contact with concrete or dissimilar metals, a protective coating must be applied. In all cases except on galvanized metal, a standard epoxy primer should be applied, if the exposure is in a normal environment. In the case of galvanize, a modified zinc dust galvanize primer should be used in a normal exposure environment. If the environment is semi to severe, an unmodified epoxy chromate primer should be used.

B. A vinyl gasket may be used in lieu of the protective coating.

C. The bottom of aluminum railing posts and aluminum clip angles shall be coated with an aluminum-impregnated caulking compound (Alumilastic, or equal) prior to erection.

D. After erection and alignment, opening between non-ferrous metal surfaces and the concrete shall be sealed in a watertight manner with the proper caulking compound. Relative to and in accordance with the opening width demand.

### 3.5 CLEANING

- A. Touch-up coatings and restore finish where damaged or defaced by construction activities.
- B. Remove coating spatter from all finished surfaces and restore affected finishes.
- C. Remove excess materials, scaffolding, staging, drop cloths, equipment, and rubbish from the job site.

### 3.6 CERTIFICATION

The Contractor shall submit to the Engineer, immediately upon completion of the job, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces.

END OF SECTION

## SECTION 11002

### MISCELLANEOUS EQUIPMENT

#### PART 1 GENERAL

##### 1.1 SCOPE OF WORK

A. Under this item the Contractor shall furnish all materials, labor, equipment and services required for a complete and operating system as specified herein and as shown on the Drawings.

B. The Contractor shall furnish and install, as needed, electrical connections, control wiring, supply lines, drains, overflows, vents and all associated piping and appurtenances to the equipment.

##### 1.2 SHOP DRAWINGS

A. Shop drawings, catalog cuts, descriptive data shall be submitted for approval. Shop drawings shall include;

1. Dimensional data for each feeder
2. Typical installation data
3. Wiring diagrams
4. List materials of construction

##### 1.3 OPERATION and MAINTENANCE MANUALS

A. Two (2) Operations and Maintenance Manuals shall be furnished to the engineer for each type specified herein equipment.

#### PART 2 PRODUCT

##### 2.1 HEAVY DUTY WAGON TRUCK

A. The heavy duty wagon shall have a reinforced steel deck with a 1 ½" retaining lip, structural undercarriage and a 1" diameter axle. The wagon shall have 12" x 2 ½" mold-on rubber wheels. The wagon shall have "fifth wheel" steering and come equipped with a T-handle and vinyl handgrips allowing for two-man operation.

B. The heavy duty wagon truck shall be model CH-3048-12MR as manufactured by Little Giant, or approved equal.

C. Heavy duty wagon schedule:

Deck Size	Deck Height	Deck Capacity	Deck Thickness
30" x 48"	16 ½"	3,500 pounds	12 gauge

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

A. All equipment shall be installed in accordance to the manufacturer's recommendations.

### **3.2 START-UP and MANUFACTURER'S SERVICES**

A. Start-up, field testing, inspection, etc. shall be performed by a trained representative of the equipment manufacturer. Start-up reports shall be submitted to the engineer.

**END OF SECTION**

## SECTION 11007

### ELECTROMAGNETIC FLOWMETERS

#### 1.0 GENERAL

The Contractor shall furnish all materials, equipment and labor for installing flow-measuring equipment of the type specified herein and as shown on the Drawings.

#### 2.0 EQUIPMENT

##### 2.1 ELECTROMAGNETIC FLOWMETER

Electromagnetic flowmeters shall be installed as shown on the plans and in accordance with the manufacturer's recommendations. The flow meter shall consist of a flow tube (sensor), and a flow transmitter (converter), which shall indicate, totalize and transmit flow data. The flow tube shall use a spool piece configuration with sensors containing coils and electrodes. The electromagnetic flow meter shall be as manufactured by Badger Magnetoflow, or approved equal. The following schedule lists the meters covered under this specification:

Location	Meter Use	Meter Size (inches)
County Farm Pump Station	Station Flow & Total	8

The flowmeter shall maintain a minimum accuracy of  $\pm 0.25\%$  of rate in the velocity range of 1.0 to 33 feet per second (fps). Minimum accuracies for velocities below 1.0 fps shall be better than  $\pm (0.41/\text{velocity})\%$  of rate.

##### 2.2 FLOW TUBE (SENSOR)

The flow tube body shall be constructed from carbon steel and rated for an operating pressure of 150 psi. End connections shall be with ANSI Class 125 flanges. The exterior shall receive two coatings of an approved epoxy paint system. The interior of the flowmeter shall be equipped with a PTFE liner. The electrodes shall be Alloy C and grounding rings shall be 316 stainless steel. The sensor shall contain an EEPROM storing calibration and factory default settings.

##### 2.3 REMOTE CONVERTER

The flow converter, or meter display/control panel, shall be installed as shown on the plans and in accordance with the manufacturer's recommendations. The converter case shall be either cast aluminum or stainless steel and rated NEMA 4 watertight. Power supply for the flowmeter shall be 120 VAC, 60 Hz. Power consumption will be

approximately 24 VA. The converter shall be equipped with an LCD display for showing the flow rate and total flow.

The converter shall be capable of sending a scaleable current and frequency/pulse outputs. The frequency output shall be linearly proportional to rate of flow and shall be capable of being scaleable from 0 to 10 KHz. The pulse output shall be provided with scaleable pulse of 50 to 5000 milliseconds duration, suitable for an electro-mechanical counter for totalization of flow in both forward and reverse direction. The converter outputs shall have individual galvanic isolation with an isolation voltage of more than 500 V.

The converter shall be provided with two internal counters for summation in engineering units of the flow in both directions.

The converter shall be able to detect the following fault conditions and display the faults in the LCD display as well as activate a relay for remote display.

- a) Loss of current to the coil.
- b) Loss of the load on the current output.
- c) Empty pipe.

The converter shall be provided with an error log where all fault conditions occurring within a period of 180 days are stored.

## **2.4 ADDITIONAL FEATURES**

The flowmeter shall include the following features:

- **LOCAL DISPLAY & CONTROL KEYS:** LCD display (backlit) for showing flow rate, flow total, flow direction, alarms, and faults. Flow data shall be displayed in engineering units (GPM or MGD). The control keys shall be used to set the configuration parameters of the meter.
- **ZERO ADJUSTMENT:** Zero point adjustment shall be automatic.
- **POWER FAILURE:** The parameter settings for the flowmeter shall be stored in non-volatile memory and the settings will be restored when power is interrupted.
- **SURGE PROTECTION:** Surge protectors shall be installed on the power supply and current signal output circuits.

## **3.0 EXECUTION**

### **3.1 INSTALLATION**

Equipment shall be installed as shown on the plans and in accordance with the manufacturer's installation guide.

### 3.2 START-UP SERVICES

After the equipment is capable of operating, the equipment manufacturer/supplier shall provide competent personnel for a period of one day to check the flowmeter for correct installation, calibration, set-up parameters, and instruction to the Owner's personnel.

END OF SECTION

## **SECTION 11014**

### **HORIZONTAL SPLIT CASE PUMPS**

#### **1.0 GENERAL**

1.1 SCOPE: The CONTRACTOR shall furnish the equipment and services specified herein and as shown on the Drawings. The equipment to be furnished includes, but is not limited to, pumps, motors, motor control center, and appurtenances.

The CONTRACTOR shall also provide the services of a qualified technician (factory representative) for performing start-up, checkout and initial operation services. The technician shall have a minimum a five years experience in performing pump start-up operations. Start-up services shall include overseeing the set-up of the motor drive equipment.

#### **1.2 MANUFACTURER**

A. Quality Assurance. All pumping units shall be of approved design and make and the product of manufacturers who have built equipment of similar type, size and capacity.

B. Experience Clause. The pump manufacturer shall have a minimum of 500 units of similar type pumps, installed and operating for no less than five (5) years in the United States.

C. Additional Submittals. The CONTRACTOR shall submit, upon request, any additional information that the Engineer may deem necessary to determine the ability of the proposed manufacturer to produce the specified equipment.

D. Replacement Parts Capability and Service. Pumping units shall be the standard, or typical, product of the pump manufacturer. The manufacturer shall produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as may be needed at any time within the expected life of the pumps. The CONTRACTOR shall submit full details of the proposed manufacturer's ability to promptly fill replacement orders.

E. Manufacturer Information. All manufacturer information required by the specifications shall be submitted by the CONTRACTOR within forty five (45) calendar days of the date of receipt of the Notice of Award. Any additional information or data, specifically requested by the Engineer, shall be submitted by the CONTRACTOR within fourteen (14) calendar days of the receipt of the written request. Approval of the manufacturer and equipment will not be given until all information required by the specifications, or requested by the Engineer, has been submitted and found acceptable.

F. Disqualification of Manufacturer. Failure to successfully comply with the provisions of the Contract, or specifications, will constitute grounds for disqualification of the pump manufacturer and SUPPLIER.

1. Poor performance of similar pumping equipment now in operation under the specified conditions of service and pump rating constitute grounds for disqualification of the pump manufacturer, SUPPLIER, or both, unless such poor performance has been corrected.

### 1.3 SUBMITTALS

A. General. The CONTRACTOR shall comply with the provisions in the specifications regarding submittals, unless otherwise specified herein.

B. Content of Submittals. The following shall be included in submittals as a minimum. However, any additional information or data shall be added if and whenever requested by the Engineer. Where applicable, submit separate data for each pump.

1. Descriptive Literature.

- a. Dimensions.
- b. Materials of construction (including required coatings.)
- c. Weight of pump and motor
- d. Installation details

2. Performance data.

- a. Size of pump suction/discharge
- b. Flowrate, gpm
- c. Total Dynamic Head, feet
- d. Power, Brake Hp
- e. Overall pump efficiency
- f. Speed, rpm
- g. Performance curves showing overall pump efficiencies.
- h. NPSH curve (if applicable).
- i. Shutoff head.
- j. Motor data

C. Installation Information. Submit dimensional drawings containing adequate information necessary for final layout of foundations, connecting piping and valves, electrical connections, and auxiliary equipment. Drawings shall show location, size and full details of foundation or anchoring bolts.

The dimensional drawings shall outline the complete pump, motor, base, and frame. The drawings shall show plan, and elevation views. The CONTRACTOR and manufacturer shall be responsible for;

- 1. Verify that the equipment being proposed can be installed within the space of the structure.

2. Outline any special procedures required for servicing the pumps.

D. Operation and Maintenance Manual. Manual shall contain all information necessary for proper operation and maintenance of pumping units, as well as the location of the nearest permanent service headquarters. Three (3) bound copies of the O&M Manual shall be provided.

#### 1.4 REFERENCES

A. The pumps shall be driven by variable speed drives as specified in Division 16.

### 2.0 EQUIPMENT

2.1 OPERATING CONDITIONS: The Contractor shall furnish complete horizontal split case pump(s) and appurtenances to meet the requirements specified herein or as shown on the drawing. The pumps at the indicated location shall meet the following minimum requirements:

	County Farm Pump Station
Design Condition	750 gpm @ 155 ft.
Min. Design Efficiency	70%
Secondary Operating Point	1,400 gpm @ 140 ft.
Min. Secondary Efficiency	82%
Maximum RPM	1,180
Motor Size	75 hp
Impeller Diameter	17.5 in.
Max. NPSHR	6.4 ft.

Notes: The NPSHR shall be at the design point of operation as stated above.

#### 2.2 PUMP DESIGN:

A. CASING: The casing shall be of the volute type and designed to produce a smooth flow with gradual changes in velocity. The casing shall be close-grain cast iron ASTM A48, CL30. The casing shall be split on the horizontal center line with the suction and discharge nozzles and casing feet cast integrally with the lower casing half. The interior of the pump shall be easily inspected by removing the upper half of the casing. This shall be done without disturbing the pipe connections or pump alignment. The flanges between the halves will be sealed by a pre-cut gasket. The upper and lower halves of the casing shall be accurately located by the use of straight dowel pins to eliminate mismatch between the upper and lower halves which would impair both hydraulic and mechanical performance. The casing shall be hydrotested to 1.5 times the working pressure. Suction and discharge flanges shall contain drilled and tapped gage connections. The casing shall be single volute type.

B. IMPELLER: The impeller shall be double-suction enclosed type. Impellers shall be bronze ASTM B584 AL836. It shall be hydraulically balanced by its inherent design. The impeller shall be firmly secured to the shaft by a key positioned by shaft sleeves and both locked in place by shaft sleeve locknuts external to the stuffing box. Impeller to be dynamically balanced in accordance with ANSI S2.19, G6.3 requirements.

C. RENEWABLE CASING WEAR RINGS: Renewable bronze ASTM B505 AL932 wear rings shall be locked in place and protected against rotation by corrosion resistant pins.

D. SHAFT SLEEVE: Renewable shaft sleeves shall be provided which extend through stuffing box. They shall be securely keyed and held in place with shaft nuts incorporating set screws for locking purposes. Sealing to protect against leakage under the shaft sleeves shall be with "O" rings at the shaft outer diameter.

E. SHAFT: The shaft shall be heat-treated steel, machined to accurate dimensions and polished to a smooth surface. The shaft shall have the same nominal diameter from one shaft sleeve locknut to the other to minimize fatigue failure due to the stress concentration. The shaft sleeves shall protect the shaft at the stuffing boxes. The sleeves shall be secured in a lateral position by external shaft nuts. The impeller keys shall extend into the hub of the shaft sleeves. The shaft shall be adequately sized and designed to minimize deflection. The maximum shaft deflection at the stuffing box face shall not exceed .003" at 25% of BEP.

F. BEARINGS: The bearings shall be single row, deep-groove type ball bearings. They shall be designed and sized for at least 50,000 hours calculated minimum B10 rated bearing life at 25% BEP per ANSI B 3.15. Each bearing shall be capable of carrying both line and thrust type loads. The thrust bearing shall be securely held to the shaft.

G. BEARING BRACKETS: The bearing brackets shall be integrally cast with the pump case. Oil lubrication shall be utilized and a constant-level oiler shall be provided. Bearing bracket shall have a threaded drain outlet and the Contractor shall install drain piping to the nearest floor drain.

H. MECHANICAL SEALS: Mechanical seals shall be furnished with the pumps. As a minimum requirement, the seals shall be high performance mechanical seals with carbon/ceramic faces.

I. CASING FEET: The casing feet shall be integrally cast with the lower casing and be immediately adjacent to suction and discharge flanges in order to transmit any pipe strain loads to the base and foundation.

J. BASE: Each pump is to be mounted on a steel base with coupling and coupling guard. Base drip rims shall be piped to the nearest floor drain.

K. MOTOR: The motor shall be a premium efficiency, inverter duty, horizontal ODP type. The motor shall be designed to operate on 480 volt AC, 3 phase, 60 cycle electric current. Coupling guards shall comply with all OSHA standards.

1. Motor Requirements

a. Applicable Codes and Regulations. All motors furnished shall be designed, manufactured, and tested in accordance with the latest applicable standards of NEMA, ANSI, IEEE, and ASTM. As a minimum requirement, all motors shall conform to the latest applicable sections of NEMA Standard No. MG-1. Motors must meet or exceed the Consortium for Energy Efficiency (CEE) Premium Efficiency™ full load efficiencies.

2. Enclosures

a. In general, all motors shall be ODP (Open Drip-Proof), NEMA T frame, NEMA F1 assembly for horizontal applications. Motor enclosures shall be equal to the Baldor Super-E™ motor (EM).

3. Electrical & Mechanical Design Requirements.

a. Motors shall be premium efficiency Super-E™ type, NEMA Design B (normal starting torque, full voltage starting), squirrel cage, induction type.

b. Per CEE Premium Efficiency™ Criteria, minimum efficiencies for ODP motors shall be equal to or greater than those shown below:

Hp	1200 RPM	1800 RPM	3600 RPM
5	89.5	89.5	89.5
7.5	91.7	91.0	89.5
10	91.7	91.7	90.2
15	92.4	93.0	91.0
20	92.4	93.0	92.4
25	93.0	93.6	93.0
30	93.6	94.1	93.0
40	94.1	94.1	93.6
50	94.1	94.5	93.6
60	95.0	95.0	94.1
75	95.0	95.0	94.5
100	95.0	95.4	94.5
125	95.4	95.4	95.0
150	95.8	95.8	95.4
200	95.4	95.8	95.4

c. Motors shall be wound for 200, 230, 460, 230/460 or 575-volt, three-phase, 60-hertz, 1.15 service factor.

d. Windings shall be copper magnet wire rated at 200° C and moisture resistant. Magnet wire insulation varnish must be of a type designed to

resist transient spikes (such as Inverter Spike Resistant™ ISR), high frequencies, and short time rise pulses produced by inverters. Motor insulation system shall comply with NEMA MG1 Part 31.4.4.2.

e. Insulation shall be a Class F, non-hygroscopic varnish. The maximum permissible temperature for the insulation is not exceeded when the motor operates at service factor load in a 40° C ambient. Magnet wire shall have a service coating equivalent in thickness to a commercial "heavy" coating. The combination of magnet wire and varnish when tested in accordance with IEEE No. 57, latest revision, shall show a thermal rating of not less than 150° C for a duration of 30,000 hours life. Normal temperature rises for 1.0 service factor operation shall not exceed a Class B rise.

f. Windings shall be firmly held in the stator slots to prevent coil shifts. Sharp edges and burs shall be removed from the stator core slots prior to inserting the winding. All coils shall be phase insulated using Nomex paper or equal and laced down such that the windings will not move during repetitive starting. All stator connections will be securely made.

g. The insulation resistance of the sealed stator winding shall be greater than 100 megohms when measured at 25° C with a megohm bridge having 1000-volt direct current.

h. The motor design shall use the best available materials and methods to achieve premium efficiency, power factor and long life operation.

i. Motors shall be designed for operation in either direction of rotation without a physical change in the motor.

j. All motors shall have anti-friction, vacuum-degassed steel ball bearings electric motor quality. On frames 254-up, grease fittings and reliefs are supplied for external lubrication while machine is in operation. These grease fittings and reliefs are plugged.

k. The bearings shall have a rated fatigue life of L-10 (B-10) of 150,000 hours. Bearing located on the non-drive end shall be insulated from shaft voltage and induced bearing currents

l. Shaft Grounding Ring (SGR) shall be installed on the drive end of the motor to meet the requirements of NEMA MG1 31.4.4.3. and protect the motor bearings. The SGR shall be the AEGIS™ SGR as manufactured by Electro Static Technology, or approved equal.

m. Bearing cavities and greasing passages shall be thoroughly cleaned of all debris before lubricating. Motors shall be lubricated at the factory with Exxon Mobil Polyrex™ EM grease or equal.

n. Maximum vibration allowed shall be 0.15 inches per second velocity measured at the bearing housings.

o. Rotor assemblies shall be die cast aluminum for NEMA frames. Rotors shall be keyed and shrunk or pressed to the shaft. Welding will not be acceptable. Keyed rotors shall be press-fitted on a shoulder the full length of the rotor utilizing the full shaft surface diameter.

p. Each motor design shall receive the testing called out for "Polyphase Induction Motors and Generators", IEEE 112, latest edition. The routine tests shall, as a minimum, conform to the NEMA MG-1 tests.

q. The following motor information shall be furnished:

- 1) Model and/or catalog numbers.
- 2) Motor rated voltage, freq., full load current, Hp and rated speed.
- 3) Max KVAR allowed for power factor correction.
- 4) All options in the motor.
- 5) Induction motor time constants.
- 6) Outline drawings with all nameplate data clearly identified.
- 7) Motor weight.
- 8) Bearing size and type data.
- 9) Guaranteed efficiency and power factor at various loads.
- 10) Acceleration time with maximum inertia.
- 11) Internal winding connection of the motor.

4. Motor Warranty Period: Motors are warranted for 36 months from the date of shipment.

### **3.0 EXECUTION**

3.1 TIME OF DELIVERY: The CONTRACTOR shall deliver all specified equipment to the project site no later than one hundred twenty (120) consecutive calendar days after the approval of the equipment by the Engineer.

3.2 PUMP TESTS. The pump manufacturer and/or representative shall perform the following inspections and tests on each pump:

1. Hydraulic Institute Standard, ANSI/HI 1.6 Test, Level A, utilizing motor nameplate efficiencies. Each pump shall be tested with its job motor. Tests shall be certified by the manufacturer.
2. The pump shall be laser aligned after the pump base is grouted in place and piping connections are completed.

3.3 MANUFACTURER'S REPRESENTATIVE: The CONTRACTOR shall furnish the services of an accredited representative of the pump manufacturer who shall review the installation and perform the start-up tests for each pump. The representative shall instruct the Owner on the operation and maintenance of the pumps. Pumping equipment shall be tested for performance according to operating curves and other

approved data as soon as practical after installation. Failure of the equipment to perform in accordance to the approved operating curves shall be sufficient cause for rejection. As one condition necessary to final acceptance of any pumping unit, the CONTRACTOR shall submit a certificate from the manufacturer's representative, stating that the installation of the pumping unit is satisfactory, that the unit is ready for operation, and that the operating personnel have been suitably instructed in the operation, lubrication, and care of the unit.

3.4 WARRANTY. The manufacturer shall warrant the equipment being supplied to the OWNER to be free from defects in workmanship and material, covering part and labor, for a period of eighteen (18) months from the date of shipment or twelve (12) months from the start-up under normal use, operation and service.

END OF SECTION

## **SECTION 13100**

### **PUMP STATION PIPING**

#### **1.0 GENERAL**

##### **1.1 SCOPE OF WORK**

Provide all labor, materials, equipment and services required to furnish and install all plant process piping as shown on the Drawings and specified herein.

##### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

- A. Pump Station Piping: Section 13100.
- B. Water Lines: Section 13103
- C. Valves: Section 13500.
- D. Painting: Section 09901.

#### **2.0 PRODUCTS**

##### **2.1 DUCTILE IRON PIPE/DUCTILE AND CAST IRON FITTINGS**

Unless otherwise noted or required, all inside ductile iron piping shall be flanged pipe with threaded flanges in accordance with ANSI A21.51 (AWWA C151) and ANSI A21.15 (AWWA C115). All piping shall be rated for 250 psi unless otherwise noted and shall have ring gaskets, 1/8-inch thick.

All exposed iron pipe to be field painted shall be furnished with an external coating of rust inhibitive primer per the specifications. Do not apply asphalt or bituminous coatings on pipe to be painted.

The interior of ductile iron pipe shall be cement-mortar lined with bituminous seal coat in accordance with AWWA C 104.80. Thickness of the lining shall be as set forth in Section 4-10.1 of the aforementioned specification unless otherwise directed by the Engineer.

Ductile and cast iron fittings shall conform to ANSI A21.10 AWWA C110 with flanges faced and drilled 125-pound. Fittings 12-inch and smaller shall be 250 psi ductile iron. Fittings shall have interior lining and exterior coating same as the pipe.

## 2.2 PLASTIC PIPE AND FITTINGS

All exposed interior PVC process piping shall be ASTM D 1785, Schedule 80, Type 1, Grade 1. Joints shall be solvent welded. Use flanged connections where required for connection to appurtenances or where indicated on the Drawings. All plastic pipe, fittings and valves shall be suitable for minimum 200 psi operating pressure.

## 2.3 WALL PIPE AND SLEEVES

All wall pipe shall be furnished with cast or welded collar waterstops. Welding of water stop collars on pipe shall be accomplished by the wall pipe manufacturer in their shop. Centrifugally cast wall pipe shall be ductile iron meeting the requirements of AWWA C151 for the pipe barrel, conforming to the pressure rating of the pipeline in which installed. All statically cast wall pipe shall be gray or ductile iron meeting the requirements of AWWA C110 for fittings. Mechanical joint end and cast-on flange end wall pipe shall conform to AWWA C110 and threaded flange wall pipe shall conform to AWWA C115. Where flanged or mechanical joint bell ends are flush with the wall, they shall be drilled and tapped for study bolts. Bolts shall be constructed from 300 Series stainless steel. The length of all wall pipe shall be not less than the thickness of the wall in which installed. Wall pipe shall be cement-mortar lined per AWWA C104. The exposed end of wall pipe inside structures shall be shop primed for field painting; embedded portion left uncoated; exterior buried portion coated with standard bituminous coating.

Contractor may have the option to install wall pipe flush face-to-face of wall in lieu of the dimensioned length wall pipe shown on the Drawings, in order to eliminate form penetrations. This option will be subject to Engineer's review at each wall pipe location and covers both flanged and mechanical-joint bell-end wall pipe. Embedded flanged and M.J. bell-end bolt holes shall be tapped for stud bolts; tapped bolt holes in embedded flanges shall be plugged for protection during concrete pouring.

All pipe wall sleeves shall be plain end galvanized steel pipe. Sleeve length to fit flush face-to-face of wall. Link-Seal, or equal, shall be used seal void between the carrier pipe and sleeve. Non-shrink grout shall be used on both end to fill remainder of void flush with wall.

## 2.4 INTERLOCKING LINK PIPE SEALS

Link pipe seals shall be used in lieu of packing a pipe wall sleeve. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve.

The Contractor shall determine the required diameter of each individual wall opening according to the manufacturer's recommendations before ordering and installing the

seal. Pipe shall be accurately centered in the sleeve and the link seals shall be sized, installed and tightened in accordance with the manufacturer's instructions. Remainder of void to be filled with non-shrink grout.

## 2.5 FLANGE COUPLING ADAPTER (FCA)

Flange Coupling Adapters (FCA) shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C115/A21.15. Restraint for the flange adapter shall consist of a plurality of individually actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of the gripping wedges. "Quick Flange" or "EZ Flange" configurations using only set screws for restraint will not be accepted. The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6" gap between the end of the pipe and the mating flange without affecting the integrity of the seal. For PVC pipe, the flange adapter will have a pressure rating equal to the pipe. For Ductile Iron Pipe, the flange adapter shall have a safety factor of 2:1 minimum.

## 2.6 FLANGED JOINTS

Flange bolts and nuts shall be ASTM A 307, Grade B and shall have hexagonal heads. All bolts, nuts and studs for flanged pipe in submerged locations shall be of 300 Series stainless steel. The flanges shall be drawn together until the joint is perfectly tight, with bolts of a length such that they will not project greater than 1/4-inch from the nut nor fall short of the end of the nut when drawn up. No washer shall be used. Gaskets shall be carefully fabricated prior to installation and must be suitable for pressure rating for the pipe for which it is used.

All flanges (unless otherwise indicated or required) shall be faced and drilled ANSI A21.15 125-pound for ductile iron and rated for 250 psi.

## 2.7 PIPE SUPPORTS AND HANGERS

The Contractor shall furnish and install all pipe hangers, inserts, brackets, plates, anchors, and other supports not specifically included under other items. Generally pipe supports are not shown on the Drawings, but shall be supplied as specified herein. However, any bracing or support details shown on the Drawings shall be followed.

Supports and hangers shall be as manufactured by Grinnell, Elcen, B-Line, or Fee & Mason, or fabricated by the Contractor. Field fabricated supports may be used only for special conditions where manufactured items may not be suitable. In such cases, details of proposed supports shall be submitted to the Engineer for review. All such supports shall be galvanized.

Except as shown on the Drawings or as directed by the Engineer, supports and hangers shall be as follows:

- A. Pipes with centerlines less than 24 inches from a wall shall be supported by a typical wall support bracket. Pipes with centerlines less than 6 feet above a floor shall be supported from below. All other pipes shall be hung from above. Piping shall be supported at no greater than 10 feet 0 inches on centers.
- B. Pipe supported from underneath shall have adjustable pipe saddle supports on properly sized pipe stanchions. The saddle assembly shall be of cast iron.
- C. Hangers are to be suspended from concrete work. Hangers shall be supported from approved metal inserts placed in concrete before the concrete is placed.
- D. All pipe hangers, inserts, clamps, supports and other like items shall be submitted for review by the Engineer prior to installation.
- E. All inside horizontal flanged piping shall be supported with approved split ring type adjustable hangers of malleable iron with suitable hanger rods unless shown otherwise on the Drawings. Special supports shall be constructed in accordance with details shown on the Drawings. Wall supports and/or hangers shall be placed not over 10 feet apart. All piping shall be rigidly supported to prevent loosening under vibration.
- F. Pipe, valve operating stems, fixtures and conduits shall be bracketed or suspended from walls, ceilings, and beams at or near valves and fittings and where needed for firm support, by standard brackets, rods, turnbuckles, and rings made especially for pipe of sizes supported. Perforated strap iron and/or copper will not be acceptable.
- G. Clevis hangers for "iron pipe size" O.D. pipe shall be Grinnell Figure 65, Elcen Figure 12, Fee & mason Figure 239, or equal. Clevis hangers for Cast Iron O.D. pipe shall be Grinnell Figure 260, Elcen Figure 12C, Fee & Mason Figure 104, or equal.
- H. Turnbuckles shall be forged steel. Rods shall be of black steel, machine threaded of following sizes:

Pipe Size	Rod Diameter
1/2" - 2"	3/8"
2 1/2" - 3"	1/2"
4" - 5"	5/8"
6"	3/4"
8" - 12"	7/8"
14" - 16"	1"
18"	1 - 1/8"
20" - 24"	1 - 1/4"

- I. Brackets shall be of standard castings of fabricated steel and shall be reviewed by the Engineer.

- J. Column type pipe supports shall consist of pipe columns of size required to carry the full pipe and standard cast iron bases and saddles as required. Saddles shall be of proper size to fit the pipe being supported.

### **3.0 EXECUTION**

#### **3.1 INSTALLATION**

- A. All materials shall be new.
- B. Each piece of iron pipe and each fitting shall be plainly marked at the foundry with class number and weight.
- C. Where indicated on the Drawings, plain-end pipe shall be joined by means of flanged coupling adapters.
- D. All pipe couplings shall be designed to safely withstand the operating pressure of the lines in which they are installed. All couplings shall be shop primed with an approved rust inhibitive primer.
- E. Taps and connections to piping shall be made as required to connect equipment, sample lines, etc., and where otherwise shown on the Drawings.
- F. Piping shall be installed straight and true, parallel or perpendicular to walls, with approved offsets around obstructions. Standard pipe fittings shall be used for changing direction of piping. No mitered joints or field fabricated pipe bends are permitted unless accepted by the Engineer.
- G. All piping, fittings, valves and other accessories shall be thoroughly cleaned of dirt, chips and foreign matter before joint connections are made.
- H. All plastic pipe shall be adequately supported and braced. Support spacing shall not exceed the recommendations of the Plastics Pipe Institute.
- I. Teflon tape shall be used on all plastic pipe threaded connections.
- J. Field cut male threads on plastic pipe shall be made with plastic pipe threading dies.
- K. The annular space of plain wall sleeves shall be packed tight with lead wool to within 3/4" of wall face and then patch grouted flush to wall face with non-staining non-shrink grout, Masterflow 713 by Master Builders, SonogROUT by Sonneborn-Contech, or equal.
- L. All pipe sleeves passing through walls or floors of chlorine feed and storage areas shall be provided with gas tight seals.

- M. All pipe threads shall conform to ANSI B2.1.
- N. Piping shall be erected to provide for expansion and contraction.
- O. Screwed or soldered unions shall be provided in all small piping as required to permit convenient removal of equipment, valves and piping accessories from the piping system.
- P. Dielectric insulating couplings or brass adapters shall be used whenever the adjoining materials being connected are of dissimilar material such as connections between copper tubing and steel pipe.
- Q. All inside piping shall be color coded, stenciled and label tagged for identification.
- R. All flanged pipe shall be installed with at least one factory assembled flanged end. Flange coupling adaptor may be used for the opposite end.
- S. All pipe, fittings, and appurtenances shall be pressure tested at the pressure rating of the pipe.

#### **4.0 MEASUREMENT AND PAYMENT**

No separate measurements or payment shall be made for in plant and vault piping. Payment for this item shall be included in the work which it is subsidiary in the Bid Schedule.

END OF SECTION

## **SECTION 13103**

### **WATER LINES**

#### **1.0 GENERAL**

The CONTRACTOR shall furnish all labor, materials and equipment to install the water lines as shown on the plans and as specified herein.

The water lines may either be pressure-rated municipal plastic pipe (MPVC) or ductile iron (DI), all as specified hereinafter.

#### **1.1 RELATED WORK SPECIFIED ELSEWHERE**

- A. Pump Station Piping: Section 13100.
- B. Water Lines: Section 13103
- C. Valves: Section 13500.

#### **2.0 PIPE AND FITTINGS**

##### **2.1 POLYVINYL CHLORIDE RIGID PIPE AND FITTINGS**

This specification covers rigid, pressure-rated, polyvinyl chloride pipe and fittings, hereinafter called PVC pipe and PVC fittings, for sizes 1/2 inch through 12-inch.

A. PVC Pipe. PVC pipe shall be extruded from Type 1, Grade 1, polyvinyl chloride material with a hydrostatic design stress of 2,000 psi for water at 73.4°F, designated as PVC 1120, meeting ASTM Specifications D-1784 for material and D-2241 for pipe, latest revisions. Pipe shall also meet all applicable provisions of the Product Standards and shall bear the National Sanitation Foundation (NSF) seal of approval in compliance with NSF Standard No. 14. PVC pipe having a maximum hydrostatic working pressure of 160 psi (SDR26), 200 psi (SDR21), 250 psi (SDR17), or 315 psi (SDR13.5) shall be used as shown in the Bid Documents and Plans.

Samples of pipe and physical and chemical data sheets shall be submitted to the ENGINEER for review and determination of compliance with these specifications before pipe is delivered to job. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects.

The workmanship, pipe dimensions and tolerances, outside diameters, wall thickness, eccentricity, sustained pressures (ASTM D-1598), burst pressures (ASTM D-1599), flattening, extrusion quality (ASTM D-2152), marking and all other requirements of the Product Standard PS 22-70 shall be conformed with in all

respects. No pipe, 2 inches in diameter or larger, with a wall thickness less than 0.090 inches may be used.

Pipe shall be furnished in 20 feet or 40 feet lengths. The pipe may be double plain end or with bell on one end. Male ends of pipe must be beveled on the outside. Pipe shall have a ring painted around the male end or ends in such a manner as to allow field checking of setting depth of pipe in the socket. This requirement is made to assist construction superintendents and inspectors in visual inspection of pipe installation.

Pipe must be delivered to job site by means which will adequately support it, and not subject it to undue stresses. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe must not be exposed to the direct rays of the sun for an extended period of time. If pipe is not to be installed shortly after delivery to the job site, it must be stored in a shaded location and strung as needed.

B. PVC Pipe Jointing. Pipe shall be joined with slip-type joints with rubber gaskets. Pipes with bells shall have all parts of the bell, including the gasket groove, made from the same extruded piece, integral with the pipe, and shall be thickened to meet standard dimension ratios of wall thickness to outside diameter. The gasket groove shall be constructed such that gasket rollout will not occur. Rubber gasketing shall conform to ASTM 1869. The pipe manufacturer shall have an experienced representative on the job for a minimum of one day at the commencement of joining and laying operations. Joint lubricant shall be of a type recommended by the manufacturer for their pipe subject to the Engineer's approval. Lubricant shall be water soluble, non-toxic and have no objectionable properties.

C. PVC Couplings. Where PVC couplings are used, they shall be of the same material as the pipe and may be of the molded, or extruded type. PVC couplings shall have a minimum rating of 200 psi for continuous operation at 73.4 F°.

G. Service Connections. All service connections on PVC lines shall be made by means of tees, factory tapped couplings, or bronze service clamps manufactured specifically for use with PVC pipe, with Mueller threads, Mueller Catalog No. H-134 or approved equal. Whenever possible, corporation stops shall be installed in plastic lines before conducting hydrostatic tests. Service lines shall have the same pressure rating as its main line. The specifications for Copper and PVC service lines are contained elsewhere in this section.

## 2.2 DUCTILE IRON PIPE

These specifications cover ductile iron pipe (3-inch diameter and greater) to be used in water transmission systems with mechanical joints, rubber ring slip type joints or flanged joints.

A. General. Ductile iron pipe shall be designed in accordance with AWWA H3 (ASA A21.50) and for pressures and conditions as stated in these specifications or called for on the plans. Ductile iron pipe shall conform to AWWA C-151 (ASA A21.51.).

B. Minimum Nominal Thickness. The specified thickness will be determined for the given internal and external loading requirements in accordance with ASA A21.50. The class of pipe, wall thickness, and coatings required will be shown on the plans or the bid form for all ductile iron pipe installation.

C. Lengths. Pipe may be furnished in 12, 16, 16 1/2, 18 or 20 feet nominal laying lengths.

D. Tests. Hydrostatic and acceptance tests shall be in accordance with AWWA Specification C-106 for "Cast Iron Pipe Centrifugally Cast In Metal Molds" or C-108 for sand molds. The ENGINEER shall be provided with five (5) copies of each of the following tests for each contract involved:

1. Talbot strip test.
2. Ring and full length bursting tests.
3. Chemical analysis of pipe.
4. Certification that pipe was hydrostatically tested.

Any pipe not meeting the AWWA Specifications quoted above shall be rejected in accordance with the procedure outlined in the particular specifications.

D. Marking. The net weight, class or nominal thickness and sampling period shall be marked on each pipe.

E. Pipe Joints for Ductile Iron Pipe. Pipe joints shall be rubber ring slip joint. Locking gaskets may be used where indicated on the plans.

F. Rubber Ring Slip Joint. Rubber ring slip joint shall be equal to AWWA C-111-64 or latest revision. The joints shall be of the following materials:

1. Rubber ring gasket compressed in groove in bell of pipe.
2. Beveled spigot end of pipe for initial centering into rubber gasket in bell.

H. Locked Mechanical Joint. Locked mechanical joints shall be equal to Clow Corporation's "Locked Mechanical Joint".

I. All items used for jointing pipe shall be furnished with the pipe and tested before shipment. The joints shall be made with tools and lubricant in strict conformity with the manufacturer's instructions. Three (3) copies of such instruction shall be delivered to the ENGINEER at start of construction.

J. Coatings and Lining. All buried ductile iron pipe shall have manufacturers outside coal tar or asphaltic base coating and a cement lining and bituminous seal coat on

the inside. Cement mortar lining and a bituminous seal coat inside shall conform to ANSI A21.4 (AWWA C-104) latest revision.

All pipe and fittings housed and in vaults shall be lined and coated on the inside as specified herein for buried ductile iron pipe and fittings. Exterior shall be prime coated.

N. Mechanical Joint, Rubber Ring Slip and Flanged Joints Fittings. Cast iron mechanical, rubber ring slip and flanged joints shall conform to ASA Specifications A21.10 (AWWA C-110) for centrifugally cast iron water pipe. Mechanical joints shall also conform in all respects to ASA 21.11 (AWWA C-111). All fittings shall be manufactured for the size and pressure class of the pipeline in which they are to be used. All fittings shall be furnished complete with all joint accessories. All cast iron pipe fittings for water, sewer, air, gas and force main service shall be bituminous coated outside and lined on the inside same as the line on which they are installed.

## 2.3 FITTINGS

Ductile iron mechanical joint or push-on type fittings with appropriate adaptors shall be used. Fittings shall be approved by the ENGINEER for use on the project, and complete manufacturer's data shall be submitted for review. Fittings shall comply with AWWA C110 and C153 and shall be manufactured for the size and pressure class of the line on which they are used.

## 3.0 HAULING AND STORAGE

The CONTRACTOR shall notify the ENGINEER when pipe will be received on the job so that proper arrangements may be made for inspecting the unloading and stringing, as well as inspecting and examining the pipe materials.

The CONTRACTOR will be required to deliver all equipment and other materials and place same as and where required for installation. Care must be exercised in the handling of all materials and equipment and the CONTRACTOR will be held responsible for all breakage or damage to same caused by his workmen, agents, or appliances for handling or moving. Pipes and other castings shall in no case be thrown or dropped from cars, trucks, or wagons to the ground, but same shall be lowered gently and not allowed to roll against or strike other castings and unyielding objects violently. Pipe and other castings may be distributed at places that will not interfere with other building operations and unloaded, or yarded and distributed as required, as the CONTRACTOR may elect.

Valves, castings, fabricated metal, reinforcing steel, etc. shall be yarded or housed in some convenient location by the CONTRACTOR and delivered on the ground as required. All equipment and materials subject to damage from the weather, dampness, changes in temperature, or exposure shall be protected by a dry, weatherproof enclosure until ready for installation or use. The cost of all hauling, handling, and

storage shall be included in the prices bid for equipment and materials in place. The OWNER takes no risk or responsibility for fire, flood, theft, or damage until after the final acceptance of the work.

#### **4.0 LINES AND GRADES**

The ENGINEER will mark the location of all new pipe lines on the ground and will assist the CONTRACTOR in making such locations in the field. The CONTRACTOR will be required to accomplish any detailed layout, including that required for establishing the grade of the pipe line.

#### **5.0 TRENCH EXCAVATION**

The CONTRACTOR shall include in his unit price bid, all trenching necessary for installation of all pipelines as planned and specified. Trenching shall include all clearing and grubbing, including all weeds, briars, small trees, stumps, etc. encountered in the trenching. The CONTRACTOR shall dispose of any such material by burning, burial, or hauling away (or as noted on the drawings), at no extra cost to the OWNER. It shall be the CONTRACTOR'S responsibility to notify the appropriate State and local Air Pollution Control agencies when he conducts open burning of refuse. Ornamental shrubs shall be removed, protected, and replanted. Trenching also includes such items as minor street, road, sidewalk, pipe and small creek crossings; cutting, moving or repairing damage to fences, poles, or gates and other surface structures regardless of whether shown on the plans.

The CONTRACTOR shall protect existing facilities against danger or damage while pipeline is being constructed and backfilled, or from damage due to settlement of this backfill. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structures will be in as good condition and serve its purpose as completely as before and such restoration and repair shall be done without extra cost to the OWNER. The use of trench-digging machinery will be permitted except where its operations will cause damage to trees, buildings or existing structures above or below the ground. At such locations hand methods shall be employed to avoid such damage. All excavated material shall be piled in a manner that will not endanger the work and will avoid obstructing sidewalks and driveways. Gutters shall be kept clear or other satisfactory provisions made for street drainage.

All excavation shall be open trenches, except where the drawings call for tunneling, boring, or jacking under structures, railroads, sidewalks and roads. The construction procedure for these types of excavation is described elsewhere in these specifications.

#### **5.2 CLEARING**

The CONTRACTOR shall accomplish all clearing and/or grubbing as required for the construction under this contract. Clearing and grubbing shall include the cutting and

removal of trees, stumps, brush, roots, logs, fences and other loose or projecting material and natural obstructions which, in the opinion of the ENGINEER, must be removed to properly prosecute the construction and operate the facilities upon completion of construction. Trees, unless designated otherwise on the plans, shall remain and be properly protected. Ornamental shrubs, plantings, fences, walls, etc. shall be removed and replanted or replaced or protected from the construction activity. Clearing and/or grubbing shall be incidental to the various bid items and no additional compensation will be paid for same.

### 5.3 TRENCH DEPTH

Trenches shall be excavated to the line and grade required for the installation of pipe at the elevations indicated on the plans. The minimum depth of cover shall be 30 inches above the top of the pipe, unless shown otherwise on the plans or on the Standard Details. When the pipe is laying in or on solid rock, the minimum depth of cover shall also be 30 inches above the top of the pipe. No additional compensation will be made for extra depth where required by the plans or due to CONTRACTOR error. Excavation, except as required for exploration, shall not begin until the proposed work has been staked out. Materials which are not required for backfill and site grading shall be removed and disposed of as directed by the ENGINEER. Hauling, bedding, and backfilling shall be considered incidental to the various bid items and will not be paid for directly. Excavation shall be of sufficient depth to allow the piping to be laid on the standard pipe bedding in accordance with the Section 6 of this section. The trenches shall be excavated to a minimum of six (6) inches below the bottom of the pipe barrel in rock. In all cases where lines are under traffic a minimum cover of thirty-six (36") inches shall be provided. Should it be necessary to avoid existing utilities, culverts, outlets, or other structures, the water line shall be carried deeper at no additional expense to the OWNER.

Where the plans call for extra trench depth, this extra depth shall be provided at no extra cost.

### 5.4 TRENCH WIDTH

Trench widths shall exceed the minimum width that will provide free working space on each side of the pipe and to permit proper backfilling around the pipe as shown in the accompanying table and unless specifically authorized by the ENGINEER, shall not be excavated to wider than two (2) feet plus the nominal diameter of the pipe at the top of the trench. Before laying the pipe, the trench shall be opened far enough ahead to reveal any obstruction that may necessitate changing the line and grade of the pipe. Should the CONTRACTOR fail to accomplish this, and changes are required, they shall be at his sole expense. In rock, all ledge rocks, boulders and large stones shall be removed to provide six (6) inches of clearance on each side and below all pipe and fittings.

**MINIMUM TRENCH WIDTH IN EARTH &  
PAY WIDTH FOR ROCK EXCAVATION**

<b>Size</b>	<b>Width</b>	<b>Size</b>	<b>Width</b>
Up to 4" Pipe	1'-6"	15" Pipe	2'-8"
6" Pipe	2'-0"	16" Pipe	2'-8"
8" Pipe	2'-0"	18" Pipe	3'-0"
10" Pipe	2'-4"	20" Pipe	3'-2"
12" Pipe	2'-6"	21" Pipe	3'-4"
14" Pipe	2'-6"	24" Pipe	3'-8"

### 5.5 SHORING, SHEETING, AND BRACING OF EXCAVATION

Where unstable material is encountered, or where the depth of the excavation in earth exceeds five (5) feet, the sides of the trench or excavation shall be supported by substantial sheeting, bracing, or shoring. The design and installation of all sheeting, sheet piling, bracing or shoring shall be based on computations of pressure exerted by the materials to be retained under retaining conditions. Adequate and proper shoring of all excavations will be the entire responsibility of the CONTRACTOR. The Standards of the Federal Occupational Safety and Health Act and the Kentucky Department of Labor shall be followed.

### 5.6 REMOVAL OF WATER

The CONTRACTOR shall provide for adequate removal of all water and the prevention of surface water from entering the excavation. The CONTRACTOR shall maintain dry conditions within the excavations until the backfill is placed. No additional compensation will be paid for replacement and/or stabilization of prepared excavations due to flooding and/or deterioration from extended exposure. All water pumped or drained from the excavation shall be disposed of in a suitable manner without damage to adjacent property or to other work under construction.

### 5.7 PAVEMENT REMOVAL

Pavement removal shall be as indicated on the plans or directed by the ENGINEER. When so required, or when directed by the ENGINEER, only one-half (1/2) of the street crossings or road crossings shall be excavated before placing temporary bridges over the side excavated, for the convenience of the traveling public. All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property OWNERS abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged at the direction of the ENGINEER. Pavement replacement shall be in accordance with Section AC of these specifications. Excavated materials shall be disposed of so as to cause the least interference and in every case the disposition of excavated materials shall be satisfactory to the ENGINEER.

## 5.8 TRAFFIC MAINTENANCE

The CONTRACTOR must "red light" and guard all open trenches or obstructions placed on the streets or sidewalks. The lights must be burning from sunset to sunrise in order to effectually warn and safeguard the public against dangers connected with open trenches, excavations and other obstructions. The CONTRACTOR shall be held responsible for any damage that may occur to persons or property by reason of the failure of the CONTRACTOR to properly "red light" and guard all open trenches or obstructions along the routes of the water lines. This CONTRACTOR at his own expense shall also maintain warning signs, barricades and a watchmen or flagmen to control traffic at such times as his work would interfere with the flow of traffic. No excavation shall begin that may present a safety hazard unless the signs, barricades, lights, etc. are available to protect the open excavation at the conclusion of the day. The CONTRACTOR will comply with all Federal and State Occupational Safety and Health requirements for this type of construction. The CONTRACTOR shall also comply with all local and Kentucky Department of Highways requirements for signing and traffic control.

## 5.9 LINE LOCATION

The location of pipelines and their appurtenances as shown are those intended for the final construction. However, conditions may present themselves before construction on any line is started that would indicate desirable changes in location. In such cases, the OWNER reserves the right to make reasonable changes in line and structure locations without extra cost, except as may be determined by extra units of materials and construction actually involved. The OWNER is under no obligation to locate pipelines so they can be excavated by machine.

## 5.10 SOLID ROCK EXCAVATION

The method for payment for solid rock excavation is provided in the Bid. Rock excavation and trenching in earth may be combined into a single "unclassified" bid and no extra payment for rock shall be made in this case. Where provision is made for extra compensation solid rock excavation is defined as the removal of materials of one-half (1/2) cubic yard or more in one location through the use of explosives. Boulders which can be moved economically without explosives; decomposed, shattered, or weathered rock; pavement; and shale rock will not be included when rock excavation is encountered. The CONTRACTOR shall notify the Engineer for the purpose of obtaining an accurate survey of rock excavation required before blasting is done. No payment will be made for rock excavation which is not inspected by the ENGINEER. Whenever blasting is necessary, ample precautions shall be taken to prevent accidents to life and property from flying rock or debris by either covering the trench or excavation with heavy timbers, or mats or by using other suitable means. The CONTRACTOR should refer to the blasting requirements contained in Section AC of these specifications. Any damages to pipelines of this or other CONTRACTORS or to any

structures caused by blasting done under this contract shall be repaired promptly by this CONTRACTOR at his expense and to the satisfaction of the ENGINEER.

A. Where applicable, the basis for payment for rock excavation shall be computed by multiplying the average depth of rock strata by the length of strata and by the width of trench used. The maximum allowable pay width of trench is determined from Paragraph 5.4 of these specifications. Measurement of strata depth will be from top of strata to six (6) inches below the bottom of pipe barrel when the pipe is laid in accordance with these specifications. Rock excavations below the minimum grades, unless authorized by the ENGINEER, will be at the CONTRACTOR'S expense. The depth measurements will be taken at each end of the strata and at 25 foot intervals. The length of the strata will be the distance between intersections of the bottom of the trench with each end of the strata.

B. Unclassified excavation by trenching includes removal of all rocks, earth, boulders, masonry, hidden concrete, etc. There will be no extra payment for rock excavation in pipeline trenches of any kind where unclassified excavation is specified. All excavation costs shall be included in the unit price bid for the contract.

## **6.0 BEDDING OF PIPELINE**

In all cases the foundation for pipe shall be prepared so that the entire load of the backfill on top of the pipe will be carried uniformly on the barrel of the pipe. The bells of the pipe shall not carry any of the load of the backfill. The CONTRACTOR should refer to the Standard Details for pipe bedding shown in the plans. The bedding specifications shall govern the backfill from the bottom of the trench up to the centerline or spring line of the pipe.

### **6.1 STABLE EARTH FOUNDATION**

On all galvanized or copper lines, the CONTRACTOR may use either the "solid trench bottom method" or the "undercutting method" as shown in the Standard Details. The solid trench bottom method allows support of the pipe barrel by the trench bottom with holes dug out for the bells. The bottom must be leveled with soil and free of irregularities. The undercutting method calls for 4 inches of excavation below the barrel and then refill with evenly spread earth cushion or other standard bedding.

On all PVC pipelines, the trench bottoms shall be smooth and free of frozen material, clodded dirt and stones over 1/2" diameter. Bottom dirt left by trenching equipment will usually provide adequate material to level the trench bottom and provide bedding support for the pipe barrel. If the trench bottom is free of dirt, soft material may be shoveled off the side walls or shoveled under the pipe to insure proper pipe barrel bedding. In areas where the trench bottom is hard, a layer of soft backfill must be provided to insure the pipe barrel is properly cushioned. See the plans for proper bedding material depth.

If the foundation is good firm earth the pipe may be laid directly on the undisturbed earth provided the pipe barrel is supported for its full length.

Bedding of No. 9 stone, fine gravel, sand or compacted finely graded select earth shall be used to correct irregularities in the subgrade. Where bell and spigot is involved, bell holes shall be excavated to prevent the bells from being supported on undisturbed earth.

As an alternative to the above method, excavation in earth may be undercut to a depth below the required invert elevation that will permit laying the pipe on a bed of granular material or finely graded select earth to provide continuous support for the pipe barrel. Bedding depth shall be as shown on the plans.

All cast iron or ductile iron lines 4 inches or above in size will be installed using the undercutting method and a crushed stone bedding in accordance with the Standard Details. The crushed stone bedding is not a separate pay item and shall be included as incidental expense in the unit price for the pipe bid per foot of pipe. Cast iron or ductile iron lines less than 4 inches may be installed using the undercutting method and earth refill.

## 6.2 TRENCHES IN ROCK

All installation in rock will utilize the undercutting method. Bedding will be with 6 inches crushed stone as shown in the Standard Details. The only exception to this will be with PVC, copper, or galvanized iron pipe 4 inches in diameter or smaller. These may be bedded on 6 inches of evenly spread earth backfill.

## 6.3 UNSTABLE TRENCHES

If unstable material is encountered which may not provide a suitable foundation for the pipe, the unstable material will be removed and an adequate layer of encasement concrete or other special bedding shall be placed for the pipe foundation in accordance with the Standard Details in the plans. Such "special pipe foundation" shall only be installed if directed by the ENGINEER in writing or on the plans. This special pipe foundation shall be considered a pay item and shall be paid for per lineal foot at the contract price for the type of bedding required.

## 6.4 TRENCH CHECK

In all installations where a smooth trench bed on grade with no irregularities is required, the CONTRACTOR shall use a notched wood plank or similar device to check the bed before each length of pipe is laid. Plank shall be at least 4 feet longer than the laying length of pipe being installed. The notch at end allow the edge of plank to line up with edge of pipe which is already installed.

## **7.0 PIPE LAYING**

### **7.1 GENERAL**

Proper instruments, tools and facilities satisfactory to the ENGINEER shall be provided and used by the CONTRACTOR for the safe and convenient prosecution of the work. Each pipe manufacturer shall have an experienced representative on the job for at least one day at the commencement of jointing and laying operations.

Before any length of pipe is placed in the trench, a careful inspection shall be made of the interior of the pipe to see that no foreign material is in the pipe. In order to properly remove any foreign materials, a swab of necessary length is to be available at all times.

All pipe shall be lowered carefully into the trench, properly aligned and properly jointed by use of suitable tools and equipment, in such a manner as to prevent damage to water line materials and protective coatings and linings. Excessive scratching of the exterior surface of the pipe will be cause for rejection of the pipe.

Under no circumstances shall pipeline materials be dropped or dumped into the trench. The pipe and fittings shall also be inspected for the purpose of determining if they are sound and free from cracks. Laying of pipe shall be commenced immediately after excavation is started. Pipe shall be laid with bell ends facing in the direction of laying.

When pipe laying is not in progress, the open ends of pipe shall be closed by approved means to prevent entrance of trench water into the line. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. Any pipe which has floated shall be removed from the trench and relaid as directed by the ENGINEER. No pipe shall be laid in water or on frozen trench bottom, or whenever the trench conditions or the weather are unsuitable for such work.

If any defective pipe and fittings shall be discovered after the pipeline is laid, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge to the OWNER. Open ends of unfinished pipe lines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time.

### **7.2 LAYING DUCTILE IRON PIPE**

Ductile iron bolted joint, rubber ring slip joint, and ball and socket river crossing pipe shall first be thoroughly cleaned at joints, then joined according to instructions and with tools recommended by the manufacturer. Three (3) copies of instructions shall be furnished the ENGINEER and one (1) copy shall be available at all times at the site of the work. The lining inside ductile iron pipe must not be damaged by handling.

All pipes must be forced and held together, or "homed" at the joints, before sealing or bolting. Pipe must be aligned as each joint is placed, so as to present as nearly true, straight lines and grades as is practical, and all curves and changes in grades must be

laid in such a manner that the manufacturer's recommended maximum deflection is not exceeded at any joint.

Cutting of pipe may be done by wheeled pipe cutters or saws, or by hammer and chisel, as the CONTRACTOR may elect, but the CONTRACTOR will be held responsible for breakage or damage caused by careless cutting or handling.

Ductile iron pipe 4" diameter and larger, shall be laid on an evenly spread and compacted crushed stone cushion four (4) inches depth above bottom of trench uniformly supporting the pipe. Six (6") inches crushed stone bedding shall be used in rock. When ductile iron pipe less than 4" diameter is used, granular compacted earth may be substituted for crushed stone. Sufficient space (limited to 2 feet longitudinally) shall be left out of 4 or 6 inch cushion for tightening of bolts where bolted joints are used. No pipe shall be laid resting on rock, blocking, or other unyielding objects. Jointing before placing in trench, and subsequent lowering of more than one section jointed together may be allowed, subject to the ENGINEER'S approval and direction.

When using pipe with push-on joints care must be exercised to make certain that the correct gasket is being used for the type of joint installed and that the gasket faces the proper direction. Before inserting the gasket, the groove and bell socket should be carefully cleaned of all dirt. If sand or dirt is permitted to remain in the groove, leaks may occur. Lubricant must be applied to bell socket, gasket and plain-end of pipe as required by manufacturer. Plain-end must be beveled before joint is made. Deflection required at the joint shall be obtained after the joint is made.

Cut pieces of ductile iron pipe 18 inches or more in length, shall be used in fitting to special conditions, and valves and fitting changes in grade and alignment, provided cutting is even enough to make first class joints and no cracks are evident.

Bell and spigot pipe with caulked joints may be used for special cases only. Where this type of pipe is required the joints shall be made as described in this paragraph. After placing a length of pipe on the prepared grade in the trench, the yarning material shall be held around the bottom of the spigot end of the next length so that it will enter the bell of the previously laid pipe as the pipe is shoved into position. The spigot shall be centered there with earth carefully tamped under and on each side of it, excepting at the bell holes. Care shall be taken to prevent dirt from entering the joint space. Two or more joints of pipe shall be in place ahead of each joint before it is poured. Yarning material for bell and spigot joints shall be rubber rings, asbestos rope, or treated paper rope. Joint material for bell and spigot pipe, unless otherwise shown on the drawings, shall be of the sulphur compound type "Leadite," "Mineralead", or approved equal. Jute shall not be used for joint material. Yarning material shall be thoroughly caulked into the joint to insure centering of the spigot and within the ball and prevent loss of molten joint material into the interior of the pipe, but in no event shall a depth of less than 2-1/2 inches be left for the joint compound. Each length of material shall be such as to pass completely around the pipe and provide a lap of two inches. Joint compound shall be heated in accordance with the directions of the manufacturer, care being taken to

prevent under and over heating and burning. Joints shall be run with the aid of a runner and metal pouring gate thoroughly clayed to the pipe to prevent the molten compound from breaking out of the joint. Each joint shall be run full to the top of the pouring gate in one continuous pour. Material contained in the pouring gate when it is cut free from the joint may be reused. No joint shall be run in a wet trench and no water shall be allowed to come in contact with the joint until it is thoroughly hardened. If, upon inspection by the ENGINEERS, imperfect joints are disclosed, the compound shall be cut out or otherwise removed and the joint re-run.

### 7.3 LAYING PLASTIC PIPE

The trench bottom must be smooth and uniform and the alignment must conform with the plans. Bedding and cover as specified herein and shown in the Standard Details is required.

To make a clean and unobstructed joint, it is necessary to wipe the ring, groove and pipe spigot free from all foreign materials at the time of assembly (welded joints will be allowed only in special cases and will be required as shown on the plans). The ring must be positioned properly in the fitting to receive the pipe by a worker who is not in contact with the lubricant. In general, the lubricant is applied to the spigot (not the ring or groove). However, the manufacturer's instructions are to be followed in all cases. Only an approved lubricant may be used in accordance with the manufacturer's recommendations. All plastic pipe shall be joined by hand.

Where good bedding conditions are attained PVC pipe smaller than 4 inches may be assembled outside the trench in longer sections (as conditions allow) and then lowered into the trench. At any time when improper bedding is discovered or the pipe is severely deflected the pipe will be removed from the trench and the condition corrected. Pipe in sizes 4 inch and above may be assembled outside the trench but must be lowered into the trench as each joint is assembled. Regardless of installation methods all couplings must be inspected after laying in trench for proper insertion and alignment. Field cuts and bevels will be allowed in accordance with the manufacturer's recommendations for these operations. A new reference mark shall be installed before joining any field cut pipe. The same requirements for clearance from rock or other objects, thrust blocking and deflections shall apply to PVC pipe as for other pipe materials.

Municipal PVC pipe of all sizes must be assembled in the trench in strict accordance with the manufacturer's requirements.

### 7.4 INSTALLING FLANGED OR THREADED PIPE AND FITTINGS

The CONTRACTOR shall clean off all rust and dirt and paint all threads with red lead, before assembling. This pipe shall be installed by skilled pipe men, with flanges and pipes plumb and level, showing no leakage. Unions shall be included to allow for the taking down of all runs of pipes. All valve operating devices shall be in locations and of

types shown on the plans. They shall be accurately plumbed, levelled, supported and braced for smooth operation.

A. Coatings and Lining. All buried ductile iron pipe shall have manufacturer's outside coal tar or asphaltic base coating and a cement lining and bituminous seal coat on the inside. Cement mortar lining and a bituminous seal coat inside shall conform to ANSI A21.4 (AWWA C-104) latest revision.

All pipe and fittings housed and in vaults shall be lined and coated on the inside as specified herein for buried ductile iron pipe and fittings, but shall be left uncoated on the outside so that it may be painted without the use of tar stop.

B. Mechanical Joint, Rubber Ring Slip and Flanged Joints Fittings. Cast iron mechanical, rubber ring slip and flanged joints shall conform to ASA Specifications A21.10 (AWWA C-110) for centrifugally cast iron water pipe. Mechanical joints shall also conform in all respects to ASA 21.11 (AWWA C-111). All fittings shall be manufactured for the size and pressure class of the pipeline in which they are to be used. All fittings shall be furnished complete with all joint accessories. All cast iron pipe fittings for water, sewer, air, gas and force main service shall be bituminous coated outside and lined on the inside same as the line on which they are installed.

## **8.0 BACKFILLING**

Backfilling must be started as soon as practicable after pipe has been laid, joints hardened sufficiently, and jointing and alignment approved. Spading of crushed rock, sand, or mechanical tamping of earth, around pipe (as specifically required) between joints shall be the usual procedure as the laying progresses. This is in order to avoid danger or misalignment from slides, flooding or other causes. The ENGINEER shall be given a minimum of 24 hours for inspection before backfilling. The backfill shall be crushed rock, sand, or finely divided earth free from debris, organic material and stones, places simultaneously on both sides of pipe to the same level by hand.

In backfilling of the lower part of the trench beginning at the top of the bedding, the backfill material shall be carefully and solidly tamped by hand or approved mechanical methods in 6" layers around the pipe and up to a point 8 inches higher than the top of the pipe. For PVC only the backfill shall be select material and may be walked-in. Walking or working on the completed pipe line, except as necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a point one diameter higher than the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipe line will not be disturbed and injurious side pressures do not occur.

After the above specified backfill is hand placed, rock may be used in the backfill in pieces no larger than 18 inches in any dimension and to an extent not greater than one-half (1/2) the backfill materials used. If additional earth is required, it must be obtained

and placed by the CONTRACTOR. Filling with rock and earth shall proceed simultaneously, in order that all voids between rocks may be filled with earth. Above the hand placed backfill, machine backfilling may be employed without tamping, (if not contrary to specified conditions for the location) provided caution is used in quantity per dump and uniformity of level of backfilling. Backfill material must be uniformly ridged over trench and excess hauled away, with no excavated rock over 1-1/2 inch in diameter or pockets of crushed rock or gravel in top 6 inches of backfill. Ridged backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth and its height shall not be in excess of needs for replacement of settlement of backfill. All rock, including crushed rock or gravel from construction, must be removed from yards and fields. Streets, roadways and walks shall be swept to remove all earth and loose rock immediately following backfilling.

In the case of street, highway, railroad, sidewalk and driveway crossings or within any roadway paving or about manholes, valve and meter boxes, the backfill must be machine tamped in not over 4-inch layers, measured loose in accordance with the standard details. Where backfill is under paved driveways, streets, highways, railroads, sidewalks, paved parking areas and other areas where settlement is not allowed, crushed stone or coarse sand backfill only shall be used up to the paving surface. Crushed stone shall be Kentucky Department of Highways Standard Specification No. 78 or finer. Coarse sand backfill shall be spread in layers not over 4 inches thick and thoroughly compacted. Sand may be moistened to aide compaction. Tunnels shall be backfilled in not over 3-inch layers, measured loose, with selected material suitable for mechanically tamping. If material suitable for tamping cannot be obtained, sand, gravel or crushed rock (No. 78) shall be blown, packed or sluiced to completely fill all void spaces.

Where local conditions permit, pavement shall not be placed until 30 days have passed since placing backfill. Crushed stone is specified for roads and parking areas and sidewalks or their bases, shall be placed and compacted to the top of trench. Backfills shall be maintained easily passable to traffic at original ground level, until acceptance of project or replacement of paving or sidewalks. Where the final surfacing is to be crushed stone, compacted earth backfill may be used in the trench to within 6 inches of the top as shown in the Standard Details.

Railroad Company and Highway Department requirements in regard to backfilling will take precedence over the above general specification where they are involved.

Excavated materials from trenches and tunnels in excess of quantity required for trench backfill shall be disposed as shown on the plans or as directed by the ENGINEER.

The CONTRACTOR shall protect all sewer, gas, electric, telephone, water and drain pipes or conduits, power and telephone poles and guy wires from danger of damage while pipelines are being constructed and backfilled, or from danger due to settlement of this backfill.

In case of damage to any such existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before uncovering and such restoration and repair shall be done without extra charge.

No extra charge shall be made for backfilling of any kind, except as provided in the Bid. Backfilling shall be included as a part of the unit price bid for which it is subsidiary. No extra charge shall be made for supplying outside materials for backfill.

Before completion of contract, all backfills shall be reshaped, holes filled and surplus material hauled away, and all permanent walks, street, driveway and highway paving, and sod, replaced (if such surface replacement items are included in the contract) and reseeding performed.

The line CONTRACTOR shall be responsible for clean-up, grading, seeding, sodding or otherwise restoring all areas that he disturbs within the work limits of other CONTRACTORS on this project.

Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement, shall be supplied by the CONTRACTOR.

## **9.0 TIE-INS TO EXISTING PIPELINES**

This work shall consist of connecting new water pipes to the existing system where shown on the plans and shall include the necessary fittings, tapping sleeves, valves and necessary equipment and material required to complete the connection.

Knowledge of pipe sizes in the existing system may not be accurate, therefore, it is recommended that the CONTRACTOR check outside diameters of existing pipe and types of pipe prior to ordering the required accessories. No additional payment will be allowed for matching pipe and/or accessories when the proper size is not ordered.

Neither the OWNER nor the ENGINEER can guarantee the location of the existing lines. The CONTRACTOR shall verify the location of all existing water mains and valves pertaining to the proposed improvements before excavation is started.

The necessary regulation or operation of the valves on existing mains, to allow for the connections being made, shall be supervised by the ENGINEER. Before shutting down an existing water main or branch main for a proposed connection, prior approval for a specific time and time interval shall be obtained from a representative of the OWNER. At no time shall an existing main be shut down without the OWNER'S knowledge and permission.

Excavation to existing water mains shall be carefully made, care being exercised not to damage the pipe. The excavation shall not be of excessive size or depth beneath the pipe. The sides of the excavation shall be as nearly vertical as possible.

The CONTRACTOR shall be responsible for any damage to the existing system and any such damage shall be repaired to the satisfaction of the ENGINEER at the CONTRACTOR'S expense.

The CONTRACTOR shall verify, by field inspection, the necessary sizes, lengths and the types of fittings needed for each inter-connection. Typical connections are shown on the plans and any modifications or changes shall be subject to the approval of the ENGINEER. The exact length of the proposed water main needed for this work shall also be determined by field measurement as required.

The probing required to locate existing mains is not a separate pay item.

## **10.0 PIPE ENTERING STRUCTURES**

Ductile iron, steel or PVC pressure pipe, 4-inch diameter or larger, entering structure below original earth level, unsupported by original earth for a distance of more than six (6') feet, shall be supported by Class B concrete, where depth of such support does not exceed three (3') feet, and by Class B Concrete piers where depth exceeds three (3') feet in accordance with the Standard Details. All other pressure pipe entering buildings or basins below original earth level, which have more than 3 feet span between wall and original earth and having a cover of more than 24 inches of earth, or under roadway, shall be supported as shown on Standard Detail drawings, in order to prevent breakage from settlement of backfill about the structure. Concrete and reinforcing steel for such supports are to be included in the unit price of work to which it is subsidiary, and not as extra concrete, in order to discourage excessive excavation outside the limits of structures. Pipe entering structures shall have flexible joint within 16 inches of exterior of structure.

## **11.0 OWNERSHIP OF OLD MATERIALS**

### **11.1 PIPE**

Unless otherwise indicated, all existing pipe that is to be abandoned that interferes with construction or is easily removed shall become the property of the CONTRACTOR. All pipe that is not easily removed or not required to be removed as a result of the new construction, shall be abandoned in place by this CONTRACTOR.

### **11.2 PIPE LINE FITTINGS AND APPURTENANCES**

All pipe line fittings, valves, hydrants and other like appurtenances that are removed as a result of new construction shall be removed by this CONTRACTOR but shall become the property of the OWNER. All such fittings and appurtenances shall be delivered to a

point by the CONTRACTOR. Said point shall be on the OWNER'S property and shall be designated by the ENGINEER.

### **11.3 OTHER MATERIALS**

All other materials or items that are to be removed, demolished, or abandoned as a part of this contract shall become the property of the CONTRACTOR and shall be disposed of by him.

### **12.0 THRUST BLOCKING AND ANCHORAGE**

All angles or bends in the pipe line, either vertical or horizontal, shall be braced or anchored against the tendency of movement with concrete thrust blocking per the Standard Details, or approved equivalent joint harness or anchors to the satisfaction of the ENGINEER. Where joint harness is used, all component parts shall be stainless steel. Concrete thrust blocking or joint harness materials shall be considered incidental to the expense of installing the line and shall be included in the unit price bid for the pipe line. No separate payment will be made for these items.

Thrust blocks for plastic pipe will not be attached to couplings.

Where thrust blocks are used for extra fittings ordered by the ENGINEER, payment shall be made using the bid price for Class "B" concrete and the thrust block dimensions shown in the Standard Details. This payment shall cover all work required for extra thrust blocks.

### **13.0 TESTING PRESSURE LINES**

The CONTRACTOR will be required to test all pipelines and appurtenances before final acceptance of the project.

After the pipe has been under 200 PSIG for one hour, the pipe shall be tested for leakage. No pipe shall be accepted until the water loss is less than 10 U.S. gallons per 24 hours, per mile, per inch nominal diameter of pipe. The leakage test shall be applied to the pipe for a period of not less than 6 hours.

The test shall be made between valves, as far as practical, and within twelve working days of the line construction.

To determine the rate of leakage, the CONTRACTOR shall, as required, furnish a suitable pump, pressure gauge and water meter or other appliance for measuring the amount of water pumped. The instrument used to measure leakage shall be tested for accuracy as frequently as directed by the ENGINEER. The CONTRACTOR shall furnish all necessary labor and materials to make the test and to perform any work incidental thereto. Where it is impractical to test between the valves, the

CONTRACTOR shall as directed, at his own expense and cost, temporarily place caps and plugs on the lines and test sections of the new line.

Wherever practicable, corporation stops and service lines shall be installed before testing. If these items are installed after the main is tested, then a visual inspection of the tap and service line must be permitted while under pressure before backfilling service line.

Where any section of the main is provided with concrete reaction blocking, the hydrostatic pressure test shall not be made until at least five days have elapsed after the concrete reaction blocking was installed. If high early strength cement is used in the reaction blocking, the hydrostatic pressure test shall not be made until at least two days have elapsed.

Should there be leakage over the allowable amount, the CONTRACTOR will be required to locate and repair the leaks and retest the section. It is suggested, but not required, that the CONTRACTOR have a geophone (underground listening device) on the job at the time of testing.

If the leakage of the section of pipeline being tested is below the allowable amount, but leakage is obvious in the opinion of the ENGINEER, due to water at the surface of the ground, or by listening the leak can be heard underground with a geophone, or any other means of determining a leak, the CONTRACTOR will be required to repair these leaks.

The CONTRACTOR shall furnish a meter or suction tank, pipe test plugs and by-pass piping and make all connections for conducting the above tests. The pumping equipment used shall be centrifugal pump, or other pumping equipment which will not place shock pressures on the pipeline. Power plunger or positive displacement pumps will not be permitted for use on closed pipe systems for any purpose.

Inspection of pipe laying shall in no way relieve the CONTRACTOR of the responsibility for stopping leakage or correcting poor workmanship.

The pipe work shall be disinfected in accordance to AWWA standards prior to being placed in service.

#### **14.0 MAINTENANCE OF FLOW OF DRAINS AND SEWERS**

Adequate provision shall be made for the flow of sewers, drains and water courses encountered during construction. Any structures which are disturbed shall be satisfactorily restored by the CONTRACTOR.

#### **15.0 INTERRUPTION OF UTILITY SERVICES**

No valve, switch or other control on any existing utility system shall be operated for any purpose by the CONTRACTOR without approval of the ENGINEER and the Utility. All consumers affected by such operations shall be notified by the CONTRACTOR as directed by the ENGINEER and utility before the operation and advised of the probable time when service will be restored.

## **16.0 FENCING**

Where water supply line is being constructed in fields where stock is being grazed, CONTRACTOR shall provide temporary fence as approved by the ENGINEER around open trenches to prevent stock from falling in trenches. Where trenching operations should isolate grazing stock from their source of water, CONTRACTOR will either provide temporary bridging over trench or else provide water for such stock.

Where trench crosses near sound existing corner posts and existing fence is in good condition, fence may be taken loose, rolled back and stored until pipe line is completed at this point, then replaced by stretching tightly and thoroughly stapling. Additional posts shall be provided and additional new fence shall be provided when it is necessary to replace the fence crossed by the water line in a condition equal to existing fence before water line was constructed.

Where it is necessary to cut existing fence, new end posts shall be installed on each side of the water line and the old fence thoroughly stapled to these new posts before cutting. After pipe line is completed at this point, a new fence of galvanized wire (No. 9 gauge with No. 11 filler wires) shall be stretched between these new end posts and thoroughly stapled to existing posts and any new intermediate posts necessary to provide a good fence. Replacement of fences shall be on a replacement in-kind basis, and shall be considered incidental to laying of the lines and any additional cost shall be included in the unit price bid per lineal foot of pipe.

## **17.0 MEASUREMENT AND PAYMENT**

No separate measurements or payment shall be made for water lines. Payment for this item shall be included in the work which it is subsidiary in the Bid Schedule.

END OF SECTION

## **SECTION 13500**

### **VALVES**

#### **1.0 GENERAL**

##### **1.1 SCOPE OF WORK**

Provide all materials, labor, equipment and services required to furnish and install all valves shown on the Drawings and specified herein.

#### **2.0 PRODUCTS**

##### **2.1 SHEAR GATES**

Shear gates shall be iron body bronze mounted double wedge type with pull rod and handle. Rod length shall extend 32" above the operating floor level.

##### **2.2 AIR AND VACUUM VALVE FOR VERTICAL TURBINE PUMPS**

Air valves for Vertical Turbine Pumps shall be designed to allow large quantities of air to escape out the orifice when the pump is started and close watertight when the liquid enters the valve. The air valve shall also permit large quantities of air to re-enter thru the orifice when the pump is stopped to prevent a vacuum from forming in the pump column.

The valve shall consist of body, cover, baffle, float and seat. The baffle will be designed to protect the float from direct contact of the rushing air and water to prevent the float from closing prematurely in the valve. The seat shall be fastened into the valve cover, without distortion, and shall be easily removed, if necessary.

The entire float and baffle assembly must be shrouded with a perforated water diffuser to prevent the water column entering the valve, from slamming the float shut and eliminate water hammer in the system.

The discharge orifice shall be fitted with an adjustable throttling device to regulate the flow of air escaping to establish a pressure loading on the rising column of water to minimize shock to the pump and check valve.

The float shall be stainless steel, designed to withstand a minimum of 1000 psi. The float shall be center guided and not free floating for positive seating.

Valve may have either threaded or flanged inlet and outlet. The outlet shall be piped to the nearest floor drain.

Valve exterior shall be painted with Red Oxide Phenolic Primer Paint as accepted by the FDA for use in contact with potable water.

All materials of construction shall be certified in writing to conform to ASTM specifications as follows:

Body, cover & baffle	Cast iron	ASTM A48 Class 30
Float	Stainless Steel	ASTM A240
Seat	Buna-N	
Water diffuser	Brass	Commercial
Throttling device	Malleable iron	Commercial

## 2.3 COMBINATION AIR RELEASE VALVES

Combination air release valves (single body, double orifice) shall be designed to allow large volumes of air to escape out the large air vacuum orifice when filling a pipeline and to close watertight when the liquid enters the valve. During large orifice closure, the small air release orifice shall open to allow small pockets of air to escape automatically and independently of the large orifice. The large air vacuum orifice shall also allow large volumes of air to enter through the orifice during pipeline drainage to break the vacuum. The body inlet must be baffled to protect the lower float from direct contact of the rushing air and water to prevent premature valve shut off. The top float must be protected in similar manner for the same purpose. The Buna-N seat must be fastened to the valve cover without distortion for drop tight shut off. All floats shall be heavy stainless steel, hermetically sealed; designed to withstand 1000 psi or more. The upper float shall be center guided for positive shut off. Valve exterior to be painted red lead TT86B Type IV for high resistance to corrosion. Materials certified to ASTM specifications as follows:

Body & Cover & Baffle - Cast Iron  
Stainless Steel Float  
Buna-N Seat & Needle  
Plug & Bronze Forging  
Delrin Level Frame  
ASTM A48 Class 30  
ASTM A240  
Nitrile Rubber ASTM SB 800  
ASTM D638

## 2.4 CHECK VALVES

A. Swing Check Valves. Check valves shall be iron body, bronze mounted, horizontal swing check type, spring loaded suitable for horizontal or vertical service, American Darling, M&H, or equal.

B. Double Door Check Valves. Double door check valves shall be as manufactured by APCO, Val-Matic, or equal. Check valve shall be lug style, pressure class 150 pounds with cast iron body, aluminum bronze doors, T316 stainless steel hinge pin and stop pin, Buna-N set and T316 stainless steel spring.

C. Silent Check Valves. Silent check valves shall be as manufactured by Clay-Val, Val-Matic, or equal. Check valve shall be globe style, full flanged body, ANSI Class 125, with cast iron body, bronze seat, stainless steel spring, and bronze disc.

D. Air Cushion Swing Check. Air Cushion Swing Check Valve body shall be cast iron per AWWA C508 having integral flanges.

The seat shall be centrifugally cast bronze with an o-ring seal and be locked in place with stainless steel lock screws and be field replaceable, without the use of special tools.

The shaft shall be single and continuous stainless steel, extending both sides of the body with a lever and weight, using an air cushion cylinder side mounted.

The air cushion cylinder shall be constructed of corrosion - resistant material and the piston shall be totally enclosed within the cylinder and not open at one end.

The cushion cylinder assembly shall be externally attached to either or both sides of the valve body and will permit adjustability to cushion the closure of the valve. Cushioning shall be by air trapped in the cushion cylinder, which shall be fitted with a one-way adjustable control check valve to cushion disc contact to the seat at the shut-off point. The bottom cylinder head shall be swivel mounted and not rigid to follow the change of force angles as the lever raises or lowers to open or close the check valve.

This valve shall prevent backflow of the media on normal pump shut-off or power failure, at zero velocity and be watertight.

The disc shall be cast iron utilizing a double clevis hinge connected to a Ductile iron disc arm. The disc arm assembly shall be suspended from a stainless steel shaft, which passes thru a seal retainer on both sides of the valve body.

Valve exterior shall be painted with Red Oxide Phenolic Primer Paint as accepted by the FDA for use in contact with potable water.

Materials shall be certified to the following A.S.T.M. Specifications:

Body, cover, disc	Cast iron	ASTM A126, Class B
Disc Arm	Ductile iron	ASTM A536
Seat	Aluminum bronze or Stainless Steel	ASTM B148 ASTM A276
Disc seat	Buna-N or Metal	To suit
Cushion cylinder	Corrosive Resistant Steel	Commerical

E. Rubber Flapper Check Valve. This check valve shall have a cast iron body and cover and the body shall be long pattern design with integrally cast on end flanges.

F. Ball Check Valves. Check valve body shall be cast iron conforming to ASTM A159 Class 35. Check valves shall be rated for 150 psi working water pressure. Check valves shall be furnished with 125# ANSI flanged ends. Ball shall be hollow steel with vulcanized nitrile rubber covering and with a specific gravity greater than 1.0. Check valves shall be constructed to permit entry for complete removal/replacement of internal ball without removing the valve from the line.

## 2.5 PRESSURE RELIEF SURGE ANTICIPATOR VALVE

The pressure relief surge anticipator valve shall control high pressures and power failure surges by bypassing system pressure that exceeds the high pressure control setting and also by opening a preset amount when sensed pressure decreases below a preset minimum in anticipation of surge. The valve shall be a Model No. 52-03 as manufactured by Cla-Val, or approved equal.

The valve shall be hydraulically operated, single diaphragm-actuated and globe or angle pattern. The valve shall consist of three major components: the body with seat installed, the cover with bearings installed and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls. No separate chambers shall be allowed between the main valve cover and body. Valve body and cover shall be of cast material. Ductile Iron is standard and other materials shall be available. No fabrication or welding shall be used in the manufacturing process.

The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and one-half sides by a disc retainer, forming a tight seal against a single removable seat insert. No O-ring type disc (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent

excessive diaphragm wear as the diaphragm flexes across this surface. No hourglass-shaped disc retainers shall be permitted and no V-type or slotted type disc guides shall be used.

The diaphragm assembly containing a non-magnetic 303 stainless steel stem of sufficient diameter to withstand high hydraulic pressures, shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The seat shall be a solid, one-piece design and shall have a minimum of a five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure.

The diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 psi per layer of nylon fabric and shall be cycle tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

The main valve seat and the stem bearing in the valve cover shall be removable. The cover bearing and seat in 6" and smaller size valves shall be threaded into the cover and body. The valve seat in 8" and larger size valves shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No "pinned" covers to the valve body shall be permitted. Cover bearing, disc retainer, and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline. Packing glands and/or stuffing boxes shall not be permitted and components including cast material shall be of North American manufacture.

The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment provided the valve is installed and used in accordance with all applicable instructions. The valve manufacturer shall be able to supply a complete line of equipment from 2 1/2" through 24" sizes and a complete selection of complementary equipment. The valve manufacturer shall also provide a computerized cavitation chart which shows flow rate, differential pressure, percentage of valve opening, Cv factor, system velocity, and if there will be cavitation damage.

The pressure relief pilot shall be an adjustable, spring-loaded, normally closed diaphragm control designed to permit flow when upstream pressure exceeds the control setting. The low pressure pilot shall be an adjustable, spring loaded, normally open diaphragm control designed to open when the sensed pressure falls below the control setting and close when pressures are normal. The pilot system shall contain an adjustable hydraulic limiter to limit valve travel during low pressure opening without affecting high pressure relief valve travel. The contractor shall connect the sensing/pilot supply connection to the main header with minimum 3/4" pipe or tubing. A full range of spring settings shall be available in ranges from 0-450 psi.

A direct factory representative shall be made available for start-up service, inspection and necessary adjustments.

## 2.6 GATE VALVES

Gate valves, 3" and larger, for fabricated pipe systems shall be resilient seated, iron body, fully bronze mounted, and suitable for working water pressures of not less than 250 PSIG. Valves shall be of standard manufacture and of the highest quality both of materials and workmanship and shall conform to the latest revision of AWWA Specification C-509. Unless otherwise shown on the plans, all gate valves shall be non rising stem.

Housed valves and valves in basins shall be hand wheel operated. Hand wheels shall be ANSI B16.1 Class 125. Hand wheels shall have not less than the following diameters:

<u>Size Valves</u>	<u>Diameter</u>
1"	3 1/8"
1 1/2"	4 1/4"
2"	6"
3"	8"
4"	10"
6"	12"
8"	14"
10"	16"
12"	18"
14"	20"
16"	22"
18"	24"

Hand wheels mounted on valve stands and extension stems shall have the same minimum diameters as those shown for hand wheels mounted directly on valves. Exposed extension stems shall be have adjustable cast iron guides spaced no more than eight (8) feet apart. All extension stems shall be connected with suitable coupling castings for connection to and removal from valves and stands. Nuts and bolts on all extension stem connections shall be stainless steel.

## 2.7 PLUG VALVES

Plug valves shall be non-lubricated eccentric type with synthetic rubber faced plugs, corrosion resistant nickel seats, replaceable stainless steel sleeve type bearings in the upper and lower journals. Furnish with flanges faced and drilled ANSI B16.1 125-pound.

Valve shall provide drip-tight shut-off up to the full rated pressure. All plug valves shall be provided with limit stops and rotated 90 degrees from fully opened to fully closed. Plug valves shall be manually operated with worm gear operator hand wheel or lever actuated. Plug valves located 6 feet or more above the floor shall be furnished with chain wheel operators.

## 2.8 BUTTERFLY VALVES

All butterfly valves shall be of tight closing, rubber or synthetic rubber seat type with seats securely fastened to valve body. No metal-to-metal seating surfaces will be permitted. Valves shall be bubble tight at the rated pressure in either direction and shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity.

The valve discs shall rotate 90° from the full open position to the tight shut position.

The valve bodies themselves shall be one-piece construction. Valve bodies shall be constructed of cast iron ASTM A 126, Class B, and shall be suitable for use with 125# ANSI flanges. Valves shall meet the full structural requirements of the applicable classes of AWWA C504.

The valve discs shall be cast iron, semi-steel or bronze with a welded nickel edge free of ribbing or protrusions which may collect solids. The disc-to-shaft connections shall be via polished 316 SS pins. Sprayed or plated discs are not acceptable. All disc seating edges shall be smooth and polished.

The shafts shall be turned, ground and polished. They shall be 300 Series or 400 Series Stainless Steel with diameters per AWWA Specification C504-70, Class 75B. The shafts shall be of one-piece construction.

The shaft seals shall be of Hycar or Hypalon and shall be provided to prevent leakage into the bearing chest areas.

The valve bearings shall be Teflon coated, self-lubricating, stainless steel design and construction.

The valve seats shall be Neoprene or Hypalon and shall be simultaneously molded, vulcanized and bonded to the valve body or a rigid reinforcing ring.

All surfaces of the valve shall be clean, dry and free from grease before painting. The valve surfaces except for disc, seating and finished portions shall be evenly coated at the factory with a suitable rust inhibitive primer. Hydrostatic and leakage tests shall be conducted in strict accordance with AWWA C 504-74, Section 12.

A. Manually Operated Butterfly Valves. Manually operated valves shall be operated using a cast iron housed hand wheel or chain wheel, as required, available in standard weatherproof construction. All units shall have adjustable open and close position stops and valve position indicator with provision to prevent accidental adjustment changes. The operating shaft shall be supported, axially and radially, at the input end by permanently lubricated bronze thrust and sleeve bearings.

Manually operated butterfly valves shall be furnished and installed as shown in the contract drawings.

B. Pneumatic and Hydraulic Actuated Butterfly Valves. All pneumatic or hydraulic actuated butterfly valves shall meet the requirements of Section 2.9 contained herein.

The valves supplied with cylinder operators shall be designed and sized according to torque requirements of the valve. The method for calculating torques shall be as outlined in AWWA, Appendix A. Operator shall produce the full AWWA Standard C504 Table 1 output torque throughout entire travel. All actuated butterfly valves shall be furnished with manual override solenoid valves.

Cylinder actuators shall have working mechanisms fully enclosed and shall be sized for operation using a supply pressure between 40 to 100 psi. Contractor shall coordinate cylinder pressure requirements and settings on the plant pressure reducing valve.

Cylinder pivots shall have bearings. All cylinder actuators shall be provided with stationary supply connections and flexible cylinder supply lines to allow rigid supply piping to the valve.

Cylinder operator shall be of the base mounted configuration. Cylinder barrel shall be of molybdenum-disulfide lined glass fiber reinforced epoxy tubing, to provide a corrosion-free, self-lubricated high strength barrel. Rod seal shall be of urethane, molybdenum-disulfide filled, to provide a self-lubricated, long life seal.

Piston rod shall be of hard chromium plated 18-8 stainless steel, and shall be top and bottom guided in a heavy cast iron mechanism housing for positive alignment. Guiding shall be accomplished by bronze bearings at end of housing straddling all side loads imposed in operation. Entire operator including piston rod shall be fully enclosed.

The open/close valves shall be supplied with 4-way pre-piped solenoid valves with manual override - NEMA 4 coils, energize to operate. Coil voltage to be coordinate with equipment suppliers, controls supplier, etc.

Open/Closed Valves shall be supplied with speed control for both opening and closing speeds.

Solenoids for open/hold/close valves shall be dual coil 4-way with manual override.

Hydraulically operated butterfly valves shall have their vent ports piped to the nearest floor drain.

C. Electric Motor Operators. Electric motor operators shall be designed to move the valve from fully open to fully closed with operating speeds such that no undue surge or water hammer occurs when electrical power is applied, and hold the valve disc in any intermediate position between full open and fully closed without creeping or fluttering. Valve, gear, reducer, electric motor operator and accessories shall be furnished complete, ready for installation. Accessories shall include pre-wired control stations with indicating lights, controls and integral reversing contactor furnished for remote operation, and a valve position transmitter and feedback potentiometer enclosed in a NEMA IV housing furnished for remote indication of valve disc position. The motors shall be heavy duty, operating from 120 VAC single phase input source and shall be fused locally. Control compartment shall have internal heater to prevent condensation, a thermal cut-out switch in case of motor overload and four (4) limit switches, 2 to prevent disc over travel in each direction and 2 for signal-controlled intermediate position stop. Limit switches shall be field adjustable, independent of each other. Limit switches gearing shall be totally enclosed, permanently lubricated. Operator housing shall be heavy, cast aluminum, fully gasketed, capable of remaining watertight for 48 hours submersion in 20 feet of water with conduit access ports sealed.

One handwheel operator shall be furnished for each valve. Operator shall have manual over-ride in which the motor is disconnected when hand wheel is in use and the hand wheel is not engaged when the motor is in operation.

All valves to be integrated to a flow tube to provide means of rate of flow control shall be equipped with a proportional positioning system to be internally wired to the electric operator for remote indication and control of position of the disc. This system shall be capable of converting a DC milliampere output signal from rate of flow controller to actuate the valve operator to the position required. All valves equipped with electric operators for open and close service shall have on and off position indicators and transmitters.

## 2.9 FLAP VALVES

Flap Valves shall be of the circular port design with offset single pivoted hinge. The assembly shall consist of four components: flap gate, body, seat, and hinge pin. The flap gate and body shall be cast iron conforming to ASTM A-126 Class B. The seat and hinge shall be of bronze construction. The flap gate seat ring shall be rolled into a dovetailed groove under pressure to make a single inseparable unit. The seat shall be threaded into the body.

## 2.10 SWING PIPES

The swing pipes in size shown on the Drawings are to be fabricated from Class 50, ductile cast iron pipe. The swing connection shall be a flanged stainless steel 90° swivel joint Style 30 as manufactured by Chicksan Weco, or equal. The swing pipes shall be controlled by 1000 lbs. capacity enclosed worm gear winches with 1/4" stainless steel cable. The winch supports shall be fabricated from structural steel and shall be equipped with 1/4" winch support plates.

## 2.11 PRESSURE RELIEF VALVES, WALL TYPE

Pressure Relief Valves shall be of the vertical seat design with offset single pivoted hinge. The assembly shall consist of five components: flap gate, body, gate seat retainer plate, hinge pin, and body seat ring. The flap gate, body, and gate seat retainer plate shall be cast iron conforming to ASTM A-126 Class B. The seat and hinge shall be of bronze construction. The gate shall have a neoprene rubber seat cemented and mechanically retained in place by a cast iron retainer plate. The body seat ring shall be threaded and screwed into place and the face machined to a smooth finish.

## 2.12 MUD VALVES

Mud valves shall be of the iron body, bronze mounted type with non-rising stems, and flanged ends. Pedestals, or floor stands, and extension stems may be required as shown on the contract Drawings.

The frame, yoke and gate shall be sturdily proportioned for strength and rigidity and be of cast iron conforming to ASTM specifications A126 Class B.

The stem, stem nut and seats shall be bronze. The stem shall be machined with accurately cut modified acme threads. Stem extensions shall be stainless steel.

The gate seat shall be rolled into a dovetailed groove under pressure to make one inseparable unit. The body (frame) seat ring shall be threaded and screwed into place in the frame. Both gate and body seat ring faces shall be machined to a smooth finish. The valve body, frame, yoke, and gate shall be painted with two coats, 4 mils each, of coal tar epoxy.

## 2.13 TELESCOPING VALVES

The telescoping valve shall be of stainless steel construction, type 304, and consist of the following components: tube, seal flange, gasket, lifting bail, lift, and stem.

The tube shall be constructed from stainless steel seamless tubes, or pipe, and the finished outside diameter of the tube is to be  $\pm .04$  inches, cylindrical within .100 TIR. The tube surface shall be smooth, 125 micro inches or better. Tube lengths shall be of sufficient length to facilitate valve travel and maintain an appropriate insertion depth. Valve tubes are to be a minimum 1/8" thick and are attached to connecting stems by use of a lifting bail.

The valve manufacturer shall provide a stainless steel companion flange and neoprene slip seal gasket. The gasket must be a minimum of 1/4" thick. The inside diameter of the gasket is to be 1/8" smaller than the outside diameter of the valve tube to provide a friction seal. The gasket is to be sandwiched between the riser pipe flange and the companion flange. The gasket and companion flange shall include a 125# standard drilling pattern to match the riser pipe. Bolts shall be stainless steel. The lifting bail shall be of stainless steel construction and be rigidly welded to the tube.

Lifts shall be pedestal/hand wheel type with UHMW polyethylene thrust bearings along with an acme threaded type 304 stainless steel stem to provide automatic self-locking, infinite valve positioning. The rising stem lift shall use a galvanized steel square tube with torque nut design to prevent telescoping valve tube rotation. Hand wheels shall be sized to limit the pull on the rim to 40 pounds. Pedestals shall include a clear plastic Butyrate stem cover with a mylar strip type position indicator, calibrated in 1/4" increments to illustrate valve position. The mylar strip, provided by the manufacturer, will be affixed by the contractor after installation to provide a true and accurate indication of the tube elevation by comparing it to the top of the rising stem. Stainless steel anchor bolts shall be provided for all pedestals. Pedestals and hand wheels shall be constructed from cast iron conforming to ASTM A126 Class B. Cleaning and shop prime coat of pedestals and hand wheel will be as specified in Division 9.

## 2.14 KNIFE GATE VALVES

The valve body and chest shall be solid one piece cast from type 304 stainless steel. Valves larger than 24" may have their body fabricated with stainless steel. The valve's flanges, gate, yoke, stem, packing follower, and fasteners shall be stainless steel. Packing shall be acrylic/PTFE. Valves shall have a minimum pressure rating of 50 psi and comply with MSS-SP-81 specification. Pedestals, handwheels, stem extension, right-angle gear drives, etc. shall be furnished as shown on the Drawings.

## 2.15 FLANGE COUPLING ADAPTER (FCA)

Flange Coupling Adapters (FCA) shall be used in lieu of threaded or welded flanged spool pieces. Flange adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C115/A21.15. Restraint for the flange adapter shall consist of a plurality of individually actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of the gripping wedges. The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6" gap between the end of the pipe and the mating flange without affecting the integrity of the seal. For PVC pipe, the flange adapter will have a pressure rating equal to the pipe. For Ductile Iron Pipe, the flange adapter shall have a safety factor of 2:1 minimum.

## 2.16 PEDESTALS/FLOOR STANDS

The Contractor should attempt to obtain the pedestals from the valve manufacturers to minimize any confusion concerning the compatibility of various products. In lieu of the valve manufacturer's standard pedestals, the Contractor may furnish the pedestals as manufactured by M&H Style F-5500/5510, FastFab, or approved equal. The pedestals shall be of cast iron construction; ASTM A126 Class B. Extension stems shall be stainless steel for submerged applications and epoxy coated steel for standard installations. Pedestal base shall be a minimum of 12 inches square. Hand wheels shall also be cast iron with a minimum diameter of 12 inches.

## 2.17 SUCTION DIFFUSER

Double Suction Diffusers manufactured by Flow Conditioning Corporation or approved equal, for symmetrical flow and separation of stream debris shall be installed at the inlet of double suction pumps as indicated on plans. Diffuser shall consist of elbow type ductile iron body with exit vane, integral flanged pump connection, flanged or grooved system connection, 1/4" pressure gauge tap on BOTH the inlet and outlet flanges, blowdown connection and pipe support bosses located to assure no movement between pump and support boss. An "O" ring sealed removable cover shall permit inspection and removal of double inlet bronze and stainless steel orifice FF cylinder/venturi assembly in a direction perpendicular to the axis of the pump inlet. Diffusers for closed system operation shall be equipped with a readily replaceable start-up strainer which can be removed after initial operation and preserved for future use. Orifice cylinder shall be selected to withstand a pressure differential equal to pump shutoff head. Clean unit pressure drop shall not exceed 5 ft. at flow corresponding to 10 f.p.s. in smaller diffuser nozzle.

## 2.18 POST HYDRANTS

Post Hydrants shall be 2-1/4" post type manufactured to the quality and workmanship outlined under AWWA C502. The post hydrant shall be designed for 150-psi working pressure with a 3" mechanical joint bottom connection and 1-1/2" hose nozzle with cap and cap chain.

All hydrants shall be installed with isolating gate valves. Valve shall be sized the same as the bottom connection and as specified in this Section.

## **2.19 FIRE HYDRANTS**

Fire Hydrants shall conform in all respects to the requirements of AWWA C502. Hydrant barrel shall have safety breakage feature above the ground line. All hydrants shall have 4-inch mechanical joint shoe connection, two (2) 2-1/2-inch discharge nozzles and one (1) 4-1/3-inch pumper nozzle with caps fitted with cap chains. Connection threads shall conform to local standards. Main valve shall have 5-1/4-inch full opening and be of the compression type opening against water pressure so that valve remains closed should barrel be broken off.

Hydrants shall be fully bronze mounted. Main valve shall have a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust and corrosion.

Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stop shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.

Hydrants shall be designed for 150 psi working pressure and shop tested to 300 psi pressure with main valve both opened and closed. Under test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet.

All hydrants shall be installed with isolating gate valves. Valve shall be sized the same as the bottom connection and as specified in this Section.

## **3.0 EXECUTION**

### **3.1 INSTALLATION**

Installation shall be as shown on the Drawings and in accordance with manufacturer's recommendations.

END OF SECTION

## **SECTION 14001**

### **HOIST AND TROLLEY**

#### **1.0 GENERAL**

##### **1.1 SCOPE OF WORK**

The CONTRACTOR shall furnish all labor, tools, equipment, materials, and perform all work and services necessary for or incidental to the furnishing and complete installation of the hoisting equipment as shown on the drawings and as specified in accordance with provisions of the contract documents and completely coordinated with that of all other trades.

Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of this work.

This section describes the hoist systems including hoists, trolleys and trolley beams to be installed in the locations shown on the Drawings and described herein. Beams shall be provided and installed as part of the structural steel. The Contractor shall coordinate as required.

##### **1.2 QUALITY ASSURANCE**

The overhead hoists shall conform to the following standards.

- A. Hoist Manufacturer's Institute (HMI)
- B. American National Standards Institute (ANSI)
- C. National Electrical Code (NEC)
- D. American Society of Mechanical Engineers (ASME)
- E. Comply with CSA Standards
- F. ASME/ANSI B30.16, Safety Standards for Overhead Hoists (Underhung).
- G. Lifetime warranty against defective material and workmanship

#### **2.0 EQUIPMENT**

##### **2.1 HAND CHAIN HOIST**

- A. Hand Chain Hoist. The Contractor shall provide and install an aluminum hand chain hoist at the pump station similar to the HI-CAP series as manufactured by Budgit, or approved equal. The hoist shall have high strength spur gears and a mechanical load brake. The hoist frame and covers shall be tough, impact resistant, heat-treated cast aluminum alloy. The hoist shall attach to the trolley via a standard top hook. The hoist (s) shall be as indicated in the schedule.

- B. Chain and hook shall be corrosion resistant, i.e. stainless steel or zinc plated. End stops, where applicable, shall be furnished to prevent run-out. The lower hook blocks shall be of the swivel type and all hooks shall have a spring operated latch kit.
- C. Chain hoist shall be equipped with plastic chain containers capable of holding designated amount of chain specified above for each type of hoist. Chain containers are not required for hoists with lifts smaller than 8 feet.
- D. Hand Chain Hoist Schedule.

	Pump Station
Capacity	1.5 tons
Net Hoist Weight	80 lbs.
Chain Pull Force (max.)	80 lbs.
Chain Overhaul per Foot Lift	55 ft.
Headroom (max.)	20 in.
Lift Length (min.)	8 ft.

## 2.2 TROLLEYS

- A. The Contractor shall provide and install two (2) trolleys. Trolleys shall be lug mounted for maximum headroom and rigidity when possible. Trolleys shall have tapered or flat tread cast iron permanently lubricated, shielded ball bearings wheels to match the beam or rail on to which they are installed. Trolleys shall have wrap around side plates to act as bumpers or safety lugs.

## 3.0 SUBMITTALS

### 3.1 SHOP DRAWINGS

- A. Submit shop drawings for hoists showing all accessories with specific dimensions on drawings.
- B. Submit manufacturers' informative literature on hoists and accessories, to include standard data sheet, brochures and dimensional drawings of the equipment for approval.
- C. Indicate any required field dimensions.
- D. Submit Operation and Maintenance manuals for hoist systems.

### 3.3 MAINTENANCE INSTRUCTIONS

Submit information on required maintenance and repair procedures for chain hoist. Include location of nearest repair facilities for all equipment.

### **3.4 ASSEMBLY AND INSTALLATION INSTRUCTIONS**

Submit manufacturer's assembly and installation instructions to the Engineer for review.

### **4.0 INSTALLATION**

The Contractor shall furnish and install hoists where indicated on the Drawings. Hoist shall be installed in accordance with the manufacturer's recommendation.

END OF SECTION

## **SECTION 15784**

### **PACKAGED WALLMOUNT HEAT PUMP UNITS**

#### **PART 1 - GENERAL**

##### **1.01 SCOPE OF WORK**

- A. This Section includes packaged wall-mounted heat pump units and their accessories and controls.

##### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

##### **1.03 SUBMITTALS**

- A. Product Data: Include rated capacities, weights, furnished specialties, and accessories for each model indicated.
- B. Shop Drawings: Provide specifications/product data, detail equipment dimensions, wall penetration dimensions, and wiring diagrams. Also provide a color chart with at least (5) color options for Owner color selection, and proposed warranty information.
- C. Operation & Maintenance Data: Provide O&M manuals.
- D. Balance Report
- E. Training Report

##### **1.04 QUALITY ASSURANCE/WARRANTIES**

- A. Unit performance shall be certified in accordance with ARI standard 390 for vertical single package heat pumps.
- B. Electrical system shall be either UL or ETL listed to the latest ANSI standard for Safety for Heating and Cooling Equipment. It shall also be NEC/NFPA 70 compliant.
- C. A manufacturer 5-year (minimum) warranty certification is required.
- D. Unit shall comply with the latest Mechanical & Energy codes in effect.

## 1.05 COORDINATION

Coordinate layout and installation of units and wall construction where unit penetrates wall or is supported by it.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bard
2. Marvaire
3. Trane

### 2.02 MANUFACTURED UNITS

- A. Description: Packaged, self-contained, wall-mounted heat pumps with electric refrigeration system, heating, and temperature controls; fully charged with refrigerant and filled with oil. Heat pump can operate in heating or cooling mode.
- B. Cabinet: 20 gauge galvanized steel painted and capable of resisting a 1000 hour salt spray exposure per ASTM B117.
  1. Mounting: Wall with integral side mounting brackets.
  2. Finish: Baked enamel with polyurethane primer. The color shall be as selected by Owner during submittal review.
- C. Refrigeration System: Direct-expansion copper tube coil with aluminum fins and capillary restrictor, hermetically sealed compressor with internal spring isolation, and overload protection. Refrigerant shall be R-410A
- D. Air System: Forward-curved, centrifugal, indoor fans with permanent-split-capacitor motor and throwaway filters.
- E. Outdoor Fan: Propeller type with separate permanent-split-capacitor motor.

- F. Filter – Provide 1 inch throwaway filter.
- G. Electric Resistance heating: Electric supplemental heaters shall be provided of the capacity as indicated on the Drawings. Each heater shall be equipped with an automatic reset limit switch and a one-time high temperature thermal cutout for additional safety back up protection.
- H. Efficiency: The efficiency of the unit shall be compliant with the latest Energy Code in effect, but not less than 9.0 EER at 95°F (cooling mode) and 3.0 COP at 47°F (heating mode).
- I. Ventilation: The unit shall include a motorized fresh air damper.

## 2.03 CONTROLS

- A. Controls: Provide remote-mounted adjustable autochangeover thermostat.
- B. Low Ambient Control to allow cooling cycle operation down to 0°F.
- C. Shall include an alarm relay to provide signal upon a condition of shutdown on either high or low-pressure controls.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

Install units according to manufacturer's written instructions.

### 3.02 CONNECTIONS

- A. Condensate Drain: Pipe to grade level. Ensure that grade is sloped away from building.
- B. Electrical: Connect units to wiring systems and to ground as indicated and instructed by manufacturer.
- C. Ground equipment.
  - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.03 CLEANING

After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

### 3.04 COMMISSIONING

- A. After installation, check the following:
  - 1. Unit casing has no visible damage.
  - 2. Compressor, air-cooled condenser coil, and fans have no visible damage.
  - 3. Labels are clearly visible.
  - 4. Controls are connected and operable.
  - 5. Shipping bolts, blocks, and tie-down straps are removed.
  - 6. Filters are installed and clean.
  - 7. Drain line is installed correctly.
- B. Lubricate bearings on fan.
- C. Check fan-wheel rotation for correct direction without vibration and binding.
- D. Start unit according to manufacturer's written instructions. Complete manufacturer's startup checks.
- E. Provide balancing and ventilation damper adjustment. Refer to the schedule on the Contract drawings and balance to within 10% of specified ventilation. Submit balance report to Engineer.
- F. After starting and performance test, change filters.

### 3.05 TRAINING

- A. Subsequent to commissioning, provide training of Owner personnel on system operation and maintenance. Submit report of training curriculum and attendance.

- END OF SECTION -

15784-4

**SECTION 16020  
PUMPING STATION ELECTRICAL**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. Provide all labor, material, tools, approvals, excavation, backfill, and other services and equipment necessary to install the electrical system as shown on the Contract Drawings and as specified herein.
- B. Each Contractor bidding on the work included in these Specifications shall view the building site and carefully examine the contract Drawings and Specifications, so that he/she may fully understand what is to be done, and to document existing conditions.
- C. Note that Owner will provide an equipment quote to the Contractor for the purchase of the Telemetry (SCADA/RTU) equipment. The Contractor shall purchase and install the equipment as part of this Contract.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Contractors bidding work under this Contract shall read and understand Division Zero and Division 1 - General Requirements. If any discrepancies are discovered between this Division and the General Requirements, the above mentioned documents shall overrule this section.
- B. Section 16900 – Control Panel

**1.03 SUBMITTALS**

- A. Provide shop drawings including descriptive literature and/or installation, operation and maintenance instructions. Shop drawings shall be submitted for all equipment proposed to be furnished under this Division.
- B. Electrical submittals shall be submitted after the pumping/process equipment has been approved. Otherwise the Contractor is responsible for any changes and costs incurred as a result of changes necessary to the electrical equipment.
- C. Shop Drawings shall be clearly marked and or highlighted as to which product, type, option, etc. is being submitted.
- D. Where wiring diagrams are not shown on the Contract Drawings, they are to be provided by the supplier of the equipment served.

#### 1.04 SYMBOLS AND ABBREVIATIONS

- A. The symbols and abbreviations generally follow standard electrical practice, however, exceptions to this shall be as shown on the Contract Drawings.

#### 1.05 COORDINATION WITH OTHER TRADES

- A. The Contractor shall coordinate the electrical work with that of other trades to ensure proper final location of all electrical equipment and/or connections.

#### 1.06 CODES

- A. Comply with the latest revision of the following codes:

1.	Kentucky Building Code	KBC
2.	National Electrical Code	NEC
3.	National Electrical Safety Code	NESC
4.	Underwriters Laboratories, Inc.	UL
5.	National Fire Protection Association	NFPA
6.	National Electrical Manufacturers Association	NEMA
7.	Occupational Safety and Health Administration	OSHA
8.	Insulated Cable Engineers Association	ICEA
9.	Instrument Society of America	ISA
10.	American National Standards Institute, Inc.	ANSI
11.	Anti-Friction Bearing Manufacturers Association, Inc.	AFBMA
12.	Federal Communications Commission	FCC

- C. Comply with any other applicable federal, state, or local laws and ordinances.
- D. Where the Engineer's design requires a higher standard than the applicable code, the Engineer's design shall be followed.

#### 1.07 INSPECTIONS AND PERMITS

- A. Inspection of the electrical system on all construction projects is required. If the local government has appointed a state licensed inspector, the Contractor shall be required to use that person to perform the inspections. If a locally mandated inspector does not exist, the Contractor shall select and hire a state licensed inspector, who has jurisdiction before any work is concealed.
- B. At the time of completion of the project, there shall be furnished to the Owner and Engineer a certificate of compliance, from the agency having jurisdiction pursuant to all electrical work performed.

- C. All permits necessary for the complete electrical system shall be obtained by the Contractor from the authorities governing such work.

#### 1.08 STORAGE

- A. All work, equipment, and materials shall be protected against dirt, water, or other injury during the period of construction. Complete replacement with new equipment is required for any damaged materials.
- B. Sensitive electrical equipment such as motor starters, controls, transmitters, etc., delivered to the jobsite, shall be protected against injury or corrosion due to atmospheric conditions or physical damage by other means. Protection is interpreted to mean that equipment shall be stored under roof, in a structure properly heated in cold weather and ventilated in hot weather. Provision shall be made to control the humidity in the storage area at 50 percent relative. The stored equipment shall be inspected periodically, and if it is found that the protection is inadequate, further protective measures shall be employed.

#### 1.09 MATERIALS

- A. All materials used shall be new and at least meeting the minimum standards as established by the NEC and/or National Electrical Manufacturers Association. All materials shall be UL listed for the application where a listing exists. All equipment shall meet applicable FCC requirements and restrictions.
- B. The material and equipment described herein has been specified according to a particular trade name or make to set quality standards. However, each Contractor has the right to substitute other material and equipment in lieu of that specified, other than those specifically mentioned at matching or for standardization, providing such material and equipment meets all of the requirements of those specified and is accepted, in writing by the Engineer.
- C. The reuse of salvaged electrical equipment and/or wiring will not be permitted unless specified herein or indicated on the Contract Drawings.
- D. All salvaged or abandoned electrical materials shall become the property of the Contractor and shall be removed from the job site upon completion of the project, unless otherwise noted on the Contract Drawings or specified herein.

#### 1.10 ERRORS, CORRECTIONS, AND/OR OMISSIONS

- A. Should a piece of utilization equipment be supplied of a different size or

horsepower than shown on the Contract Drawings, the Contractor shall be responsible for installing the proper size wiring, conduit, starters, circuit breakers, etc., for proper operation of that unit and the complete electrical system at no extra cost to the Owner.

- B. It is the intent of these Specifications to provide for an electrical system installation complete in every respect, to operate in the manner and under conditions as shown in these Specifications and on the Contract Drawings. The Contractor shall notify the Engineer, in writing, of any omission or error at least 10 days prior to opening of bids. In the event of the Contractor's failure to give such notice, he/she may be required to correct work and/or furnish items omitted without additional cost.
- C. Necessary changes or revisions in electrical work to meet any code or power company requirement shall be made by the Contractor without additional charge.

#### 1.11 GUARANTEES AND WARRANTIES

- A. The Contractor shall guarantee all work including equipment, materials, and workmanship. This guarantee shall be against all defects of any of the above and shall run for a period of 1 year from the date of acceptance of the work, concurrent with the one year guarantee period designated for the general construction contract under which electrical work is performed.
- B. Repair and maintenance for the guarantee period is the responsibility of the Contractor and shall include all repairs and maintenance other than that which is considered as routine. (That is oiling, greasing, etc.) The Engineer shall be the judge of what shall be considered as routine maintenance.

#### 1.12 TESTING

- A. After the wiring system is complete, and at such time as the Engineer may direct, the Contractor shall conduct an operating test for acceptance. The equipment shall be demonstrated to operate in accordance with the requirements of these Specifications and the Contract Drawings. The test shall be performed in the presence of the Engineer or his authorized representative. The Contractor shall furnish all instruments and personnel required for the tests, as well as the necessary electrical power.
- B. Before energizing the system, the Contractor shall check all connections and set all relays and instruments for proper operation. He shall obtain all necessary clearances, approvals, and instructions from the serving utility company prior to placing power on the equipment.
- C. Cost of utilities for testing done prior to beneficial occupancy by the Owner

shall be borne by the Contractor.

#### 1.13 CLEANUP

- A. Cleanup shall be performed as soon as possible after the electrical installation is complete. All control panels, switches, etc., shall be free from tags, stickers, etc. All painted enclosures shall be free from scratches or splattered paint. The interior of all enclosures shall be clean from dust, wire strippings, etc. Surplus material, rubbish, and equipment shall be removed from the jobsite upon completion of the work.
- B. During construction, cover all Owner equipment subject to damage.

#### 1.14 EXCAVATION AND BACKFILL

- A. Excavation for conduits shall be of sufficient width to allow for proper jointing and alignment of the type conduit used. Conduit shall be bedded on original ground unless indicated otherwise on the Drawings. Where conduit is in solid rock, a 6 inch earth cushion must be provided. Conduit shall be laid in straight lines between pull boxes and/or structures unless otherwise notes on the Contract Drawings. The cost of solid rock excavation shall be included in the lump sum bid.
- B. Backfill shall be hand placed, loose granular earth for a height of 6 inches above the top of the largest conduit. This material shall be free of rocks over ½ inches in diameter. Above this, rocks up to 3" diameter may be included but must be mixed with sufficient earth to fill all voids.

#### 1.15 POWER COMPANY COORDINATION

- A. The Contractor is responsible for coordinating all activities onsite by the power company.
- B. The Contractor is required to meet all requirements and special provisions of the power company. The Contractor shall coordinate with the utility prior to bidding the project. No extras will be allowed for provisions required by the power company.
- C. The Owner will pay utility fees directly. The fees from the electrical system do not need to be included in the lump sum bid.

#### 1.16 TEMPORARY ELECTRICAL POWER

- A. The Contractor shall be responsible for providing temporary electrical power as required during the course of construction and shall remove the temporary service equipment when no longer required.

#### 1.17 OVERCURRENT PROTECTION

- A. Circuit breakers or fused switches shall be the size and type as written herein and shown on the Contract Drawings. Any additional overcurrent protection required to maintain an equipment listing by an authority having jurisdiction shall be installed by the Contractor at no extra cost to the Owner.

#### 1.18 TRAINING

- A. Provide onsite training on the pump control panel frequency drives. The training shall be conducted by a qualified representative of the manufacturer, and shall be sufficient in content and length such that the Owner's personnel are fully qualified to operate, maintain, and troubleshoot the equipment. O&M manuals must be approved before training can commence. Only one training class is required for each item of equipment. Coordinate the time/date with the Owner.
- B. An official training report shall be submitted to the Engineer. It shall be signed by Owner's personnel.

#### 1.19 RECORD DRAWINGS

- A. The Contractor shall maintain 1 set of the Contract Drawings on the job in good condition for examination at all times. The Contractor's qualified representative shall enter upon these Drawings, from day to day, the actual "as-built" record of construction and/or alteration progress. Entries and notes shall be made in a neat and legible manner and these Drawings delivered to the Engineer after completion of the construction, for use in preparation of Record Drawings. Underground lines must be dimensioned to permanent structures.

#### 1.20 MAINTAINING CONTINUOUS ELECTRICAL SYSTEM AND SERVICE

- A. Not applicable on this project.

#### 1.21 GROUNDING AND BONDING

- A. All metallic conduit, cabinets, equipment, and service shall be grounded in accordance with NEC requirements. All supporting framework in contact with electrical conduit, cable, and/or enclosures, shall be properly grounded.

#### 1.22 SERVICE ENTRANCE

- A. Conductors and terminations for service entrances shall be furnished and installed by the Contractor. Voltage, phase, and number of wires shall be as

shown on the Drawings. Clearances for overhead entrance wires shall be per power company, NEC, and NESC requirements.

#### 1.23 CONTRACTOR LICENSING

- A. The Contractor performing the electrical work on this project shall be a licensed electrical contractor in the State of Kentucky.

#### 1.24 ELECTRICAL COMPONENT MOUNTING HEIGHTS

- A. Mounting heights shall be as shown on the Contract Drawings. Operators and control devices shall not be mounted higher than 6'6" above finished floor or grade.

#### 1.25 EQUIPMENT IDENTIFICATION

- A. All starters, feeder units, disconnects, instruments, etc., shall be marked to indicate the motors, circuit, they control or monitor. Marking is to be done with engraved laminated nameplates. Nameplates shall be fastened to equipment with stainless steel screws, one each side. In no way shall be installation of the mounting screws void the NEMA enclosure rating of the equipment in which they are installed. If there are more than one number, the equipment shall be number consecutively and labeled as such. Nameplate background color shall be white, with black engraved letters.
- B. Disconnect switches, control panels, transfer switches, panelboards etc. shall be labeled with orange OSHA-compliant vinyl self-adhesive signs that list the maximum voltage contained inside the cabinet or panel.

#### 1.26 EQUIPMENT CONFIGURATION/PROGRAMMING

- A. Any equipment (i.e. frequency drives) furnished by the Contractor is required to be configured or programmed by the Contractor or his subcontractor/vendor. Any necessary studies or engineering necessary to configure or program this equipment shall be provided by the Contractor as needed to place the equipment into successful operation. Engineer or Owner will not be responsible for equipment configuration or programming.
- B. If a manufacturer or manufacturer's representative is required to startup/commission the equipment in these Specifications, then it is required that the Contractor provide the services of the manufacturer to configure/program the equipment. This includes the provision of any necessary studies or engineering necessary for the configuration/programming.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

#### **A. Raceways**

1. Rigid Aluminum Conduit - "Allied," "Wheatland," "Indalex," or equal.
2. PVC Conduit - "Allied," "Carlon," "Cantex," or equal.
3. Liquidtight Flexible Metal Conduit - "Allied," "Anaconda," or equal.

#### **B. Wires and Cables**

1. Building Wire (Types THWN and THW) - "Collyer," "Rome," "American," "Carol," or equal.
2. Instrumentation Cables - "Eaton-Dekoron," "Manhattan," "American," "Belden," "Okonite," or equal.

#### **C. Boxes - "Appleton," "Crouse-Hinds," "Hoffman," "Rittal," or equal.**

#### **D. Wire Connections and Connecting Devices**

1. Termination and Splice Connectors - "3M Scotchlok," "Anderson," "T&B," "Burndy," or equal.
2. Connectors, Lugs, etc. - "T&B," "Anderson," "Burndy," or equal.

#### **E. Grounding Equipment - "Cadweld," "ITT Blackburn," "Copperweld Bimetallics Group," "Cathodic Engineering Equipment Co.," or equal.**

#### **F. Motor Control Equipment - "Square D," "Allen Bradley," "Eaton Cutler-Hammer," "G.E.," or equal.**

### **2.02 MATERIALS**

#### **A. Conduit and Fittings**

##### **1. Aluminum Conduit**

- a. Aluminum conduit shall be extruded from alloy 6063 and shall be the rigid type, non-toxic, corrosion resistant, and non-

staining. It shall be manufactured per UL standards as well as listed/labeled by same.

- b. Fittings, boxes, and accessories used in conjunction with aluminum conduit shall be die cast, copper free type. They shall be resistant to both chemical and galvanic corrosion. All covers shall have neoprene gaskets. Aluminum fittings containing more than 0.4 percent copper are prohibited.
  - c. Aluminum conduit proposed for concrete slab or underground applications shall be UL listed for the purpose and factory pre-coated. Corrosion-resistant taping is allowed for stubouts out of the ground.
- 2. Polyvinylchloride (PVC) Conduit - PVC conduit and fittings shall be Schedule 80 heavy wall and UL listed. Expansion joints shall be used as recommended by the manufacturer in published literature. PVC systems shall be 90 degrees Celsius minimum UL rated, have a tensile strength of 7,000 psi @ 73.4 degrees Fahrenheit, flexural strength of 11,000 psi and compressive strength of 8,000 psi.
  - 3. Liquidtight Flexible Conduit - Flexible conduit shall be the metallic liquidtight type constructed from flexibly or spirally wound electro-galvanized steel. Connections shall be by means of galvanized malleable iron squeeze type fittings. The conduit shall be light gray in color and have sealtight fittings, type UA.
  - 4. Locknuts shall be bonding type with sharp edges for digging into the metal wall of an enclosure. Myer-style aluminum hubs shall be used rather than locknuts for all NEMA 4X and exterior penetrations.
  - 5. Bushings shall be metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
  - 6. Corrosion-Protection Tape: The corrosion protection tape shall be Scotchrap 51 or equal with 20mil thickness PVC tape and high-tack adhesive. Degreasing and priming of the conduit is required prior to applying the corrosion-protection tape.

**B. Conductors (600 Volts and Below)**

- 1. All conductors shall be insulated so that they are rated at 600 volts.
- 2. Insulated conductors shall be minimum #12 AWG for power or #14 AWG for control and shall be stranded.

3. All conductors brought to the job site shall be new and unused and where no special factory cut lengths are involved, shall be delivered to the job site in standard coils. Contractor shall provide verification to the Engineer of wire condition before wire is installed.
  4. All conductors shall be soft drawn, 98% conductivity copper conforming to the latest ASTM Specifications and the requirements of the National Electrical Code.
  5. Conductors shall be insulated with type THWN insulation and all conduits shown on the Drawings are sized accordingly.
- C. Instrumentation Cable - Instrumentation cable shall have individually shielded and twisted pairs or triads. Conductors shall be tinned copper, and the cable shall include a separate drain conductor. Voltage rating shall be 600 Volt. Conductor colors shall be black and white. Shielding shall be a combination braid/foil with 100% coverage. Insulation shall be PVC or XLPE. Conductors shall be #18AWG minimum, but no smaller than the size indicated on the Drawings. Insulation shall be polyethylene, rated for underground wet location use, and resistance at 68 degrees Fahrenheit between conductors and between conductors and ground should be at least 500 megohms per 1,000 feet.
- D. Boxes and Enclosures
1. Junction boxes for outdoors surface mounting shall be stainless NEMA 4X, with at least 5 ½ full threads for each conduit opening, and shall be suitable for surface mounting as required with drilled external, cast mounting extensions. Box covers shall be hinged or cap screw retained as required, of the same material as the box and provided with stainless steel hardware.
- E. Wire Connections and Connecting Devices
1. Terminals and splice connectors from #22 to #4 AWG shall be compression type with barrels to provide maximum conductor contact and tensile strength. Performance, construction, and materials shall be in conformance with UL standards for wire connectors and rated for 600 Volts and 105 degrees Celsius.
  2. Lugs and splice connectors from #6 AWG to 1000 kcmil shall be compression types with barrels to provide maximum conductor contact and tensile strength. They shall be manufactured from high conductivity copper and entirely tin plated. They shall be crimped with standard industry tooling. The lugs and connectors must have a

current carrying capacity equal to the conductors for which they are rated and must also meet all UL requirements. All lugs above #4/0 shall be 2 hole lugs with NEMA spacing. The lugs shall be rated for operation through 35 KV. The lugs shall be of closed end construction to exclude moisture migration into the cable conductor.

F. Wiring Devices

1. General – All receptacles shall be heavy duty specification grade duplex receptacle, Nema 5-20R, 20A, 125V, 3-wire. Provide weatherproof cover where indicated on the Drawings.
2. Duplex outlet (interior) - "Hubbell" catalog series 5362, or equal.
3. Ground fault interrupting receptacles shall be required where shown on the Contract Drawings, and shall be indicated by the abbreviation "GFI" beside the circuit symbol on the Contract Drawings. They shall be rated 20 amps (125 volts) and shall be of the duplex, feed through type, capable of protecting all downstream receptacles on the same circuit. They shall be UL listed and shall comply with UL 943 and interrupt the current between 4-6 milliamps of ground fault leakage. Appropriate plates shall be furnished and installed. The 20 ampere rating shall apply not only to device internals but to the faceplate as well. Receptacle shall be Hubbell GFI 5352, or equal.
4. Weatherproof covers shall be Hubbell WP series, Thomas and Betts 2CKG, or equal. They shall be weatherproof-in-use with cast aluminum construction. Mounting screws shall be stainless. Protection shall be Nema 3R.
5. General – Switches shall be industrial grades, 120/227VAC, 20A
  - a. Single pole (exterior) - "Hubbell" cat. no. 1222-gray, or equal.

G. Panelboards

1. Shall be UL listed with copper bussing.
2. Enclosure shall be NEMA 1 painted steel.
3. Circuit breakers shall be bolt-in.
4. Panelboards rated for 120/208V service shall have an interrupting capacity of not less than 10,000A, RMS symmetrical.

5. Panelboards rated for 480V service shall have an interrupting capacity of not less than 14,000A, RMS symmetrical.
6. Panelboards scheduled for use as service equipment shall be service-entrance listed and shall have an integral surge suppressor with disconnect. The surge suppressor rating shall be 50kA minimum.

#### H. Motors

##### 1. Ratings and Electrical Characteristics:

- a. Time: All motors shall be rated for continuous duty.
- b. Temperature: Maximum ambient temperature of 40 degrees C. and an altitude of 3,300 feet or less, according to service factor and insulation class employed.
- c. Voltage: All single phase motors shall be rated 115/208/230 volts and all polyphase motor 230/460 volts. All motors shall be capable of normal operation at balanced voltages in the range of + 10 percent from rated winding voltage.
- d. Frequency: All AC motors shall be rated for 60 hz. operation. All motors shall be capable of normal operation at frequencies 5 percent above or below the normal rating of 60 hz.
- e. Locked Rotor Current: Locked rotor current shall be in accordance with NEMA standards.
- f. Efficiency: NEMA premium efficiency is required.
- g. Speed: Slip shall not exceed 4 percent at full load.
- h. Service Factor: The service factor shall be 1.15 unless requirements of the driven load necessitate a higher service factor.
- i. Insulation Class: Insulation shall be NEMA Class F or Class H. The pump motors shall be inverter-duty and suitable for operation on variable frequency drives.
- j. Design Level: Motors shall be NEMA design B, except as otherwise noted.
- k. Winding Overtemperature Sensors: All motors 15 horsepower and over shall be provided with motor winding thermostats.

The devices shall be hermetically sealed, snap-acting thermal switches, actuated by a thermally responsive bi-metallic disk. A minimum of 1 per phase is required, with switches wired into the control circuit of the starter to provide de-energization should overheating threaten.

2. Tests, Nameplates and Shop Drawings:

- a. Test: Tests shall be required on integral horsepower motors only. A factory certified test report of "electrically duplicate motors previously tested" shall be supplied on all motors under 200 horsepower. The test shall be certified by the factory and shall contain a statement to the effect that complete tests affirm the guaranteed characteristics published in the manufacturer's catalogs or descriptive literature. Tests shall be in accordance with IEEE test procedures.
- b. Nameplates: Each motor shall have a permanently affixed nameplate of brass, stainless steel, or other metal of durability and corrosion resistance. The data contained on the nameplate shall be in accordance with NEMA standards. Provide a spare nameplate with each motor and mount the nameplate in the starter cabinet. A Brady label with equivalent nameplate information will be accepted in lieu of an actual spare nameplate.

3. Efficiency Requirements

- a. The following motor full load efficiency requirements shall be met as a minimum for totally enclosed 3 phase integral horsepower motors (per NEMA test Methods):

Horsepower	Nominal 3600 RPM (Minimum %)	Nominal 1800 RPM (Minimum %)	Nominal 1200 RPM (Minimum %)
1	75.5	82.5	80.0
1.5	82.5	84.0	85.5
2	84	84.0	86.5
3	85.5	87.5	87.5
5	87.5	87.5	87.5
7.5	88.5	89.5	89.5
10	89.5	89.5	89.5
15	90.2	91.0	90.2
20	90.2	91.0	90.2
25	91.0	92.4	91.7
30	91.0	92.4	91.7
40	91.7	93.0	93.0
50	92.4	93.0	93.0
60	93.0	93.6	93.6
75	93.0	94.1	93.6
100	93.6	94.5	94.1
125	94.5	94.5	94.1
150	94.5	95.0	95.0
200	95.0	95.0	95.0

- b. Motors shall be energy efficient and shall be documented in the shop drawings submittal in sufficient detail to allow the Engineer complete review of what is offered. Motors shall meet NEMA premium efficiency standards.

#### I. Safety Switches

1. All safety switches shall be heavy-duty load break type with a quick-make, quick-break, switch mechanism. The switches shall be fused or unfused as indicated on the Drawings. The handle position shall give visual indication of open and closed switch position. Padlocking capability shall be provided for locking the switch in the "OFF" (open) position.

2. The switch jaws shall be multi-spring type for positive grip of the switch blades and shall be provided with arc suppressors. The fuse clips shall be spring reinforced, positive pressure type of electrolytic copper. Fuse clips shall be rejection type.
  3. The switch shall be provided with cover-blade interlock so that the cover cannot be opened when the switch blades are closed, nor can the switch blades be closed with the cover open. Interlock bypassing devices shall be included for use by authorized personnel. Note: where indicated, safety switches shall have integral electrical interlocks. Contacts shall be open when the switch is in the off position.
  4. Enclosures shall be NEMA 1 where used inside the building and NEMA 4X stainless steel where used outside unless otherwise shown on the Drawings.
  5. Each safety switch shall be provided with ground lugs as required to accept grounding conductors as shown on the Drawings. The grounding lugs shall be factory installed and shall have direct metal-to-metal contact with the switch enclosure.
  6. Manual Transfer Switch (MTS) – Provide a double throw fused safety switch. It shall be lockable in any position and shall be service-entrance rated. Comply with the other safety switch specifications above.
- J. Motor Control – See Section 16900 for requirements.
- K. Overcurrent Protection
1. Main 3-Phase Breakers – Shall be thermal-magnetic, molded-case, Type FA or KA as needed, Square D or equal. Provide service-entrance rated where indicated on the Drawings as being used in a service entrance application.
  2. Power Fuses – Utilize Class J fuses and fuse blocks. Fuse blocks must have protective cover. Fuses may only be used where indicated on the Drawings. Otherwise, use circuit breakers.
- L. Lighting
1. All fixtures shall be delivered complete with suspension and mounting accessories, ballasts, diffusers, reflectors, etc., all wired and assembled. All accessory wiring shall be furnished and installed as shown on the Contract Drawings.

2. All supports required for luminaires shall be furnished and installed by the Contractor.
- M. Supporting Devices – All strut, channel, conduit clamps/straps, and other supporting devices shall be either stainless steel or aluminum. All hardware such as nuts, bolts, anchors, washers, etc. shall be stainless steel.
- N. General Purpose Dry-Type Transformers
1. Three phase transformers shall be 480 volts delta primary and 208 Y/120 secondary. Transformers 25 KVA and larger shall have a minimum of 4 (2 above, 2 below) 2 ½ percent full capacity primary taps.
  2. Transformers shall be 150 degrees Celsius temperature rise above a 40 degrees Celsius ambient. All insulating materials are to be in accordance with the latest NEMA Standards for a 220 degrees Celsius UL recognized insulation system.
  3. Transformer coils shall be of the continuous wire wound construction and shall be impregnated with non-hygroscopic, thermo-setting varnish. The coils shall also have a final wrap of electrical insulating material to prevent mechanical injury to the wire as well as increasing the electrical breakdown strength.
  4. All cores shall be constructed of high grade, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. The core laminations shall be clamped together with steel angles. The completed core and coil shall then be bolted to the base of the enclosure but isolated from the base by means of rubber, vibration absorbing mounts. There shall be no metal-to-metal contact between the core and coil to the enclosure. On transformers 500 KVA and smaller, the vibration isolation system shall be designed to provide a permanent fastening of the core and coil to the enclosure. To further facilitate vibration and noise isolation, the final section of conduit to the transformer shall be flexible.
  5. Transformers 25 KVA and larger shall be in heavy gauge, sheet steel, ventilated enclosures. The ventilating openings shall be designed to prevent accidental access to live parts in accordance with UL, NEMA, and National Electrical Code Standards for ventilated enclosures. Transformers 25 KVA through 75 KVA shall be designed so they can either be floor or wall mounted. Above 75 KVA they shall be of the floor mounted design.

6. The entire transformer enclosure shall be degreased, cleaned, phosphatized, primed, and finished in the same color as the motor control equipment.
7. The maximum temperature of the top of the enclosure shall not exceed 50 degrees Celsius rise above a 40 degrees Celsius ambient.
8. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with NEMA and NEC Standards.
9. The transformer shall be marked "DANGER HIGH VOLTAGE" with labels specified in the section on marking, this Division.
10. The transformers shall be manufactured to requirements of applicable standards, especially as they apply to noise level, surface temperatures, and Energy code requirements.

O. Pressure Switches

1. Pressure switches shall be industrial type NEMA 4X epoxy-coated aluminum body with UL listing.
2. The pressure switch shall have a single pole double throw relay output. The setpoint shall have an adjustable range suitable for operation in the conditions shown on the Drawings and in the equipment specifications.
3. The switch shall be rated for operation in -25°F to 130°F ambient. Setpoint shall drift no more than 1.5% for a 50°F ambient temperature change.
4. Setpoint repeatability shall be within 1.5% of adjustable range, maximum.
5. Electrical connection shall be either a 1/2" or 3/4" threaded connection.
6. Pressure connection shall be NPT.
7. The pressure switch shall be Omega, or equal.

P. Electromagnetic Flowmeter and Transmitter

1. The electromagnetic flow meter shall consist of a flow sensor based on Faraday's Law of Electromagnetic Induction and microprocessor-based signal converter & transmitter.
2. The sensor flow tube liner material shall be EPDM rubber. Measurement and grounding electrodes shall be 316 stainless steel. Flow tube shall have corrosion resistant epoxy coating. Flow meter shall be approved by NSF for drinking water.
3. Operating temp: Operating Temp: -5 to +120° F minimum acceptable band
4. Display: Background illumination with alphanumeric 3-line, 20-character display to indicate flow rate, totalized values, settings, and faults
5. Power supply: 115/230 VAC as indicated on Contract Drawings.
6. Outputs: 4-20 mA into 800 ohms max. One relay rated at 42 VAC/2 A, 24 DC/1A. Provide Digital pulse for external display of flow rate or totalizer.
7. Flow Range: 1.5 fps to 33 fps for accuracies stated below.
8. Accuracy: 0.5% of actual flow.
9. Separation: Allowable distance of 900 feet between signal converter and sensor without the use of any additional equipment
10. Provide Bi-directional flow capabilities
11. Totalizer: Two eight-digit counters for forward, net, or reverse flow.
12. The transmitter shall be mounted integrally as indicated on the Drawings.
13. Insertion type or doppler type flow meters will not be accepted.

Q. Door Contact Switches

1. The contact shall be a hermetically sealed reed switch nominally 3" L x 1" H x 0.50" D with matching actuating magnet. Mounting holes shall be on approximately 2" centers. Contact and magnets shall be in brushed anodized aluminum tube housing. Contact shall be sealed in polyurethane potting compound. Right angle mounting bracket shall be furnished with contact.
2. The contact shall be a Form C (SPDT) reed contact. For doors, the contact shall be biased such that contact will be difficult to defeat with an external magnet and three feet of flex stainless steel conduit shall be permanently attached to the contacts. Contacts in cabinets need not have the biased feature and can be provided with vinyl-jacketed cable.
3. The contact shall be GE Sentrol, or equal.

**R. Pressure Cell & Transmitter**

1. The transmitter shall be Foxboro Model IGP20, or equal, for measuring gauge pressure.
2. The transmitter shall loop-powered
3. The transmitter shall transmit a 4-20 mA signal when supplied with voltage in a range from 11.5 to 42 VDC
4. The transmitter shall have an LCD display with on-board pushbuttons
5. The transmitter shall have an external zero adjustment
6. The transmitter shall have a Type 316 stainless steel cover and housing. It shall be rated NEMA 4X.
7. The transmitter range shall be as indicated on the Contract drawings.
8. The transmitter may be equipped with a two-valve manifold, stainless steel, in lieu of the valving arrangement indicated on the Drawings.
9. Accuracy shall be  $\pm 0.075$  percent of calibrated span, minimum. Repeatability shall be better than 0.5 percent of calibrated span.
10. Mounting bracket shall be stainless steel.
11. Provide a snubber appropriately sized for the application.
12. Manufacturer warranty shall be 5 years, minimum.

**PART 3 - EXECUTION**

**3.01 INSTALLATION/APPLICATION/ERECTION**

**A. Conduit**

1. PVC conduit shall be utilized below grade, and aluminum conduit shall be used above grade. The transition from PVC to aluminum shall occur below grade prior to the elbow. The aluminum conduit shall be taped with corrosion-prevention tape from the transition point to 6" above finished grade.
2. The Contractor shall be responsible for setting of all sleeves for his work. Passage of conduit through masonry and concrete walls shall be provided with steel pipe sleeves. Sleeves shall be flush with each face of the wall. Seal space between sleeve and conduit with oakum and waterproof mastic.
3. All conduit 1-1/4 inches and larger shall be sleeved.
4. Concrete encasements of underground conduit is not required on this project.

5. During construction, all new conduits shall be kept dry and free of moisture and debris. Before the wire is pulled in, all conduits shall be swabbed to clear all moisture and debris which may have unavoidably accumulated.
6. Rigid conduits, where they entered panelboards, cabinets, pull boxes or outlet boxes shall be secured in place by galvanized, double locknuts (one inside and one outside) and bushings. Conduit bushings shall have insulating material which has been permanently fastened to the fittings. Bushings for conduit 1-1/2 inches trade size and larger shall be complete with grounding lug and shall be bonded to the box by means of bare copper wire. Myers hubs shall be utilized rather than locknuts for all exterior and NEMA 4X penetrations.
7. All field bends shall be made with standard tools and bending equipment manufactured especially for this purpose. Bends in metallic conduit shall be made while cold and in no case shall the conduits be heated. Conduits shall not be bent through more than 90 degrees.
8. Size of conduits shall not be less than that required by the National Electrical Code. The Contractor shall install larger size conduits than detailed where there is more than 100 feet of unbroken run or where the total of the angles through which the conduit has been bent during a single run exceeds 270 degrees.
9. In general, flexible conduit is prohibited. Where absolutely necessary, it shall be liquidtight, with maximum lengths of 3 feet.
10. All conduit joints shall be made up tight and no running threads shall be permitted on threaded connections. No kinked, clogged or deformed conduits shall be permitted on the job.
11. During construction, all installed conduits shall be temporarily capped or corked.
12. All moisture proofing or other material for thread protection shall be removed from conduit threads prior to installation. No material of insulating quality shall be used on the conduit threads or other places which will reduce the overall conductivity of the conduit system.
13. Raceways shall be securely and rigidly fastened in place with conduit clamps or approved conduit hangers. Bolts, screws, etc. used in securing the work shall be stainless steel and of ample size for the service. Assembly bolts, nuts, washers, etc., shall be stainless steel.

Raceways shall NOT be welded to steel structures.

14. Horizontal and vertical conduit runs shall be supported by one hole straps with clamp backs, special brackets, or other approved devices with suitable bolts, expansion shields where required. All mounting hardware shall be stainless steel.
15. The use of perforated iron straps or wire for supporting conduits will not be permitted.
16. Where conduit is run in a concrete slab, the conduit shall be installed as close to the middle of the concrete slabs as practicable without disturbing the reinforcement. The outside diameter shall not exceed one-third of the slab thickness and conduits shall be placed not closer than three diameters on centers, except at cabinet locations where the slab thickness shall be increased upon consultation with and approval by the Engineer.
17. Depth of bury for all conduit shall be as indicated but not less than 30 inches below finished grade.
18. All conduit shall have an insulated ground wire pulled to all equipment.
19. All conduits penetrating enclosures shall have duct seal applied to seal the conduit and prevent moisture from entering the enclosure.

**B. Wire and Cable (600 Volts and Below):**

1. All wiring shall be installed in conduit. Wire shall not be installed until all work of any nature that may cause injury to the wire is completed.
2. Mechanical means shall not be used in pulling in wires No. 8 or smaller.
3. Approved wire pulling lubricant shall be used as required to prevent insulation damage and over stressing of the wire while pulling through conduit. In no case shall conductors be greased or coated with any substance injurious to the conductor insulation or sheath.
4. All wiring in control equipment, cabinets, etc., shall be neatly wrapped, taped, or laced into groups to provide a neat and orderly appearance in the equipment.
5. Where the wire is shown larger than that required for the load, it is done so for voltage drop or other purposes and must be installed as shown. Where the wire is stranded, the removal of strands in order to

install the wire into a lug provided on any equipment will not be permitted. A larger lug shall be installed which will accept the wire size indicated.

6. For the wiring of circuits consisting of AWG No. 10 or smaller wire, self-insulated pressure connectors (wirenuts) shall be utilized for all splices or joints.
7. Each wire shall be labeled at both termination points. Individual conductor or circuit identification shall be carried throughout, with circuit numbers or other identification clearly stamped on terminal strips and shown in wiring diagrams.
8. In all junction boxes, cabinets, control compartments and terminal boxes where no terminal board is provided, each wire, including all power wires, shall be properly identified by plastic coated, self-adhesive, wire marker.
9. In cases similar to the above where the terminal boards are provided for the control, indicating, and metering wires, all wires including motor leads and other power wires shall be identified by wire markers as specified above.
10. Equipment ground wire insulation shall be colored green or green with two or more yellow stripes. Isolated grounding conductors shall be green with striping that identifies the conductor as "isolated ground" and different from the equipment (bonded) ground.
11. In general and unless otherwise shown on the drawings, no two wires of the same color shall be run in the same conduit except such as control wiring, switch legs, neutral, and ground. Where a conduit run is shown on the drawings to have two or more wires connected to the same phase and, therefore, are the same color, pressure sensitive, plastic marked wire marker identification tape shall be used wherever the wire is accessible (junction boxes, panels, device boxes, etc). The numbers shall in each case, correspond to the circuit number and panelboard from which the circuit emanates. Control wiring inside any compartment which may be energized from a source outside the compartment shall have insulation. Where yellow insulated wires are used inside any cabinet, compartment, etc., a machine engraved, laminated plastic identification marker shall be installed on the outside of the compartment.
12. Insulation on ungrounded conductors larger than AWG #10 and on grounded (neutral) and grounding (equipment ground) conductors larger than AWG #6 may be black with color coding accomplished

with the use of colored plastic tape. Tape shall be installed on the conductors wherever they are visible and shall be wrapped at least three (3) turns around the conductor.

13. All wiring on this project, except control wiring, shall reflect the phase relationship as follows:

480 volt system: brown, orange and yellow for ungrounded conductors, gray with brown tracer for neutral conductors.

208Y/120 volt system: black, red and blue for ungrounded conductors, white for neutral conductors.

120/240 volt, 3-phase

4-wire, delta system: black, red for ungrounded conductors, orange for ungrounded conductor connected to "high leg", white for neutral.

#### C. Grounding

1. Ground rods shall be driven vertically into the earth to at least one foot below finished grade. Where a counterpoise or grounding grid is indicated and where rock is encountered at a depth of less than four (4) feet, rods shall be buried in a trench at not less than two feet below finished grade, and at equal angles from any two adjacent sides on the outside of the counterpoise or grid. In these cases, at the Contractor's option, equal lengths of bare conductor of the same size as the counterpoise or grid may be used in place of ground rods.
2. Conductors connecting the main ground bars in switchgear to the earth shall be continuous without joints or splices. Connections to the grounding system at the switchgear shall be made with pressure connectors such as defined in Article 100, "Connector, Pressure (Solderless)", of the National Electrical Code.
3. Connections to ground rods and all other ground connections below grade shall have a minimum mechanical contact surface area between the conductor and the ground rod of not less than three (3) square inches.
4. All connections made below finished grade shall be exothermic.
5. Installation of grounding conductors shall be such that they are not exposed to physical damage. All connections shall be firm and tight. Conductors and connectors shall be so arranged and provided so that

there is no strain upon the connection. Buried equipment grounding conductors shall be buried at least 24 inches below finished grade and shall not be buried below concrete pads, paving, etc. except where running a tap to the grid or where shown on the contract drawings. Where buried below concrete or paving, grounding conductors shall be in rigid conduit unless shown on the drawings as a part of a grid.

6. Resistance measurements shall be made between the main grounding bar in the switchgear and a good earth ground. If this resistance is not equal to or less than 5 Ohms, an additional grounding electrode system in the form of ground rods installed and connected together in a 10 feet by 10 feet grid shall be added. The rods shall be connected together and this grid connected to the system with AWG #3/0 bare tinned copper. The number of rods shall be as required to register the resistance value mentioned above. Measurements shall be made in normally dry conditions and, in no case, less than 48 hours after rainfall. Submit a ground test report to the Engineer using the "Fall of Potential" method and appropriate ground testing instrumentation.
7. Where a bare conductor is the only conductor installed in conduit or other raceway, and this conductor is serving as a grounding conductor, it shall be bonded to the raceway that contains it at each end of the raceway. The bond shall be made using a grounding type bushing and bonding jumper. The size of the jumper shall be the maximum size that the grounding bushing lug will accept and it shall be connected to the bushing with the lug and to the grounding conductor with a split bolt connector.
8. All metal electrical equipment cabinets (wireways, panels, switchgear, device boxes, junction and pull boxes, motor control panels, etc.) shall be securely bonded to a grounding conductor running through any conduit terminating at the cabinet or enclosure by use of a grounding lug bushing and jumper wire to the enclosure wall. Switchgear, panelboards and motor control equipment shall be provided with an equipment ground bus (including lugs or screw terminals) securely bonded to the enclosure. Junction boxes and other enclosures shall utilize an equipment ground bus or lug as required to securely bond the equipment grounding conductor to the enclosure. The grounding conductor shall be connected with pressure connectors at the main switchgear to the main grounding system. Where screw terminals or set screw lugs are used, sufficient lugs shall be provided such that not more than one conductor is installed into each lug or terminal.
9. No raceway (including rigid steel conduit, EMT, etc.) shall serve as a grounding conductor.

10. All main feeder circuits and all branch circuits shall contain a grounding conductor sized according to Table 250-95, Article 250 of the National Electrical Code or as shown on the drawings. This grounding conductor shall be connected to the main grounding conductor in the switchgear from which the circuit emanates. Individual components of the system served by the main feeder circuit shall have their enclosures connected to the main feeder grounding conductor with pressure connectors.
11. The grounding conductor serving motor circuitry shall be connected inside the entrance compartment to the motor frame with a bolted solderless pressure connector. Bolts, nuts, washers and other assorted hardware shall be bronze, cadmium plated steel, or other corrosion resistant material. The motor ground connection shall be to the motor frame and independent of the mounting bolts or sliding base.
12. Grounded and Grounding Conductor: Connections to the grounding conductor and/or the neutral (grounded) conductor shall be made in such a manner that removal of any device or equipment will not interrupt the continuity of these conductors to any device downstream from the device removed.

D. Lighting

1. The Contractor shall furnish all light fixtures, lighting equipment, components, hangers, etc., as shown on the Contract Drawings and shall install them at the locations shown on the Contract Drawings.
2. Mounting heights specified as indicated shall be to bottom of fixture. Coordinate exact mounting of lighting fixture with type, style and pattern of ceiling being installed.
3. Clean interior lighting fixtures of dirt and debris upon completion of installation. Protect installed fixtures from damage during remainder of construction period.
4. No light fixtures shall be hung or installed until after painting is completed, however, the Contractor shall provide temporary lighting.

END OF SECTION

## **SECTION 16483 ADJUSTABLE FREQUENCY DRIVES**

### **PART 1 GENERAL**

#### **1.01 SCOPE**

- A. Provide three-phase, Adjustable Frequency Drives (AFD) as specified herein and as shown on the Contract Drawings. The drives shall be installed inside the pump control panel.

#### **1.02 RELATED SECTIONS**

- A. Section 16020 General Electrical Requirements
- B. Section 16900 Pump Control Panel

#### **1.03 REFERENCES**

- A. The adjustable frequency drives and all components shall be designed, manufactured and tested in accordance with the latest applicable standards.
  - 1. Underwriters Laboratories (UL508C: Power Conversion Equipment)
  - 2. IEC 61800-3

#### **1.04 SUBMITTALS**

- A. The following information shall be submitted to the Engineer for approval:
  - 1. Dimensioned outline drawing
  - 2. Schematic diagram
  - 3. Power and control connection diagram(s)
  - 4. Descriptive bulletins
  - 5. Product sheets
- B. O&M manuals are required in accordance with Section 16020 requirements. As-built wiring diagrams and as-built parameter settings list are required.

#### **1.05 QUALIFICATIONS**

- A. The supplier of the assembly shall be the manufacturer of the electromechanical power components used within the assembly, such as bypass contactors when specified.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 certified.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Equipment shall be handled and stored in accordance with manufacturer's instructions. A copy of these instructions shall be included with the equipment at time of shipment.

## 1.07 SPARE PARTS

- A. Not required.

# PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. Allen Bradley Powerflex 750 series
- B. Eaton
- C. Schneider
- D. Or equal.

## 2.02 ADJUSTABLE FREQUENCY DRIVES (AFD)

- A. Adjustable frequency drives shall have the following features:
  - 1. The AFD shall be rated for the voltage indicated on the Drawings. The AFD shall provide microprocessor-based control for three-phase induction motors. The AFD may be rated either variable torque or constant torque.
  - 2. The AFD shall be of the Pulse Width Modulated (PWM) design converting the utility input voltage and frequency to a variable voltage and frequency output via a two-step operation. Adjustable Current Source AFDs are not acceptable. Insulated Gate Bipolar Transistors (IGBT's) shall be used in the inverter section. Bipolar Junction Transistors, GTO's or SCR's are not acceptable.
  - 3. The AFD shall have efficiency at full load and speed that exceeds 95% for AFD below 15-HP and 97% for drives 15-HP and above. The efficiency shall exceed 90% at 50% speed and load.
  - 4. The AFD shall maintain the line side displacement power factor at no less than 0.96, regardless of speed and load.
  - 5. The AFD shall have a one (1) minute overload current rating of 110% for variable torque drives.
  - 6. The AFD shall be capable of operating of operating any NEMA design B squirrel cage induction motor, regardless of manufacturer, with a horsepower and current rating within the capacity of the AFD.
  - 7. The AFD shall have an integral EMI/RFI filter as standard.
  - 8. AFDs rated 5HP and below are not required to have line reactors. AFDs rated 6HP to 20HP shall have a standard 3% nominal impedance AC three-phase line reactor. AFDs above 20HP shall have a standard 5% nominal impedance AC three-phase line reactor. The line reactors may be integral to or separate from the drive.

9. The AFD shall be able to start into a spinning motor. The AFD shall be able to determine the motor speed in any direction and resume operation without tripping. If the motor is spinning in the reverse direction, the AFD shall start into the motor in the reverse direction, bring the motor to a controlled stop, and then accelerate the motor to the preset speed.
10. Standard operating conditions shall be:
  - a. Incoming Power: As indicated voltage (+10% to -15%) and 50/60 Hz ( $\pm 5$  Hz)
  - b. Frequency stability of  $\pm 0.05\%$  for 24 hours with voltage regulation of  $\pm 1\%$  of maximum rated output voltage.
  - c. Speed regulation of  $\pm 0.5\%$  of base speed.
  - d. Load inertia dependant carryover (ride-through) during utility loss.
  - e. Insensitive to input line rotation.
  - f. Humidity: 0 to 95% (non-condensing and non-corrosive).
  - g. Altitude: 0 to 3,300 feet (1000 meters) above sea level.
  - h. Ambient Temperature: -10 to 40 °C
  - i. Storage Temperature: -40 to 60 °C.
11. Control Functions
  - a. AFD programmable parameters shall be adjustable from a digital operator keypad. The AFD shall have a alphanumeric programmable display with status indicators. Keypads must use plain English words for parameters, status, and diagnostic messages. Keypads that are difficult to read or understand are not acceptable, and particularly those that use alphanumeric code and tables. Keypads shall have backlighting.
  - b. The keypad shall include a Local/Remote pushbutton selection.
  - c. The frequency drive shall include an Ethernet port for programming, monitoring, and control. Ethernet/IP or Modbus TCP are acceptable protocols.
  - d. The operator shall be able to scroll through the keypad menu to choose between the following:
    1. Monitor
    2. Operate
    3. Parameter setup
    4. Actual parameter values
    5. Active faults
    6. Fault history
    7. Information to indicate the standard software and optional features software loaded.
  - e. The following setups and adjustments, at a minimum, are to be available:
    1. Start command from keypad, remote or communications port
    2. Speed command from keypad, remote or communications port
    3. Motor direction selection
    4. Maximum and minimum speed limits

5. Acceleration and deceleration times, two settable ranges
  6. Critical (skip) frequency avoidance
  7. Torque limit
  8. Multiple attempt restart function
  9. Multiple preset speeds adjustment
  10. Catch a spinning motor start or normal start selection
  11. Programmable analog output
  12. DC brake current magnitude and time
  13. PID process controller
12. The AFD shall have the following system interfaces:
- a. Inputs – A minimum of four (4) programmable digital inputs, two (2) analog inputs and Ethernet communications interface shall be provided with the following available as a minimum:
    1. Remote manual/auto
    2. Remote start/stop
    3. Remote forward/reverse
    4. Remote preset speeds
    5. Remote external trip
    6. Remote fault reset
    7. Process control speed reference interface, 4-20mA DC
    8. Potentiometer and 1-10VDC speed reference interface
    9. Ethernet programming and operation interface port
- B. Outputs – A minimum of two (3) discrete programmable digital outputs and two (2) programmable analog outputs shall be provided, with the following available at minimum.
1. Programmable relay outputs with one (1) set of Form C contacts for each, selectable with the following available at minimum:
    - a. Fault
    - b. Run
    - c. Ready
    - d. Reversed
    - e. Jogging
    - f. At speed
    - g. Torque Limit Supervision
    - h. Motor rotation direction opposite of commanded
    - i. Over-temperature
  2. Programmable analog output signal, selectable with the following available at minimum:
    - a. Motor current
    - b. Output frequency
    - c. Frequency reference
    - d. Motor speed
    - e. Motor torque

- f. Motor power
  - g. Motor voltage
  - h. DC-bus voltage
  - i. AI1 (Analog Input 1)
  - j. AI2 (Analog Input 2)
  - k. PT100 temperature
3. Monitoring and Displays
- a. The AFD display shall be a LCD type capable of displaying the following thirteen (13) status indicators:
    - 1. Run
    - 2. Forward
    - 3. Reverse
    - 4. Stop
    - 5. Ready
    - 6. Alarm
    - 7. Fault
    - 8. Input/Output (I/O) terminal
    - 9. Keypad
    - 10. Bus/Communication
    - 11. Local (LED)
    - 12. Remote (LED)
    - 13. Fault (LED)
4. The AFD keypad shall be capable of displaying the following monitoring functions at a minimum:
- a. Output frequency
  - b. Frequency reference
  - c. Motor speed
  - d. Motor current
  - e. Motor torque
  - f. Motor power
  - g. Motor voltage
  - h. DC-bus voltage
  - i. Unit temperature
  - j. Calculated motor temperature
  - k. Voltage level of analog input
  - l. Current level of analog input
  - m. Digital inputs status
  - n. Digital and relay outputs status
  - o. Analog Input
5. Protective Functions
- a. The AFD shall include the following protective features at minimum:
    - 1. Over-current
    - 2. Over-voltage

3. Inverter fault
4. Under-voltage
5. Input phase loss
6. Output phase loss
7. Under-temperature
8. Over-temperature
9. Motor stalled
10. Motor over-temperature
11. Motor under-load
12. Logic voltage failure
13. Microprocessor failure
- b. The AFD shall provide ground fault protection during power-up, starting, and running. AFD with no ground fault protection during running are not acceptable.
6. Diagnostic Features
  - a. Fault History
    1. Record and log faults
    2. Indicate the most recent first, and store up to 30 faults
7. Enclosure
  - a. The AFD enclosure shall be NEMA 1. The AFD shall have complete front accessibility with easily removable assemblies.
8. The AFD manufacturer shall maintain, as part of a national network, engineering service facilities within 100 miles of project to provide start-up service, emergency service calls, repair work, service contracts, maintenance and training of customer personnel.

## **PART 3 EXECUTION**

### **3.01 FACTORY TESTING**

- A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.
  1. All printed circuit boards shall be functionally tested via automatic test equipment prior to unit installation.
  2. After all tests have been performed, each AFD shall undergo a burn-in test. The drive shall be burned in at 100% inductive or motor load without an unscheduled shutdown.
  3. After the burn-in cycle is complete, each AFD shall be put through a motor load test before inspection and shipping.
- B. The manufacturer shall provide three (3) certified copies of factory test reports.

### 3.02 INSTALLATION

- A. Install per manufacturer's instructions.
- B. Configure parameters according to actual driven motor nameplate data.
- C. Set the minimum and maximum speeds as directed by the motor manufacturer.

### 3.03 FIELD QUALITY CONTROL

- A. Provide the services of a qualified manufacturer's employed Field Service Engineer to assist the Contractor in installation and start-up of the equipment specified under this section. Field Service personnel shall be factory trained with periodic updates and have experience with the same model of AFD on the job site. Sales representatives will not be acceptable to perform this work. The manufacturer's service representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, installation as specified in manufacturer's installation instructions, wiring, application dependant adjustments, and verification of proper AFD operation.
- B. The Contractor under the technical direction of the manufacturer's service representative shall perform the following minimum work.
  - 1. Inspection and final adjustments.
  - 2. Operational and functional checks of AFD and spare parts.
  - 3. The Contractor shall certify that he has read the drive manufacturer's installation instructions and has installed the AFD in accordance with those instructions.
- C. The Contractor shall provide three (3) copies of the manufacturer's field start-up report.

### 3.04 MAINTENANCE / WARRANTY SERVICE

- A. Warranty shall be a minimum of two years from the date of start-up and include all parts, labor, and travel time.

### 3.05 TRAINING

- A. The Contractor shall provide a training session for up to 5 owner's representatives. Training and instruction time shall be in addition to that required for start-up service.
- B. The manufacturer's qualified representative shall conduct the training.
- C. The training program shall consist of the following:
  - 1. Instructions on the proper operation of the equipment.
  - 2. Instructions on the proper maintenance of the equipment.

END OF SECTION

## **SECTION 16900**

### **PUMP CONTROL PANEL**

#### **PART 1 - GENERAL**

##### **1.01 SCOPE OF WORK**

- A. Pump control panel shall be provided as specified herein and as shown on the Contract Drawings.

##### **1.02 RELATED WORK**

- A. Drawings and General and Supplementary Conditions of the Contract and Division 1 Specifications sections apply to this Section.

##### **1.03 SUBMITTALS**

- A. Panel and enclosure plan and elevation drawings depicting all components and wiring duct
- B. Complete wiring diagrams
- C. Catalog cut-sheets on all components, with options clearly indicated and non-applicable items clearly excluded
- D. Enclosure heat gain calculation – Shall indicate the maximum temperature inside the enclosure on a 100°F day taking into account heat losses and inefficiencies of all panel components. Heat gain shall include the effects of radiation (if located outside) and air-conditioners or ventilation fans. The maximum operating temperature of all major equipment and panel components shall be listed. The heat transfer calculation shall be based on the enclosure manufacturer's published heat transfer data. This manufacturer's data or curve shall be submitted with the calculation for review.
- E. Shop Drawings shall be clearly marked and or highlighted as to which product, type, option, etc. is being submitted. Product literature with one or more styles / configurations for a single product shall have a written description of use for each of the styles / configurations represented on the literature. For example: Device boxes – Styles shall be listed as: For masonry walls, for electrical devices, for ceiling mounted light fixtures, etc
- F. O&M manuals shall be submitted in accordance with Section 16020. They shall include all field modifications made such that the wiring diagrams exactly match the field-installed equipment and control panels. They shall

also include complete cut-sheets, product data, operation, and maintenance information.

#### 1.04 REFERENCES

- A. NFPA 79 – Control panels shall comply with NFPA 79.
- B. NEC – Control panels shall comply with NEC article 409.
- C. UL508 – Control panels shall be listed to UL508 and shall bear the UL label.

#### 1.05 GENERAL REQUIREMENTS

- A. All control panels furnished under this Contract shall be manufactured in accordance with industry standards and as herein specified. The Contractor shall coordinate all subcontractors and vendors to ensure that the control panels are furnished and meet the requirements specified herein.
- B. Control panels shall be as manufactured by ControlWorks, Inc., Quality Controls, ADGO, or other UL or ETL qualified panel vendor. Panel construction shall comply with OSHA requirements and shall be either UL or ETL listed.
- C. Control panels to be furnished on this project shall be wired to function according to schematics shown on the Contract Drawings. All Control Panels shall be manufactured using “relay logic” as shown on schematics (control circuits) located in the Contract Drawings. In addition to the requirements shown on the Contract Drawings, the panels shall adhere to additional requirements as written herein, and in the utilization equipment specifications.
- D. Interior enclosures shall be dead front with all operator devices accessible without opening the enclosure door.
- E. All components shall be mounted with threaded screws to a subpanel inside the enclosure such that they are replaceable without removing the subpanel. All wiring must be stranded and protected by a circuit breaker. Supplementary circuit breakers may be utilized for circuits that require wiring smaller than 14 gauge. Wiring ducts for cable/conductor management are required to be utilized for routing of conductors and cables. Ducts are also required to be provided for field-wiring at the top and bottom of the panels. All field wires should terminate at a terminal strip upon entering the control panel enclosure.
- F. All terminal strips and lugs shall be of a type UL listed to terminate the size

and quantity of wires encountered. Where conduits enter the boxes, if they are NEMA 4 or 3R, sealing locknuts or hubs must be used to maintain the box rating. The exterior of steel panels shall be painted ANSI 49 light gray, lacquer or enamel.

- G. Enclosures for interior use in dry areas shall be NEMA 12 enclosed, unless otherwise indicated.
- H. Elementary control schematics and connection diagrams showing the spatial relationship of components and wiring shall be submitted for review. Also, a bill of materials, drawing of device arrangement on front, and enclosure fabrication drawings shall be submitted. Further, descriptive literature is required on all components. A copy of the as-built wiring diagrams and BOM shall be stored in a pocket inside the control panel enclosure.
- I. Sleeve type wire markers or other "permanent" type marker shall be installed on all wires, keynoted back to the elementary schematic or the connection diagram, and all terminals identified.
- J. Short circuit ampacity: The minimum short circuit ampacity of the control panel shall be as follows:
  - 1. 480V control panels: 14kA
  - 2. 208/240V control panels: 10kA
  - 3. 120V control panels: 10kA

## **PART 2 - PRODUCTS**

### **2.01 ENCLOSURES**

- A. Control panel enclosure shall be floor-mount type, double door. Enclosure shall include a NEMA flange-mounted lockable disconnect for three-phase power supply. Enclosures shall be manufactured by Hoffman, or equal.
- B. Enclosure NEMA rating shall be NEMA 12. The enclosure shall be sized to provide 25% spare panel space. Seams shall be continuously welded and ground smooth.
- C. Enclosure door shall have a 3-point latch. Screw clamps are not acceptable. The latch handle shall have a padlock hasp.
- D. The enclosure shall have an interior pocket for holding wiring diagrams, and an interior sub-panel for mounting control equipment.

## 2.02 WIRING REQUIREMENTS

- A. Wire and cable shall comply with Section 16020 except Type MTW conductors shall be used inside the control panel for control circuits. Control circuit wiring shall be 18 gauge or larger.
- B. Control wiring shall be terminated using crimp-type ferrule, fork, or ring terminals. Power wiring shall utilize compression lugs.
- C. Wiring shall extend to terminal blocks for connection to external equipment.

## 2.03 TEMPERATURE CONTROL DEVICES

- A. Electric Heater for Control Panels
  - 1. Not required on this project.
- B. Air Conditioners for Control Panels
  - 1. Not required on this project. Panel shall be cooled via fans and filtered louvers.

## 2.04 ADJUSTABLE FREQUENCY DRIVES

- A. See Section 16483 for requirements.

## 2.05 POWER SUPPLIES

- A. DC Power Supplies – Not required for this project.

## 2.06 OVERCURRENT PROTECTION

- A. Main 3-Phase Breakers – Shall be thermal-magnetic, molded-case, Type FA or KA as needed, Square D or equal. Provide service entrance rating where indicated on the Drawings as being used in a service entrance application. See short circuit rating requirements above. Provide cable assembly to connect to flange-mounted disconnect.
- B. Main Single-Phase Breakers – Shall be Din-rail mountable with clear “on,” “off,” and “tripped” positions, Square D QOU or equal. Where a substantial number of breakers are used, provide a panelboard mounting base.
- C. Combination Starters – Circuit breakers for use with drives shall be magnetic-only, Square D MagGuard, or equal, with adjustable trip settings.
- D. Supplementary Protectors – Shall be Din-rail mountable UL489 listed. Trip rating shall match load served.

- E. Power Fuses – Utilize Class J fuses and fuse blocks. Fuse blocks must have protective cover. Fuses may only be used where indicated on the Drawings. Otherwise, use circuit breakers.

## 2.07 MISCELLANEOUS PANEL COMPONENTS

- A. Terminal Blocks, #10 conductor size and smaller.
  - 1. Terminal blocks shall be Din-rail mountable IEC style with minimum width of 6.2 mm. They shall be rated for conductors from #10 to #24 AWG. Current rating shall be 30A, minimum. Terminal blocks shall be finger-safe. Double level terminal blocks may be utilized where necessary to conserve space.
  - 2. Screw clamp terminal blocks are required. Terminal blocks that rely upon spring pressure only for conductor termination are not acceptable.
  - 3. Provide cross connection bridges, partition plates, end anchors, zack strip labels, and all other components necessary for a complete installation. Each block shall be labeled with a machine-printed label. No more than 2 conductors may be landed under on single terminal block terminal screw.
  - 4. Utilize the following terminal block colors:
    - a. 120V Power – Black
    - b. 120V Control – Red
    - c. 120V Neutral – White
    - d. Equipment Grounding – Green or Green/Yellow
    - e. DC Positive – Blue
    - f. DC Negative/Grounded – Gray
    - g. Conductor energized from remote source: Yellow
  - 5. Terminal blocks shall be manufactured by Phoenix Contact, Allen-Bradley, or equal.
- B. Fuse blocks (control circuits) – Fuse blocks shall be finger safe and shall have LED indication when the fuse is blown. Fuses may be used only where indicated on the Drawings; otherwise use circuit breakers.
- C. Conductor Labels – Shall be the heat-shrink type, machine printed. Brady, or equal.
- D. Component nameplates – Shall be engraved, rigid, laminated plastic with adhesive back and letter height of 3/16" minimum. Nameplates shall be white with black letters.
- E. Control transformers shall be machine tool type transformers with epoxy encapsulated coils or resin impregnated coils, high quality silicon steel laminations, copper magnet wire, molded-in terminals, and 55°C rise insulation system.
- F. Voltage/Phase Monitor – Not required on this project as this functionality is

required to be built into the frequency drive protection algorithm.

G. Pilot Devices

1. Selector switches shall be NEMA 12, 30mm, oil-tight construction, and of the quick-make, quick-break type.
2. Pushbuttons shall be NEMA 12 oil-tight, 30mm.
3. Pilot lights shall be 30mm, oil-tight, push-to-test, NEMA 12 LED type. Green pilot lights shall be used for indicating "pump running," and red shall be used for alarms.
4. Elapsed time meters shall be non-resettable.
5. Timing relays shall have an adjustable time range suitable for the application, with the time delay occurring after energization.

H. Control Relays

1. Control relays shall be magnetic, general purpose, "ice cube" type with 3-pole (minimum), double throw contacts rated at 5 amperes (minimum), 120 volts (minimum). Coils shall be rated to operate at the indicated control voltage.
2. Provide proper bases, mounting track, etc. for a complete installation. All relays shall have a retainer clip, manual operator, and pilot light. Coils connected to solid-state digital outputs shall have transient surge protection.

I. Surge Protection Device (SPD):

1. The SPD shall be suitable for application in category C3 environments as described in ANSI/IEEE C62.41. The SPD shall be of parallel design and provide protection, line to ground, neutral to ground, and line to neutral for wye or delta distribution systems. The SPD shall be compatible with the indicated electrical system, voltage, current and distribution configuration.
2. SPD shall comply with ANSI/IEEE C62.1, C62.41, and C62.45. The SPD shall be capable of surviving 1,000 sequential category C3 surges without failure following IEEE test procedures established in C62.45.
3. The SPD shall have LED indicators that provide indication of suppression failure. It shall also have a surge counter. It shall also have a relay contact that provides remote indication of surge

protection failure.

4. The SPD maximum continuous operating voltage (MCOV) shall be capable of sustaining 110 percent of the nominal RMS voltage continuously without degradation.
5. SPD shall have surge current capacity of 80,000 amps minimum per mode with a response time no greater than 5 nanoseconds, for any of the individual protection modes, under laboratory conditions with optimum lead lengths.
6. The SPD UL 1449 surge suppression rating for any suppression mode shall not exceed 700V.

### **PART 3 - EXECUTION**

#### **3.01 LABELING**

- A. Provide labels for all conductors and components.
- B. Legends for starter nameplates shall be taken from the one line diagram in the Contract Drawings. Wire and miscellaneous component labels shall match the O&M manual wiring diagrams.

#### **3.02 GROUNDING**

- A. Enclosures shall be grounded in accordance with the NEC.
- B. Each analog signal loop shall be grounded at a single point for the loop at the location of the DC power supply for the loop.

#### **3.03 PROTECTION**

- A. All electrical and electronic components of the Control Panel shall be protected against damage due to electrical transients induced in interconnecting lines from lightning discharges and surges in nearby electrical systems. Provide a surge protection device (SPD).

#### **3.04 INSTALLATION/ERECTION**

- A. Equipment furnished under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, manufacturer Shop Drawings, and manufacturer installation instructions.

**END OF SECTION**