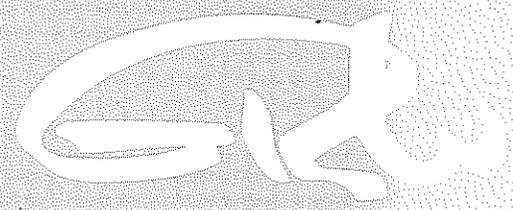


2008-00380

- Engineering
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# Specifications and Contract Documents



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 SEP. 11 2008  
 PUBLIC SERVICE  
 COMMISSION

**Oldham County Water District  
 Wells No. 12 and 13**

**Oldham County Water District  
 Buckner, KY**

**GRW Project No. 3257-05**

**October 2007**

*Stephen L. Vogelsberg*

9-9-08

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# ADVERTISEMENT FOR BIDS

Oldham County Water District

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P.O. Box 51

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Buckner, KY 40010

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Sealed Bids for Oldham County Water District Wells No. 12 and 13 consisting of the installation of two new water wells, piping and all related work as specified and shown on the Drawings will be received by, 2007 at the office of the Oldham County Water District at 3707 W. Hwy 146, La Grange, Kentucky, until pm (local time), and then at said office opened and publicly read aloud. Bidders shall have installed at least 10 municipal water supply wells, each with a capacity of at least 700 GPM, within the last 5 years. At least 4 of those wells shall have elevated platforms (designed for installation in flood plains) similar to this project. Each bidder shall provide with its bid a list of installations with dates, contact names, and phone numbers.

The CONTRACT DOCUMENTS, consisting of Advertisement for Bids, Instructions to Bidders, Bid, Bid Bond, Agreement, Notice of Award form, Notice to Proceed form, Construction Performance Bond, Construction Payment Bond, Sample Certificate of Insurance form, Affidavit of Assurances form, Application for Payment form, General Conditions, Supplemental General Conditions, Change Order form, Technical Specifications, Addenda, and Drawings, may be examined at the following locations:

GRW Engineers, Inc.  
GRW Aerial Surveys, Inc.  
801 Corporate Drive  
Lexington, KY 40503  
Tel: 859-223-3999 or 800-432-9537  
Fax: 859-223-8917

GRW Engineers, Inc.  
GRW Aerial Surveys, Inc.  
11909 Shelbyville Road, Suite 100  
Louisville, KY 40243  
Tel: 502-489-8484  
Fax: 502-489-8485

Builders Exchange of Louisville  
2300 Meadow Drive  
Louisville, KY 40218  
(502) 459-9800  
(502) 459-9803 FAX  
P.O. Box 5398  
Louisville, KY 40205

Reed Const. Data/ABC Plan Rooms  
1812 Taylor Avenue  
Louisville, KY 40213  
(502) 479-5661  
(502) 479-5720 FAX  
Michelle Gilroy-Edwards  
1-800-762-5703

Copies of the CONTRACT DOCUMENTS may be obtained at the office of GRW Engineers Inc., located at 11909 Shelbyville Road, Suite 100, Louisville, Kentucky 40243, upon payment of \$ 50.00 for each set. Payment is *not refundable*.

Bids shall be accompanied by a bid bond or a certified check in an amount equal to five percent (5%) of the bid to insure the execution of the contract for which the bid is made. In case the bid is not accepted, the check or bid bond will be returned to the bidder, but if the bid is accepted and the bidder shall refuse or neglect to enter into a contract with the Oldham County Water District within ten (10) days after the time he has been notified of the acceptance of his bid, the said check or bid bond shall be forfeited to the Oldham County Water District as liquidated damages for the failure to do so.

No bidder may withdraw his bid for a period of ninety (90) days after closing time scheduled for the receipt of bids.

The Oldham County Water District reserves the right to waive informalities and to reject any and all bids.

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

# INSTRUCTIONS TO BIDDERS

## 1. DEFINED TERMS

Terms used in these Instructions to Bidders have the meanings assigned to them in the General Conditions and the Supplemental General Conditions. The term "Bidder" means one who submits a Bid directly to Owner, as distinct from a subbidder, who submits a bid to a Bidder. The term "Successful Bidder" means the lowest, qualified, responsible, and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

## 2. COPIES OF CONTRACT DOCUMENTS

- 2.1 Complete sets of the Contract Documents in the number and for the payment sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from Engineer.
- 2.2 Complete sets of Contract Documents must be used in preparing Bids; neither Owner nor Engineer assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.
- 2.3 Owner and Engineer in making copies of Contract Documents available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant for any other use.

## 3. QUALIFICATIONS OF BIDDERS

- 3.1 To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit written evidence, such as financial data, previous experience, present commitments and other such data as may be called for herein or in the General Conditions. Each Bid must contain evidence of Bidder's qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the contract. The Owner may make such investigations as she/he deems necessary to determine the ability of the bidder to perform the Work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the contract and to complete the Work contemplated therein. Conditional Bids will not be accepted.
- 3.2 Bidders shall have installed at least 10 municipal water supply wells, each with a capacity of at least 700 GPM, within the last 5 years. At least 4 of those wells shall have elevated platforms (designed for installation in flood plains) similar to this project. Each bidder shall provide with its bid a list of installations with dates, contact names, and phone numbers

## 4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

- 4.1 It is the responsibility of each Bidder before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with local conditions that may affect cost, progress, performance or furnishing of the Work, (c) consider federal, state, and local laws and regulations that may affect cost, progress, performance or

furnishing of the Work, (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify Engineer of all conflicts, errors or discrepancies in the Contract Documents.

- 4.2 Reference is made to the Supplemental General Conditions of identification of:
- 4.2.1 Those reports of exploration and test of subsurface conditions at the site which have been utilized by Engineer in preparation of the Contract Documents. Bidder may rely upon the accuracy of the technical data contained in such reports but not upon nontechnical data, interpretations or opinions contained therein or for the completeness thereof for the purposes of bidding or construction.
  - 4.2.2 Those drawings of physical conditions in or relating to existing surface and subsurface conditions (except Underground Facilities) which are at or contiguous to the site which have been utilized by Engineer in preparation of the Contract Documents. Bidder may rely upon the accuracy of the technical data contained in such drawings but not upon the completeness thereof for the purposes of bidding or construction.
  - 4.2.3 Copies of such reports and drawings 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 Paragraphs 4.2.1 and 4.2.2 are incorporated therein by reference. Such technical data has been identified and established in the Supplemental General Conditions.
- 4.3 Information and data reflected in the Contract Documents with respect to 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 or others, and Owner does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplemental General Conditions.
- 4.4 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, Underground Facilities and other physical conditions, and possible changes in the Contract Documents due to differing conditions appear in Paragraphs 4.02 and 4.03 of the General Conditions.
- 4.5 Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (surface, subsurface, and Underground Facilities) at or contiguous to the site or otherwise which may affect cost progress, performance or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.
- 4.6 On request in advance, Owner will provide each Bidder access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. Bidders shall fill all holes, clean up and restore the site to its former condition upon completion of such explorations.
- 4.7 The lands upon which the Work is to be performed, rights-of-ways, and easement for access thereto and other lands designated for use by the Contractor to perform the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be

provided by Contractor. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

- 4.8 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 Contract Documents and such means, methods, techniques, sequences, or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

## **5. INTERPRETATIONS AND ADDENDA**

- 5.1 All questions about the meaning or intent of the Contract Documents are to be directed to Engineer. 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 Contract Documents. Questions received less than ten days prior to the date for Opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 5.2 Addenda may also be issued to modify the Contract Documents as deemed advisable by Owner or Engineer.

## **6. BID SECURITY**

- 6.1 Each Bid must be accompanied by Bid Security made payable to Owner in an amount of five percent of the Bidder's maximum Bid price and in the form of a Certified Check or a Bid Bond (on form attached, if a form is prescribed) issued by a surety meeting the requirements of Paragraph 5.02 of the General Conditions.
- 6.2 The Bid Security of the Successful Bidder will be retained until such Bidder has executed the Agreement and furnished the required contract surety, whereupon the Bid Security, if in the form of a Certified Check, will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security within ten (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 the seventh day after the Effective Date of the Agreement or 90th day after Bid opening, whereupon Bid Security furnished by such Bidders, if in the form of a Certified Check, will be returned. Bid Security with Bids which are not competitive will be returned within seven (7) days after Bid opening.

## **7. CONTRACT TIME**

The number of days which, or the date by which, the Work is to be substantially completed and also completed and ready for final payment (the Contract Time) are set forth in the Bid Form and the Agreement.

## **8. LIQUIDATED DAMAGES**

Provisions for liquidated damages, if any, are set forth in the Supplemental General Conditions and are referred to in the Agreement.

## **9. SUBSTITUTE OR "OR-EQUAL" ITEMS**

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or-equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute "or-equal" item of material or equipment may be furnished or used by contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement. The procedure for submission of any such application by Contractor and consideration by Engineer is set forth in Paragraph 6.05 of the General Conditions and may be supplemented in the General Requirements.

## **10. SUBCONTRACTORS, SUPPLIERS AND OTHERS**

10.1 If the Bid Form or Contract Documents require the identity of certain Subcontractors, Suppliers and other persons and organizations (including those who are to furnish the principal items of material and equipment) to be submitted to Owner in advance of the specified date prior to the Effective Date of the Agreement, the Bidder shall submit to Owner a list of all such Subcontractors, Suppliers and other persons and organizations 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, person or organization if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, either may before the Notice of Award is given request the apparent Successful Bidder to submit an acceptable substitute without an increase in Bid price. If apparent Successful Bidder declines to make any such substitution, Owner may award the contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers and other persons and organizations. This will not constitute grounds for sacrificing the Bid Security of any Bidder. Any Subcontractor, Supplier, other person or organization listed and to whom Owner or Engineer does not make 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.

10.2 No Contractor shall be required to employ any Subcontractor, Supplier, other person or organization against whom Contractor has reasonable objection.

## **11. BID FORM**

11.1 The Bid Form is included with the Contract Documents; additional copies may be obtained from Engineer (or the issuing office).

11.2 All blanks on the Bid Form must be completed in ink or by typewriter.

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

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

- 11.5 All names must be typed or printed below the signature.
- 11.6 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).
- 11.7 The address and telephone number for communications regarding the Bid must be shown.
- 11.8 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of any cash allowances named in the Contract Documents as provided in Paragraph 11.02 of the General Conditions.
- 11.9 Each Bid must be submitted on the prescribed form and accompanied by the submittals listed in the Bid Form.

## **12. SUBMISSION OF BIDS**

Bids shall be submitted at the time and place indicated in the Advertisement for Bids and shall be enclosed in an opaque sealed envelope, marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted) and name and address of the Bidder and accompanied by the Bid Security and other required documents. If the Bid is sent through the mail or other delivery system the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it.

## **13. MODIFICATION AND WITHDRAWAL OF BIDS**

- 13.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.
- 13.2 If, within twenty-four (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, that Bidder will be disqualified from further bidding on the Work to be provided under the Contract Documents.

## **14. OPENING OF BIDS**

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

## **15. BIDS TO REMAIN SUBJECT TO ACCEPTANCE**

All Bids will remain subject to acceptance for ninety (90) days after the day of the Bid opening, but Owner may, in its sole discretion, release any Bid and return the Bid Security prior to that date.

## **16. AWARD OF CONTRACT**

- 16.1 Owner reserves the right to reject any and 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 nonresponsible. Owner may also reject the Bid of any Bidder if Owner

believes that it would not be in the best interest of the Project to make an award to that Bidder.

Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate Contract terms with the Successful Bidder.

- 16.2 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.
- 16.3 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.
- 16.4 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 Supplemental General Conditions.
- 16.5 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.
- 16.6 If the Contract is to be awarded, Owner will award the Contract to the Bidder whose Bid is in the best interests of the Project.
- 16.7 If the Contract is to be awarded, Owner will give the Successful Bidder a Notice of Award within ninety (90) days after the day of the Bid opening.

## **17. CONTRACT SECURITY**

Paragraph 5.01 of the General Conditions as may be modified by the Supplemental General Conditions set forth Owner's requirements as to Performance and Payment Bonds. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by the required Performance and Payment Bonds.

## **18. SIGNING OF AGREEMENT**

When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within ten (10) days thereafter, Contractor shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner with the required Bonds. Within ten (10) days thereafter, Owner shall deliver one fully signed counterpart to Contractor. Each counterpart is to be accompanied by a complete set of the Drawings with appropriate identification.

## **19. RETAINAGE**

Provisions concerning retainage and Contractors' rights to deposit securities in lieu of retainage are set forth in the Agreement.

**20. POWER OF ATTORNEY**

Attorneys-in-fact who sign Bid Bonds or Contract Bonds must file with each bond a certified and effective dated copy of their power of attorney.

**21. LAWS AND REGULATIONS**

The Bidder's attention is directed to the fact that all applicable State Laws, municipal ordinance, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

**22. SAFETY STANDARDS AND ACCIDENT PREVENTION**

With respect to all Work performed under this contract, the Contractor shall:

- a. Comply with the safety standards provisions of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register", Volume 36, No. 75, Saturday, April 17, 1971.
- b. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.
- c. Maintain at his/her office or other well known place at the job site, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or doctor's care of persons (including employees), who may be injured on the job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.





technical data contained in such reports and drawings upon which BIDDER is entitled to rely.

- (d) BIDDER has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, and studies (in addition to or to supplement those referred to in (c) above) which pertain to the subsurface or physical conditions at the site or otherwise may affect the cost, progress, performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.02 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports or similar information or data are or will be required by BIDDER for such purposes.
- (e) BIDDER has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports, or similar information or data in respect of said Underground Facilities are or will be required by BIDDER in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 4.04 of the General Conditions.
- (f) *BIDDER has correlated the results of all such observations, examinations, investigations, explorations, tests, and studies with the terms and conditions of the Contract Documents.*
- (g) BIDDER has given ENGINEER written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to BIDDER.

**4.01** BIDDER further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

**5.01** BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following lump sum:

- Notes: 1. Bids shall include sales tax, where required, and all other applicable taxes and fees
2. All specific cash allowances are included in the price(s) set forth and have been computed in accordance with Paragraph 11.02 of the General Conditions.

BASE BID CONTRACT PRICE: \_\_\_\_\_  
(Use Words)

\_\_\_\_\_, (\$ \_\_\_\_\_)  
(Figures)

## ALTERNATIVE EQUIPMENT INFORMATION

Equipment Item	Base Bid Equipment Manufacturer	Alternate Bid Equipment Manufacturer	Lump Sum Deduction For Alternate Eqt.
1. Vertical Turbine Pump	Floway	a.	a.
		b.	b.
		c.	c.

- Notes: 1. Where more than one Base Bid equipment manufacturer is listed above, the Bidder has the option of including any of the listed manufacturers in the Base Bid. The bidder must indicate the Base Bid equipment included in the Bid by circling the selected manufacturer at the time of the submission of the Bid. The design has been completed using the first listed Base Bid equipment manufacturer. Should the Bidder list the second or third Base Bid equipment or the Owner select other Alternate Bid equipment, the Bidder, at no additional cost to the Owner, shall make any changes to structure, piping controls, electrical, instrumentation, architectural, mechanical, etc. that may be necessary to accommodate this equipment.
2. Should the Bidder choose to offer for consideration to the Owner, any alternate manufacturers/products to those listed above, the Bidder shall provide a detailed submittal of applicable items such as catalog cut sheets, pump curves, hydraulic calculations, specifications, wiring diagrams, technical literature, dimensional drawings, etc., or any other information requested by the Owner. This submittal information shall be included with the Bidder's bidding documents for proper evaluation by the Owner. These submittal items shall be in addition to the submittal requirements listed in the respective technical specifications section of the equipment item or product hereinafter. Alternates will not be evaluated or pre-qualified prior to Bid opening.
3. The best, lowest Bidder will be determined by reducing the lump sum Bid proposal by the amount of the deductive alternates selected by the Owner for each Bidder.

**6.01** BIDDER agrees that the Work will be complete within 150 days after the date when the Contract Time commences to run as provided in Paragraph 2.03 of the General Conditions and ready for final payment within 180 days after the date when the Contract Time commences to run.

BIDDER accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work on time.

**7.01** The following documents are attached to and made a condition of this bid:

- (a) Required Bid Security in the form of Bid Bond or Certified Check
- (b) A tabulation of Subcontractors, Suppliers and other persons and organizations required to be identified in the Bid.
- (c) Required BIDDER'S Qualification Statement with supporting data.

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

**Respectfully submitted:**

**Contractor:**

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

**By:** \_\_\_\_\_  
**(Signature)**

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

**Contractor's Address:**

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

**Telephone Number** \_\_\_\_\_

**SEAL (if BID is by Corporation)**

**Attest** \_\_\_\_\_

# PROPOSED SUBCONTRACTORS

Each bidder shall enter, in the spaces provided, the names of major subcontractors he proposes to employ and the classification or type of work that they will perform. Upon award of contract, the named subcontractors shall be employed to perform the work, unless changes are specifically authorized by the Engineer.

A major subcontractor is defined as a subcontractor whose subcontract constitutes approximately three (3) per cent or more of the total contract amount.

Failure to furnish all information requested in this Questionnaire may be cause for rejection of the Bid.

## LIST OF SUBCONTRACTORS

SUBCONTRACTOR'S /ADDRESS

WORK DESCRIPTION/TOTAL VALUE

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# SAMPLE

## BID BOND

**BIDDER** (Name and Address):

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

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

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

**OWNER** (Name and Address):

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

**BID**

BID DUE DATE: \_\_\_\_\_

PROJECT (Brief Description Including Location):

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

**BOND**

BOND NUMBER: \_\_\_\_\_

DATE (Not later than Bid due date): \_\_\_\_\_

PENAL SUM: \_\_\_\_\_

(Words)

(Figures)

IN WITNESS WHEREOF, 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

SURETY

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

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

Bidder's Name and Corporate Seal

Surety's Name and Corporate Seal

By: \_\_\_\_\_  
Signature and Title

By: \_\_\_\_\_  
Signature and Title  
(Attach Power of Attorney)

Attest: \_\_\_\_\_  
Signature and Title

Attest: \_\_\_\_\_  
Signature and Title

- 
- Note: (1) Above addresses are to be used for giving required notice.  
 (2) Any singular reference to Bidder, Surety, OWNER or other party shall be considered plural where applicable.

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.

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 and 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 or 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.

# QUESTIONNAIRE

The undersigned guarantees the accuracy of all statements and answers herein contained. (Please print in ink).

1. How many years has your firm been in business as a General Contractor? \_\_\_\_\_

2. List three (3) projects of this nature that you have completed and give the name, address, and telephone number of a reference from each. Also give the completed cost of each project listed.

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3. List projects presently under construction by your firm, dollar volume of the contract, and the percent of completion.

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4. Have you ever failed to complete work awarded to you? If so, state where and why.

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5. Have you or your authorized representative personally inspected the location of the proposed work and do you have a clear understanding of the requirements of the Plans, Specifications, and other Contract Documents?

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6. Do you plan to sublet any part of this work? If so, give details.

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7. What equipment do you own that is available for this work?

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8. What equipment do you plan to rent or purchase for this work?

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9. Have you ever performed similar work under the direction of a Consulting Engineer or Registered Architect? If so, list three (3) such firms giving the name of the firm, its address, telephone number and the name of the project. (List most recent project.)

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10. Give the name, address, and telephone number of an individual who represents each of the following who the Owner may contact to investigate your financial responsibility: A surety, a bank and a major material supplier.

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11. Give a summary of your financial statement. (List assets and liabilities; use an insert sheet, if desired).

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**Respectfully submitted,**

\_\_\_\_\_  
**Signature**

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



**EJCDC**  
**STANDARD FORM OF AGREEMENT**  
**BETWEEN OWNER AND CONTRACTOR**  
**ON THE BASIS OF A STIPULATED PRICE**

THIS AGREEMENT is dated as of the \_\_\_\_\_, day of \_\_\_\_\_, in the year 2007,

by and between the \_\_\_\_\_ Oldham County Water District

(hereinafter called Owner) and \_\_\_\_\_ (hereinafter called Contractor).

Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

**ARTICLE 1 - WORK**

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

Oldham County Wells No. 12 and 13, to include furnishing and construction of well towers, pumps, valve vaults, with all appurtenances.

**ARTICLE 2 - ENGINEER**

The Project has been designed by

GRW Engineers, Inc.

who is hereinafter called Engineer and who is to act as Owner's representative, assume all duties and responsibilities and have the rights and authority assigned to Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

**ARTICLE 3 - CONTRACT TIME**

3.1 The Work will be substantially complete within 150 days from the date when the Contract Time commences to run as provided in Paragraph 2.03 of the General Conditions and completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions within 180 days from the date when the Contract Time commences to run.

3.2 Liquidated Damages. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer a financial loss if the Work is not completed within the times specified in Paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in a legal or arbitration proceeding in proving the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner as stipulated in Section 17.06 of the Supplemental General Conditions for each day that expires after the time specified in Paragraph 3.1 for Substantial Completion until the Work is

substantially complete. After Substantial Completion, if Contractor shall neglect, refuse or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner as stipulated in Section 17.06 of the Supplemental General Conditions for each day that expires after the time specified in Paragraph 3.1 for completion and readiness for final payment.

#### **ARTICLE 4. CONTRACT PRICE**

- 4.1 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents in current funds in the amount stated in the Contractor's Bid, copy of which is attached.

#### **ARTICLE 5. PAYMENT PROCEDURES**

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.

- 5.1 Progress Payments. Owner shall make payments on account of the Contract Price on the basis of Contractor's Applications for Payment as recommended by Engineer, on or about the 30th day of each month during construction as provided below. All progress payments will be on the basis of the progress of the Work measured by the schedule of values established in Paragraph 2.07 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.
- a. The Progress Payments shall include the cost of Stored Materials, LESS an amount of retainage equal to 10% of their total cost. Stored materials are defined as materials and equipment not incorporated in the Work but delivered, suitably stored and accompanied by documentation satisfactory to Owner as provided in Paragraph 14.02A of the General Conditions.
  - b. Prior to completion of 50% of the total project, calculated on the basis of Work completed, Progress Payments shall be made in the amount of Work completed, LESS an amount of retainage equal to 10% of the total entitlement to date.
- 5.2 Upon completion of 50% of the total project, calculated on the basis of Work completed, Owner may determine that the percentage of retainage may be reduced. This determination is based on the satisfactory quality and progress of the Work as determined by the Engineer and the Owner. Upon application by Contractor and approval by Owner, there will be no additional retainage on account of Work subsequently completed; that is, the total monetary value of the retainage will remain the same until the approved Certificate of Substantial Completion has been issued, in accordance with Paragraph 14.04.A of the General Conditions.
- 5.3 Upon issuance of the Certificate of Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100% of the Contract Price, LESS such amounts as the Engineer has determined and documented in the issuance of the Certificate of Substantial Completion, or which Owner may withhold in accordance with Paragraph 14.04.A of the General Conditions.
- 5.4 Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

## **ARTICLE 6 - CONTRACTOR'S REPRESENTATIONS**

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

- 6.1 Contractor has familiarized itself with the nature and extent of the Contract Documents, Work, Site, Locality, and all local conditions and laws and regulations that in any manner may affect cost, progress, performance, or furnishing the Work.
- 6.2 Contractor has studied carefully any reports of explorations and tests of subsurface conditions and drawings of physical conditions which are identified in the Supplemental General Conditions as provided in Paragraph 4.02 of the General Conditions, and accepts the determination set forth in of the Supplemental General Conditions of the extent of the technical data contained in such reports and drawings upon which Contractor is entitled to rely.
- 6.3 Contractor has obtained and carefully studied (or assumes responsibility of obtaining and carefully studying) all such examinations, investigations, exploration, tests, reports, and studies (in addition to or to supplement those referred to in Paragraph 7.2 above) which pertain to the subsurface or physical conditions at or contiguous to the site or otherwise may affect the cost, progress, performance or furnishing of the Work as Contractor considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 4.02 of the General Conditions; and no additional examination, investigations, explorations, tests, reports, studies or similar information or data are or will be required by Contractor for such purposes.
- 6.4 Contractor has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing Underground Facilities at or contiguous to the site and assumes responsibility for the accurate location of said Underground Facilities. No additional examinations, investigations, explorations, tests, reports, studies, or similar information or data in respect of said Underground Facilities are or will be required by Contractor in order to perform and furnish the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 4.04 of the General Conditions.
- 6.5 Contractor has correlated the results of such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the Contract Documents.
- 6.6 Contractor has given Engineer written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- 6.7 The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

## **ARTICLE 7. CONTRACT DOCUMENTS**

The Contract Documents consist of the following:

- 7.1 This Agreement (Pages 1 to 5 inclusive).
- 7.2 Performance, Payment, and other Bonds.

- 7.3 Notice of Award and Notice to Proceed.
- 7.4 General Conditions (Pages 1 to 38 inclusive).
- 7.5 Supplemental General Conditions (Pages 1 to 46 inclusive).
- 7.6 Specifications as listed in the Table of Contents.
- 7.7 Drawings, consisting of 8 sheets, including cover, bearing the following general title: Oldham County Water District Wells No. 12 and 13.
- 7.8 Addenda numbers \_\_\_\_\_ to \_\_\_\_\_, inclusive.
- 7.9 Contractor's Bid (Pages \_\_\_ to \_\_\_, inclusive) together with Supplementary Information Submitted with the Bid.
- 7.10 Documentation submitted by Contractor prior to Notice of Award.
- 7.11 The following which may be delivered or issued after the Effective Date of the Agreement and are not attached hereto: All Written Amendments and other documents amending, modifying, or supplementing the Contract Documents pursuant to Paragraph 3.04 of the General Conditions.

There are not Contract Documents other than those listed above in this Article 8. The Contract Documents may only be amended, modified or supplemented as provided in Paragraph 3.04 of the General Conditions.

#### **ARTICLE 8. MISCELLANEOUS**

- 8.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 8.2 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 monies that may become due and monies 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.
- 8.3 Owner and Contractor each binds itself, its partners, successor, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representative in respect of all covenants, agreements, and obligations contained in the Contract Documents.

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

This Agreement will be effective on \_\_\_\_\_

OWNER:

\_\_\_\_\_

\_\_\_\_\_

(Authorized Signature for Owner)

ATTEST:

(Corporate Seal)

\_\_\_\_\_

(Signature)

Address For Giving Notices:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

CONTRACTOR:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Authorized Signature for Contractor)

ATTEST:

(Corporate Seal)

\_\_\_\_\_

(Signature)

Address For Giving Notices:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



# NOTICE OF AWARD

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

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

(Bidder)

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

Contract: \_\_\_\_\_

(Insert Name of Contract As It Appears in the Bidding Documents)

Owner's Contract No. \_\_\_\_\_

You are notified that your bid dated \_\_\_\_\_ for the above Contract has been considered. You are the apparent successful bidder and have been awarded a contract for:

(Indicate Total Work, Alternates or Sections of Work Awarded)

The Contract Price of your Contract is \_\_\_\_\_

Dollars

(\$

).

Copies of each of the Proposed Contract Documents (except Drawings) accompany this Notice of Award. Sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within ten days of the date of this Notice of Award.

1. You must deliver to the OWNER fully executed counterparts of the Agreement including all the Contract Documents. This includes the Drawings. The appropriate Contract Documents must bear your signature.
2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Instructions to Bidders (Paragraph 17), General Conditions (Paragraph 5.01) and Supplementary Conditions (Paragraph SC-5.01).

EJCDC No. 1910-22 (1996 Edition)

Prepared by the Engineers Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute

3. (List other conditions precedent).

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Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

Within ten days after you comply with those conditions, OWNER will return to you one fully signed counterpart of the Agreement with the Contract Documents attached.

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(OWNER)

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(AUTHORIZED SIGNATURE)

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(TITLE)

**COPY TO ENGINEER**  
**(Use Certified Mail,**  
**Return Receipt Requested)**

# ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by \_\_\_\_\_

\_\_\_\_\_

this the \_\_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_ .

\_\_\_\_\_  
**Contractor**

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



# NOTICE TO PROCEED

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

To: \_\_\_\_\_  
(Contractor)

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

Contract: \_\_\_\_\_  
(Insert Name Of Contract As It Appears In The Bidding Documents)

Owner's Contract No.: \_\_\_\_\_

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You are notified that the Contract Times under the above Contract will commence to run \_\_\_\_\_, By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Agreement, the date of Substantial Completion is \_\_\_\_\_ and the date of readiness for final payment is \_\_\_\_\_.

Before you may start any Work at the Site, Paragraph 2.05.C of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

EJCDC No. 1910-23 (1996 Edition)  
Prepared by the Engineers Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute

Also, before you may start any Work at the Site you must:

(add other requirements)

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\_\_\_\_\_  
(OWNER)

**COPY TO ENGINEER**  
(Use Certified Mail,  
Return Receipt Requested)

\_\_\_\_\_  
(AUTHORIZED SIGNATURE)

\_\_\_\_\_  
(TITLE)

# ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by \_\_\_\_\_

\_\_\_\_\_

this the \_\_\_\_\_ day of \_\_\_\_\_ 2006 \_\_\_\_\_ .

\_\_\_\_\_  
**Contractor**

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



# CONSTRUCTION PERFORMANCE BOND (SAMPLE)

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

CONTRACTOR (Name and Address):

SURETY (Name and Principal Place of Business):

OWNER (Name and Address):

## CONSTRUCTION CONTRACT

Date:

Amount:

Description (Name and Location):

## BOND

Date (Not earlier than Construction Contract Date):

Amount:

Modifications to this Bond Form:

### CONTRACTOR AS PRINCIPAL

Company: (Corp. Seal)

Signature \_\_\_\_\_  
Name and Title:

### SURETY

Company: (Corp. Seal)

Signature \_\_\_\_\_  
Name and Title:

### CONTRACTOR AS PRINCIPAL

Company: (Corp. Seal)

Signature \_\_\_\_\_  
Name and Title:

### SURETY

Company: (Corp. Seal)

Signature \_\_\_\_\_  
Name and Title:

EJCDC No. 1910-28A(1984 Edition)

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

2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Subparagraph 3.1

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

3.1 The Owner has notified the Contractor and the Surety at its address described in Paragraph 10 below, that the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Construction Contract. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a (Contractor Default); and

3.2 The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the contract. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Subparagraph 3.1; and

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

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

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

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

4.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and the contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor's 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 the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner; or

2 Deny liability in whole or in part and notify the Owner citing reasons therefor

5 If the Surety does not proceed as provided in Paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Subparagraph 4.4, and the Owner refuses the payment tendered or the Surety has denied liability, in whole or in part without further notice, the Owner shall be entitled to enforce any remedy available to the Owner

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

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

6.2 Additional legal, design, professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 4; and

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

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

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

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 the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10 Notice to the Surety, the Owner or the 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 or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. 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 the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

12.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.

12.3 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.

12.4 Owner Default: Failure of the Owner which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

(FOR INFORMATION ONLY - Name, Address and Telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE (Architect, Engineer or other party):

# CONSTRUCTION PAYMENT BOND (SAMPLE)

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

CONTRACTOR (Name and Address):

SURETY (Name and Principal Place of Business):

OWNER (Name and Address):

## CONSTRUCTION CONTRACT

Date:

Amount:

Description (Name and Location):

## BOND

Date (Not earlier than Construction Contract Date):

Amount:

Modifications to this Bond Form:

## CONTRACTOR AS PRINCIPAL

Company: (Corp. Seal)

## SURETY

Company: (Corp. Seal)

Signature \_\_\_\_\_  
Name and Title:

Signature \_\_\_\_\_  
Name and Title:

## CONTRACTOR AS PRINCIPAL

Company: (Corp. Seal)

## SURETY

Company: (Corp. Seal)

Signature \_\_\_\_\_  
Name and Title:

Signature \_\_\_\_\_  
Name and Title:

EJCDC No. 1910-28B(1984 Edition)

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

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

2. With respect to the Owner, this obligation shall be null and void if the Contractor:

- 2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and
- 2.2. Defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity whose claim, demand, lien or suit is for payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety, and provided there is no Owner Default

3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due

4. The Surety shall have no obligation to Claimants under this Bond until:

- 4.1. Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the 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 the Contractor:
  - 1. Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the 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 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 the Contractor, or not received within 30 days of furnishing the above notice any communication from the Contractor by which the Contractor has 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 the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor

5. If a notice required by Paragraph 4 is given by the Owner to the Contractor or to the Surety, that is sufficient compliance

6. When the Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

- 6.1. Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and that basis for challenging any amounts that are disputed
- 6.2. Pay or arrange for payment of any undisputed amounts

7. The 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 the Surety

8. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract

and to satisfy claims, if any, under any Construction Performance Bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work

9. The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for 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. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations

11. 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 after the expiration of one year from the date (1) on which the Claimant gave the notice required by Subparagraph 4.1 or Clause 4.2 (iii), 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 the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by Surety, the Owner or the 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 or other legal requirement in the location where the construction was to be performed, any provision in the Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory bond and not as a common law bond

14. Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the 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 the Contractor or with a subcontractor of the 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 Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.
- 15.2. Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.
- 15.3. Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

(FOR INFORMATION ONLY-Name, Address and Telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE (Architect, Engineer or other party):

# CERTIFICATE OF INSURANCE

DATE (MM/DD/YY)

# SAMPLE

PRODUCER	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.	
	COMPANY A	
INSURED	COMPANY B	
	COMPANY C	
	COMPANY D	

**COVERAGES**  
 THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY				GENERAL AGGREGATE	\$ 1,000,000
	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY				PRODUCTS-COMP/OP AGG	\$ 1,000,000
	<input type="checkbox"/> CLAIMS MADE <input checked="" type="checkbox"/> OCCUR				PERSONAL & ADV INJURY	\$ 1,000,000
	<input checked="" type="checkbox"/> CONTRACTOR'S PROTECTION				EACH OCCURRENCE	\$ 1,000,000
					FIRE DAMAGE (Any One)	\$ 100,000
					MED EXP (Any One Person)	\$ 10,000
A	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT	\$ 1,000,000
	<input checked="" type="checkbox"/> ANY AUTO				BODILY INJURY	\$ 1,000,000
	<input checked="" type="checkbox"/> ALLOWED AUTOS				(Per Person)	
	<input checked="" type="checkbox"/> SCHEDULED AUTOS				BODILY INJURY	\$ 1,000,000
	<input checked="" type="checkbox"/> HIRED AUTOS				(Per Accident)	
	<input checked="" type="checkbox"/> NON-OWNED AUTOS				PROPERTY DAMAGE	\$ 1,000,000
A	GARAGE LIABILITY				AUTO ONLY-EA ACCIDENT	\$
	<input type="checkbox"/> ANY AUTO				OTHER THAN AUTO ONLY	\$
					EACH ACCIDENT	\$
					AGGREGATE	\$
A	EXCESS LIABILITY				EACH OCCURRENCE	\$
	<input type="checkbox"/> UMBRELLA FORM				AGGREGATE	\$
	<input type="checkbox"/> OTHER THAN UMBRELLA FORM					\$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY LIMITS	
	THE PROPRIETOR/ PARTNERS/EXECUTIVE OFFICERS ARE:				EACH ACCIDENT	\$ 1,000,000
	<input type="checkbox"/> INC				DISEASE-POLICY LIMIT	\$ 1,000,000
	<input type="checkbox"/> EXC				DISEASE-EACH EMPLOYEE	\$ 1,000,000
A	OTHER: BUILDER'S RISK AND/OR INSTALLATION FLOATER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS:

CERTIFICATE HOLDER	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.
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# SUPPLEMENTAL ATTACHMENT FOR CERTIFICATE OF INSURANCE

**PROJECT** \_\_\_\_\_

**INSURED** \_\_\_\_\_

- |  | Yes                      | No                       | N/A                      |
|--|--------------------------|--------------------------|--------------------------|
| <b>A. General Liability</b>  |                          |                          |                          |
| 1. Does the General Aggregate apply to this Project only?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Does this policy include coverage for:  |                          |                          |                          |
| a. Premises—Operations?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Explosion, Collapse and Underground Hazards?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Personal Injury Coverage?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Products Coverage?  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Completed Operations?   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Contractual Coverage for the Insured's Obligations in Paragraph 5.04.B.4 of the General Conditions. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- B. Worker's Compensation**
- |   |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|
| 1. If the Insured is exempt from Worker's Compensation statutes, does the Insured carry the equivalent Voluntary Compensation coverage? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|---|--------------------------|--------------------------|--------------------------|

- C. Final Payment Information**
- |   |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|
| 1. Is the certificate being furnished in connection with the Contractor's request for final payment in accordance with the requirements of Paragraph 14.07.A.2 of the General Conditions? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. If so, and if the policy period extends beyond Project Completion Date, is Completed Operations coverage for this Project continued for the balance of this policy period?             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

- D. Termination Provisions**
- |  |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|
| 1. Has each policy shown on the certificate and this Supplement been endorsed to provide the holder with 30 days notice of cancellation and/or expiration? List below any policies which do not contain this notice. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|--|--------------------------|--------------------------|--------------------------|

**E. Other Provisions**

\_\_\_\_\_  
**Authorized Representative**

\_\_\_\_\_  
**Date of Issue**

Case No. \_\_\_\_\_

Project Name \_\_\_\_\_

City/County \_\_\_\_\_

## AFFIDAVIT OF ASSURANCES PURSUANT TO KRS.198B.060 (10)

Come the Applicant, (*PLEASE PRINT NAME*) \_\_\_\_\_  
and states pursuant to KRS 198B.060 (10), that all contractors and subcontractors employed or that will be employed on any activity under the above referenced project shall be in compliance with the Commonwealth of Kentucky requirements for Worker's Compensation Insurances (according to KRS Chapter 342) and Unemployment Insurance (according to KRS Chapter 341).

This the \_\_\_\_\_ Day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
CONTRACTOR, OWNER OR OWNER'S AGENT

SUBSCRIBED AND SWORN to before me by \_\_\_\_\_,  
Applicant, on this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
NOTARY PUBLIC                      STATE AT LARGE

MY COMMISSION EXPIRES: \_\_\_\_\_, 20\_\_.

NOTE: This Affidavit of Assurances shall be submitted for any project under state jurisdiction and where there is no local building official. Persons claiming exemption to the Worker's Compensation Laws should file Affidavit of Exemption with the Kentucky Department of Worker's Claims, Division of Security & Compliance, 1270 Louisville Road, Frankfort, KY 40601. (800/554-8601)







EJCDC  
**GENERAL CONDITIONS**



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# GENERAL CONDITIONS

## ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

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### 1.01 *Defined Terms*

A. Wherever used in the Contract Documents and printed with initial or all capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work

3. *Application for Payment*--The form acceptable to ENGINEER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.

8. *Bonds*--Performance and payment bonds and other instruments of security.

9. *Change Order*--A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement

10. *Claim*--A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price

or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral

12. *Contract Documents*--The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and Engineer's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

13. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.

15. *CONTRACTOR*--The individual or entity with whom OWNER has entered into the Agreement.

16. *Cost of the Work*--See paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *ENGINEER*--The individual or entity named as such in the Agreement.

20. *ENGINEER's Consultant*--An individual or entity having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

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 I 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 apparent successful bidder stating that upon timely compliance by the apparent 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, entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed.

31. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

32. *PCBs*--Polychlorinated biphenyls.

33. *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.

34. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

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. *Resident Project Representative*--The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.

38. *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.

39. *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.

40. *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.

41. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto

42. *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.

43. *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.

44. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

45. *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.

46. *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.

47. *Unit Price Work*--Work to be paid for on the basis of unit prices

48. *Work*--The entire completed 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.

49. *Work Change Directive*--A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is

to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

50. *Written Amendment*--A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

## 1.02 Terminology

### A. Intent of Certain Terms or Adjectives

1. Whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or 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 action or determination will be solely to evaluate, in general, the completed 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 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 9.10 or any other provision of the Contract Documents.

### B. Day

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

### C. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or 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).

*D. 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.

E. 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**

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**2.01 Delivery of Bonds**

A. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish

**2.02 Copies of Documents**

A. OWNER shall furnish to CONTRACTOR up to ten copies of the Contract Documents. 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. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

**2.04 Starting the Work**

A. CONTRACTOR shall 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. *CONTRACTOR's Review of Contract Documents:* 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; however, 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. *Preliminary Schedules:* Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for its timely review:

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; 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.

C. *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

## **2.06 Preconstruction Conference**

A. Within 20 days after the Contract Times start to run, but before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

## **2.07 Initial Acceptance of Schedules**

A. Unless otherwise provided in the Contract Documents, at least ten 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.B. CONTRACTOR shall have an additional ten 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 any specified Milestones and 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 Shop Drawing and Sample 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**

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### **3.01 Intent**

A. The Contract Documents are complementary; what is called for by one is as binding as if called for 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, nor shall any such provision or instruction be effective to assign to OWNER, ENGINEER, or any of ENGINEER's Consultants, agents, or employees 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. 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 report it to ENGINEER in writing at once. 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; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity, or discrepancy 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 in one or more of the following ways: (i) a Written Amendment; (ii) a Change Order; or (iii) 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: (i) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample; or (iii) ENGINEER's written interpretation or clarification.

**3.05 *Reuse of Documents***

A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with OWNER: (i) shall not 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 Consultant, including electronic media editions; and (ii) shall not 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 adaptation by ENGINEER. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

**ARTICLE 4 - AVAILABILITY OF LANDS;  
SUBSURFACE AND PHYSICAL CONDITIONS;  
REFERENCE POINTS**

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**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, 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, ENGINEER, or any of ENGINEER's Consultants 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 9.08 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 in respect of 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 within the time and 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, ENGINEER, and ENGINEER's Consultants 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, ENGINEER or any of ENGINEER's Consultants 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); 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, ENGINEER, ENGINEER's Consultants and the officers, directors, partners, employees, agents, other 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.E 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, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, other 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.F 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 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

## ARTICLE 5 - BONDS AND INSURANCE

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### 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 CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, 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 such 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 within 20 days thereafter substitute 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. 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: (i) by any person as a result of an offense

directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) 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 so required by this paragraph 5.04 to be purchased and maintained 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 in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants, 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, and other 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 6.07, 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 thirty 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 (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

#### **5.05 OWNER's Liability Insurance**

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

#### **5.06 Property Insurance**

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

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other 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 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, false work, 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, 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. OWNER 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, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, 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.

E. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

#### **5.07 Waiver of Rights**

A. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraph 5.06 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, 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, and other 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, and other 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, ENGINEER, ENGINEER's Consultants, 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, and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

B. OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other 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 peril 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, ENGINEER, or ENGINEER's Consultants and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them.

#### **5.08 Receipt and Application of Insurance Proceeds**

A. Any insured loss under the policies of insurance required by paragraph 5.06 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.08.B. OWNER shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

B. OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

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

A. If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party 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 2.05.C. 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**

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### **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, but 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. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent thereto 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, lay out, and construct the Work 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, and CONTRACTOR will not permit overtime work or the performance of Work on 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 General Requirements, 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 warranties and guarantees specifically called for 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. 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 (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of Article 12. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

### **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: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, 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 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 first 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 shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified.

The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, 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 work on the Project) to adapt the design to the proposed substitute item and 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. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also 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, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and 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 procedure for review by ENGINEER will be similar to that provided in subparagraph 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 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 time required by ENGINEER and ENGINEER's Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.05 A.2 and 6.05 B and in making changes in the Contract Documents (or in the provisions of any other

direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such 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 or Written Amendment signed. 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 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 shall it 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, ENGINEER, ENGINEER's Consultants, 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, and other 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. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees or agents, and other consultants 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. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

#### **6.09 Laws and Regulations**

A. CONTRACTOR shall give all notices and 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 may 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, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants 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 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, Written Amendments, 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. 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 ENGINEER's Consultant, 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). 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 to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The 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.E.

B. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.17.E. The numbers of each Sample to be submitted will be as specified in the Specifications

C. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER as required by paragraph 2.07, 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.

### D. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. 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 means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR 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 indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

3. At the time of each submittal, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

### E. ENGINEER's Review

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample 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 of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of each submittal as required by paragraph 6.17.D.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 approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.17.D.1

### F. 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, ENGINEER, and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. 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.

B. 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 acceptance by OWNER or any failure to do so;
6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by OWNER.

#### **6.20 Indemnification**

A. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other 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:

1. 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; and

2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

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 Consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them 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.

## **ARTICLE 7 - OTHER WORK**

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

A. OWNER may perform other work related to the Project at the Site by OWNER's employees, or let 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 and each utility owner (and OWNER, if OWNER is performing the other work with OWNER's employees) proper and safe access to the Site and 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. Unless otherwise provided in the Contract Documents, 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

## **ARTICLE 8 - OWNER'S RESPONSIBILITIES**

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### **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 Promptly When Due***

A. OWNER shall make payments to CONTRACTOR promptly 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**

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#### **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 9.10, and 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 responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.10 and in the Supplementary Conditions. 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 Clarifications and Interpretations**

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the

requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a written clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

#### **9.05 *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 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, as a result of a Field Order, a Claim may be made therefor as provided in paragraph 10.05.

#### **9.06 *Rejecting Defective Work***

A. ENGINEER will have authority to disapprove or 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.

#### **9.07 *Shop Drawings, Change Orders and Payments***

A. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.

B. In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11, and 12.

C. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

#### **9.08 *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.

#### **9.09 *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. Claims, disputes and other matters relating to the acceptability of the Work, the quantities and classifications of Unit Price Work, the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and Claims seeking changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing, in accordance with the provisions of paragraph 10.05, with a request for a formal decision.

B. When functioning as interpreter and judge under this paragraph 9.09, 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. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

#### **9.10 *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 9.10 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants.

## **ARTICLE 10 - CHANGES IN THE WORK; CLAIMS**

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### **10.01 *Authorized Changes in the Work***

A. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Written Amendment, 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 (or Written Amendments) 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 and Disputes***

A. *Notice:* Written notice stating the general nature of each Claim, dispute, or other matter 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. Notice of the amount or extent of the Claim, dispute, or other matter 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, dispute, or other matter). 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).

B. *ENGINEER's Decision*: ENGINEER will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:

1. an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16; or

2. if no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If ENGINEER does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

D. No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.05

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

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

A. *Costs Included*: The term Cost of the Work means the sum of all costs 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, expressage, and similar petty cash items in connection with the Work.

i. When the Cost of the Work is used to determine the value of a Change Order or of a Claim, the

cost of premiums for additional Bonds and insurance required because of the changes in the Work or caused by the event giving rise to the Claim.

j. When all the Work is performed on the basis of cost-plus, 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, 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 Cash 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 as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the 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

B. 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. 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 9.08.

B. 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.

C. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. if 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

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### 12.01 Change of Contract Price

A. The Contract Price may only be changed by a Change Order or by a Written Amendment. 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 (or Milestones) may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Times (or Milestones) 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 (or Milestones) covered by a Change Order or of any Claim for an adjustment in the Contract Times (or Milestones) will be determined in accordance with the provisions of this Article 12.

#### **12.03 Delays Beyond CONTRACTOR's Control**

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) 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.

#### **12.04 Delays Within CONTRACTOR's Control**

A. The Contract Times (or Milestones) will not be extended due to 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.

#### **12.05 Delays Beyond OWNER's and CONTRACTOR's Control**

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

#### **12.06 Delay Damages**

A. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR; or

2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

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

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#### **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, ENGINEER's Consultants, 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.B; 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. If it is found that such 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. If, however, such 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 Milestones), 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. 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).

### **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 Laws or Regulations or 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: (i) repair such defective land or areas, or (ii) correct such defective Work or, if the defective Work has been rejected by OWNER, remove it from the Project and replace it with Work that is not defective, and (iii) 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. If CONTRACTOR does not promptly comply with the terms of such 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, and 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.

B. 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 or by Written Amendment.

C. 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.

D. 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 and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and 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 (or Milestones) 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**

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### **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 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 9.08, 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 represent-

ed that: (i) 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 (ii) 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 to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or 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 referred to 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 Written Amendment or 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. there are other items entitling OWNER to a set-off against the amount recommended; or
- d. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.02 B.5 a through 14.02 B.5.c or paragraph 15.02.A.

2. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER must 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. Promptly thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does

not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and 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. 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.

B. OWNER shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

#### **14.05 Partial Utilization**

A. Use by OWNER at OWNER's option of 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, may be accomplished prior to Substantial Completion of all the Work subject to the following conditions.

1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready

for its intended use and substantially complete. If 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. 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. 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.

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

#### **14.06 Final Inspection**

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

#### **14.07 Final Payment**

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

1. After CONTRACTOR has, in the opinion of ENGINEER, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in paragraph 6.12), and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents,

including but not limited to the evidence of insurance required by subparagraph 5.04.B.7; (ii) consent of the surety, if any, to final payment; and (iii) 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. 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 will become due and, when due, 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 and recommendation of ENGINEER, and without terminating

the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims

#### **14.09 Waiver of Claims**

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

1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing which are still unsettled.

### **ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION**

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#### **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 allowed 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 the surety, if any) seven days written notice, terminate the services of CONTRACTOR, 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), 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 finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. 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.

C. 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.

#### **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, elect to terminate the Contract. In such case,

CONTRACTOR shall be paid (without duplication of any items):

1. for 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. for 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. for 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. for 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, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or 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. 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

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### 16.01 *Methods and Procedures*

A. Dispute resolution methods and procedures, if any, shall be as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of paragraphs 9.09 and 10.05, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

## ARTICLE 17 - MISCELLANEOUS

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### 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 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 if 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, and 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 Agreement.

### 17.05 *Controlling Law*

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

**GRW SUPPLEMENTAL GENERAL  
CONDITONS TO EJCDC GENERAL  
CONDITIONS**



# GRW SUPPLEMENTAL GENERAL CONDITIONS TO EJCDC GENERAL CONDITIONS

These Supplemental General Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplemental General Conditions which are defined in the Standard General Conditions of the Construction Contract have the meanings assigned to them in the General Conditions.

## **SGC-2.03**

**Delete the following sentence from Paragraph 2.03A:**

In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

## **SGC-3.01**

**Add the following new paragraph immediately after Paragraph 3.01C:**

If there is any conflict between the provisions of the Contract Documents and any referenced provisions within the Contract Specifications, the language of the Contract Documents will take precedence over that of any standard specification, manual, or code.

## **SGC-4.02**

**Add the following new paragraph after Paragraph 4.02B:**

If any geotechnical exploration for the project was performed and reported, said report will be included as an Appendix. The geotechnical report shall be used as a reference and all recommendations included therein shall be followed in full.

## **SGC-4.04**

**Add the following new paragraphs immediately after Paragraph 4.04 B.2:**

Special precautions shall be taken by the Contractor to avoid damage to existing overhead and underground utilities owned and operated by the Owner or by public or private utility companies.

The available information concerning the location of existing underground utilities is shown on the Drawings. While it is believed that the locations shown are reasonably correct, neither the Engineer nor the Owner can guarantee the accuracy or adequacy of this information.

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, or conferences, shall be to notify said companies, agencies or departments of the proposed construction schedule, verify the location of, and possible interference with, the existing utilities that are shown on the Drawings, arrange for necessary suspension of service, and make arrangements to locate and avoid interference with all utilities (including house connections) that are not

shown on the Drawings. The Engineer and Owner have no objection to the Contractor arranging for the said utility companies, agencies, or departments to locate and uncover their own utilities; however, the Contractor shall bear the entire responsibility and cost of locating and avoiding, or repairing damage to said existing utilities.

The Contractor shall locate all unknown metallic hazards, namely buried pipe, metals, etc., by using a pipe locator. The pipe locator shall immediately precede the trench ditching and all hazards located shall be marked in such manner as to notify the machine operator of such hazard.

Where existing utilities or appurtenant structures either underground or above ground, are encountered, they shall not be displaced or molested unless necessary, and in such case shall be replaced in as good or better condition than found as quickly as possible. Relocation and/or replacement of all utilities and appurtenant structures to accommodate the construction work shall be at the Contractor's expense, unless such relocation and/or replacement is by statute agreement the responsibility of the owner of the utility.

#### **SGC-5.01**

**Add the following new paragraph immediately after Paragraph 5.01C:**

The Performance Bond shall remain in full force and effect throughout the Guaranty period referred to in SGC 6.03. All warranties and guarantees remaining in effect at and beyond the Guaranty expiration date shall be relinquished and transferred to the Owner. Copies of such warranty/guaranty shall be submitted to the Engineer prior to date of the start of the Guaranty period.

#### **SGC-5.06**

**Delete Paragraph 5.06A in its entirety and insert the following in its place:**

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

**Delete Paragraph 5.06B in its entirety and insert the following in its place:**

Contractor shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplemental General Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's Consultants, and any other individuals or entities identified in the Supplemental General Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

**Add the following paragraphs after Paragraph 5.06E:**

F. The insurance required by this Paragraph shall include specific coverage and be written for not less than the limits of liability and coverages tabulated in the prototype Certificate of Insurance included as Section 00620, or as required by law, whichever is greater.

G. The Contractor shall provide INSTALLATION FLOATER INSURANCE when Builder's Risk Insurance is inappropriate, or when Builder's Risk Insurance will not respond, to cover damage or destruction to renovations, repairs, materials, or equipment being installed or otherwise being handled or stored by the Contractor, including off-site storage, transit and installation. The amount of coverage shall

provide full replacement value (FRV) of the property, repairs, additions, materials, or equipment being installed, otherwise being handled or stored on or off premises. All risks coverage shall be provided.

**SGC-5.08 Delete Paragraph 5.08 in its entirety.**

**SGC-6.02**

**Add the following new paragraphs immediately after Paragraph 6.02A:**

The Contractor shall employ workmen skilled in their various duties and shall remove from the project, at the request of the Engineer, any person employed in, about, or upon the work, who misconducts himself or is incompetent or negligent in the performance of the duties assigned to him.

No person under the age of eighteen (18) years and no convict labor shall be employed to perform any work under this Contract. No person whose age or physical condition is such as to make his employment dangerous to his health or safety or to the health or safety of others shall be employed to perform any work under this Contract, provided that this shall not operate against the employment of physically handicapped persons, otherwise employable, where such persons may be safely assigned to work which they can ably perform. There shall be no discrimination because of race, creed, color or political affiliation in the employment of persons for work under this Contract.

With respect to additional skilled, semi-skilled and unskilled workers employed to perform work on the project, preference in employment shall be given first to persons who reside in the city in which the work is to be performed, and second to persons residing in the county in which the work is to be performed.

**SGC-6.03**

**Add the following new paragraph immediately after Paragraph 6.03B:**

The Contractor agrees that he will obtain from the manufacturers of equipment and materials furnished under this Contract guarantees against defective materials and workmanship, and if those guarantees furnished by the manufacturer do not extend for the term of one (1) year from and after the date upon which the final estimate of the Engineer is formally approved by the Owner or other established date as set forth hereinbefore, he shall make the necessary arrangements and assume all cost for extending this guarantee for the required period.

**SGC-6.08**

**Delete Paragraph 6.08A in its entirety and insert the following in its place.**

Owner shall obtain and pay for all construction permits, including building permits. Contractor is responsible for all utility permits and fees for usage during the construction period. Contractor is responsible for any electrical, plumbing and/or building inspections and fees which may be required.

**SC-9.03.A.**

The Duties, Responsibilities, and Limitations of Authority of the Resident Project Representative will be as stated in the attached document.

**SGC-10.03**

**Add the following new paragraph immediately after Paragraph 10.03:**

B. A sample Change Order form is included as Section 00940.

**SGC-12.03**

**Add the following new paragraph immediately after Paragraph 12.03:**

The Contractor shall make no claim for extra compensation due to delays of the project beyond his control. Such delays may include those caused by any act or neglect on the part of the Owner or Engineer, or by any employee of either, or by any separate contractor employed by the Owner, or by changes ordered in the work, or by labor disputes, fire, unusual delays in transportation, adverse weather conditions not reasonably anticipatable, unavoidable casualties, or by delay authorized by the Owner pending arbitration, or by any other cause which the Engineer determines may justify the delay. Additional costs incurred in accelerating the work to compensate for such delays (as defined above) shall also not form the basis for such compensation claims.

**SGC-13.06**

**Add a new paragraph immediately after Paragraph 13.06 of the General Conditions which is to read as follows:**

When the repairs or replacements involve one or more items of installed equipment, Contractor shall provide the services of qualified factory-trained servicemen in the employ of the equipment manufacturers to perform or supervise the repairs or replacements.

**SGC-13.09**

**Add the following new paragraph immediately after Paragraph 13.09D:**

When the Engineer or the Owner deems it necessary, and so orders, such replacements or repairs under this section shall be undertaken by the Contractor within twenty-four (24) hours after service of notice. If the Contractor unnecessarily delays or fails to make the ordered replacements or repairs within the time specified, or if any replacements or repairs within the time specified, or if any replacements or repairs are of such nature as not to admit of the delay incident to the service of a notice, then the Owner shall have the right to make such replacements or repairs and the expense thereof shall be paid by the Contractor or deducted from any moneys due to Contractor.

**SGC-14.01**

**Add the following to Paragraph 14.01:**

The Application for Payment form shall be exactly as shown in Section 00630.

**SGC-17.06**

**Add the following new paragraph immediately after Paragraph 17.05:**

If the Contractor shall fail or refuse to complete the work within the Contract Time, or extension of time granted by the Owner, then the Contractor agrees as a partial consideration for the awarding of this

Contract that the Owner may retain from the compensation otherwise to be paid to the Contractor the amount specified below, not as a penalty but as liquidated damages, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contract Documents.

<b>SCHEDULE OF LIQUIDATED DAMAGES</b>	
<b>Original Amount of Contract</b>	<b>Liquidated Damages Per Day</b>
Up to \$100,000	\$350
\$100,000 to \$500,000	\$400
\$500,000 to \$1,000,000	\$450
\$1,000,000 to \$2,000,000	\$500
Over \$2,000,000	\$550 Plus \$150 Per Each Additional Million Dollars or Fraction Thereof

The said amount is fixed and agreed upon by and between the Contractor and Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain.

**SGC 17.07**

**Add the following new paragraph immediately after Paragraph 17.06:**

The Contractor shall take all necessary precautions to minimize the disruption in water and/or wastewater system operations. When a disruption in the operations is required, the Contractor shall coordinate in advance (5 days minimum) the interruption with the Engineer and the Owner; the interruptions shall be held to a minimum by wise and prudent coordination of Contractor work efforts. The Contractor shall be held responsible for all damages brought about by disruptions of the operations if such disruptions are a direct cause of Contractor negligence and or a failure of the Contractor to coordinate his work effort with the Engineer and Owner.

# **DUTIES, RESPONSIBILITIES AND LIMITATIONS OF AUTHORITY OF THE RESIDENT PROJECT REPRESENTATIVE**

## **1.01 PROJECT REPRESENTATIVE**

Engineer shall furnish a Resident Project Representative (RPR), assistants and other field staff to assist Engineer in observing performance of the Work of the Contractor.

Through more extensive on-site observations of the Work in progress and field checks of materials and equipment by the RPR and assistants, Engineer shall endeavor to provide further protection for Owner against defects and deficiencies in the Work; but, the furnishing of such services will not make Engineer responsible for or give Engineer control over construction means, methods, techniques, sequences or procedures or for safety precautions or programs, or responsibility for Contractor's failure to perform the work in accordance with the Contract Documents.

The duties and responsibilities of the RPR are limited to those of Engineer in Engineer's agreement with the Owner and in the construction Contract Documents, and are further limited and described as follows:

## **1.02 GENERAL**

RPR is Engineer's agent at the site will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions. RPR's dealings in matters pertaining to the on-site work shall in general be with Engineer and Contractor keeping Owner advised as necessary. RPR's dealings with subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner with the knowledge of and under the direction of Engineer.

## **1.03 DUTIES AND RESPONSIBILITIES OF RPR**

- A. Conference and Meetings: Attend meetings with Contractor such as preconstruction conferences, progress meetings, job conferences and other project related meetings, and prepare and circulate copies of minutes thereof.
- B. Liaison:
  - 1. Serve as Engineer's liaison with Contractor working principally through Contractor's superintendent and assist in understanding the intent of the Contract Documents; and assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-site operations.
  - 2. Assist in obtaining from Owner additional details or information when required for proper execution of the Work.

- C. Shop Drawings and Samples:
1. Maintain file of Shop Drawings.
  2. Advise Engineer and Contractor of the commencement of any Work requiring a Shop Drawing or sample if the submittal has not been approved by Engineer.
- D. Review of Work, Rejection of Defective Work, Inspections and Tests:
1. Conduct on-site observations of the Work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
  2. Report to Engineer whenever RPR believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of Work that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing inspection or approval.
  3. Verify that tests equipment and systems start-ups and operating and maintenance training are conducted in the presence of appropriate personnel, and that Contractor maintains adequate records thereof; and observe, record and report to Engineer appropriate details relative to the test procedures and start-ups.
  4. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to Engineer.
- E. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
- F. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report with RPR's recommendations to Engineer. Transmit to Contractor decisions as issued by Engineer.
- G. Records:
1. Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and samples, reproductions of original Contract Documents including all Work Directive Changes, Addenda, Change Orders, Field Orders, additional Drawings issued subsequent to the execution of the Contract, Engineer's clarifications and interpretations of the Contract Documents, progress reports, and other Project related documents.
  2. Keep a diary or log book, recording Contractor hours on the job site, weather conditions, data relative to questions of Work Directive Changes, Change Orders, or change conditions, list of job site visitors, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

3. Record names, addresses and telephone numbers of all Contractor's, subcontractors and major suppliers of materials and equipment.
- H. Reports:
1. Furnish Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule.
  2. Consult with Engineer in advance of scheduled major tests, inspections or start of important phases of the Work.
  3. Report immediately to Engineer and Owner upon the occurrence of any accident.
  4. Maintain file of Daily Reports of the job progress and conditions
- I. Payment Request: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the schedule of values, work completed, and materials and equipment delivered at the site but not incorporated in the Work.
- J. Certificates, Maintenance and Operation Manuals: During the course of the Work, verify that certificates, maintenance and operation manuals and other data required to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have this material delivered to Engineer for review and forwarding to Owner prior to final payment for the Work.
- K. Completion:
1. Before Engineer issues a Certificate of Substantial Completion, submit to Contractor a list of observed items requiring completion or correction.
  2. Conduct final inspection in the company of Engineer, Owner and Contractor and prepare a final list of items to be completed or corrected.
  3. Observe that all items on final list have been completed or corrected and make recommendations to Engineer concerning acceptance.

#### **1.04 LIMITATIONS OF AUTHORITY**

##### **Resident Project Representative:**

- A. Shall not authorize any deviation from the Contract Documents or substitution of materials or equipment unless authorized by Engineer.
- B. Shall not exceed limitations of Engineer's authority as set forth in the Contract Documents.
- C. Shall not undertake any of the responsibilities of Contractor, subcontractors or Contractor's superintendent

- D. Shall not advise on, issue directions relative to or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction unless such advice or directions are specifically required by the Contract Documents.
- E. Shall not advise on, or issue directions regarding, or assume control over safety precautions and programs in connection with the Work.
- F. Shall not authorize Owner to occupy the Project in whole or in part.
- G. Shall not participate in specialized field or laboratory tests or inspections conducted by others except as specifically authorized by Engineer.



# PREVAILING WAGE RATE REQUIREMENTS

## GENERAL:

- A. Contractor shall comply in every respect with all labor provisions of the Prevailing Wage Law.
- B. Current Prevailing Wage Rates are attached as part of this section. Any revised Wage Rates will be issued by addendum.



DIVISION 1

GENERAL



## SECTION 01110 - SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK PERFORMED UNDER THIS CONTRACT

This project involves the installation of two gravel packed wells in Westport, along with all associated piping and appurtenances. Each well shall be capable of pumping a minimum of 1400 gpm under all normal conditions of operation.

#### 1.02 ENUMERATION OF DRAWINGS & SPECIFICATIONS

Following are the Drawings and Specifications which form the Contract Documents as set forth in Section 1.1 of the General Conditions:

<u>Drawings</u>	<u>Sheet Number</u>
Cover Sheet with Project Location Map	
Site Plan, Wells No. 12 & 13	C01.01
Well Plans, Sections & Elevations	C01.02
Water Line Details	G00.01
Erosion Control Plans	G00.02
Electrical Plans	E00.01
Instrumentation and Controls	E00.02
<u>Specifications</u>	
See Table of Contents	

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION



## **SECTION 01120 - GENERAL PROVISIONS**

### **PART 1 - GENERAL**

#### **1.01 DESIGNATION OF PARTIES**

- A. All references in the Specifications, Contract Documents and Drawings to "Owner" shall mean Oldham County Water District; La Grange, Kentucky; all references to "Engineer" shall mean GRW Engineers, Inc., 11909 Shelbyville Road, Suite 100, Louisville, Kentucky 40243.

#### **1.02 EXPERIENCE CLAUSE**

- A. Wherever experience is required of equipment manufacturers in manufacturing or in records of satisfactory operation for a specified period of time, in lieu of the experience, the manufacturer may furnish a 100 percent (100%) performance guarantee bond or a cash deposit. The bond or cash deposit provided by the manufacturer shall guarantee replacement of the equipment process in the event of failure or unsatisfactory service. The period of time for which the bond or cash deposit is required shall be the same as the experience period of time specified.

#### **1.03 ACCESS TO INSPECTION OF WORK**

- A. Representatives of the State Department of Health, the State Department for Natural Resources and Environmental Protection, local public health agencies, Owner, and Engineer shall at all times have full access to the project site for inspection of the work accomplished under this Contract and for inspection of all materials intended for use under the Contract. The Contractor shall provide proper facilities for such access and inspection.

#### **1.04 EQUIPMENT LUBRICATION**

- A. The Contractor shall make suitable provision for the proper lubrication of all equipment furnished under this Contract. Accessible grease fittings shall be provided where required. A supply of oil, grease and other lubricants of proper quality, as recommended by the manufacturer of the equipment, shall be furnished. Lubricants shall be furnished in their original, unopened containers, in sufficient quantity for initial fillings and for at least one (1) year of operation.

#### **1.05 PRE-CONSTRUCTION CONFERENCE**

- A. The Contractor, Engineer and Owner, or their duly appointed representative, shall meet in a preconstruction conference prior to the initiation of construction to organize, schedule and determine responsibilities for the work as it pertains to each party of the Contract.

## **1.06 CONSTRUCTION SCHEDULE CHART**

- A. Prior to start of any construction, the Contractor shall furnish a construction schedule or progress chart. The schedule or chart shall be subject to the approval of the Engineer, and be of sufficient detail to show the chronological relationship of all activities of the project, the order in which the Contractor proposes to carry on the work, estimated starting and completion dates of major features, procurement of materials, and scheduling of equipment. The schedule shall be in a form suitable for appropriately indicating the percentage of work scheduled for completion at any time. The schedule shall be kept current and shall reflect completion of all work under the Contract within the specified time and in accordance with these Specifications.

## **1.07 CONSTRUCTION PROGRESS MEETINGS**

- A. Monthly construction progress meetings shall be held at the project site or at a designated location established by the Owner. The Contractor, appropriate Sub-Contractors, the Engineer and the Owner shall meet to review construction progress, equipment or material submittals, construction schedules, etc.

## **1.08 PRECONSTRUCTION PHOTOGRAPHS**

- A. Prior to construction and mobilization of equipment, Contractor shall take record photographs of all areas of the project site.
- B. In lieu of photographs, a videographic record may be made of the project site.

## **1.09 SPARE PARTS**

- A. Spare parts for routine maintenance and minor repairs shall be provided for specified equipment items in the respective technical sections of these Specifications. Required spare parts to be provided are listed in the particular equipment Specifications.
- B. Parts shall be coated to protect them from a moist atmosphere. All spare parts shall be plainly tagged, marked for identification and reordering, and shall be delivered properly boxed. Required identification includes (but is not limited to):
  - 1. Name of the manufacturer or supplier of equipment.
  - 2. Name of the unit for which the part is intended.
  - 3. Name of the spare part.
  - 4. Name of the supplier of the spare part.
  - 5. Manufacturer's catalogue part number.
  - 6. Precautionary information.
  - 7. Any other identifying information deemed appropriate.

- C. All spare parts for a single equipment item shall be crated together in containers suitable for handling with hoisting equipment and designed for prolonged storage and stenciled to identify contents.
- D. Where oil or grease lubricated equipment is concerned, sufficient oil or grease of types recommended by the equipment manufacturer shall be supplied for one year's operation.
- E. The Contractor shall furnish and deliver the spare parts to the Owner at such time as he (Owner) may direct but prior to Contract expiration date. Furnish to the Engineer for record purposes a list of spare parts delivered to the Owner.

#### **1.10 CLEANING**

- A. The Contractor shall at all times keep the construction site and the surrounding area presentable to the public, and clean of rubbish caused by the Contractor's operation. At completion of the work, the Contractor shall remove all the rubbish, all tools, equipment, temporary work and surplus materials, from and about the premises, and shall leave the site clean and ready for use.
- B. After completion of all work and before final acceptance of the work, the Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of the piping, equipment and all associated fabrication.
- C. All waste and excess materials shall be disposed of off the project site and at no additional expense to the Owner. In no case shall waste materials (any removed concrete, piping, equipment, etc.) be buried on the site. Burning is not permitted.
- D. Upon completion of the project, the Contractor is responsible for leaving the project site in as good as or better condition than the original. This includes site grading, landscaping, replacement of sidewalks, driveways, curbs, mailboxes, clotheslines, fences, etc. and removal of all construction debris.

#### **1.11 TAXES**

- A. Proposals shall be made to include any applicable taxes on payrolls, materials, equipment, vehicles, utilities, etc., including State sales taxes and shall include compensation for such taxes on all work under this Contract.

#### **1.12 LINES AND GRADES**

- A. The Engineer will set a benchmark or marks near the site and furnish the Contractor with the elevation of same. The Engineer will assist the Contractor in laying out the axes of the structures. The Contractor shall be responsible for all other lines and grades required for the construction of structures. The Contractor shall set line and grade stakes for all gravity sewers, offset from the centerline of the trench or the axes of the pipelines.

- B. The Contractor shall use a laser beam instrument to set the grades on gravity sewer lines. In using such an instrument, the Contractor shall be responsible for maintaining grades and elevations as called for on the drawing profiles, and any variances found shall be corrected by the Contractor at his expense. The Contractor shall verify invert elevation at each manhole for a check. A blower shall be used with the laser beam instrument during warm or hot weather to assure accurate line and grade for the laser beam.
- C. When water lines, process piping and other such buried pressure pipelines are involved, the Engineer will assist the Contractor in the location of these lines; however, any detailed layout requiring surveying, or excavation including that required for establishing the grade of the pipeline, shall be accomplished by the Contractor.
- D. The Contractor shall furnish all materials, stakes and grade boards that are required for layout by the Contractor's forces. In addition, the Contractor shall furnish any necessary survey personnel to mark the location of the various facilities on the ground, establishing bench levels and determining as-built conditions after work is completed. The Contractor's personnel engaged in the layout work described herein and the aides furnished to the Engineer shall be fully capable of performing the duties set out herein and shall be fully qualified as required. Contractor shall be responsible for verifying all profiles and elevations prior to construction.

**1.13 BLASTING**

- A. All blasting operations shall be conducted in strict accordance with the Rules and Regulations of the State Department of Mine and Minerals, Division of Explosives and Blasting, which shall be deemed to be included in these Specifications the same as though herein written in full. The Contractor shall also comply with applicable municipal ordinances, Federal Safety Regulations and Section 9 of the Manual of Accident Prevention in Construction, published by the Associated General Contractor's of America, Inc. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. No blasting shall be done within five feet of any water mains, or ten feet of any gas mains except with light charges of explosives. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him. All blast events shall be designed in accordance with state laws. These guidelines are established to limit peak particle velocities occurring as a result of blasting to protect structures from damage due to ground motions from blast events. The peak particle velocity is the maximum velocity of particle excitation measured along any of the three orthogonal axes (longitudinal, vertical or transverse). In addition the following guidelines shall be applicable to new concrete.

<u>Age of Concrete, Days*</u>	<u>Maximum Permissible Particle Velocity, IPS**</u>
0 to 1	0.25
2	0.50
3-or more	1.00

\* Concrete is defined as properly designed and placed, well-consolidated Portland Cement concrete achieving a normal increase in strength with age.

\*\* Measured at location of concrete, by probe fixed in or on soil surface.

As an option, a scaled distance (distance from blast to concrete/-square root of charge weight) of 130 or more can be used conservatively to design blast events.

- B. Unless otherwise required by ordinance or law, each excavation crew shall be provided with two metal boxes equipped with suitable locks. One of these boxes shall be for storing explosives and one for caps. The boxes shall always be locked except when in actual use. They shall be painted a bright color and stenciled with appropriate warning signs. At night, explosives and caps shall be stored in separate magazines.
- C. If any possibility exists of rock or any other debris leaving the site during a blast event, the shot shall be covered with rope, heavy timber or rubber mats, to prevent the aforementioned.
- D. The Contractor shall keep a blasting log and, for each blast, shall record the date, time of blast, number of holes, type of explosive, number of delays, amount of charge per delay; stemming type, and number of caps; and all other items as required by State laws and regulations.
- E. All blasting shall be supervised and performed by qualified personnel and shall be monitored to ensure compliance with the particle velocity requirements. The Contractor shall submit a monitoring plan to the Engineer prior to beginning blasting activities.
- F. A pre-blast survey shall be performed by the Contractor. The pre-blast survey shall be accurate and up to date at the time of the blast event. The survey shall be a compilation of the condition, type, and general appearance of all nearby structures. It shall also include a listing of any vibration-sensitive equipment or conditions which exist at adjacent facilities. The owners and occupants of these facilities shall be notified of the intent to blast and the blasting schedule. The survey shall be conducted by a competent engineering firm or other qualified firm and sufficiently documented by photographs, video, measurements, and diagrams. The survey shall include all structures within 200' of the project or any such structure the Contractor feels may be reasonably affected by ground and/or air vibrations from blasting. Pre-blast survey results shall be submitted to the Owner upon request.
- G. Shot rock which is excavated shall be disposed of offsite by the Contractor. No rock larger than one-half cubic foot will be permitted in the backfill.

#### **1.14 COMPLIANCE WITH SAFETY REGULATIONS**

- A. The equipment items furnished shall comply with all governing federal and state laws regarding safety, including all current requirements of the Occupational Safety and Health Act (OSHA). Contractor shall be solely responsible for job safety in accordance with all laws, regulations, methods, etc. of OSHA and the state.

#### **1.15 MAINTENANCE AND OPERATIONS MANUAL**

- A. Every piece of equipment furnished and installed shall be provided with complete maintenance and operations manuals. These shall be detailed in instructions to the Owner's personnel. They shall be attractively bound for the Owner's records. See Section 01340 and Section 01780 for requirements. The manuals shall be submitted to the Engineer for review as to adequacy and completeness. Provide four copies each, unless otherwise noted.

## **1.16 OBSTRUCTIONS**

- A. In cases where storm sewers, sanitary sewers, gas lines, water lines, telephone lines, electric lines or other underground structures are encountered, they shall not be displaced or molested unless necessary, in which case they shall be replaced in as good a condition as found and as quickly as possible.
- B. The Contractor is responsible for notifying the appropriate utility companies, and coordinating the protection of the utility. All such lines or underground structures damaged or molested in the construction shall be replaced at the Contractor's expense, unless in the opinion of the Engineer, such damage was caused through no fault of the Contractor.

## **1.17 STORAGE FACILITIES**

- A. The Contractor shall be responsible for proper and adequate storage of all materials and equipment used on the site. Any additional off-site space required for construction purposes shall be the Contractor's responsibility to obtain.
- B. Upon completion of the work, the Contractor shall remove all storage facilities, surplus materials and equipment and restore the site to its original condition, or to the finished condition as required by the Contract.

## **1.18 STANDARDS OF WORKMANSHIP**

- A. Work of all crafts and trades shall be laid out to lines and elevations as established by the Contractor from the Drawings or from instructions by the Engineer. Unless otherwise shown, all work shall be plumb and level, in straight lines and true planes, parallel or square to the established lines and levels. The work shall be accurately measured and fitted to tolerance as established by the best practices of the crafts and trades involved, and shall be as required to fit all parts of the work carefully and neatly together.

## **1.19 PERFORMANCE AND PAYMENT BONDS**

- A. Performance and payment bonds, as specified in of the General Conditions, shall run for a period of one (1) year after final acceptance of the work by the Owner. These bonds shall be executed on the forms provided as a part of the Contract Documents.

## **1.20 INITIAL START-UP AND OPERATION**

- A. The initial operation period provided for herein is to check and provide the satisfactory mechanical operation of the facilities. These requirements for start-up and operation in no way relieve the Contractor of his responsibility with respect to guaranty of work as specified in the "General Conditions." The manufacturer's representatives shall be present during this period to instruct the operators in the care, operation and maintenance of the equipment. When the shakedown period is completed, the Owner will assume responsibility for maintenance and operation, provided that all major items of the Work are operating satisfactorily.
- B. If any or all of the facilities are not operating satisfactorily at the end of the shakedown period, the Contractor shall continue to maintain those facilities that are incomplete or not

operating satisfactorily until they are complete and acceptable to the Owner. Maintenance by the Contractor shall include all mechanical facilities such as pumps and like equipment. Prior to start-up, the Contractor will be required to prepare an operating schedule detailing the proposed start-up and his plans for manpower and auxiliary facilities to be provided.

## 1.21 GUARANTY

- A. Except as otherwise specified herein, the Contractor shall guarantee all work from latent defects in materials, equipment and workmanship for one (1) year from the date of final completion of the Contract. The date of final completion shall be that date upon which the final estimate is approved by the Owner or the date of substantial completion as defined in Section 01770 of the technical Specifications. In case any date but the date of final completion is established to govern the time of the Guaranty, such date shall be duly recorded together with the terms and conditions of such agreement.
- B. The Contractor agrees that he will obtain from the manufacturers of equipment and materials furnished under this Contract, guarantees against defective materials and workmanship, and if those guarantees furnished by the manufacturer do not extend for the term of one (1) year from and after the date upon which the final estimate is formally approved by the Owner or other established date as set forth hereinbefore, he shall make the necessary arrangements and assume all cost for extending this guarantee for the required period.
- C. The Contractor shall promptly make such repairs or replacement as may be required under the above specified guarantee, and, when the repairs or replacements involve one or more items of installed equipment, shall provide the services of qualified factory-trained servicemen in the employ of the equipment manufacturers to perform or supervise the repairs or replacements.
- D. When the Engineer or the Owner deems it necessary, and so orders, such replacements or repairs under this section shall be undertaken by the Contractor within twenty-four (24) hours after service of notice. If the Contractor unnecessarily delays or fails to make the ordered replacements or repairs within the time specified, or if any replacements or repairs are of such nature as not to admit of the delay incident to the service of a notice, then the Owner shall have the right to make such replacements or repairs, and the expense thereof shall be paid by the Contractor or deducted from any moneys due the Contractor.
- E. The Performance Bond shall remain in full force and effect throughout the Guaranty period.
- F. All warranties and guarantees remaining in effect at and beyond the Guaranty expiration date shall be relinquished and transferred to the Owner. Copies of such warranty/guaranty shall be submitted to the Engineer prior to date of the start of the guaranty period.

## 1.22 TRAFFIC CONTROL AND MAINTENANCE

- A. Traffic shall be maintained on all highways and streets at all times during construction of pipe lines across or along side said highways and streets. Access to all existing subdivisions and private residences shall also be kept open. Work shall be performed in

accordance with applicable City, County, and KY Transportation Cabinet guidelines. Traffic control shall include proper signing and flagging per these guidelines.

- B. Traffic shall be maintained in accordance with the Manual on Uniform Traffic Control Devices. Work shall include all labor and materials necessary for construction and maintenance of traffic control devices and markings.
- C. Traffic control shall also include all flag persons and traffic control devices such as, but not limited to, flashers, signs, barricades and vertical panels, plastic drums (steel drums will not be permitted) and cones necessary for the control and protection of vehicular and pedestrian traffic as specified by the Manual on Uniform Traffic Control Devices.
- D. Any temporary traffic control items, devices, materials, and incidentals shall remain the property of the Contractor when no longer needed.
- E. The Contractor shall maintain a two-lane traveled way with a minimum lane width of 10 feet; however, during working hours, one-way traffic may be allowed at the discretion of the Engineer, provided adequate signing and flagpersons are at the location.
- F. The Contractor shall fully cover with plywood any signs, either existing, permanent or temporary, which do not properly apply to the current traffic phasing, and shall maintain the covering until the signs are applicable or are removed.
- G. In general, all traffic control devices shall be placed starting and proceeding in the direction of the flow of traffic and removed starting and proceeding in the direction opposite to the flow of traffic.
- H. The Engineer and Contractor shall review the signing before traffic is allowed to use lane closures, crossovers, or detours, and all signing shall be approved by the Engineer before work can be started by the Contractor.
- I. If traffic should be stopped due to construction operations and an emergency vehicle on an official emergency run arrives on the scene, the Contractor shall make provisions for the passage of that vehicle immediately.

### **1.23 FLOOD INSURANCE**

- A. Contractor is required to carry flood insurance for projects which are located in designated flood hazard areas unless Federal Flood Insurance is not available.

### **1.24 CONSTRUCTION ALONG OR ACROSS A STREAM**

- A. All excavations along or across a stream shall be done in such a manner as to prevent degradation of the waters. Spoil material shall not be allowed to enter the flowing portion of the stream.
- B. Effective erosion and sedimentation measures must be employed at all times during the project to prevent degradation of the waters.
- C. Site regrading and reseeding shall be accomplished within 14 days after disturbance, regardless of the season.

**1.25 PIPE AND MANHOLE REPLACEMENT**

- A. Where indicated in the Contract Documents, pipe and manholes to be replaced shall be removed from the site and disposed of by the Contractor. Material shall not be placed back in the trench or buried on the site.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION



## **SECTION 01130 - CONTRACTORS SEQUENCE OF CONSTRUCTION**

### **PART 1 - GENERAL**

#### **1.01 CONTRACTOR'S CONSTRUCTION SEQUENCE, SCHEDULE & PROVISIONS**

A. The Raw Water and Transmission Mains contractor and the Wells 12 & 13 contractor will receive notices to proceed at the same time. The Wells 12 & 13 contractor must achieve substantial completion within 150 days of notice to proceed. The Raw Water and Transmission Mains contractor will be required to place the new raw water main in service within 135 days of notice to proceed to enable the well contractor to complete this project on schedule.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION



## **SECTION 01270 - BASIS OF MEASUREMENT AND PAYMENT - LUMP SUM**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION OF REQUIREMENTS**

- A. The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, service and other necessary supplies and perform all Work shown on the Drawings and/or described in the Specifications and Contract Documents at the lump sum price as indicated by the Bidder in the Bid.
- B. The Bidder declares that he has examined the site of the Work and informed himself fully in regard to all conditions pertaining to the place where the Work is to be done; that he has examined the Plans, Specification and Contract Documents for the Work, and has read all special provisions furnished prior to the opening of bids; and that he has further satisfied himself relative to the Work to be performed.

#### **1.02 PAY ITEMS**

- A. The items listed hereinbefore in Paragraph 1.01A refer to and are the same items listed in the Bid and constitute all of the pay items in this Contract. Any other items of Work listed in the Specifications or shown on the Drawings shall be considered incidental to the above items.

### **PART 2 - PRODUCTS (Not Applicable)**

### **PART 3 - EXECUTION (Not Applicable)**

END OF SECTION



## **SECTION 01310 - PROJECT COORDINATION**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION OF REQUIREMENTS**

Minimum administrative and supervisory requirements necessary for coordination of work on the project include but are not necessarily limited to the following:

- A. Coordination and meetings.
- B. Limitations for use of site.
- C. Coordination of crafts, trades and subcontractors.
- D. General installation provisions.
- E. Cleaning and protection.
- F. Conservation and salvage

#### **1.02 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

#### **1.03 COORDINATION AND MEETINGS**

- A. Monthly general project coordination meetings will be held at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Representation at each meeting by every party currently involved in coordination or planning for the work of the entire project is requested. Meetings shall be conducted in a manner which will resolve coordination problems. Results of the meeting shall be recorded and copies distributed to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

#### **1.04 LIMITATIONS ON USE OF THE SITE**

- A. Limitations on site usage as well as specific requirements that impact site utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements, allocation of available space shall be administered equitably among entities needing both access and space so as to produce the best overall efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.

## **1.05 COORDINATION OF CRAFTS, TRADES AND SUBCONTRACTORS**

- A. The Contractor shall coordinate the work of all the crafts, trades and subcontractors engaged on the work, and he shall have final responsibility as regards the schedule, workmanship and completeness of each and all parts of the work.
- B. All crafts, trades and subcontractors shall be made to cooperate with each other and with others as they may be involved in the installation of work which adjoins, incorporates, precedes or follows the work of another. It shall be the Contractor's responsibility to point out areas of cooperation prior to the execution of subcontractor agreements and the assignment of the parts of the work. Each craft, trade and subcontractor shall be made responsible to the Owner, for furnishing embedded items and giving directions, for doing all cutting and fitting and making all provisions for accommodating the work, and for protecting, patching, repairing and cleaning as required to satisfactorily perform the work.
- C. The Contractor shall be responsible for all cutting, digging and other action of his subcontractors and workmen. Where such action impairs the safety or function of any structure or component of the project, the Contractor shall make such repairs, alterations and additions as will, in the opinion of the Engineer, bring said structure or component back to its original design condition at no additional cost to the Owner.
- D. Each subcontractor is expected to be familiar with the General Requirements and all sections of the detailed Specifications for all other trades and to study all Drawings applicable to his work including Architectural and Structural Drawings, to the end that complete coordination between trades will be effected. Consult with the Engineer if conflicts exist on the Drawings.
- E. Special attention shall be given to points where ducts or piping must cross other ducts or piping, where lighting fixtures must be recessed in ceilings and where ducts, piping and conduits must fit into walls and columns. It shall be the responsibility of such subcontractor to leave the necessary room for other trades.
- F. No extra compensation will be allowed to cover the cost of removing piping, conduit, ducts, etc., or equipment found encroaching on space required by others.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION

## SECTION 01320 - PROGRESS SCHEDULES

### PART 1 - GENERAL

#### 1.01 DESCRIPTION OF REQUIREMENTS

A. Scheduling Responsibilities:

1. In order to provide a definitive basis for determining job progress, a construction schedule of a type approved by the Owner will be used to monitor the project.
2. The Contractor shall be responsible for preparing the schedule and updating on a monthly basis. It shall at all times remain the Contractor's responsibility to schedule and direct his forces in a manner that will allow for the completion of the work within the contractual period.

B. Construction Hours:

1. No work shall be done between 6:00 p.m. and 7:00 a.m. nor on Saturdays, Sundays or legal holidays without the prior written permission of the Owner. However, emergency work may be done without prior written permission.
2. If the Contractor, for his convenience and at his own expense, should desire to carry on his work at night or outside the regular hours, he shall submit a written request to the Engineer and shall allow nine (9) days for satisfactory arrangements to be made for inspecting the work in progress. If permission is granted, the Contractor shall light the different parts of the project as required to comply with all applicable federal, state, and local regulations. The Contractor shall also revise his schedule as appropriate at the next monthly schedule update meeting to reflect the changes in working hours.

C. Progress of the Work:

1. The work shall be started within ten (10) days following the Notice to Proceed and shall be executed with such progress as may be required to prevent delay to other Contractors or to the general completion of the project. The work shall be executed at such times and in or on such parts of the project, and with such forces, material and equipment, to assure completion of the work in the time established by the Contract.
2. The Contractor agrees that whenever it becomes apparent from the current monthly schedule update that delays have resulted and, hence, that the Contract completion date will not be met or when so directed by the Owner, he will take some or all of the following actions at no additional cost to the Owner:
  - a. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of work.
  - b. Increase the number of working hours per shift, shifts per working day or days per week, the amount of construction equipment, or any combination of the foregoing to substantially eliminate the backlog of work.

- c. Reschedule activities to achieve maximum practical concurrency of accomplishment of activities, and comply with the revised schedule.
- d. The Contractor shall submit to the Owner or the Owner's representative for review a written statement of the steps he intends to take to remove or arrest the delay to the critical path in the accepted schedule. If the Contractor should fail to submit a written statement of the steps he intends to take or should fail to take such steps as required by the Contract, the Owner may direct the level of effort in manpower (trades), equipment, and work schedule (overtime, weekend and holiday work, etc.), to be employed by the Contractor in order to remove or arrest the delay to the critical path in the accepted schedule, and Contractor shall promptly provide such level of effort at no additional cost to the Owner.

## **1.02 CONSTRUCTION SCHEDULE**

- A. Within ten (10) calendar days of the Notice to Proceed, the Contractor shall submit to the Engineer five (5) copies of his proposed schedule. The schedule will be the subject of a schedule review meeting with the Contractor, the Engineer and the Owner or the Owner's representative within one (1) week of its submission. The Contractor will revise and resubmit the schedule until it is acceptable and accepted by the Owner or the Owner's representative.

## **1.03 SUBMITTAL SCHEDULE**

- A. In addition to the above scheduling requirements, the Contractor will be required to submit a complete and detailed listing of anticipated submittals during the course of the Contract. The Contractor will coordinate his submittals with those of his Subcontractors and Suppliers and will identify each submittal by Contract drawing number and specification number. The anticipated submission date for each submittal must be indicated along with the date on which its return is anticipated. For planning purposes, the Engineer will usually return shop drawings thirty (30) days after receipt. However, longer durations for review will not be considered a basis for a claim.
- B. The Submittal Schedule must be submitted within twenty (20) working days of the Notice to Proceed and will be the subject of a special meeting with the Engineer and the Owner or the Owner's representative within one (1) week of the schedule's submission. At that meeting, the Submittal Schedule will be reviewed for comprehensiveness and feasibility. The Engineer will adjust the projected return dates based on the need for more or less time for each submittal's review. The Submittal Schedule will then be accepted or revised as required.

## **1.04 SCHEDULE UPDATES**

- A. Monthly Meetings:

A monthly Schedule Update Meeting will be held in conjunction with the applicable progress meeting at the construction site to review and update the Schedule. The Schedule Update Meetings will be chaired by the Owner or the Owner's representative and attended by the Contractor and the Engineer. Actual progress of the previous month will be recorded and future activities will be reviewed. The duration of activities and their logical connections may be revised as needed. Decisions made at these meetings

and agreed to by all parties are binding with the exception that no contractual completion dates will be modified without formal written requests and acceptance as specified herein.

B. Revisions to Schedule:

The Schedule shall be formally revised if any of the following conditions are encountered:

1. When a delay in completion of any work item or sequence of work items results in an indicated extension of the project completion.
2. When delays in submittals or deliveries or work stoppages are encountered which make replanning or rescheduling of the work necessary.
3. When the schedule does not represent the actual prosecution and progress of the project.

**1.05 CONTRACT COMPLETION TIME**

A. Causes for Extensions:

The Contract completion time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any Contract completion date, he shall furnish such justification and supporting evidence as the Owner or the Owner's representative may deem necessary for a determination as to whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Owner, with the assistance of the Engineer, will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof.

B. Requests for Time Extension:

Each request for change in any Contract completion date shall be initially submitted to the Owner within the time frame stated in the General Conditions. All information known to the Contractor at that time concerning the nature and extent of the delay shall be transmitted to the Owner at that time. Within the time frame stated in the General Conditions but before the date of final payment under this Contract, all information as required above concerning the delay must be submitted to the Owner. No time extension will be granted for requests which are not submitted within the foregoing time limits.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION



## **SECTION 01340 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION OF REQUIREMENTS**

- A. General: This section specifies procedural requirements for non- administrative submittals including shop drawings, product data, samples (when samples are specifically requested) and other miscellaneous work-related submittals. Shop drawings, product data, samples and other work-related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.
  
- B. Refer to other Division-1 sections and other Contract Documents for Specifications on administrative, non-work-related submittals. Such submittals include, but are not limited to the following items:
  - 1. Permits.
  - 2. Payment applications.
  - 3. Performance and payment bonds.
  - 4. Insurance certificates.
  - 5. Inspection and test reports.
  - 6. Schedule of values.
  - 7. Progress reports.
  - 8. Listing of subcontractors.
  - 9. Operating and Maintenance Manuals
  
- C. All submittals shall be furnished in at least six (6) copies and shall be checked and reviewed by the Contractor before submission to the Engineer. The review of the submittals by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Review of such submittals will not relieve the Contractor of the responsibility for any errors which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

#### **1.02 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.
  
- B. Section 01780 - Operating and Maintenance Manuals.

### 1.03 DEFINITIONS

A. Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

1. Fabrication and installation drawings.
2. Setting diagrams.
3. Shopwork manufacturing instructions.
4. Templates.
5. Patterns.
6. Coordination drawings (for use on-site).
7. Schedules.
8. Design mix formulas.
9. Contractor's engineering calculations.

Standard information prepared without specific reference to a project is not considered to be shop drawings.

B. Product data includes standard printed information on manufactured products that has not been specially-prepared for this project, including but not limited to the following items:

1. Manufacturer's product specifications and installation instructions.
2. Standard color charts.
3. Catalog cuts.
4. Roughing-in diagram and templates.
5. Standard wiring diagrams.
6. Printed performance curves.
7. Operational range diagrams.
8. Mill reports.
9. Standard product operating and maintenance manuals.

C. Samples, where specifically required, are physical examples of work, including but not limited to the following items:

1. Partial sections of manufactured or fabricated work.
2. Small cuts or containers of materials.
3. Complete units of repetitively-used materials.

4. Swatches showing color, texture and pattern.
  5. Color range sets.
  6. Units of work to be used for independent inspection and testing.
- D. Miscellaneous submittals are work-related, nonadministrative submittals that do not fit in the three previous categories, including, but not limited to the following:
1. Specially-prepared and standard printed warranties.
  2. Maintenance agreements.
  3. Workmanship bonds.
  4. Survey data and reports.
  5. Testing and certification reports.
  6. Record drawings.
  7. Field measurement data.

#### **1.04 SUBMITTAL PROCEDURES**

- A. General: Refer to the General Conditions and Paragraph 1.02A hereinbefore for basic procedures for submittal handling:
- B. Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity.
- Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal. The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.
- C. Coordination of Submittal Times: Prepare and transmit each submittal to the Architect/Engineer sufficiently in advance of the scheduled performance of related work and other applicable activities. Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.
- D. Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary. Advise the Architect/Engineer on each submittal, as to whether processing time is critical to the progress of the work and if the work would be expedited if processing time could be shortened.

1. Allow a longer time period where processing must be delayed for coordination with subsequent submittals. The Architect/Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination.
  2. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.
- E. Submittal Preparation: Mark each submittal with a permanent label for identification. Provide the following information on the label for proper processing and recording of action taken.
1. Project name.
  2. Date.
  3. Name and address of Architect/Engineer.
  4. Name and address of Contractor.
  5. Name and address of subcontractor.
  6. Name and address of supplier.
  7. Name of manufacturer.
  8. Number and title of appropriate specification section.
  9. Drawing number and detail references, as appropriate.
  10. Similar definitive information as necessary.
- F. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect/Engineer, and to other destinations as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender "without action".

#### **1.05 SPECIFIC SUBMITTAL REQUIREMENTS**

- A. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Drawings. Where applicable, show fabrication, layout, setting and erection details.

Shop drawings are defined as original drawings prepared by the Contractor, subcontractors, suppliers, or distributors performing work under this Contract. Shop drawings illustrate some portion of the work and show fabrication, layout, setting or erection details of equipment, materials and components. The Contractor shall, except as otherwise noted, have prepared the number of reviewed copies required for his distribution plus two (2) which will be retained by the Engineer. Shop drawings shall be folded to an approximate size of 8-1/2" x 11" and in such manner that the title block will be located in the lower right-hand corner of the exposed surface.

- B. Project data shall include manufacturer's standard schematic drawings modified to delete information which is not applicable to the project, and shall be supplemented to provide additional information applicable to the project. Each copy of descriptive literature shall be clearly marked to identify pertinent information as it applies to the project.
- C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.
- D. All submittals shall be referenced to the applicable item, section and division of the Specifications, and to the applicable drawing(s) or drawing schedule(s).
- E. The Contractor shall review and check submittals, and shall indicate his review by initials and date.
- F. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer, in writing of the deviation and the reasons therefore.
- G. In the event the Engineer does not specifically reject the use of material or equipment at variance to that which is shown on the Drawings or specified, the Contractor shall, at no additional expense to the Owner, and using methods reviewed by the Engineer, make any changes to structures, piping, controls, electrical work, mechanical work, etc., that may be necessary to accommodate this equipment or material. Should equipment other than that on which design drawings are based be accepted by the Engineer, shop drawings shall be submitted detailing all modification work and equipment changes made necessary by the substituted item.
- H. Additional information on particular items, such as special drawings, schedules, calculations, performance curves, and material details, shall be provided when specifically requested in the technical Specifications.
- I. Submittals for all electrically operated items (including instrumentation and controls) shall include complete size, color coding, all terminations and connections, and coordination with related equipment.
- J. Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers and fabricators; the Contractor shall be responsible for insuring the compatibility of such coatings with the field-applied paint products and systems.
- K. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.
- L. Where manufacturers brand names are given in the Specifications for building and construction materials and products, such as grout, bonding compounds, curing compounds, masonry cleaners, waterproofing solutions and similar products, the Contractor shall submit names and descriptive literature of such materials and products he proposes to use in this Contract.
- M. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.

- N. All bulletins, brochures, instructions, parts lists, and warranties package with and accompanying materials and products delivered to and installed in the project shall be saved and transmitted to the Owner through the Engineer.

**1.06 CONTRACTOR RESPONSIBILITIES**

- A. Verify field measurements, field construction criteria, catalog numbers, and similar data.
- B. Coordinate each submittal with requirements of work and of Contract Documents.
- C. Notify Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.
- D. Begin no work, and have no material or products fabricated or shipped which requires submittals until return of submittals with Engineer's stamp and initials or signature indicating review.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION

## SECTION 01450 - QUALITY CONTROL SERVICES

### PART 1 - GENERAL

#### 1.01 DESCRIPTION OF REQUIREMENTS

- A. Required inspection and testing services are intended to assist in the determination of probable compliance of the Work with requirements specified or indicated. These required services do not relieve the Contractor of responsibility for compliance with these requirements or for compliance with requirements of the Contract Documents.
- B. Tests, inspections and certifications of materials, equipment, subcontractors or completed Work, as required by the various sections of the Specifications shall be obtained by the Contractor and all costs shall be included in the Contract Price.
- C. The Contractor shall submit to the Engineer the name of any testing laboratory to be used.
- D. Contractor shall deliver written notice to the Engineer at least 24 hours in advance of any inspections or tests to be made at the project site. All inspections or tests to be conducted at the field shall be done in the presence of the Engineer or his representative.
- E. Certifications by independent testing laboratories may be by copy of the attest and shall give scientific procedures and results of tests. Certifications by persons having interest in the matter shall be by original attest properly sworn to and notarized.
- F. Inspections, tests and related actions specified in this section and elsewhere in the Contract Documents are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the Contract Documents.

#### 1.02 RELATED DOCUMENTS

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

#### 1.03 SUBMITTALS

- A. General: Refer to Section 01340 for the general requirements on submittals. Submit a certified written report of each inspection, test or similar service, directly to the Architect/Engineer.
- B. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to the following:
  - 1. Name of testing agency or test laboratory.
  - 2. Dates and locations of samples and tests or inspections.
  - 3. Names of individuals making the inspection or test.

4. Designation of the work and test method.
5. Complete inspection or test data.
6. Test results.
7. Interpretations of test results.
8. Notation of significant ambient conditions at the time of sample-taking and testing.
9. Comments or professional opinion as to whether inspected or tested work complies with requirements of the Contract Documents.
10. Recommendations on retesting, if applicable.

#### **1.04 RESPONSIBILITIES**

- A. Contractor Responsibilities: Except where they are specifically indicated as being the Owner's responsibility, or where they are to be provided by another identified entity, inspections, tests and similar quality control services are the Contractor's responsibility; these services also include those specified to be performed by an independent agency and not directly by the Contractor. Costs for these services shall be included in the Contract Sum. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.
- B. Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related Work with the requirements of the Contract Documents, then retests are the responsibility of the Contractor, regardless of whether the original test was the Contractor's responsibility. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original Work.
- C. Responsibility for Associated Services: The Contractor is required to cooperate with the independent performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:
  - Providing access to the work.
  - Taking samples or assistance with taking samples.
  - Delivery of Samples to test laboratories.
  - Delivery and protection of samples and test equipment at the project site.
- D. Coordination: The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the Work. In addition, the Contractor and each independent testing agency shall coordinate their Work so as to avoid the necessity of removing and replacing Work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**3.01 REPAIR AND PROTECTION**

- A. Upon completion of inspection, testing, sample taking and similar services performed on the Work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the Contract Document requirements for "Cutting and Patching". Protect Work exposed by or for quality control service activities, and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION



## SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.01 DESCRIPTION OF REQUIREMENTS

This section specifies administrative and procedural requirements for temporary services and facilities, including such items as temporary utility services, temporary construction and support facilities, and project security and protection.

- A. Use Charges: No cost or usage charges for temporary services or facilities are chargeable to the Owner or Engineer. Cost or use charges for temporary services or facilities will not be accepted as a basis of claims for a change-order extra.
- B. Temporary utility services required for use at the project site include but are not limited to the following:
  - 1. Water service and distribution.
  - 2. Temporary electric power and light.
  - 3. Telephone service.
  - 4. Storm and sanitary sewer.
  - 5. Provide adequate utility capacity at each stage of construction. Prior to availability of temporary utilities at the site, provide trucked-in services for start-up of construction operations.
  - 6. Obtain and pay for temporary easements required to bring temporary utilities to the project site, where the Owner's permanent easement cannot be utilized for that purpose.
- C. Temporary construction and support facilities required for the project include but are not limited to the following:
  - 1. Temporary heat.
  - 2. Field offices and storage sheds.
  - 3. Temporary roads and paving.
  - 4. Sanitary facilities, including drinking water.
  - 5. Dewatering facilities and drains.
  - 6. Temporary enclosures.
  - 7. Project identification, bulletin boards and signs.
  - 8. Waste disposal services.
  - 9. Construction aids and miscellaneous general services and facilities.

10. Alternate temporary services and facilities, equivalent to those specified, may be used, subject to acceptance by the Engineer.
- D. Security and protection facilities and services required for the project include but are not limited to the following:
1. Environmental protection.
  2. Alternate security and protection methods or facilities, equivalent to those specified, may be used, subject to acceptance by the Engineer.

#### **1.02 RELATED DOCUMENTS**

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

#### **1.03 PROPERTY PROTECTION**

- A. Care is to be exercised by the Contractor in all phases of construction, to prevent damage and/or injury to the Owner's and/or other property. Payments for the repair and restoration are limited as set forth in the "Conflict With or Damage to Existing Utilities Facilities" of the Supplementary General Conditions.
- B. All exposed existing piping must be immediately supported to prevent damage. Prior to completion of each day's work, such piping must be adequately covered by the Contractor and approved by the Owner's representative.
- C. The Contractor shall avoid unnecessary injury to trees and shall remove only those authorized to be removed by written consent of the Owner. Fences, gates, and terrain damaged or disarranged by the Contractor's forces shall be immediately restored in their original condition or better.

#### **1.04 CONSTRUCTION WARNING SIGNS**

- A. The Contractor shall provide construction warning signs for each location where he is working in the state highway right-of-way or in City or County streets. He will further provide flagmen as required and shall abide by all Department of Highways safety rules, including size, type and placement of construction signs. All signs shall be of professional quality.

#### **1.05 ACCESS ROADWAYS**

- A. The Contractor shall construct all access roadways needed during construction, and the planned access roadways for the completed project. The Contractor shall maintain access roadways continuously during the construction period.
- B. The Contractor shall maintain all existing roadways within the project site which are used for any purpose by his construction operations. The degree and frequency of maintenance shall be adequate to keep existing roadways in a condition at least equal to

their condition prior to construction. Road maintenance shall include daily dust control and grading as necessary on all roads and sweeping of paved roads every other day.

#### **1.06 RESPONSIBILITY FOR TRENCH SETTLEMENT**

- A. The Contractor shall be responsible for any settlement caused by the construction, that occurs within one (1) year after the final acceptance of this Contract by the Owner. Repair of any damage caused by settlement shall meet the approval of the Owner.

#### **1.07 WASTE DISPOSAL**

- A. The Contractor shall dispose of waste, including hazardous waste, off-site in accordance with all applicable laws and regulations.

#### **1.08 CONTRACTOR'S TRAILERS AND MATERIAL STORAGE**

- A. The location of the Contractor's and Subcontractor's office and work trailers and parking areas on the project site shall be subject to the Owner's approval.
- B. The location of the Contractor's and Subcontractor's material storage yards on the project site shall be subject to the Owner's approval.

#### **1.09 QUALITY ASSURANCE**

- A. Regulations: Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities, including but not limited to the following:

1. Obtain all permits as required by governing authorities.
2. Obtain and pay for temporary easements required across property other than that of Owner.
3. Comply with applicable codes.

In addition, comply with "Environmental Impact" commitments the Owner or previous Owners of the site may have made to secure approval to proceed with construction of the project.

- B. Inspections: Inspect and test each service before placing temporary utilities in use. Arrange for required inspections and tests by governing authorities, and obtain required certifications and permits for use.

#### **1.10 JOB CONDITIONS**

- A. General: Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in performance of the Work. Maintain, expand as required, and modify temporary services and facilities as needed throughout the progress of the Work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.

With the establishment of the job progress schedule, establish a schedule for the implementation and termination of service for each temporary utility. At the earliest feasible time, and when acceptable to the Owner and Engineer, change over from the use of temporary utility service to the use of the permanent service, to enable removal of the temporary utility and to eliminate possible interference with completion of the Work.

- B. Conditions of Use: Operate temporary services and facilities in a safe and efficient manner. Do not overload temporary services or facilities, and do not permit them to interfere with the progress of the Work. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.
  - 1. Temporary Utilities: Do not permit the freezing of pipes, flooding or the contamination of water sources.
  - 2. Temporary Construction and Support Facilities: Maintain temporary facilities in such a manner as to prevent discomfort to users. Take necessary fire prevention measures. Maintain temporary support facilities in a sanitary manner so as to avoid health problems and other deleterious effects.
  - 3. Security and Protection: Maintain site security and protection facilities in a safe, lawful and publicly acceptable manner. Take necessary measures to prevent erosion of the site.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS, EQUIPMENT AND SERVICES**

- A. General: Provide new materials and equipment for temporary services and facilities; used materials and equipment that are undamaged and in serviceable condition may be used, if acceptable to the Engineer. Provide only materials and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards.
- B. Temporary Electricity:
  - 1. Provide temporary electrical service for construction needs, power to all construction trailers, and for lighting and heating facilities, throughout construction period.
  - 2. Service shall be adequate for construction use by all trades during construction period.
  - 3. Contractor shall make all necessary arrangements with the power company to obtain this service. He shall furnish, erect, and maintain the service pole, wires, main switch, panelboards, outlets, lights and metering facilities as required by the power company and as necessary to provide electrical service throughout the construction site.
  - 4. Contractor shall be responsible for payment of all monthly billing charges for temporary electric power. Contractor shall pay costs of equipment, materials, furnishing, installing, maintenance and removal of temporary electric service facilities.

5. Contractor shall pay costs of equipment, furnishing, installing, maintenance and removal of temporary service facilities.
6. Maintenance of temporary electric service shall be the sole responsibility of the General Contractor.

C. Temporary Lighting:

1. Furnish and install temporary lighting required for :
  - a. Construction needs.
  - b. Safe and adequate working conditions.
  - c. Public Safety.
  - d. Security lighting.
  - e. Temporary office and storage area lighting.
2. As each building is enclosed, temporary lighting shall be furnished to provide not less than 10 foot-candles in all areas.
3. Service Periods:
  - a. Security lighting: All hours of darkness.
  - b. Safety lighting:
  - c. Within construction area: All times that authorized personnel are present.
  - d. Public areas: At all times.
4. Costs of installation and operation: Contractor shall pay all installation, maintenance and removal costs of temporary lighting.
5. Maintenance of temporary lighting service (replacement of bulbs, etc.) shall be the sole responsibility of the General Contractor.

D. Temporary Heating and Ventilating

1. Furnish and install temporary heat and ventilation in enclosed areas throughout construction period required to:
  - a. Facilitate progress of work.
  - b. Protect work and products against dampness and cold.
  - c. Prevent moisture condensation on surfaces.
  - d. Provide suitable ambient temperatures and humidity levels for installation and curing of materials.

- e. Provide adequate ventilation to meet health regulations for safe working environment
  - f. Heat and ventilate temporary field offices for Contractor and for Engineer, and other storage and construction buildings.
  - g. Allow beneficial occupancy of project, or portion of project, prior to final completion, including air conditioning
2. Temperatures required in buildings:
- a. Generally, 24 hours a day: Minimum 40 degrees F. (4.5 degrees C.).
  - b. 24 hours a day during placing, setting and curing of cementitious materials: As required by specification section for each product.
  - c. 24 hours a day, seven (7) days prior to, and during, placing of interior finishes; woodwork, flooring, painting and finishing: As required by specification section for each product.
  - d. 24 hours a day after application of finishes, and until Substantial Completion: Minimum 70 degrees F. (21 degrees C.).
  - e. Storage areas: As required by Specification Section for each product.
3. Ventilation Required:
- a. General: Prevent hazardous accumulations of dusts, fumes, mists, vapors or gases in areas occupied during construction.
  - b. Provide local exhaust ventilation to prevent harmful dispersal of hazardous substances into atmosphere of occupied areas.
  - c. Dispose of exhaust materials in a manner that will not result in harmful exposure to persons.
  - d. Ventilate storage spaces containing hazardous or volatile materials.
  - e. Provide adequate ventilation for:
    - (1) Curing installed materials.
    - (2) Dispersal of humidity.
    - (3) Ventilation of temporary sanitary facilities.
  - f. Duration of operation:
    - (1) At all times personnel occupies an area subject to hazardous accumulations of harmful elements.
    - (2) Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful elements.

(3) For curing installed materials: As required by specification section for respective materials.

(4) For humidity dispersal: As needed to provide suitable ambient conditions for work.

4. Contractor shall pay costs of installation, operation, maintenance and removal of temporary heat and ventilation.

E. Temporary Telephone and Fax Service:

1. Furnish and install temporary telephone service for construction needs throughout construction periods.

2. Pay costs for temporary telephone service including installation, maintenance, and removal.

3. Pay service costs for all local telephone service.

4. Pay costs of toll charges related to construction of the Project.

5. Do not use Owner's existing telephone system.

F. Temporary Water:

1. Contractor shall make his own arrangements at his own expense for obtaining the water supply necessary for construction purposes.

2. Contractor shall pay costs of the furnishing, maintaining and removing all temporary water service equipment, fixtures, hose, piping, etc.

G. Protection and Security:

1. Provide barricades, lanterns and other such signs and signals as may be necessary to warn of the dangers in connection with open excavation and obstructions.

2. Provide an adequate and approved system to secure the project area at all times, especially during non-construction periods; General Contractor shall be solely responsible for taking proper security measures.

3. Contractor shall pay all costs for protection and security systems.

H. Sanitary Facilities:

The Contractor shall furnish, install and maintain ample sanitary facilities for the workmen. As the needs arise, enclosed temporary toilets, in sufficient number, shall be placed as directed by the Engineer. Permanent toilets installed under this Contract shall not be used during construction. Drinking water shall be provided from a proven safe source so piped or transported as to be kept clean and fresh and served from single service containers of satisfactory types.

I. Temporary Protection:

1. Temporary Enclosures:

Furnish and install temporary enclosures at doorways, windows and other openings in exterior walls, as necessitated by weather and other conditions, and when required for the progress of the Work. Temporary doors shall be substantially built and hung, equipped with proper hinges, locks and other necessary hardware and shall be removed and reset whenever required to accommodate the work of other trades requiring their removal. All enclosures shall be maintained in good repair and removed when no longer needed. Door and window frames and sills shall be protected as necessary to prevent damage to items during construction.

2. Temporary Covering:

Provide substantial temporary wood covering over all floor openings for ducts, shafts, equipment, etc., using rough planking at least two (2) inches thick, cleated together and made sufficiently strong and put in place wherever required.

3. Temporary Railing:

Temporary railing shall be provided on stairs and around wells, pits and other locations where needed, to prevent accidents or injury to persons.

J. Project Sign:

The Contractor shall provide sign(s), as detailed hereinafter, near the site of the work. The sign(s) shall set forth the description of the work and the names of the Owner, Engineer, and Contractor, and other information as required.

The sign shall be constructed of 3/4-inch thick APA A-B Exterior grade or marine plywood. Posts shall be 4" x 4" of fencing type material. Prime all wood with white primer.

The sign shall be maintained in good condition until completion of the project.

K. Contractor's Field Office:

Each Contractor shall establish and maintain a field office on his project and have available at the office a responsible representative who can officially receive instructions from the Engineer. The Contractor's Field Office shall be provided in accordance with Section 01520.

L. Resident Project Representative's Field Office:

The Contractor shall furnish and maintain a field office for the exclusive use of the Resident Project Representative at a location designated by the Engineer and shall be in accordance with the requirements of Section 01520.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION, GENERAL**

- A. Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the Work.
- B. Relocate, modify and extend services and facilities as required during the course of work so as to accommodate the entire work of the Project.

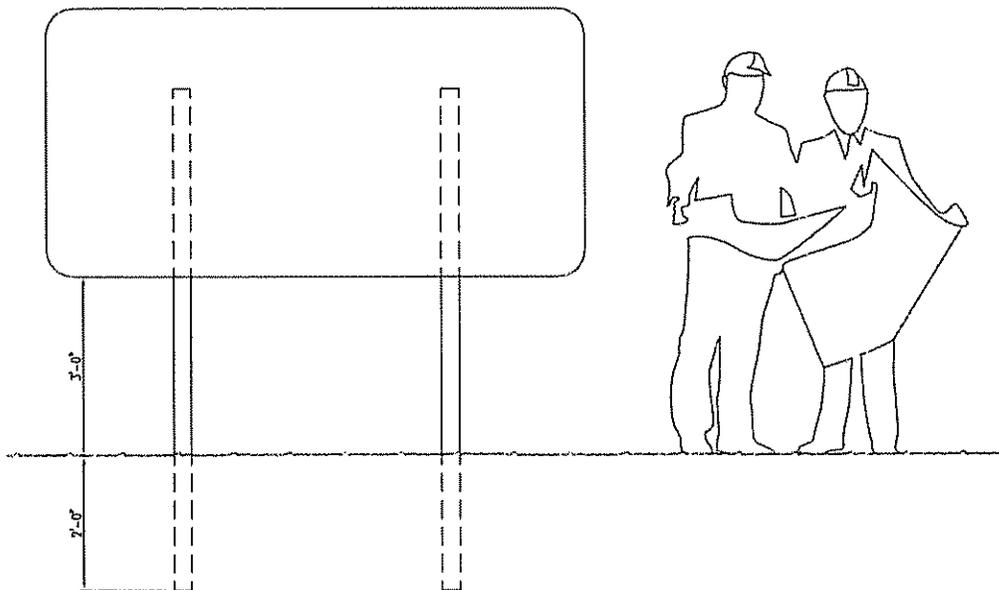
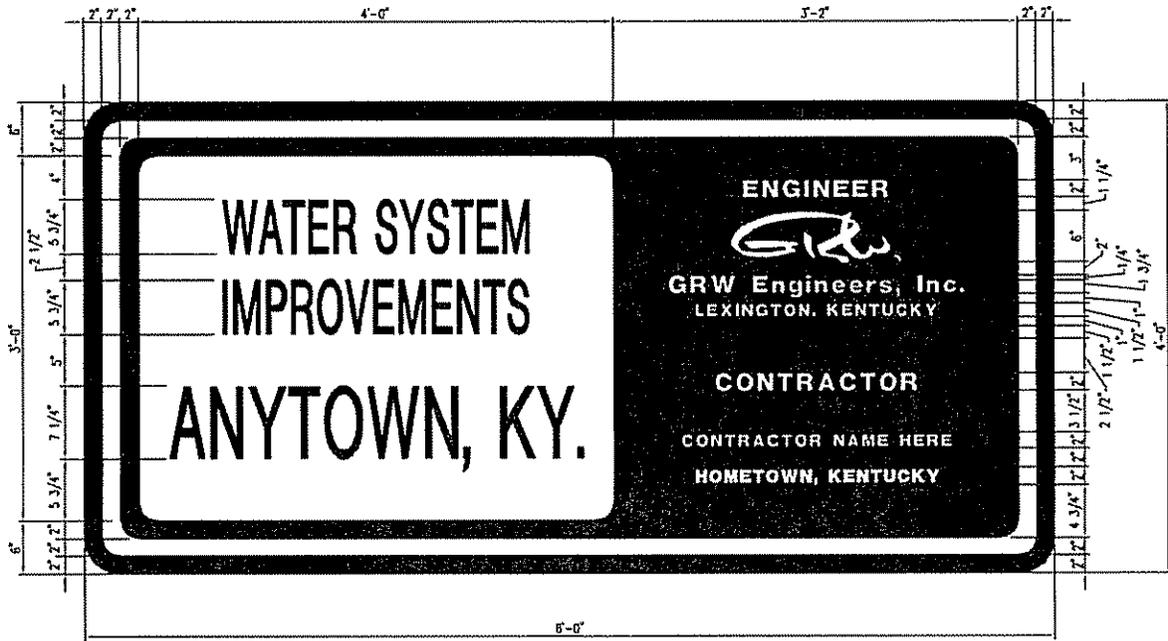
### **3.02 REMOVAL**

- A. Completely remove temporary materials, equipment, and offices upon completion of construction.
- B. Repair damage caused by installation, and restore to specified or original condition.

END OF SECTION

# USE THIS SIGN FOR NONFUNDED PROJECTS.

## Figure 1: Typical Project Sign



## SECTION 01631 - PRODUCTS AND SUBSTITUTIONS

### PART 1 - GENERAL

#### 1.01 DESCRIPTION OF REQUIREMENTS

- A. General: Substitution of materials and/or equipment is defined in Paragraph 6.7.1 of the General Conditions and more fully hereinafter.
- B. Definitions: Definitions used in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents including such terms as "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction" and similar terms. Such terms are self-explanatory and have recognized meanings in the construction industry.
  - 1. "Products" are items purchased for incorporation in the Work, regardless of whether they were specifically purchased for the project or taken from the Contractor's previously purchased stock. The term "product" as used herein includes the terms "material", "equipment", "system" and other terms of similar intent.
  - 2. "Named Products" are products identified by use of the manufacturer's name for a product, including such items as a make or model designation, as recorded in published product literature, of the latest issue as of the date of the Contract Documents.
  - 3. "Materials" are products that must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form units of work.
  - 4. "Equipment" is defined as a product with operational parts, regardless of whether motorized or manually operated, and in particular, a product that requires service connections such as wiring or piping.
- C. Substitutions: The Contractor's requests for changes in the products, materials, equipment and methods of construction required by the Contract Documents are considered requests for "substitutions", and are subject to the requirements specified herein. The following are not considered as substitutions:
  - 1. Revisions to the Contract Documents, where requested by the Owner, Engineer are considered as "changes" not substitutions.
  - 2. Substitutions requested during the bidding period, which have been accepted prior to the Contract Date, are included in the Contract Documents and are not subject to the requirements for substitutions as herein specified.
  - 3. Specified Contractor options on products and construction methods included in the Contract Documents are choices available to the Contractor and are not subject to the requirements for substitutions as herein specified.

4. Except as otherwise provided in the Contract Documents, the Contractor's determination of and compliance with governing regulations and orders as issued by governing authorities do not constitute "substitutions" and do not constitute a basis for change orders.
- D. Standards: Refer to Division-1 section "Definitions and Standards" for applicability of industry standards to the products specified for the project, and for acronyms used in the text of the specification sections.

## **1.02 RELATED DOCUMENTS**

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

## **1.03 SUBMITTALS**

The information required to be furnished for evaluation of product substitution will be as follows:

- A. Performance capabilities, and materials and construction details will be evaluated based upon conformance with the Specifications. Products that do not conform with the Specification shall not be accepted.
- B. Manufacturer's production and service capabilities, and evidence of proven reliability will be acceptable if the following is furnished.
  1. Written evidence that the manufacturer has not less than (3) years experience in the design and manufacture of the substitute product.
  2. Written evidence of at least one application, of a type and size similar to the proposed substitute product, in successful operation in a wastewater treatment plant for a period of at least one year.
  3. In lieu of furnishing evidence of a manufacturer's Experience and successful operation of an application of the product to be substituted, the Contractor has the option of furnishing a cash deposit or bond which will guarantee replacement if the product the furnished does not satisfy the other requirements specified in this section. The amount of each deposit or bond will be subject to the approval.
- C. Specific reference to characteristics either superior or inferior to specified requirements will be evaluated based on their net effect on the project. Products with any characteristics inferior to those specified will not be acceptable unless offset by characteristics that, in the opinion of the Engineer, will cause the overall effect of the product on the project to be at least equal to that of those specified.

## **1.04 QUALITY ASSURANCE**

- A. Source Limitations: To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work.

- B. Compatibility of Options: Compatibility of products is a basic requirement of product selection. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected must be compatible with other products previously selected, even if the products previously selected were also Contractor options. The complete compatibility between the various choices available to the Contractor is not assured by the various requirements of the Contract Documents, but must be provided by the Contractor.
- C. The detailed estimate of operating and maintenance costs will be evaluated based on comparison with similar data on the specified products. Proposed substitute products which have an operating and maintenance cost that, in the opinion of the Engineer, exceeds that of the specified products will not be considered equal and will not be acceptable.

## **1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING**

General: Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft. Control delivery schedules to minimize long-term storage at the site and to prevent overcrowding of construction spaces. In particular coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.

- A. Deliver products to the site in the manufacturer's sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
- B. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
- C. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL PRODUCT COMPLIANCE**

- A. General: Requirements for individual products are indicated in the Contract Documents; compliance with these requirements is in itself a Contract Requirement. These requirements may be specified in any one of several different specifying methods, or in any combination of these methods. These methods include the following:
  - 1. Proprietary
  - 2. Descriptive.
  - 3. Performance.
  - 4. Compliance with Reference Standards.

Compliance with codes, compliance with graphic details, allowances, and similar provisions of the Contract Documents also have a bearing on the selection process.

- B. Procedures for Selecting Products: Contractor's options in selecting products are limited by requirements of the Contract Documents and governing regulations. They are not controlled by industry traditions or procedures experienced by the Contractor on previous construction projects.

## 2.02 SUBSTITUTIONS

- A. Conditions: Contractor's request for substitution will be received and considered when extensive revisions to the Contract Documents are not required, when the proposed changes are in keeping with the general intent of the Contract Documents, when the request are timely, fully documented and properly submitted, and when one or more of the following conditions is satisfied, all as judged by the Engineer; otherwise the requests will be returned without action except to record non-compliance with these requirements.
1. The Engineer will consider a request for substitution where the request is directly related to an "or equal" clause or similar language in the Contract Documents.
  2. The Engineer will consider a request for substitution where the specified product or method cannot be provided within the Contract Time. However, the request will not be considered if the product or method cannot be provided as a result of the Contractor's failure to pursue the work promptly or to coordinate the various activities properly.
  3. The Engineer will consider a request for substitution where the specified product or method cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
  4. The Engineer will consider a request for a substitution where a substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include such considerations as additional compensation to the Engineer for redesign and evaluation services, the increased cost of other work by the Owner or separate contractors, and similar considerations.
  5. The Engineer will consider a request for substitution when the specified product or method cannot be provided in a manner which is compatible with other materials of the work, and where the Contractor certifies that the substitution will overcome the incompatibility.
  6. The Engineer will consider a request for substitution when the specified product or method cannot be properly coordinated with other materials in the work, and where the Contractor certifies that the proposed substitution can be properly coordinated.
  7. The Engineer will consider a request for substitution when the specified product or method cannot receive a warranty as required by the Contract Documents and where the Contractor certifies that the proposed substitution receive the required warranty.
  8. The Contractor shall reimburse the Owner any costs for review by the Engineer of proposed product substitutions which require major design changes, as determined by the Owner, to related of adjacent work made necessary by the proposed substitutions.

- B. Work-Related Submittals: Contractor's submittal of and the Engineer's acceptance of shop drawings, product data or samples which relate to work not complying with requirements of the Contract Documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

### 2.03 GENERAL PRODUCT REQUIREMENTS

- A. General: Provide products that comply with the requirements of the Contract Documents and that are undamaged and, unless otherwise indicated, unused at the time of installation. Provide products that are complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
1. Standard Products: Where they are available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  2. Continued Availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced products for which the manufacturer has published assurances that the products and its parts are likely to be available to the Owner at a later date.
- B. Nameplates: Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on the exterior of the completed project.
1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.
  2. Equipment Nameplates: Provide permanent nameplate on each item of service-connected or power operated equipment. Locate the nameplate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.
    - a. Name of manufacturer
    - b. Name of product
    - c. Model number
    - d. Serial number
    - e. Capacity
    - f. Speed
    - g. Ratings

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION OF PRODUCTS**

- A. General: Except as otherwise indicated in individual sections of these Specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at Time of Acceptance.

END OF SECTION

## **SECTION 01731 - CUTTING AND PATCHING**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION OF REQUIREMENTS**

- A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other Work and subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting and patching is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes upon written instructions of the Engineer.
- C. Cutting and patching is performed during the manufacture of products, or during the initial fabrication. Erection or installation processes are not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".
- D. "Cutting and Patching" includes removal and replacement of Work not conforming to requirements of the Contract Documents, removal and replacement of defective Work, and uncovering Work to provide for installation of ill-timed Work.
- E. No Work shall be endangered by cutting or altering Work or any part of it.

#### **1.02 RELATED DOCUMENTS**

- A. Drawing and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to Work of this Section.

#### **1.03 SUBMITTALS**

- A. Prior to cutting which affects structural safety of Project, submit written notice to the Engineer, requesting consent to proceed with cutting, including:
  - 1. Identification of Project
  - 2. Description of affected work.
  - 3. Necessity for cutting.
  - 4. Effect on structural integrity of Project.
  - 5. Description of proposed work. Designate:
    - a. Scope of cutting and patching.
    - b. Trades to execute work.
    - c. Products proposed to be used.

- d. Extent of refinishing.
  - 6. Alternatives to cutting and patching
- B. Should conditions of work, or schedule, indicate change of materials or methods, submit written recommendation to the Engineer, including:
  - 1. Conditions indicating change.
  - 2. Recommendations for alternative materials or methods.
  - 3. Submittals as required for Substitutions.
- C. Submit written notice to the Engineer, designating time Work will be uncovered, to provide for observation.

#### **1.04 QUALITY ASSURANCE**

- A. Requirements for Structural Work: Do not cut and patch structural Work in a manner that would result in a reduction of load-carrying capacity or of load-deflection ratio.
- B. Operational and Safety Limitations: Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in the manner intended, including energy performance, or that would result in increased maintenance, or decreased operational life or decreased energy.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. For replacement of work removed, comply with Specifications for type of work to be done.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Before cutting, examine the surfaces to be cut and patched and the conditions under which the Work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the Work.

#### **3.02 PREPARATION**

- A. Temporary Support: To prevent failure, provide temporary support of Work to be cut. Provide shoring, bracing and support as required to maintain structural integrity of project.
- B. Protection: Protect other Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be

exposed during cutting and patching operations. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.

### 3.03 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching Work. Except as otherwise indicated or as approved by the Engineer, proceed with cutting and patching at the earliest feasible time and complete Work without delay.
- B. Cutting: Cut the Work using methods that are least likely to damage work to be retained or adjoining Work. Where possible, review proposed procedures with the original installer; comply with original installer's recommendations.
  - 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
  - 2. Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.
  - 3. By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in wall or partitions to be removed. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.
- C. Patching: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the Work.
  - 1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
  - 2. Restore exposed finishes of patched areas and where necessary, extend finish restoration into retained adjoining Work in a manner which will eliminate evidence of patching and refinishing.
  - 3. Execute fittings and adjustment of products to provide finished installations to comply with specified tolerances.
  - 4. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.
  - 5. Refinish entire surfaces as necessary to provide an even finish.
    - a. Continuous Surfaces: To nearest intersection.
    - b. Assembly: Entire refinishing.

### 3.04 CLEANING

- A. Thoroughly clean areas and spaces where Work is performed or used as access to work. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

## **SECTION 01740 - CLEANING**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION OF REQUIREMENTS**

- A. Maintain premises free from accumulations of waste, debris, and rubbish.
- B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces. Leave project clean and ready for occupancy.

#### **1.02 RELATED DOCUMENTS**

- A. Cutting and Patching: Section 01731.
- B. Project Closeout: Section 01770.
- C. Cleaning for Specific Products of Work: Specification Section for that work.

#### **1.03 SAFETY REQUIREMENTS**

- A. Hazards Control:
  - 1. Store volatile wastes in covered metal containers, and remove from premises daily.
  - 2. Prevent accumulation of wastes which create hazardous conditions.
  - 3. Provide adequate ventilation during use of violative noxious substances.
- B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
  - 1. Do not burn or bury rubbish and waste materials on project site.
  - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
  - 3. Do not dispose of wastes into streams or waterways.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

## **PART 3 - EXECUTION**

### **3.01 DURING CONSTRUCTION**

- A. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- C. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris and rubbish.
- D. Provide on-site containers for collection of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.
- F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

### **3.02 FINAL CLEANING**

- A. Employ experienced workmen, or professional cleaners, for final cleaning.
- B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior or exterior finished surfaces; polish surfaces so designated to shine finish.
- D. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
- E. Broom clean paved surfaces; rake clean other surfaces of grounds.
- F. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION

## SECTION 01770 - PROJECT CLOSEOUT

### PART 1 - GENERAL

#### 1.01 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Liquidated Damages: Supplemental General Conditions
- B. Cleaning: Section 01740.
- C. Project Record Documents: Section 01785.

#### 1.02 SUBSTANTIAL COMPLETION

- A. In order to initiate project closeout procedures, the Contractor shall submit the following:
  - 1. Written certification to Engineer that project is Substantially Complete.
  - 2. List of major items to be completed or corrected.
- B. Engineer will make an inspection within seven (7) days after receipt of certification, together with Owner's Representative.
- C. Should Engineer consider that work is Substantially Complete:
  - 1. Contractor shall prepare, and submit to Engineer, a list of items to be completed or corrected, as determined by the inspection.
  - 2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:
    - a. Date of Substantial Completion.
    - b. Contractor's list of items to be completed or corrected, verified and amended by Engineer.
    - c. The time within which Contractor shall complete or correct work of listed items.
    - d. Time and date Owner will assume possession of work or designated portion thereof.
    - e. Responsibilities of Owner and Contractor for:
      - (1) Insurance
      - (2) Utilities
      - (3) Operation of Mechanical, Electrical, and Other Systems.
      - (4) Maintenance and Cleaning.

- (5) Security.
- f. Signatures of:
  - (1) Engineer
  - (2) Contractor
  - (3) Owner
- 3. Owner occupancy of Project or Designated Portion of Project:
  - a. Contractor shall:
    - (1) Obtain certificate of occupancy.
    - (2) Perform final cleaning in accordance with Section 01740.
  - b. Owner will occupy Project, under provisions stated in Certificates of Substantial Completion.
- 4. Contractor: Complete work listed for completion or correction, within designated time.

D. Should Engineer consider that work is not Substantially Complete:

- 1. He shall immediately notify Contractor, in writing, stating reasons.
- 2. Contractor: Complete work, and send second written Engineer, certifying that Project, or designated portion of Project is substantially complete.
- 3. Engineer will reinspect work.

E. Should Engineer consider that work is still not finally complete:

- 1. He shall notify Contractor, in writing, stating reasons.
- 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send third written notice to the Engineer certifying that the work is complete.
- 3. Engineer and Owner will reinspect work at Contractor's expense.

### 1.03 FINAL INSPECTION

A Contractor shall submit written certification that:

- 1. Contract Documents have been reviewed.
- 2. Project has been inspected for compliance with Contract Documents.
- 3. Work has been completed in accordance with Contract Documents.
- 4. Equipment and systems have been tested in presence of Owner's Representative and are operational.

5. Project is completed, and ready for final inspection.
- B. Engineer will make final inspection within seven (7) days after receipt of certification.
- C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.
- D. Should Engineer consider that work is not finally complete:
  1. He shall notify Contractor in writing, stating reasons.
  2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Engineer certifying that work is complete.
  3. Engineer will reinspect work.

#### **1.04 CLOSEOUT SUBMITTALS**

- A. Project Record Documents: To requirements of Section 01785.
- B. Guarantees, Warranties and Bonds: To requirements of particular technical Specifications and Section 01782.

#### **1.05 INSTRUCTION**

- A. Instruct Owner's personnel in operation of all systems, mechanical, electrical, and other equipment.

#### **1.06 FINAL APPLICATION FOR PAYMENT**

- A. Contractor shall submit final applications in accordance with requirements of General Conditions.

#### **1.07 FINAL CERTIFICATE FOR PAYMENT**

- A. Engineer will issue final certificate in accordance with provisions of general conditions.
- B. Should final completion be materially delayed through no fault of Contractor, Engineer may issue a Semi-Final Certificate for Payment.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION



## SECTION 01780 – OPERATIONS AND MAINTENANCE MANUALS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Compile product data and related information appropriate for Owner's maintenance and operation of equipment furnished under the Contract. Prepare operating and maintenance data as specified.
- B. In addition to maintenance and operations data, the manufacturer's printed recommended installation practice shall also be included. If not part of the operations and maintenance manual, separate written installation instructions shall be provided, serving to assist the Contractor in equipment installation.
- C. Related requirements specified elsewhere:
  - 1. Shop Drawings, Product Data and Samples: Section 01340.
  - 2. Project Closeout: Section 01770.
  - 3. Project Record Documents: Section 01785
  - 4. Warranties and Bonds: Section 01782.

#### 1.02 FORM OF SUBMITTALS

- A. Prepare data in the form of an instructional manual for use by Owner's personnel
- B. Format:
  - 1. Size: 8-1/2 in. x 11 in.
  - 2. Paper: 20 pound minimum, white, for typed pages.
  - 3. Text: Manufacturer's printed data, or neatly typewritten.
  - 4. Photo copies must be clear and legible.
  - 5. Drawings:
    - a. Provide reinforced punched binder tab, bind in with text.
    - b. Fold large drawings to the size of the text pages where feasible.
    - c. For flow or piping diagrams that cannot be detailed on the standard size drawings, a larger, appropriate size drawing may be submitted and supplied in a properly marked map packet.

6. Provide fly-leaf for each separate product, or each piece of operating equipment.
    - a. Provide typed description of product, and major component parts of equipment.
    - b. Provide indexed tabs.
  7. Cover: Identify each volume with types or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
    - a. Title of Project.
    - b. Identity of separate structure as applicable.
    - c. Identity of general subject matter covered in the manual.
- C. Binders:
1. Commercial quality, durable and cleanable, 3-hole, 3" or 4" D-ring binders, with oil and moisture resistant hard covers.
  2. When multiple binders are used, correlate the data into related consistent grouping.
  3. Imprinted on the front cover and side of each binder shall be the name of the Plant, the Contract Number and Volume Number.
  4. Binders shall be new and not recycled form a prior data manual.

### **1.03 SUBMITTAL SCHEDULE**

- A. Submit one (1) copy of preliminary draft of proposed formats and outlines of contents prior to operation of equipment.
  1. Engineer will review draft and return with comments.
- B. Submit one (1) copy of completed data for final review:
  1. Prior to the completion of the Contract and before payment in excess of 90% of the total Contract amount is authorized.
- C. Provide two (2) copies of approved completed O & M Manual in final form ten (10) days prior to final inspection or acceptance to the Owner.

### **1.04 QUALITY ASSURANCE**

- A. Preparation of data shall be done by personnel:
  1. Trained and experienced in maintenance and operation of the described products.
  2. Completely familiar with requirements of this Section.
  3. Skilled as a technical writer to the extent required to communicate essential data.

4. Skilled as a draftsman competent to prepare required drawings.

#### 1.05 CONTENTS OF MANUAL

- A. Each item of equipment shall be placed in a logical sequential order, as listed or ordered in the Contract Documents.
- B. Content, for each unit of equipment and system, as appropriate:
  1. Detailed description of the process and operation procedures as applicable.
  2. Instructions for all components of the equipment whether manufactured by the supplier or not, including valves, controllers and other miscellaneous components.
  3. Description of unit and component parts.
    - a. Function, normal operating characteristics, and limiting conditions.
    - b. Performance curves, engineering data and tests.
    - c. Complete nomenclature and commercial number of all replaceable parts.
    - d. Exploded and/or sectional drawing views.
    - e. Equipment model number.
  4. Operating procedures:
    - a. Start-up, break-in, routine and normal operating instructions.
    - b. Regulation, control, stopping, shutdown and emergency instructions.
    - c. Summer and winter operating instructions.
    - d. Special operating instructions.
  5. Maintenance Procedures:
    - a. Routine operations.
    - b. Guide to "trouble-shooting".
    - c. Disassembly, repair and reassembly.
    - d. Alignment, adjusting and checking.
    - e. Preventative maintenance schedule.
    - f. Recommended spare parts list and quantities.
    - g. Equipment parts list.



4. Operating procedures:
    - a. Routine and normal operating instructions.
    - b. Sequences required.
    - c. Special operating instructions.
  5. Maintenance procedures:
    - a. Routine operations.
    - b. Guide to "trouble-shooting".
    - c. Disassembly, repair and reassembly.
    - d. Adjustment and checking.
  6. Manufacturer's printed operating and maintenance instructions.
  7. List of original manufacturer's recommended spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
  8. Other data as required under pertinent sections of Specifications.
- D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.
- E. Additional requirements for operating and maintenance data: The respective section of Specifications.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION



## **SECTION 01782 - WARRANTIES AND BONDS**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION OF REQUIREMENTS**

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Submit to Engineer for review and transmittal to Owner.

#### **1.02 RELATED DOCUMENTS**

- A. Bid Bond: Instructions to Bidders
- B. Performance and Payment Bonds: General Conditions and Supplemental General Conditions.
- C. Guaranty: General Conditions and Supplemental General Conditions.
- D. General Warranty of Construction: General Conditions.
- E. Project Closeout: Section 01770.
- F. Warranties and Bonds required for specific products: As listed herein.
- G. Provisions of Warranties and Bonds, Duration: Respective specification sections for particular products.

#### **1.03 SUBMITTALS REQUIREMENTS**

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Furnish two (2) original signed copies.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
  - 1. Product, equipment or work item.
  - 2. Firm name, address and telephone number.
  - 3. Scope
  - 4. Date of beginning of warranty, bond or service and maintenance contract.

5. Duration of warranty, bond or service and maintenance contract.
6. Provide information for Owner's personnel:
  - a. Proper procedure in case of failure.
  - b. Instances which might affect the validity of warranty or bond.
7. Contractor name, address and telephone number.

#### **1.04 FORM OF SUBMITTALS**

- A. Prepare in duplicate packets
- B. Format:
  1. Size 8-1/2 in. x 11 in., punch sheets for 3-ring binder.
    - a. Fold larger sheets to fit into binders.
  2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS." List:
    - a. Title of Project
    - b. Name of Contractor
- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

#### **1.05 TIME OF SUBMITTALS**

- A. For equipment or component parts of equipment put into service during progress of construction:
  1. Submit documents within 10 days after inspection and acceptance.
- B. Otherwise make submittals within 10 days after date of substantial completion, prior to final request for payment.
- C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

#### **1.06 SUBMITTALS REQUIRED**

- A. Submit warranties, bonds, service and maintenance contracts as specified in the respective sections of the Specifications.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

END OF SECTION



## **SECTION 01785 - PROJECT RECORD DOCUMENTS**

### **PART 1 - GENERAL**

#### **1.01 MAINTENANCE OF DOCUMENTS**

- A. Maintain at job site, one copy of:
  - 1. Contract Drawings
  - 2. Specifications
  - 3. Addenda
  - 4. Reviewed Shop Drawings
  - 5. Change Orders
  - 6. Other Modifications to Contract
- B. Store documents in approved location, apart from documents used for construction.
- C. Provide files and racks for storage of documents.
- D. Maintain documents in clean, dry, legible condition.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by Engineer and Owner.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Shop Drawings, Product Data, and Samples: Section 01340.

#### **1.03 MARKING DEVICES**

- A. Provide colored pencil or felt-tip marking pen for all marking.

#### **1.04 RECORDING**

- A. Label each document "PROJECT RECORD" in 2-inch high printed letters.
- B. Keep record documents current.
- C. Do not permanently conceal any work until required information has been recorded.

- D. Contract Drawings: Legibly mark to record actual construction:
1. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements. Contractor shall provide GPS data, in State Plane Coordinates, for wells, vaults, pipe (at 50-ft intervals), and fittings for the record drawings.
  2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
  3. Field changes of dimension and detail.
  4. Changes made by Change Order or Field Order.
  5. Details not on original Contract Drawings.
- E. Specifications and Addenda: Legibly mark up each section to record:
1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
  2. Changes made by Change Order or Field Order.
  3. Other matters not originally specified.
- F. Shop Drawings: Maintain as record documents; legibly annotate shop drawings to record changes made after review.

#### **1.05 SUBMITTALS**

- A. At completion of project, deliver record documents to Engineer.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
1. Date.
  2. Project Title and Number.
  3. Contractor's Name and Address.
  4. Title and Number of each Record Document.
  5. Certification that each Document as Submitted is Complete and Accurate.
  6. Signature of Contractor, or His Authorized Representative.

#### **PART 2 - PRODUCTS (Not Applicable)**

#### **PART 3 - EXECUTION (Not Applicable)**

END OF SECTION

DIVISION 2

SITework



**SECTION 02371 - EROSION AND SEDIMENTATION CONTROL-KY NPDES  
REQUIREMENTS (for disturbed areas of one acre or more)**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, and equipment required for erecting, maintaining and removing temporary erosion and sedimentation controls as shown on the Drawings and as specified herein and as recommended by state and local regulatory agencies.
- B. Temporary erosion controls include, but are not limited to grassing, mulching, seeding, providing erosion control and turf reinforcement mats on all disturbed surfaces including waste area surfaces and stockpile and borrow area surfaces; scheduling work to minimize erosion and providing interceptor ditches at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.
- C. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances on sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.
- D. Contractor is responsible for providing and maintaining effective temporary erosion and sediment control measures prior to and during construction or until final controls become effective.
- E. The Contractor shall be responsible for placement of erosion and sedimentation controls. Prior to construction, the Contractor shall develop an erosion control plan and submit to the Engineer for review. Prior to excavation, fill or grade work, the Contractor shall place controls in locations required by the erosion control plan. If during the course of construction, the Engineer determines additional controls are required, the Contractor shall furnish, install and maintain additional mulching, blankets and/or sediment barriers to control erosion and sedimentation to the satisfaction of the Engineer.
- F. The Contractor shall notify the appropriate state agency before beginning construction, and shall implement erosion control measures as may be required by state and federal agencies. Contractor shall submit a signed Notice of Intent form to the Division of Water at least 48 hours prior to beginning of construction activity.
- G. The Contractor shall inspect and repair all erosion and sedimentation controls every seven (7) days and after each rainfall of 0.5 inch or greater.
- H. Bare soil areas must be seeded, mulched, or covered after 14 days if no work will be done in the area within the next 7 days.

**1.02 RELATED WORK**

- A. Dewatering is included in this Division, Section 02240.
- B. Final erosion protection measures where required are included in this Section.

## PART 2 – PRODUCTS

### 2.01 SEED

- A. The seed mixture to be sown shall be in the following proportions:

<u>Common Name</u>	<u>Proportion By Weight</u>	<u>% of Purity</u>	<u>% of Germination</u>
Kentucky 31 Tall Fescue	75	90	85
Italian Rye Grass	10	90	85
Red Top	10	90	85
White Clover	5	95	90

- B. All seed shall be fresh and clean and shall be delivered mixed, in unopened packages, bearing a guaranteed analysis of the seed mixture.

### 2.02 FERTILIZER

- A. Just prior to the planting of turf, evenly broadcast 15 pounds per thousand square feet of fertilizer, 10-10-10 (nitrogen, phosphorus, potassium). Disc or harrow fertilizer 2 to 4 inches into the soil.
- B. Fertilizer shall be delivered to the site in the original unopened container bearing the manufacturer's guarantee analysis. Any fertilizer that becomes caked or damaged making it unsuitable for use, will not be accepted.

### 2.03 SOD

- A. Sod shall be at least 70% Bluegrass, strongly rooted and free of weeds.
- B. It shall be mowed to a height not to exceed 3" before lifting, and shall be of uniform thickness with not over 1-1/2" of soil.

### 2.04 MULCH

- A. Mulch for seeded areas shall be Conwed Hydro Mulch, Silva-Fiber, or equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment.
- B. Clean straw is acceptable as mulch. It shall be spread at the rate of one (1) bale per 1,000 feet (approximately 2" loose depth).
- C. Mulch on slopes greater the 4:1 shall be held in place with erosion control netting.
- D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with erosion control netting.

### 2.05 EROSION CONTROL BLANKETS

- A. Erosion Control Blanket shall be made up of biodegradable and/or photodegradable products such as jute, wood fiber, coconut fiber, straw and degradable plastic netting. They shall degrade at a rate of approximately 6 months to 24 months.

- B. Erosion Control Blanket shall be installed on slopes greater than 4:1 and in all ditches and drainage channels, and where otherwise indicated on the Contract Drawings or directed by regulatory agencies.

**2.06 TURF REINFORCEMENT MAT**

- A. Where indicated on the Contract Drawings or as described in the Specifications, Turf Reinforcement Mat shall be installed for permanent erosion control.
- B. Turf Reinforcement Mat shall consist of top and bottom heavy weight netting and biodegradable matrix such as coconut fiber or aspen curled wood excelsior.
- C. Where slope and hydraulic conditions are severe, a synthetic matrix may be used, based on manufacturer's recommendations.

**2.07 SILT FENCE**

- A. Temporary Silt Fence shall consist of woven geotextile fabric attached to 2" X 2" X 48" tall hardwood stakes.
  - 1. Fabric shall be 48" tall, with top being even with top of stakes. Bottom 12" shall be buried in trench as shown on the Detail Drawings.
  - 2. Stakes shall be at 6' centers unless stated otherwise on Contract Documents.
- B. Temporary Reinforced Silt Fence
  - 1. For areas of steep slopes and high flows, where indicated on the Contract Drawings, or as directed by state or local regulations, Reinforced Silt Fence shall be installed.
  - 2. Fabric shall be woven monofilament geotextile attached to 11 gauge steel fencing of 2" X 4" grid.
  - 3. Stakes shall be 5" tall steel and shall be installed on 4' centers.
  - 4. Fabric and fencing shall be buried in trench as shown on the Detail Drawings.
- C. Spacing of Silt Fences on slopes shall be according to the following table, or as directed by state or local regulatory agencies:

Slope Angle	Soil Type		
	Silty	Clays	Sandy
Very Steep (1:1)	50 ft.	75 ft.	100 ft.
Steep (2:1)	75 ft.	100 ft.	125 ft.
Moderate (4:1)	100 ft.	125 ft.	150 ft.
Slight (10:1)	125 ft.	150 ft.	200 ft.

- D. If runoff flows along the uphill side of the silt fence, Contractor shall install "J-hooks" every 40 to 80 feet. These are curved sections of silt fence above the continuous fence that serve as small dams to stop and hold the flow to allow sediment to settle.

## **2.08 FIBER ROLLS**

- A. On long slopes less than 10:1, and where indicated on the Contract Drawings or recommended by the regulatory agency, Fiber Rolls shall be installed.
- B. Fiber Rolls shall be made of wood shavings, coconut fiber or other similar material encased in heavy duty netting.
- C. Wooden stakes at 4'-0" on center shall be used to anchor the Fiber Rolls along the contours of the slope.

## **2.09 AGGREGATE SILT CHECKS**

- A. Where needed to slow flow velocity, to cause ponding or to protect storm water inlet structures, Aggregate Silt Checks shall be installed.
- B. Aggregate Silt Checks shall consist of rock of various sizes ranging from 2" to 6" contained in or placed on geotextile filter fabric. Pea-stone or gravel-filled bags are acceptable for temporary silt checks in low-flow conditions.

## **2.10 RIP RAP**

- A. Rip Rap shall be installed at the outlets of storm drains and on channel banks as noted on the Contract Drawings and/or recommended by state and local regulatory agencies.
- B. Rip Rap shall have no less than 80%, by volume, of individual stones that range in size from 0.0247 to 1.483 cubic feet.

## **2.11 CONSTRUCTION ENTRANCE PAD**

- A. Contractor shall construct entrance pads at all locations where vehicles will enter or exit the site.
- B. Pad shall be a minimum of 20 feet wide, 50 feet long and 6" thick, and consist of No. 2 stone laid on top of filter fabric

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Erosion and sediment control practices shall be consistent with the requirements of the state and local regulatory agencies and in any case shall be adequate to prevent erosion of disturbed and/or regraded areas.
- B. Contractor is responsible for notifying the state regulatory agency concerning inclusion under the NPDES General Permit for Storm Water Discharges From Construction Activities.

### 3.02 SEEDING

- A. The areas to be seeded shall be thoroughly tilled to a depth of at least 4" by discing, harrowing, or other approved methods until the condition of the soil is acceptable to the Engineer. After harrowing or discing, the seed bed shall be dragged and/or hand raked to finish grade.
- B. The incorporation of the fertilizer and the agricultural lime may be a part of the tillage operation and shall be applied no less than 24 hours nor more than 48 hours before the seed is to be sown.
- C. Seed shall be broadcast either by hand or approved sowing equipment at the rate of ninety (90) pounds per acre (two pounds per 1,000 square feet), uniformly distributed over the area. Broadcasting seeding during high winds will not be permitted. The seed shall be drilled or raked into a depth of approximately ½ inch and the seeded areas shall be lightly raked to cover the seed and rolled. Drilling seeding shall be done with approved equipment with drills not more than 3 inches apart. All ridges shall be smoothed out, and all furrows and wheel tracks likely to develop into washes, shall be removed.
- D. After the seed has been sown, the areas so seeded shall be mulched with clean straw at the rate of one (1) bale per 1,000 feet (approximately 2 inch loose depth). Mulch on slopes and in all ditches and drainage channels shall be held in place with erosion control blankets.
- E. Areas seeded shall be watered and protected until a uniform stand develops, and then inspected periodically and maintained appropriately. Displaced mulch shall be replaced or any damage to the seeded area shall be repaired promptly, both in a manner to cause minimum disturbance to the existing stand of grass. If necessary to obtain a uniform stand, the Contractor shall refertilize, reseed and remulch as needed. Scattered bare spots up to one (1) square yard in size will be allowed up to a maximum of 10 percent of any area.
- F. Payment for seeding and mulching shall be included in the Contractor's bid.

### 3.02 SOD

- A. To install, bring soil to final grade and clear of trash, wood, rock, and other debris. Apply topsoil, fertilizer at approximately 1000 lbs per acre.
- B. Use sod within 36 hours of cutting. Lay sod in straight lines. Butt joints tightly, but do not overlap joints or stretch sod. Stagger joints in adjacent rows in a brickwork type pattern. Use torn or uneven pieces on the end of the row.
- C. Notch into existing grass. Anchor sod with pins or stakes if placed on slopes greater than 3:1. Roll or tamp sod after installation and water immediately. Soak to a depth of 4 to 6 inches. Replace sod that grows poorly. Do not cut or lay sod in extremely wet or cold weather. Do not mow regularly until sod is well established.

### **3.04 INSTALLATION OF EROSION AND SEDIMENT CONTROL DEVICES**

- A. All erosion and sediment control products and materials shall be installed per manufacturer's recommendations and in accordance with the Kentucky Erosion Prevention and Sediment Control Field Guide.
- C. Contractor shall pay special attention to the trenching-in of the bottoms of silt fence, the staking of sediment barriers, and the stapling of erosion control blankets.

### **3.05 MAINTENANCE OF EROSION AND SEDIMENT CONTROL DEVICES**

- A. Erosion and sedimentation controls shall be inspected weekly and after rain events of 0.5 inch or greater. Replace silt fencing as needed, filter stone which is dislodged, erosion control blanket which is damaged, and make other necessary repairs.
- B. Remove sediment from fences and barriers when it accumulates to half the height of the barrier, or more often as needed.

### **3.06 CLEAN UP**

- A. Upon completion of the project and/or establishment of satisfactory turf, vegetation or permanent erosion control structures, Contractor shall remove all temporary devices and properly dispose of such.

### **3.07 NPDES GENERAL PERMIT FOR STORM WATER DISCHARGES FROM CONSTRUCTION ACTIVITIES**

- A. The Contractor is responsible for filing the appropriate Notice of Intent (NOI) letter at least 48 hours prior to start of construction activity. The Notice of Intent (NOI) is a Kentucky Pollution Discharge Elimination System (KPDES) permit application as provided by the Kentucky Revised Statutes, Chapter 224. This application is required to be submitted for construction projects that disturb one or more acres of land. A permit application form is included at the end of this section.
- B. The NOI is filed under the General Permit for Storm Water (issued 9/30/92, effective 10/01/92) and labeled as KYR100000 - General Permit for construction sites. The Notice of Intent (NOI) letter requirements are stated along with the mailing address below.

### **3.08 NOTICE OF INTENT LETTER REQUIREMENTS**

- A. Concerning storm water permitting, you will be required to submit a letter of Notice of Intent to be covered under the storm water general permit. The following are to be contained in the Notice of Intent letter:
  - 1. Name, mailing address, and location of the facility for which the notification is submitted;
  - 2. Up to four (4) 4-digit SIC codes that best represent the principal products or activities provided by the facility. The following are the typical construction SIC codes utilized:

1542 - Building Construction, nonresidential, except industrial and warehouses  
1623 - Water Main Construction, Sewer Construction  
1629 - Water and Wastewater Treatment Plant Construction  
1711 - Water Pump Installation  
1781 - Drilling Water Wells

3. The operator's name, address, telephone number, ownership status and status as federal, state, private public or other entity. On construction sites, the facility operator is the Contractor.
4. The name of the receiving water(s), or if the discharge is through a municipal separate storm sewer, the name of the municipal operator of the storm sewer and the ultimate receiving water(s); and
5. Existing quantitative data describing the concentration of pollutants in the storm water discharge. If there is no existing quantitative data, report "no existing quantitative data."
6. **Additional requirements for construction activities.** The Notice of Intent for a storm water discharge associated with industrial activity from a construction site shall, in addition to the information required above, include a brief description of the project, estimated timetable for major activities, estimates of the number of acres of the site on which soil will be disturbed, **and a certification that the storm water pollution prevention plan for the facility provides compliance with state or locally approved sediment and erosion plans, state or locally approved storm water management plan, state or local sewer use ordinances, and state or local septic system requirements.**

### 3.09 WHERE TO SUBMIT

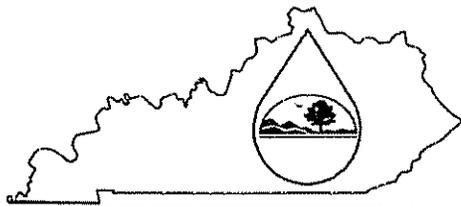
Section Supervisor, Inventory and Data Management Section, KPDES Branch, Kentucky Division of Water, 14 Reilly Road, Frankfort Office Park, Frankfort, Kentucky 40601.

### 3.10 REQUIRED FOR THIS CONTRACT

- A. The Contractor shall prepare the NOI for both the Contractor and the Owner's signature.
- B. The Contractor shall submit the NOI to the Kentucky Division of Water (address noted above) at least forty-eight (48) hours prior to the start of work activities. There is no need to wait on a response from the regulatory agency.
- C. This shall occur at or before the Order to Commence Work date given by the Owner.
- D. The Contractor shall file a Notice of Termination (NOT) when General Permit coverage is no longer needed (General Permits describe how this is done). An example copy shall be on file as noted in Item 5 above.

END OF SECTION

**KPDES FORM NOI-SW**



**Kentucky Pollutant Discharge Elimination System  
 (KPDES)  
 Notice of Intent (NOI)  
 for Storm Water Discharges  
 Associated with Industrial Activity Under the  
 KPDES General Permit**

Submission of this Notice of Intent constitutes notice that the party identified in Section I of this form intends to be authorized by a KPDES permit issued for storm water discharges associated with industrial activity. Becoming a permittee obligates such discharger to comply with the terms and conditions of the permit.

**ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM (See Instructions on back)**

**I. Facility Operator Information**

<b>Name:</b>		<b>Phone:</b>	
<b>Address:</b>		<b>Status of Owner/Operator:</b>	
<b>City, State, Zip Code:</b>			

**II. Facility/Site Location Information**

<b>Name:</b>			
<b>Address:</b>			
<b>City, State, Zip Code:</b>			
<b>County:</b>			
<b>Site Latitude: (degrees/minutes/seconds)</b>		<b>Site Longitude: (degrees/minutes/seconds)</b>	

**III. Site Activity Information**

<b>MS4 Operator Name:</b>							
<b>Receiving Water Body:</b>							
<b>Are there existing quantitative data?</b>	Yes <input type="checkbox"/>	If Yes, submit with this form.					
	No <input type="checkbox"/>						
<b>SIC or Designated Activity Code Primary</b>		<b>2nd</b>		<b>3rd</b>		<b>4th</b>	
<b>If this facility is a member of a Group Application, enter Group Application Number:</b>							
<b>If you have other existing KPDES Permits, enter Permit Numbers:</b>							

**IV. Additional Information Required FOR CONSTRUCTION ACTIVITIES ONLY**

<b>Project Start Date:</b>		<b>Completion Date:</b>	
<b>Estimated Area to be disturbed (in acres):</b>			
<b>Is the Storm Water Pollution Prevention Plan in Compliance with State and/or Local Sediment and Erosion Plans?</b>		Yes <input type="checkbox"/>	No <input type="checkbox"/>

**V. Certification:** I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

<b>Printed or Typed Name:</b>		
<b>Signature:</b>	<b>Date:</b>	





## **SECTION 02510 - WATER DISTRIBUTION PIPING**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances specified herein.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Valves - Utility Services: Section 02515

#### **1.03 SUBMITTALS**

- A. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications.
- B. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 01340.

#### **1.04 EXISTING CONDITIONS**

- A. The existing piping shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping depicted. All new piping which ties into existing lines must be made compatible with that piping.
- B. So that piping conflicts may be avoided, Contractor shall open up his trench well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.
- C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

### **PART 2 - PRODUCTS**

#### **2.01 DUCTILE IRON PIPE AND FITTINGS**

- A. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, latest revision, with push-on joints unless otherwise noted on Drawings. All pipe shall be pressure class 250, or greater, with the exception of 24-inch pipe. Twenty-four inch pipe shall be pressure class 200.

- B. The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision. Thickness of the lining shall be as set forth in the ANSI/AWWA C104/A21.4 specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.
- C. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.
- D. Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.
- E. Joints for ductile iron pipe and fittings, as described hereinbefore, shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11, latest revision. Joints shall have the same pressure rating as the pipe or fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.
- F. Provide ANSI/AWWA C110/A21.10 mechanical joint plugs and locked or restrained pipe joints where indicated on Drawings. Fittings under structures shall be mechanical joint with retainer glands.

## 2.02 RESTRAINED JOINT DUCTILE IRON PIPE

- A. Restrained joint ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, latest revision, pressure class 350, with restrained push-on joints unless otherwise noted on Drawings.
- B. The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision. Thickness of the lining shall be set forth in the aforementioned specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.
- C. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.
- D. Fittings shall be pressure class 350 ductile iron and have restrained push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision with the exception of the manufacturer's proprietary design dimensions. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.
- E. The use of restrained joints utilizing a friction type connection shall **not** be accepted.
- F. Joints for ductile iron pipe and fittings, as described hereinbefore, shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11, latest revision. Joints shall have the same pressure rating as the pipe or fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.

- G. All pipe in the vicinity of a series of bends shall have restrained push-on joints, with lengths as recommended by the Engineer or pipe manufacturer. Pipe at ends left for future connections shall also have restrained push-on joints. All other tees, bends, and dead-ends shall have concrete thrust blocking.
- H. Restrained joint pipe and fittings shall be FLEX-RING Restrained Joint by American Ductile Iron Pipe, TR FLEX Restrained Joint by U.S. Pipe, SUPER-LOCK Restrained Joint by Clow Water Systems, SNAP-LOCK Restrained Joint by Griffin Pipe, or approved equal.
- I. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly.
- J. All restrained joint pipe and fittings shall be fabricated by the same pipe manufacturer.
- K. Where spigot end of restrained joint pipe connect with valves or other items that have mechanical-joint ends, connection shall be made with a restrained mechanical-joint gland. Restrained mechanical-joint connection shall be Mechanical- Joint Coupled-Joint by American Ductile Iron Pipe, MECH-LOK Restrained Joint by Griffin Pipe, or approved equal.

**2.03 COUPLING AND ADAPTORS**

- A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.
- B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.
- C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:
- D. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe -

Dresser	Rockwell
Style 138	4II

- E. Transition couplings for joining pipe of different outside diameters-

Dresser	Rockwell
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

- F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

Dresser	Rockwell
Style 127 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" C.I. Pipe)	913 steel (3" and larger)
Style 128 steel (2"-96" steel pipe)	

#### 2.04 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

- A. Where indicated on the Drawings, required by the Specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed.
- B. Concrete shall be 3000 psi, and reinforcing bars shall be as installed as indicated on the details.

#### 2.05 CONNECTION OF NEW WATER MAINS TO EXISTING SYSTEM

- A. The Contractor shall connect the new water main to existing water main where shown on the Drawings or directed by the Engineer, and shall furnish all necessary equipment and materials required to complete the connection.

### PART 3 - EXECUTION

#### 3.01 EXCAVATION FOR PIPELINE TRENCHES

- A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ANSI/AWWA C600 for ductile iron and Cast Iron O.D. (AWWA) PVC pipe or ASTM F-645 for Iron Pipe O.D. (ASTM) PVC pipe except as modified herein.
- B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.

- C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.
- D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.
- E. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.
- F. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.
- G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.
- H. Minimum cover of 30" shall be provided for all pipelines.

### **3.02 PIPE BEDDING**

- A. All pipe shall be supported on a bed of granular material, unless the trench has been prepared in accordance with Paragraph 3.01B. In no case shall pipe be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from large rock, foreign material, frozen earth, and shall be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel.
- B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.
- C. Where flexible pipe is used, the bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the

pipe. Granular bedding shall be Size #9-m or ASTM C 33, Size #7 crushed stone, fine gravel, or sand, and is not a separate pay item.

- D. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.
- E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.
- F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

### **3.03 SPECIAL GRANULAR FILL**

- A. As noted in Paragraph 3.02E, granular material for " Special Granular Fill " when directed by the Engineer shall be Department of Transportation crushed limestone, Size #9. Payment for " Special Granular Fill " must have approval from the Engineer prior to installation.

### **3.04 LAYING PIPE**

- A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.
- B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.
- C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure that it is clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. In case a length of pipe is cut to fit in a line it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.
- D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02 "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.
- E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.

- F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.
- G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

### 3.05 BACKFILLING PIPELINE TRENCHES

- A. Backfilling of pipeline trenches shall be accomplished as shown on the Drawings and with details set forth hereinafter. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction. In the event that pavement is not placed immediately following trench backfilling in paved areas, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times. Under pavement, all trench backfill shall be in accordance with Method C as shown on the Detail Drawings. All other trench backfill shall be in accordance with Method A or B.

- B. Method "A" - Backfilling in Open Terrain:

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12" above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner approved by the Engineer, and shall be carefully compacted to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.
2. The upper portion of the trench above the compacted portion shall be backfilled with material which is free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.

- C. Method "B" - Backfilling Under Sidewalks & Unpaved Driveways:

Backfilling of pipeline trenches under sidewalks and unpaved driveways shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner to avoid displacement of the pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.
2. The middle portion of the trench, from a point 12" above the top of the pipe to a point 6" below the grade line, shall be backfilled with material free from rock and/or acceptable to the Engineer. This material shall be placed and compacted

in layers of approximately 6 inches. Water (puddling) may be used as required to obtain maximum compaction.

Upon approval of the Engineer, the Contractor may backfill the middle portion of the trench with crushed stone, fine gravel, or sand in lieu of materials which require compaction.

3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

D. Method "C" - Backfilling Under Streets, Roads, and Paved Driveways:

Backfilling of pipeline trenches under streets, roads and paved driveways shall be accomplished in the following manner:

1. The lower portion of the trench from the pipe bedding to a point 6" below the bottom of the pavement or concrete sub-slab, shall be backfilled with # 9 crushed stone.
2. The upper portion of the trench, from a point 6" below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with a base course of dense graded aggregate. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

- E. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalk and unpaved driveways shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways and driveways shall be backfilled in accordance with Method "C". All methods are shown on the Detail Drawings. When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.

Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.

In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

### **3.06 SETTLEMENT OF TRENCHES**

- A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these rights-of-way within one (1) year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner.

### **3.07 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASUREMENT**

- A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the Specifications, or as directed by the Engineer.
- B. For cradle and encasement, concrete shall be 3000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.
- C. For thrust blocks and anchors, concrete shall be 3000 psi, and shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.
- D. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.
- E. Water mains shall have concrete thrust or "kicker" blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline. All reducers (increasers) shall be anchored.

### **3.08 UNPAVED DRIVEWAY (CRUSHED STONE) SURFACE REPLACEMENT**

- A. The Contractor shall replace those sections of existing driveways and parking areas required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.
- B. Material for backfilling of the pipeline trench shall be dense-graded aggregate in accordance with Method "B" as described hereinbefore.

### **3.09 TESTING**

- A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test to the rated working pressure of the pipe, under which leakage shall not exceed 10 gallons per 24 hours per inch of diameter per mile of pipe. Loss of water pressure during test shall not exceed 10 psi in a 24 hour period, 5 psi in a 10 hour period or, 0 psi in a 4 hour period.
- B. Leakage in pipelines, when tested under pressure of 50 psi excess of normal operating pressure, shall not exceed 10 gallons per 24 hours per inch of diameter per mile of pipe.
- C. Contractor shall furnish a recording gauge and water meter for measuring water used during leakage test and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-

hour spring wound clock, designed for 9-inch charts, and shall be approved by the Engineer. For Contractor's information only, such pressure recording devices may be available from the Foxboro Company, Foxboro, Massachusetts; Bristol Division of ACCO, Waterbury, Connecticut; or Weksler Instruments Corporation, Freeport, New York.

- D. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.
- E. Duration of test shall be not less than four (4) hours where joints are exposed and not less than 24 hours where joints are covered.
- F. Where leaks are visible at exposed joints and/or evident on the surface where joints are covered, the joints shall be laid and leakage must be minimized, regardless of total leakage as shown by test.
- G. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.
- H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.
- I. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.
- J. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.
- K. The cost of testing of pressure piping is incidental and is to be included in the Contractor's unit Contract Price.

### **3.10 CLEAN UP**

- A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

### **3.11 DISINFECTION OF RAW WATER LINES**

- A. The new raw water lines shall not be placed in service--either temporarily or permanently--until they have been thoroughly disinfected in accordance with the following requirements and to the satisfaction of the Engineer.
- B. After pressure and leak testing, a solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 50 ppm in the main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 50 ppm has been obtained throughout the pipe. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall be allowed to remain in the pipe for 24 hours, after which a residual of at least 25 ppm shall be

obtained. The disinfection shall be repeated until 25 ppm is obtained after which time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm, and then may be tested for the presence of coliform bacteria. Also, no additional payment will be allowed for providing taps for chlorine injection and/or flushing, if necessary. The Contractor is responsible for the disposal of highly chlorinated water flushed from the main.

- C. Sampling and testing for the presence of coliform bacteria in the lines that have been disinfected will be conducted by the Oldham County Water District. The contractor will allow sufficient time for notification of representatives of the District when raw water lines are ready for testing, which in no case will later than 3:00 pm.

### **3.12 ALTERNATE METHOD OF INSTALLATION**

- A. In lieu of traditional trenching methods for pipe installation, with the approval of the Engineer, the Contractor may choose to install the pipe utilizing the trenchless technology of horizontal directional drilling (HDD). Horizontal directional drilling shall be as specified in Section 02508.

END OF SECTION



## **SECTION 02516 - VALVES AND PIPING - WELL SITE**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required to furnish and install all valves, piping and appurtenances as shown on the Drawings and/or specified herein.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.
- B. Gravel Packed Well: Section 02520.
- C. Vertical Turbine Pumps: Section 11212.
- D. Access Hatches: Section 08370.

#### **1.03 SUBMITTALS**

- A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering. Comply with provisions of Section 01340.
- B. At the time of submission, the Contractor shall, in writing, call Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL**

- A. All inside valves and piping shall be painted with a Polyamide Epoxy three coat system.

#### **2.02 GATE VALVES**

- A. Gate valves 4" and larger shall conform with AWWA C-509 standard, and shall be of the resilient seat type, iron body, fully bronze mounted, non-rising stem and have a design working pressure of 150 psi. Valves shall be of standard manufacturer and of the highest quality both as to materials and workmanship.
- B. All gate valves shall be furnished with mechanical joint connections, unless otherwise shown on the Drawings or specified hereinafter.
- C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.

- D. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.
- E. Each gate valve shall be installed in a vertical position with a roadway type valve box. Gate valves set with valve boxes shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counter-clockwise). There shall be a maximum 48" depth of valve operating nut. CONTRACTOR must use extension stems, if necessary, to raise operator nut within 48" of final grade.

### 2.03 SILENT CHECK VALVES

- A. Silent check valves shall have a semi-steel body, 150 psi pressure class, flanged and drilled ANSI B16.1, Class 125. Plug, seat and guide bushings shall be ASTM B 143. Stainless steel helical spring shall be ASTM A 276.
- B. The plug which shall be guided at both ends with a through integral shaft will be opened by the velocity flow and closed by a stainless steel helical spring, which returns the plug to the seat before the reversal of flow occurs.
- C. To permit regrinding of seat in the field, the seat, plug and guide bushing shall all be easily removable and replaceable without the need for any special training and without the need for any tools unless provided by the manufacturer with the valve.
- D. Silent check valves shall be APCO Series 600 as manufactured by Valve & Primer Corporation, or approved equal.

### 2.04 WELL PUMP AIR AND VACUUM RELIEF VALVES

- A. Air and vacuum valve shall be designed to allow large quantities of air to escape out the orifice when the vertical turbine pump starts and must close water tight when the liquid enters the valve. The air and vacuum valve shall also permit large quantities of air to enter thru the orifice when the pump stops to break the vacuum and drain the pump suction. The discharge orifice shall be fitted with a throttling device, adjustable for restricting the discharge of air from the pump suction to minimize shock to the pump on pump starts.
- B. The valve shall consist of a body, cover, float, seat, and ductile iron baffle. The baffle will be shrouded with a water diffuser, designed to protect the float from direct contact of the rushing air and water to prevent the float from direct contact of the rushing air and water to prevent the float from closing with a shock or prematurely, in the valve.
- C. The seat shall be compression molded Buna-N, fastened to the valve cover, without distortion, for tight shut-off and easy removal and replacement, if necessary.
- D. The float shall be stainless steel, designed to withstand a minimum of 1,000 psi. The float shall be center guided for positive shut-off into the seat.
- E. The throttling device shall be cast iron with a heavy steel adjusting screw and locknut for locking in place after correct settlings are determined.
- F. The valve shall also be supplied with an additional air release valve.

- G. All materials of construction shall be certified in writing to conform to ASTM specifications as follows:

Body and Cover and Throttling Device:	Cast Iron	ASTM A48, Class 30
Baffle:	Ductile Iron	ASTM B536
Float:	Stainless Steel	ASTM A240
Seat:	Buna-N	
Water Diffuser:	Brass	ASTM B16
Exterior Paint:	Epoxy	TNEMEC Series 66 or equal, two coat system.

- H. All turbine pump air and vacuum valves shall be APCO (model number as listed below) as manufactured by Valve and Primer Company.

AIR AND VACUUM RELIEF VALVE SCHEDULE				
Location	Quantity	Size	Model	Working Pressure
Well	1 each well	2"	144 WD	150 psi

## 2.05 VALVE VAULTS

- A. Rectangular Valve Vault shall be either precast or cast-in-place reinforced concrete, of the dimensions and specifications noted on the Contract Drawings. Concrete shall have a 28-day compressive strength of 4000 psi. Cast-in-place concrete shall be as specified in Section 03300.
- B. Precast section joints shall be mortared or grouted; joined with AASHTO M-198-75 preformed flexible butyl type joint sealant, Hamilton-Kent "Kent-Seal No. 2", K.T. Snyder Company "rub'r-Nek", Press Seal Gasket "E-Z Stik", or equal. Joints shall be watertight.
- C. The vault floor shall be solid bottom with a layer of dense graded aggregate crushed stone base approximately 6-inches thick.

## 2.06 ACCESS LADDER

- A. Ladder shall be fabricated from aluminum alloy 6063T5. Side rails shall be 1/2" X 2-1/2" channels, spaced 24" apart. Rungs shall be aluminum channel or bars, spaced 12" on center. Top of rungs shall have non-slip surface.
- B. Ladder shall be supported at top and bottom and at minimum 5' intervals with stainless steel brackets, welded or bolted, designed for adequate support and anchorage. Ladder shall be mounted with a minimum 7" clearance from wall to rungs.
- C. Comply with the requirements of ANSI A14.3, unless otherwise indicated.

## 2.07 ACCESS HATCHES

- A. Access hatches for valve vault shall be as specified in Section 08370 of these specifications. Dimensions shall be as noted on the Drawings.

## **2.8 FLANGED PIPE AND FITTINGS**

- A. All inside piping shall be flanged ductile iron with threaded flanges in accordance with ANSI A21.15. All piping shall be rated for a working pressure of 200 psi and shall have ring gaskets, 1/8-inch thick.
- B. The interior of all ductile iron pipe shall be cement-mortar lined with bituminous seal coat in accordance with ANSI A21.4. Thickness of the lining shall be as set forth in Section 02530 of the aforementioned specification.
- C. Ductile iron fittings shall conform to ANSI A21.10 with flanges faced and drilled 125 pound.
- D. The pipe manufacturer shall furnish notarized certificate of compliance with applicable specifications.

## **2.9 FLANGED COUPLING ADAPTERS**

- A. Flanged coupling adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling. All flanged adapters shall be harnesses. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending the adjacent pipe flanges. The harness shall be designed for axial thrust due to a working pressure of not less than 200 psi. Not less than four special bolts shall be furnished for each adaptor. Flanges on flanged adaptor (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.
- B. Flanged adapters shall be as manufactured by Dresser, Rockwell, or equal.

## **2.10 HOSE BIBB**

- A. Hose bibb shall be rough bronze body, with wheel handle, renewable composition disc, 1/2- or 3/4-inch threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, nonremovable, drainable, hose connection vacuum breaker.

## **PART 3 - EXECUTION**

### **3.01 EXCAVATION**

- A. All excavation required for execution of the work shall be done as part of the lump sum price for the complete valve vault; no classification of excavation will be made.

### **3.02 INSTALLATION**

- A. All equipment, piping and appurtenances shall be installed in accordance with the manufacturer's recommendations.

END OF SECTION

## **SECTION 02520 - GRAVEL PACKED WELLS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. The work to be done by the Contractor shall consist of furnishing and delivering to the job site all material and equipment and furnishing all labor necessary for the complete installation of two (2) new municipal water supply wells and well pumps. The work to be accomplished shall include drilling of wells, installing well pumps, pump and motor platforms, piping and valving, valve vault, site work, fencing, and associated electrical work. The work to be done shall also include all necessary test drillings and tests on completed wells which will verify to the Owner and the Engineer that each new well will meet the minimum guaranteed capacity of no less than 2100 gallons per minute, although specified capacity of the pumps shall be 1400 gpm. The new wells shall meet all requirements as set forth in the following detailed Specifications, and shall comply with 401 KAR Chapter 6.

#### **1.02 REQUIRED WORK SPECIFIED ELSEWHERE**

- A. Division 2 – Site Work
- B. Division 5 – Metals
- C. Section 09960 – Painting
- E. Section 11212 – Vertical Turbine Pumps
- E. Division 16 – Electrical

#### **1.03 PERMITS, CERTIFICATES, LAWS AND ORDINANCES**

- A. The Contractor shall at his own expense procure all permits, certificates, and licenses required of him by law for the execution of this work. He shall comply with all Federal, State and local laws, ordinances, rules and regulations governing the performance of the work. The Contractor shall have a minimum of seven years of experience in the drilling of similar size or larger municipal water supply wells.

#### **1.04 SUBMITTALS**

- A. In addition to the submittals required by Specification Section 01340 – Shop Drawings, Product Information and Samples, the Contractor shall provide detailed drawings of the well tower platform, ladder, handrail, grating and other related metal items, bearing the stamp of a registered structural engineer.

#### **1.05 WELL LOCATIONS**

- A. The new wells shall be located in the area shown on the Contract Drawings, in the same locations of the test wells drilled on the Campisano property. If there is a reason to

change the placement of the new wells, the exact locations will be determined in the field by the Owner and Engineer.

#### **1.06 TEST WELLS DRILLING REPORT**

- A. Prior to construction of the production wells, pilot holes were advanced to bedrock. Two (2) sets of samples were taken at 5' intervals and at changes in formation character. Samples were taken by means of mechanically driven split type core barrels. Sieve analyses were conducted on appropriate samples to determine gravel pack gradation and screen slot openings. Water samples were collected and sent to an approved laboratory for mineral and chemical analysis (see Appendix for Test Well Report).

#### **1.07 WELL CONSTRUCTION METHOD**

- A. The wells shall be constructed by the reverse circulation process or by bucket auger, with the free standing walls, using only clean water for drilling and completion. No additives may be used unless previously approved by the Engineer.

#### **1.08 DRILLING EQUIPMENT**

- A. The drilling equipment used for the work must be adequate in all respects to insure expeditious completion of the work. If the drilling equipment, in the opinion of the Engineer, proves to be inadequate or not in proper repair for the execution of work, the Engineer may order that repairs be made immediately or that more adequate equipment be furnished by the Contractor.

#### **1.09 DRILLER CERTIFICATION**

- A. The well driller/installer must be a certified driller in the state of Kentucky. Upon completion of the well installation, the Contractor shall submit the well drilling reports and test results to the Natural Resources and Environmental Protection Cabinet, Division of Water, Groundwater Branch.

#### **1.10 DEPTH OF WELLS**

- A. The wells will be advanced to bedrock, approximately 124' deep to 127.5' below existing grade. However, the exact depth will be determined by the well driller and the Engineer in the field.

#### **1.11 DECOMMISSIONING EXISTING TEST WELL**

- A. The Contractor shall cap and seal the existing test well on the property, and shall ensure that all work complies with 401 KAR Chapter 6. The well shall be sealed to prevent contamination by Ohio River flood water, but remain available for future use.

## **PART 2 - PRODUCTS**

### **2.01 OUTER CASING PIPE**

- A. The outer casing pipes shall have a minimum diameter of 36" and are to extend down to the top of the water bearing formation, or a minimum depth of 35'. The casings shall be galvanized corrugated metal pipe with a minimum wall thickness of 0.375". A minimum annular space of 6" between the formation and the casings will be maintained for the full length of the casing pipe. The space will be concreted throughout its entire depth with neat cement grout which shall not weigh less than 12.5 pounds per gallon. The grout shall be placed by pumping through the bottom of the casing under pressure.

### **2.02 INNER CASING PIPE**

- A. The inner casing pipe shall extend up and into the outer casing pipe to the Pitless Adapter Unit. The inner casing shall have a minimum diameter of 20" and shall be standard weight steel line pipe with a minimum wall thickness of 0.375." The inner casing shall be supplied with guides of adequate spacing to properly center it in the outer casing pipe.

### **2.03 SCREEN**

- A. Contractor shall install no less than 45' of well screen of the continuous slot, wire-wound design. It shall be directly connected to inner casing. It shall be fabricated by circumferentially wrapping a triangular shaped wire profile around equally spaced internal rods circular in shape. To insure maximum collapse strength and to provide a rugged one piece unit, which will neither loosen nor unwrap, each juncture between horizontal and vertical wire profiles shall be made by rapid electrical resistance fusion-welding under water. The entire unit shall be of all-welded construction including attachment of end fittings. The inlet slots shall have sharp outer edges, widening inwardly to resist clogging. Based on previous analysis of formation samples from existing test borings, slot openings are anticipated to be 0.060". The well screen shall be as manufactured by Johnson Division, Universal Oil Products Company, or approved equal.

The well screen and attached end fittings shall be completely fabricated of one corrosion-resistant metal which shall be type 304 stainless steel. The end fittings shall be provided constant with the well design and drilling methods used. The entire unit must be guaranteed by the well screen manufacturer. The diameter, length and wire shape or shapes of the well screen shall be such that the desired yield of the well will be transmitted through the slot openings at a minimum calculated entrance velocity of 0.1 feet per second. No louvered or "shutter" type screen will be considered.

A length of 45' of well screen will be required.

### **2.04 GRAVEL FILTER**

- A. A gravel filter shall be installed around the screen and casing pipe for the entire length. The gravel shall be well rounded and graded to proper size so as to retain at least 90% of the formation sand. The gravel wall filter surrounding the screen shall have a minimum thickness of not less than 8". The gravel shall be of the pure silica type only, as supplied by Parry Company of Chillicothe, Ohio or the Northern Gravel Company of Muscatine,

Iowa. Gravel shall be size #2 as designated by the Northern Gravel Company, unless information from the test boring dictates otherwise.

## **2.05 WELL STRUCTURE AND PLATFORM**

- A. The well structure, including the ladder, platform and handrail shall be of all aluminum construction and fabricated according to the contract plans.

## **PART 3 - EXECUTION**

### **3.01 VERTICAL ALIGNMENT AND PLUMBNESS**

- A. The wells shall be constructed round, true to line and shall not depart from the vertical more than 6" per each 100'. If doubt exists as to the departure from the vertical, the Contractor may be required by the Engineer to furnish equipment to test the plumbness of the well at no extra cost. No well will be accepted if the straightness or vertical alignment is unsatisfactory to the extent that it interferes with the installation of the pump intended for the well.

### **3.02 WELL DEVELOPMENT**

- A. The Contractor shall develop the well by means of both straight mechanical and air surging. The surge blocks shall consist of double surge blocks that are spaced at least 2' to three 3' apart and the surge block should fit freely in the well casing.

The proper air supply for this diameter well shall be furnished by the Contractor and consist of an air compressor of no less than 375 cfm capacity.

Prior to development, a solution of HTH shall be pumped into the well. This mixture shall consist of 100 pounds of HTH and shall be mixed in a drum or container of water on the surface.

The solution shall then be pumped into the well and straight mechanically surged throughout the full length of the screen for four (4) to five (5) hours. The well shall then be air surged throughout the full length of the screen for at least twelve (12) hours.

A second charge of HTH, equal in weight to the first charge, shall then be added to the well in the same manner as the first charge. Following straight mechanical surging of the solution of the well, the well shall be air surged until the water being discharged is clear of any discoloration due to the silt, clay, and/or chemicals being pumped out of the well. This second period of air surging shall be at least twelve (12) hours, and may be required for an additional 16 hours in order to accomplish maximum efficiency.

### **3.03 WELL STERILIZATION**

- A. At the conclusion of redevelopment, a solution of HTH with 70% available chlorine by weight shall be applied to the well in order to sterilize the well. The solution of ten (10) pounds of HTH shall be dissolved in a drum or container of water on the surface and then pumped into the well. The HTH shall have a contact time of four (4) hours and shall be

straight mechanically surged throughout the full length of the well in order to disinfect the well screen and casing. The chlorine solution shall then be pumped to waste.

### **3.04 TEST PUMP**

- A. A deep well turbine test pump capable of pumping at least 2,800 gpm shall be furnished by the Contractor and temporarily installed in the well to complete its development and to conduct a final pumping test of the well. Motive power such as a gasoline or diesel engine shall also be furnished by the Contractor. A valve shall be installed in the discharge pipe from the pump to control the rate of pumping and a freely discharging orifice of proper dimensions shall be installed at the end of the discharge pipe together with a transparent plastic manometer tube for measuring the rate of pumping from the well. The engine shall be capable of operating at least 24 hours without shutdown.

### **3.05 PUMPING TEST**

- A. Constant Rate Method: The Contractor shall furnish, install and remove the necessary measuring instruments and pumping equipment capable of pumping to the required point of discharge a minimum of 2,800 gpm. The pumping unit shall be complete with an ample power source, controls and appurtenances and shall be capable of being operated without interruption for a period of twenty-four (24) hours.

The well shall be pumped at a discharge rate of 2,800 gpm for a minimum of twenty-four (24) hours. The test pump shall have its intake at least 5' (1.5m) below the estimated lowest pumping level and shall have sufficient power and capacity to achieve the designated discharge rate. Discharge shall be measured with an accurate totalizing meter and stopwatch, a circular orifice meter, or a Venturi meter, any of which are subject to approval by the Owner or his representative. Discharge shall be maintained within plus or minus 5% of the designated rate by means of a gate valve or throttling device. Discharge shall be checked and adjusted, if necessary, every 10 minutes during the first hour of pumping and at thirty (30) minute intervals thereafter. The discharge and time of measurement shall be recorded each time it is checked and a note made of any adjustments. The static or non-pumping water level trend shall be established prior to the start of the test. Drawdown shall be measured each half hour; to the end of the test. Should the measurements not be made exactly at the times specified, actual time of each measurement shall be recorded. On completion of pumping, recovery measurements shall be made according to the above drawdown schedule.

The Engineer shall be notified of the test at least two (2) days prior to the test.

### **3.06 DISPOSAL OF PUMPING TEST WATER**

- A. During the period of final testing of the well, the Contractor will be required to conduct the water away from the well to avoid flooding of the land in the vicinity.

Method of disposal shall be approved by the Engineer. All ditches dug by the Contractor shall be filled to the satisfaction of the Engineer upon completion of the work.

### **3.07 RECORD OF PUMPING TESTS**

- A. The Contractor shall keep accurate records of the pumping test and furnish copies of all records to the Engineer upon completion of the test. The records shall also be available to the Engineer for inspection at any time during the test.

### **3.08 MEASUREMENT OF WATER LEVEL**

- A. The method of taking water level measurements shall be at the discretion of the Contractor; however, accuracy to within plus or minus .05 feet (1.5 cm) must be attained.

### **3.09 WATER SAMPLES AND ANALYSIS**

- A. A sample of the water from each strata of the well should be collected and analyzed by an independent laboratory, approved in advance by the Engineer, for coliform organisms after all traces of development and disinfectant chemicals have been removed from the well. If the laboratory analysis shows the water is not safe to use, disinfection and analysis shall be repeated until negative (good) results are reported by the laboratory, or until it is determined by the Health Department that disinfection of the well cannot overcome the problem.

### **3.10 SPECIFIC CONSTITUENT ANALYSIS**

- A. In order to obtain planning data for well maintenance, water treatment considerations and future needs and references, water quality data shall be obtained. The procedure shall be field analysis with confirming samples sent to approved laboratories for confirmation. Chemical analysis shall be as indicated below. Where three samples are indicated, separate samples shall be collected in the field and shipped to three independent laboratories.

1. Total Dissolved Solids
2. Total Hardness
3. Total Iron
4. Total Manganese
5. Chloride
6. Total Alkalinity
7. Nitrates (3 samples)
8. Ammonia (3 samples)
9. pH
10. Stability Index
11. Carbon Dioxide\*

12. Hydrogen Sulfide Gas\*

\* May require field test at well site.

**3.11 PROTECTION OF WELL**

- A. At all times during the progress of the work, the Contractor shall protect the well in such a manner as to effectively prevent either tampering with the well or the entrance of foreign matter into it

**3.12 ABANDONMENT OF WELL**

- A. In the event that the Contractor shall fail to sink any well to the depth required or should he abandon the well for any other reason, he shall, if requested and as directed by the Engineer, fill the well as specified by EPA Standards. If he salvages the casing or the materials before filling the well, such salvaged material shall remain his property.

**3.13 CONTRACTOR'S RESPONSIBILITY**

- A. The Contractor shall be responsible for performing all of the work in strict accordance with these Specifications. If evidence indicates that the screen or casing in a well is broken or that the well is not constructed in accordance with the Specifications to the satisfaction of the Engineer, the Engineer may order that proper changes be made by the Contractor. In the event that proper changes cannot be made, the Engineer may order the Contractor to abandon the well, without additional cost and to drill a new well.

**3.14 WELL LOGS AND CONSTRUCTION DRAWINGS OF GRAVEL WALL WELL**

- A. The Contractor shall keep a log of the geologic materials encountered in the drilling of the pilot well and shall furnish three (3) typewritten copies of such log to the Engineer on completion of the well. The Contractor shall also furnish three (3) copies of a drawing for the well showing the depth and exact construction of the well and giving all dimensions regarding lengths and diameters of casing and screen size of slot openings and other pertinent details and dimensions.

**3.15 OPERATIONS AND MAINTENANCE MANUAL**

- A. The contractor shall provide an operations and maintenance manual to the Owner upon final completion of the new wells. The manual shall include well logs and records, drillers logs, the results of sieve analysis, laboratory analysis and pumping tests, as well as operation, preventive maintenance and troubleshooting information on all mechanical and electrical equipment provided on the project. Also included shall be record drawings of the installation and programming for any telemetry that was provided.

END OF SECTION



## **SECTION 02730 - CRUSHED STONE ACCESS DRIVE**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required to construct the access roads and parking areas shown on the Drawings.
- B. This work shall be scheduled near the end of the project to minimize construction traffic on finished surface.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Earthwork: Section 02300

#### **1.03 APPLICABLE STANDARDS**

- A. All references in this section to the DOT Standard Specifications shall refer to the most recent edition of Standard Specifications for Road and Bridge Construction with all amendments and supplements thereto as published by the Kentucky State Transportation Cabinet, Department of Highways

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. All materials required for work in this section shall be as specified in the DOT Standard Specifications.
- B. Crushed stone aggregate course for the access road and parking area shall consist of DGA as specified in DOT Standard Specifications.
- C. Final compacted thickness shall be six (6) inches.

### **PART 3 - EXECUTION**

#### **3.01 SUBGRADE**

- A. On all areas, the ground surface shall be stripped of all vegetative cover, and the top 3" layer of soil shall be scarified and compacted in place.
- B. The subgrade shall be prepared to a smooth finish without indentation to the full width of the base course plus one foot of additional width beyond each edge, except where limited by structures.

- C. The subgrade shall be shaped by mechanical means until a uniform line and grade are established.
- D. Subgrade for the aggregate surface access road shall be shaped to a crown with slopes 1/2" to 3/4" per foot.

**3.02 AGGREGATE COURSE**

- A. Aggregate base course for the access road and parking area shall consist of DGA. Compacted thickness shall be six (6) inches over all areas.
- B. Thickness on the access road shall be uniform over the shaped subgrade to maintain the crown.
- C. Aggregate shall be machine compacted to the density established as satisfactory by the Engineer.

END OF SECTION

## **SECTION 02820 - CHAIN LINK SECURITY FENCES AND GATES**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and service required to furnish and install chain link fencing and gates according to the layout shown on the Contract Drawings. Height of the fencing fabric shall be seven (7) feet.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Finish Grading: Section 02300
- B. Concrete: Section 03300

#### **1.03 SUBMITTALS**

- A. Comply with provisions of Section 01340. At the time of submission, the Contractor shall in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.
- B. Shop Drawings:  
  
Indicate details of fabrication and installation, including but not limited to fence height, post spacing, dimensions, unit weights and footing details.
- C. Manufacturer's Literature:
  - 1. Descriptive data of installation methods and procedures;
  - 2. Standard drawings of fence and gate installation.

#### **1.04 PRODUCT DELIVERY, HANDLING AND STORAGE**

- A. Deliver materials with manufacturer's tags and labels.
- B. Handle and store material as to avoid damage.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Framework shall conform to one of the following:

1. Steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to ASTM F1043 - Group IA; external coatings per F1043 paragraph 7.1.1 and internal coatings per F1043 paragraph 7.2.1.
2. High strength steel pipe triple coated per ASTM F1043 - Group IC; external coatings per F1043 paragraph 7.1.2, and internal coatings per F1043 paragraph 7.2.4.

All coatings to be applied after welding.

Pipe shall be straight, true to section and shall conform to the following weights:

Pipe Size Outside Diameter	Group 1A Weight (Lbs per Ft.)	Group 1C Weight (Lbs per Ft.)
1-5/8"	2.27	1.84
2"	2.72	2.28
2-1/2"	3.65	3.12
3"	5.79	4.64
3-1/2"	7.58	5.71
4"	9.11	6.56

B. Fabric: Fabric shall be aluminized fabric manufactured in accordance with ASTM A-491 and coated before weaving with a minimum of 0.4 ounces of aluminum per square foot of surface area. The steel wire and coating shall conform to ASTM A-817. Fabric shall be 9 gauge, woven in a 2" diamond mesh. Top selvage to be twisted and barbed. Bottom selvage to be knuckled.

The aluminum coated wire shall have a tensile strength of at least 80,000 pounds per square inch.

### 2.02 COMPONENTS

Components of the fencing system shall be in accordance with the following requirements:

A. Fence Posts:

Fabric Height	Group IA or Group IC	
	Line Post O.D.	Terminal Post O.D.
Under 6"	2"	2-1/2"
6' to 9'	2-1/2"	3"
9' to 12'	3"	4"

B. Gate Posts:

Single Gate Width	Double Gate Width	Group IA or Group IC Post O.D.
Up to 6'	Up to 12'	3"
7' to 12'	13' to 25'	4"

C. Rails and Braces: 1-5/8" O.D.

D. Fittings:

1. Post Caps: Pressed steel, cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Supply cone type caps for terminal posts and loop type for line posts. All fittings to conform to ASTM F-626.
2. Rail and Brace Ends: Pressed steel, cast iron or cast aluminum alloy, cup-shaped to receive rail and brace ends.
3. Top Rail Sleeves: Tubular steel, 0.051 thickness x 7" long, expansion type.
4. Tension Bars: Steel strip, 5/8" wide x 3/16" thick.
5. Tension Bands: Pressed steel, 14 gauge thickness x 3/4" wide.
6. Brace Bands: Pressed steel, 12 gauge thickness x 3/4" wide.
7. Truss rods: Steel rod, 3/8" diameter merchant quality with turnbuckle.
8. Barbed Wire Arms: Pressed steel, cast iron or cast aluminum alloy fitted with clips or slots for attaching three strands of barbed wire. Arms shall be set outward on a 45 degree angle and be capable of supporting a 250 pound load at outer barbed wire connecting point without causing permanent deflection.

E. Tension Wire: Marcellled 7 gauge steel wire with minimum coating of 0.80 ounces of zinc or 0.40 ounces of aluminum per square foot of wire surface and conforming to ASTM A-824.

F. Tie Wires: Aluminum, 9 gauge, alloy 1100-H4 or equal.

G. Hog rings: Steel wire, 11 gauge, with a minimum zinc coating of 0.80 ounces per square foot of wire surface

H. Barbed Wire: Commercial quality steel, 12-1/2 gauge, two strand twisted line wire with 4 point barbs at 5-inch spacing. Coating shall consist of a minimum of 0.80 ounces of zinc per square foot of wire surface conforming to ASTM A-121 or a minimum of 0.30 ounces of aluminum per square foot of wire surface conforming to ASTM A-585.

### 2.03 CONCRETE MIX

A. Concrete for footings shall be ASTM C-94 Portland Cement concrete with maximum 3/4" aggregate having a minimum compressive strength of 3,000 PSI at 28 days.

## 2.04 GATES

- A. Gates shall be of the types and sizes shown on the Drawings. Gate filler fabric shall be of the same as that used in fence.
- B. Frames:

Swing gate frames shall be of 2" outside diameter galvanized Group IA or Group IC, having corners fitted with rigid watertight heavy malleable castings or electrically welded joints. Internal bracing shall be of 1-5/8" outside diameter galvanized steel pipe, Group IA or Group IC.
- C. Hinges:

Gate hinges shall be double clamping offset type allowing gates to swing back parallel with line of fence. They shall be malleable iron and forged steel heavily galvanized.
- D. Latches and Keepers:

Gate latch shall be of eccentric double locking type which engage strike securely bolted to either gate frame or gate post at both top and bottom. Latches shall be readily locked with padlock.

Gatekeeper shall be furnished with each gate frame to automatically engage gate frame when swung to open position.
- E. Gate manufacturer and supplier shall be responsible for all hardware associated with attaching gates and removable panels.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. General: Installation to conform to ASTM F-567.
- B. Post Spacing: Space line posts at intervals not exceeding ten feet.
- C. Post Setting: Set terminal, gate and line posts plumb in concrete footings of the dimensions shown on the Details. Top of footing to be 2" above grade and sloped to direct water away from posts.
- D. Bracing: Brace gate and terminal posts back to adjacent line posts with horizontal brace rails and diagonal truss rods.
- E. Top Rail: Install through line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts.
- F. Top Tension Wire: If top rail is not required, stretch tension wire through loop caps and fasten to terminal posts.
- G. Bottom Tension Wire: Stretch between terminal posts 6" above grade and fasten to outside of line posts with tie wires.

- H. Fabric: Pull fabric taut with bottom selvage 2" above grade. Fasten to terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15" intervals. Tie to line posts and top rails with tie wires spaced at maximum 12" on posts and 24" on rails. Attach to bottom tension wire with top rings at maximum 24" intervals.
- I. Barbed Wired: Anchor to terminal extension arms, pull taut and firmly install in slots of line post extension arms.
- J. Gates: Install gates plumb, level and secure for full opening without interference. Anchor center stops and keepers in concrete.
- K. Fasteners: Install nuts for fittings, bands, and hardware bolts on inside of fence.

### **3.02 COMPLETION**

- A. Adjust brace rails and tension rods for rigid installation.
- B. Tighten hardware, fasteners, and accessories.
- C. The area of installation shall be left free of debris caused by the installation of the fence.

END OF SECTION



## **SECTION 02920 - LAWNS AND GRASSES**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION OF WORK**

- A. Provide all labor, materials, equipment, and services required for seeding of all disturbed areas caused by construction activities and for installation of sod where indicated on the Contract Drawings or specified herein.

#### **1.02 RELATED DOCUMENTS**

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to Work of this Section.
- B. Earthwork: Section 02300

#### **1.03 MAINTENANCE**

- A. Maintenance shall begin immediately following the last operation of installation for each portion of lawn.
- B. Lawns shall be maintained by watering, mowing, and for resodding for a period of forty-five (45) days. At the end of this period an inspection will be made and any deficiencies, which may be attributable to the Contractor, will be noted in writing. At this time, the Owner will assume the maintenance. Another inspection will be made at the beginning of the next planting season, and any of the previously noted deficiencies still existing shall be repaired by the Contractor.

#### **1.04 INSPECTION FOR ACCEPTANCE**

- A. The Inspection of the Work:

The inspection of the work of lawns to determine the completion of contract work exclusive of the possible replacement of plants, will be made by the Architect/Engineer upon written notice requesting such inspection submitted by the Contractor at least ten (10) days prior to the anticipated date.

- B. Acceptance:

After inspection, the Contractor will be notified in writing by the Owner of acceptance of all work of this Section, exclusive of the possible replacement of plants subject to guaranty, or if there are any deficiencies of the requirements of completion of the Work.

## PART 2 - PRODUCTS

### 2.01 WATER

- A. Water used in this work shall be suitable for irrigation and free from ingredients harmful to plant life.
- B. Hose and other watering equipment required for the Work shall be furnished by the Contractor.

### 2.02 TOPSOIL

- A. The Contractor shall furnish and place sufficient topsoil for the seeding and installation of sod.

### 2.03 FERTILIZER

- A. Commercial fertilizer for lawn areas shall be complete fertilizer, formula 10-10-10, for lawns and shall conform to the applicable state fertilizer laws. Fertilizer shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guarantee analysis. Any fertilizer which becomes caked or otherwise damaged making it unsuitable for use will not be accepted.
- B. Fertilizer shall be applied at the rate of 25 pounds per 1,000 square feet.

### 2.04 GRASS SEED

- A. The seed mixture to be sown shall be in the following proportions:

<u>Common Name</u>	<u>Proportion By Weight</u>	<u>% of Purity</u>	<u>% of Germination</u>
Fine Lawn Fescue	40	90	85
Chewings Fescue	25	90	85
Italian Rye Grass	20	90	85
Red Top	10	90	85
White Clover	5	95	90

- B. All seed shall be fresh and clean and shall be delivered mixed, in unopened packages, bearing a guaranteed analysis of the seed mixture.
- C. Germination must be certified to conform to the following minimums:

Purity	90%
Germination	85%

### 2.05 SOD

- A. Sod shall be at least 70% Bluegrass, strongly rooted and free of pernicious weeds.

- B. It shall be mowed to a height not to exceed 3" before lifting, and shall be of uniform thickness with not over 1-1/2" or less than 1" of soil

## 2.06 MULCH

- A. Mulch for seeded areas shall be Conwed Hydro Mulch, Silva-Fiber, or equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment
- B. Clean straw is acceptable as mulch. It shall be spread at the rate of one (1) bale per 1,000 feet (approximately 2 inch loose depth).
- C. Mulch on slopes greater than 1: 3 shall be held in place with erosion control netting.
- D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with erosion control netting.

## PART 3 - EXECUTION

### 3.01 TIME OF PLANTING

- A. Planting operations shall be conducted under favorable weather conditions during seasons which are normal for such work as determined by accepted practice in the locality of the project. At the option and on full responsibility of the Contractor, planting operations may be conducted under unseasonable conditions without additional compensation.

### 3.02 LAWNS

- A. Areas to be sodded are designated on the Drawings. All other lawn areas, including areas of cut and fill and where existing ground has been disturbed by construction operations shall be seeded.

- B. Fertilizer:

Fertilizer shall be applied at the rate of 25 pounds per 1,000 square feet to the lawn area being prepared for planting and mixed lightly into the top few inches of topsoil. Fertilizer may be mixed with and distributed with grass seed.

- C. Planting of Lawns:

- 1. Sowing of Seed:

Immediately before any seed is to be sown, the ground shall be scarified as necessary, and shall be raked until the surface is smooth, friable and of uniformly fine texture. Lawn areas shall be seeded evenly with a mechanical spreader at the rate of 4 pounds per 1,000 square feet of area, lightly raked, rolled with a 200-pound roller and watered with a fine spray. The method of seeding may be varied at the discretion of the Contractor on his own responsibility to establish a smooth, uniform turf composed of the grasses specified. The sowing of seed shall be done only within the season extending from March 1st to May 15th and from September 1st to October 15th, unless other seasons may be approved by the Owner.

2. Laying of Sod:

Before any sod is laid, all soft spots and inequalities in grade shall be corrected. Fertilizer spread shall be raked in. Sod shall be laid so that no voids occur, tamped or rolled and then thoroughly watered. The complete sodded surface shall be true to finished grade, even and firm at all points. Sodding shall be done only within the seasons extending from March 1st to May 15th and from September 1st to October 15th, unless other seasons may be approved by the Owner.

3. Sod on Slopes:

Sod on slopes 2 to 1 or steeper shall be held in place by wooden pins about 1-inch square and about 6 inches long driven through the sod into the soil until they are flush with the top of the sod, or by other approved methods for holding the sod in place.

4. Mulching:

All seeded areas are to be mulched with Conwed Hydro Mulch, Silva-Fiber, or equal, or with clean straw as specified under PRODUCTS. Mulch shall be applied at the rate of 1,500 pounds per acre. It may be applied with hydraulic equipment or may be added to the water slurry in a hydraulic seeder and the seeding and mulching combined in one operation. Clean straw may be spread by hand to cover the seeded areas at a depth of two (2) inches. Erosion control netting shall be installed and anchored per manufacturer's instructions in areas of slopes, ditches, or surface water runoff.

### 3.03 CLEAN UP

- A. All soil, peat or similar material which has been brought over paved areas by hauling operations or otherwise, shall be removed promptly, keeping these areas clean at all times. Upon completion of the planting all excess soil, stone and debris which have not previously been cleaned up shall be removed from the site or disposed of as directed by the Owner. All lawns shall be prepared for final inspection.

### 3.04 OTHER WORK

- A. The Contractor also shall be responsible for the repair of any damage caused by his activities or those of his subcontractors, such as the storage of topsoil or other materials, operations or equipment, or other usages to all on-site areas outside the contract limits. Such repair operations shall include any regrading, seeding or other work necessary to restore such areas to an acceptable condition.

### 3.05 QUALITY CONTROL

- A. Areas seeded shall be protected until a uniform stand develops, when it will be accepted and the Contractor relieved of further responsibility for maintenance. Displaced mulch shall be replaced or any damage to the seeded area shall be repaired promptly, both in a manner to cause minimum disturbance to the existing stand of grass. If necessary to obtain a uniform stand, the Contractor shall refertilize, reseed and remulch as needed. Scattered bare spots up to one (1) square yard in size will be allowed up to a maximum of 10 percent of any area.

END OF SECTION  
LAWNS AND GRASSES

DIVISION 3

CONCRETE



## **SECTION 03300 - CAST-IN-PLACE CONCRETE**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required to furnish and install all cast-in-place concrete as indicated on the Drawings and specified herein.
- B. All concrete construction shall conform to all applicable requirements of ACI 301 (latest), Specifications for Structural Concrete for Buildings, except as modified by the supplemental requirements specified herein.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Earthwork: Section 02300

#### **1.03 SUBMITTALS**

The Contractor shall submit the following data for Engineer's review in accordance with Section 01340.

- A. Concrete mix designs, test results and curves plotted to establish water-cement ratio if ACI 301-05 Section 4.2.3.4.b is followed.
- B. Proposed mix designs and all necessary substantiating data used to establish the proposed mix designs if ACI 301-05 Section 4.2.3.1 is followed.
- C. Mix designs shall be submitted for all mixes proposed or required to be used, including all mixes containing admixtures.
- D. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Paragraph 4.2.3.2. of ACI 301.
- E. Submit shop drawings as specified in ACI 301. Submit shop drawing showing the location of proposed construction and control joints separate from the steel reinforcement shop drawings.
  - 1. Construction Joints
  - 2. Control Joints
  - 3. Steel Reinforcement

#### **1.04 QUALITY ASSURANCE**

The Contractor shall obtain and have available in the field office at all times, the following references:

- A. Specifications for Structural Concrete for Buildings ACI 301 (latest Revision).

- B. Field Reference Manual: Specifications for Structural Concrete for Buildings SP-15 (89).

Available from:

The American Concrete Institute  
Publications Department  
P.O. Box 19150  
Detroit, Michigan 48219-0150

- C. Manual of Standard Practice - CRSI. (Latest Edition).

- D. Placing Reinforcing Bars - CRSI (Latest Edition).

Available from:

Concrete Reinforcing Steel Institute  
933 North Plum Grove Road  
Schaumburg, Illinois 60173-4758

## **PART 2 - PRODUCTS**

### **2.01 CLASSES OF CONCRETE AND USAGE**

- A. Structural concrete of the various classes required shall be proportioned by either Method 1 or Method 2 of ACI 301 to produce the following 28-day compressive strengths:

1. Selection of Proportions for Class A Concrete:

- a. 4,000 psi compressive for strength at 28 days.
- b. Type II cement plus dispersing agent and air.
- c. Max. (water)/(cement and dispersing agent) ratio = 0.45.
- d. Min. cement content = 564 lbs. (6.0 bags)/cu. yd. concrete.
- e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max.). Walls with architectural treatment shall use No. 67 (3/4" max.).
- f. Air content = 6% plus or minus 1% by volume.
- g. Slump = 3" - 4" in accordance with ASTM C 143.

2. Selection of Proportions for Class B Concrete:

- a. 3,000 psi compressive strength at 28 days.
- b. Type I cement plus dispersing agent and air.
- c. Max. (water)/(cement and dispersing agent) ratio = 0.56.
- d. Min. cement content = 470 lbs. (5.0 bags)/cu. yd. concrete.

- e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max). Walls with architectural treatment shall use No. 67 (3/4" max.).
  - f. Air content = 6% plus or minus 1% by volume.
  - g. Slump - 3" - 4" in accordance with ASTM C 143.
- B. Concrete shall be used as follows:
- 1. Class A concrete for all concrete work except as noted below.
  - 2. Class B concrete for fill concrete, thrust blocks and topping over hollow-core slabs, and where indicated on the Drawings
- C. Type II cement conforming to ASTM C 150 shall be used in all structural concrete. The alkali content shall not exceed 0.6% calculated as sodium oxide. Cement for exposed to view concrete shall have a uniform color classification.
- D. Coarse aggregate for concrete shall be size No. 57, as specified in ASTM C33 unless a smaller size aggregate is required to conform to provisions of Section 4.2.2.3 of ACI 301. Coarse aggregate shall conform to all requirements of ASTM C33.
- E. Manufactured sand shall not be used as fine aggregate in concrete.
- F. Flyash: Flyash shall not be used.
- G. Silica Fume: Silica fume shall conform to ASTM D 1240. Use Force 10,000S Silica Fume by W.R. Grace; Sikacrete 950 by Sika Corporation; Rheomac SF 110 by Master Builders; or equal. Blended cements with interground silica fume will not be allowed.
- 1. Water content of liquid slurry silica fume admixtures shall be considered as part of the mixing water when calculating the water/cement ratio.
  - 2. Silica fume shall be added at the batch plant as recommended by the manufacturer. For all types of mixing equipment, mix times shall be increased by 40 percent over the minimum mix time required to achieve mix uniformity as defined by ASTM C 94. For truck-mixed and central mixed concrete, maximum allowable batch size shall be 80 percent of the maximum as called out by ASTM 94.

## 2.02 ADMIXTURES

- A. An air entraining admixture shall be used on all concrete and shall be synthetic air entrainment such as that manufactured by Master Builders or approved equal. Certification attesting to the percent of effective solids and compliance of the material with ASTM C 260 shall be furnished, if requested.

- B. A water-reducing, set controlling admixture (nonlignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the Engineer.
- C. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C 494, Type A, water-reducing and normal setting admixture, and when required, for ASTM C 494, Type D, water-reducing and retarding admixture when used with local materials with which the subject concrete is composed.
- D. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He shall also be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.
- E. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met:

The admixture shall conform to ASTM C494, except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C 494.
- F. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion, require the use of a set retardant admixture for mass concrete 2.5 feet or more thick for all concrete whenever the temperature at the time concrete is cast exceeds 80°F. The admixture shall be selected by the Contractor subject to the review of the Engineer. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.
- G. When more than one (1) admixture is used, all admixtures shall be compatible. They should preferably be by the same manufacturer.
- H. Calcium chloride will not be permitted as an admixture in any concrete.

### 2.03 REINFORCEMENT

- A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A 615. All bar reinforcement shall be deformed.
- B. Wire-mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction, and securely wired or clipped with standard clips.
- C. Smooth dowels shall be plain steel bars conforming to ASTM A 615, Grade 60, or steel pipe conforming to ASTM A 120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the

concrete. One end of dowels shall be oiled or greased or dowels shall be coated with high density polyethylene with a minimum thickness of 14 mils.

- D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall have approved high-density polyethylene tips so that the metal portion shall be at least one-quarter of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks. Particular attention is directed to the requirement of Paragraph 3.3.2.4 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.
- E. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project toward or touch formwork

**2.04 OTHER MATERIALS**

A. Anchorage items shall be of standard manufacture and of type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the Engineer.

- 1. Slots shall be galvanized dovetail-type as specified in Section "Masonry Work".
- 2. Inserts shall be malleable iron or steel, and of sturdy design adequate strength for the load to be carried. All inserts shall be galvanized. Adjustable wedge inserts shall have an integral loop or strap at the back, or shall be slotted to receive a special-headed bolt not smaller than 5/8-inch in diameter and of the required length and fitted with hexagonal nut. Other inserts shall be either threaded or slotted as required by their usage. Threaded inserts shall have integral lugs to prevent running.
- 3. Concrete anchors shall be an approved expansion type conforming to Federal Specification FF-S-325, Groups I, II, III, or VIII and shall be installed in strict accordance with the manufacturer's recommendations. Material for anchors shall be as specified in Section 05500 "Miscellaneous Metals". Anchors shall develop ultimate shear and pull out loads of not less than the following values in Class A concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
1/2	4,500	4,600
5/8	6,900	7,700
3/4	10,500	9,900

B. Epoxy bonding adhesive used to bond fresh plastic concrete to sound, hardened concrete shall meet the following Specification. Contractor shall furnish a notarized certification by the manufacturer that the proposed material meets the Specification.

- 1. Material:

The epoxy material shall consist of a 2-component system whose components conform to the following requirements:



- E. Joint sealants shall conform to ANSI A 116.1. The following joint sealants are acceptable:
1. Colma by Sika Chemical Corporation
  2. Hornflex by A.C. Horn, Inc.
  3. Sonolastic by Sonneborn Division of Contech, Inc.
- F. Nonshrink grout shall be Embecco 636 grout by Master Builders Company, Euco Firmix grout by the Euclid Chemical Company, or equal. The approved product shall be delivered to the site of the Work in the original sealed containers, each bearing the trade name of the material and the name of the manufacturer.
- G. Hardeners and dustproofers shall be colorless, aqueous solution of zinc or magnesium fluosilicate. Each gallon of solution used for the first application shall contain not less than one pound of crystals. Each gallon of solution used for subsequent application shall contain not less than two pounds of crystals. Materials shall be reviewed by the Engineer.
- H. Porous fill shall be crushed rock or gravel of such size that all will pass a 1-1/2 inch screen and not more than 5 percent will pass a No. 4 screen, free from earth clay or other foreign substances.
- I. Waterstops: Waterstops shall be styrene-butadiene rubber, standard (non-split) type, flat dumbbell shape (no center bulb), of size shown on Drawings, complete with fittings as required such as unions, vertical tees, vertical ells, flat crosses, flat ells, flat tees, etc. Waterstops shall be securely wired into place to maintain proper position during placement of fresh concrete, as shown on the Drawings. Care shall be taken in the installation of the waterstop and the placing of the concrete to avoid "folding" while concrete is being placed, and to prevent voids in the concrete surrounding the waterstop.

All materials, including adhesive, shall be W.R. Grave SERVICISED Construction Products; Williams Products, Inc.; Construction Gaskets, Inc.; or equal, and shall be installed in accordance with the manufacturer's recommendations

- J. Form Liners: Form liners for construction of fluted wall treatment shall be prefabricated plastic liners as manufactured by Greenstreak Plastic Products, Interform Company, or Symons Corporation.

Liners shall be fiberglass or ABS (acrylonitrile - butadiene - styrene) of such configuration as to obtain the fluted pattern shown or indicated on the Drawings.

For purposes of designating type and quality of material required, form liners shall be pattern 361 trapezoidal liners as manufactured by Greenstreak Plastic Products.

Preparation of forming materials, sealing of joints to prevent grout leakage and form release treatment (if required) shall be in strict compliance with the manufacturer's printed instructions and recommendations.

### **PART 3 - EXECUTION**

### 3.01 FINISHES

#### A. Exposed to Public View Concrete Surfaces:

1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such quality that only nominal finishing will be required. The provisions of paragraphs 6.2.2.1 and 6.3.6 of ACI 301 shall apply to all exterior exposed to public view concrete surfaces, including the outside surfaces of tanks.
2. Forms for exposed concrete surfaces shall be exterior grade, high-density overlay plywood, steel, or wood forms with smooth tempered hard-board form-liners.
3. Forms shall be coated with an approved release agent before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet water prior to placing concrete.
4. Recessed joints in concrete shall be formed using lacquer-coated wood battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.
5. Chamfer strips shall be one (1) inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Corp., Vinylex Corp., or equal.
6. Particular attention is directed to the requirements of paragraphs 5.3.3.3G and 6.3.3 of ACI 301. Form panels shall be provided in the maximum sized practicable in order to minimize form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.
7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.
8. Form ties shall remain in the walls and shall be equipped with a waterseal to prevent passage of water through the walls. Minimum set back of form ties shall be 1-1/2 inches from faces of wall. The hole left by removal of tie ends shall be sealed and grouted in accordance with the procedure described hereinafter in Par. 3.01.F. Form ties will be permitted to fall within as-cast areas of architecturally treated wall surfaces (ACI Chapter 13); this does not apply to walls receiving decorative waterproof masonry coating.
9. All formed exposed to view concrete surfaces shall have a "smooth rubbed finish". Exterior vertical surfaces shall be rubbed to one foot below grade. Interior exposed to public view vertical surfaces of liquid containers shall be rubbed to one (1) foot below the minimum liquid level that will occur during normal operations.

#### B. All vertical surfaces in liquid containing structures shall have a "smooth form" finish.

All "smooth form" concrete vertical surfaces shall be a true plane within 1/4 inch in ten (10) feet as determined by a ten (10) foot straightedge placed anywhere on the surface in any direction. Abrupt irregularities shall not exceed 1/8 inch.

- C. Basin, flume, conduit and tank floors shall have a "troweled" finish unless shown otherwise on Drawings.
- D. Weirs and overflow surfaces shall be given a "troweled" finish.
- E. Exterior platforms, steps and landings, shall be given a "broom" finish. "Broom" finish shall be applied to surfaces which have been steel-troweled to an even, smooth finish. The troweled surface shall then be broomed with a fiber-bristle brush in the direction transverse to that of the main traffic.
- F. Patching of holes due to removal of tie ends and other repairable defective areas, shall be as follows: Entire contact area of hole shall be coated with two-part moisture insensitive epoxy bonding compound as specified in Par. 2.04.B. in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Patching mortar shall be mixed and placed in general accordance with ACI Par. 5.3.7.5.
- G. For floors and slabs in which drains occur, special care shall be exercised to slope the floors uniformly to the drains. All floors with drains shall be sloped not less than 1/8 inch per foot unless otherwise shown. In all areas where quarry tile or other materials requiring more than 1/4 inch drop are to be overlaid, the concrete base slab shall be depressed as shown to provide a finished floor at the same elevation as surrounding areas.

### **3.02 TESTING**

- A. All testing shall be in accordance with provisions of ACI 301. Testing services listed in ACI Sections 1.6.4 shall be performed by a testing agency acceptable to the Engineer and Owner.
- B. The testing services of ACI sections 1.6.4.2 and 1.6.4.3 shall be performed at the Contractor's expense. The Contractor shall be responsible for making concrete test cylinders, storing and protecting concrete cylinders and delivering cylinders to the Owner-approved testing laboratory.
- C. Testing services of ACI Section 1.6.4.4 shall be paid for by the Contractor. Test shall be made for each 50 cubic yards of concrete and/or each day concrete is placed.

### **3.03 ADDITIONAL REQUIREMENTS**

- A. Unless otherwise directed by the Engineer, the vertical surfaces of footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.
- B. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. Fill required to raise the subgrade shall be placed as specified in Section 02300 "Earthwork". Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Waterproof paper, polyethylene sheeting of nominal

4-mil minimum thickness, or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.

- C. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.
- D. Concrete that is truck mixed or transported in truck mixers or truck agitators shall be delivered to the site of the work and discharged completed in the forms within the time specified in Paragraph 11.7 of ASTM C 94 except that when the concrete temperature exceeds 85°F., the time shall be reduced to 45 minutes. Transit-mixed concrete that is completely mixed at the site of concrete placement or batched cement and aggregates transported to mixers shall be placed in the forms within 1-1/2 hours after cement has been added. Concrete shall be placed in the forms within 15 minutes after discharge from the mixer at the job site.
- E. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.
- F. All concrete surfaces not in contact with forms shall be moist cured by the application of absorptive mats or double thicknesses of fabric kept continuously wet. Forms shall be kept continuously wet. Use of other curing methods will not be permitted unless written authorization is received from the Engineer.
- G. The unit of operation shall not exceed 30 feet for tank walls and walls exposed to weather, and 45 feet for other work in any horizontal direction and not less than 48 hours shall elapse between casting of adjoining units unless these requirements are waived by the Engineer. Provision shall be made for jointing successive units as indicated or required to be made at spacing of approximately 25 feet. Additional construction joints required to satisfy the 25 foot spacing shall be located by the Contractor subject to the review of the Engineer. The Contractor shall submit for review drawings separate from the steel reinforcing drawings, showing the location of all proposed construction joints. All construction joints shall be prepared for bonding by roughening the surface of the concrete in an acceptable manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface. Joints in walls and columns shall be maintained level. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.
- H. Formwork for beam soffits and slabs and other parts that support the weight of concrete, shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.
- I. Concrete Walks and Curbs:
  - 1. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with approved material. Concrete walks shall be placed upon porous fill covered with waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness or polyethylene-coated burlap.

2. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 5 linear feet in each groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at all returns, driveways, and opposite expansion joints in adjacent curbs. Where curbs are not adjacent, transverse expansion joints shall be installed at intervals of approximately forty (40) feet. Sidewalks shall receive a "broomed" finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/6 inch. Sidewalks adjacent to curbs shall have a slope of 1/4 inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a slope of 1/4 inch per foot. The surface of the concrete shall show no variation in cross section in excess of 1/4 inch in 5 feet. Concrete walks shall be reinforced with 66-1010 welded wire fabric.
3. Concrete curbs shall be constructed to the section indicated on the Standard Detail, and all horizontal and vertical curves shall be incorporated as indicated or required. Forms shall be steel as approved by the Engineer. At the option of the Contractor, the curbs may be precast or cast-in-place. Cast-in-place curbs shall be divided into sections 8 to 10 feet in length using steel divider plates. The divider plates shall extend completely through the concrete and shall be removed. Precast curbs shall be cast in lengths of 4 to 5 feet. All exposed surfaces of concrete shall be finished smooth. All sharp edges and the edges of joints and divisions shall be tooled to 1/4 inch radius. Steel reinforcement shall be installed where the curb crosses pipe trenches or other insecure foundations. Such reinforcement shall consist of two (2) No. 4 deformed bars near the bottom of the curb and shall extend at least 24 inches beyond the insecure area. Transverse expansion joints shall be installed at all curb returns and at intervals of approximately 40 feet.
- J. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing with nonshrink grout. Concrete surfaces shall be rough, clean, free of oil, grease, and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions. After the grout has set, exposed surfaces shall be cut back one (1) inch and covered with a parge coat of mortar consisting of one (1) part Portland cement, two (2) parts sand and sufficient water to make the mixture placeable. Parge coat shall have a smooth dense finish. Exposed surfaces of grout and parge coat shall be water cured with wet burlap for seven (7) days.
- K. Grout fill which is formed in place by using rotating equipment as a screen, such as clarifiers and similar types of equipment, shall be mixed in proportions and consistencies as required by the manufacturer or supplier of the equipment.
- L. Watertightness:
  1. The structures which are intended to contain liquids and/or will be subjected to exterior hydrostatic pressures shall be so constructed that, when completed and tested, there shall be no loss of water and no wet spots shall show.
  2. As soon as practicable, after the completion of the structures, the Contractor shall fill them with water and if leakages develop or wet spots show, the Contractor shall empty such structures and correct the leakage in an approved manner. Any cracks which appear in the concrete shall be dug out and suitably repaired.

Temporary bulkheads over pipe openings in walls shall be provided as required for the testing.

3. After repairs, if any are required, the structures shall be tested again and further repaired if necessary until satisfactory results are obtained. All work in connection with these tests and repairs shall be at the expense of the Contractor.
  4. Waterstops shall be placed in other locations as indicated on the Drawings and as may be required to assure the watertightness of all containers of liquids. Special shop fabricated ells, tees and crosses shall be provided at junctions. Waterstops shall be extended at least 6 inches beyond end of placement in order to provide splice length for subsequent placement. In slabs and tank bottoms, water stops shall be turned up to be made continuous with waterstops at bottom of walls or in walls.
  5. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed by means of a groove cast completely around the pipe; the groove shall be filled with a quick setting hydraulic compound similar and equal to Waterplug as made by Standard Dry Wall Products, Inc., mixed and applied in accordance with the manufacturer's instructions.
- M. Unless otherwise shown or directed, all pumps, other equipment, and items such as lockers, motor control centers and the like, shall be installed on concrete bases. The bases shall be constructed to the dimensions shown on the plans or as required to meet plan elevations. Where no specific plan elevations are required, the bases shall be 6 inches thick and shall extend 3 inches outside the metal equipment base. In general, the concrete bases shall be placed up to 1-inch below the metal base. The equipment shall then be properly shimmed to grade and the 1-inch void filled with nonshrink grout. Prior to the final set of the grout it shall be cut back and the edge plastered with 1:2 cement mortar.
- N. Concrete which, in the opinion of the Architect-Engineer, has excessive honeycomb, aggregate pockets or depressions will be rejected and the Contractor shall, at his own expense, remove the entire section containing such defects and replace it with acceptable concrete.
- O. Manhole or access steps shall be plastic, constructed of copolymer polypropylene meeting the requirements of ASTM D 2146 for Type II, Grade 16906 material. Step shall be reinforced with ASTM A 615, Grade 60, #4 deformed steel reinforcing bar, be 9" deep, 14" wide, provided with notched tread ridge, foot retainer lugs on each side of tread and penetration stops for press fit installation. Plastic steps shall be PS2-PF as manufactured by M.A. industries, Inc., Peachtree City, Georgia. Steps shall be installed by drilling 1" diameter holes, minimum 3-3/4 inches deep into the wall, and then driving steps into hole to the penetration stop, resulting in a press fit condition.
- P. Tank pressure relief valves shall be 6" diameter Neenah Foundry Company R-5001-1, American Valve & Hydrant B315 1, or equal, floor type, with outside hooks or inside self-contained lock; quantity and spacing as shown on structural drawings. No part of pressure relief valves shall project above the neat line of the tank floor to prevent fouling of scraper mechanisms where used.
- Q. All existing contact surfaces with new patch shall be coated with moisture insensitive epoxy bonding adhesive, Sikadur Hi-Mod, Sonobond, or equal. Patch shall consist of base pour of 4,000 psi structural concrete, then a topping of non-shrink natural aggregate grout, Master Builders Masterflow 713, SonogROUT, or equal, mixed and placed in

accordance with manufacturer's instructions, to the thicknesses shown on Drawings.  
Coat base pour with epoxy bonding adhesive prior to placing grout course.

END OF SECTION



## **SECTION 03600-PRECISION GROUTING**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Provide all labor, material, equipment and services required for grouting of equipment, machinery, structural steel, handrails, anchor bolts and other items or work for which grouting is specified or required.
- B. The object of these Specifications is to obtain grout which can be mixed to a flowable consistency (i.e., thinner than plastic consistency), placed in leakproof forms, with a minimum of strapping, without bleed water exceeding Specification requirements. The requirement of 24 hour presoak of existing concrete is of prime importance and must be adhered to. Trade name of grout shall be submitted to Engineer for review well in advance of preparation for grouting.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Cast-in-place Concrete is included in Section 03300.
- B. Review all divisions and sections for equipment, machinery, and other items to be grouted.

#### **1.03 DESCRIPTION OF WORK**

- A. High strength, precision support of machine bases and soleplates, setting anchor bolts, including equipment subject to thermal movement and repetitive dynamic loading.
- B. Work includes providing a non-shrink, ready-to-use, fluid precision grout material; proportioned, pre-mixed and packaged at the factory; delivered to the job-site to place with only the addition of water; forming, placing and curing as specified in this section.

#### **1.04 QUALITY ASSURANCE**

Comply with the following codes, standards, tests and recommended practices for foundation concrete as applies to precision grouting.

- A. ACI 304R-85 " Guide for Measuring, Mixing, Transporting and Placing Concrete."
- B. ACI 305R-77 (Revised 1982) "Recommended Practice for Hot Weather Concreting."
- C. ACI 306R-78 (Revised 1983) "Recommended Practice for Cold Weather Concreting."
- D. ACI 347-78 "Recommended Practice for Concrete Formwork."
- E. ASTM C 309-74 "Standard Specifications for Liquid Membrane Forming Compounds for Curing Concrete."
- F. Manufacturer's Information Use of Grout: Attached to each bag of grout.

- G. Corps of Engineers CRD C-79 Method of Test for Flow of Grout Mixtures (Flow-Cone method).
- H. ASTM C 109-73 "Tentative Method of Test for Compressive Strength of Hydraulic Cement Mortars."

#### **1.05 SUBMITTALS**

- A. Purchase Orders: Furnish copies of purchase orders relating to materials in this Section to the Engineer prior to delivery.

### **PART 2 - PRODUCTS**

#### **2.01 GROUT**

- A. Precision-support grout shall consist of a cementitious system, special graded and processed ferrous metallic internal reinforcing aggregate, carefully graded natural fine aggregate and additional technical components.
- B. Grouts which depend upon aluminum powders, chemicals or other agents which produce gas for expansion are not acceptable.
  - 1. Free of gas producing agents.
  - 2. Free of oxidizing catalysts.
  - 3. Free of inorganic accelerators, including chlorides.
- C. Provide Performance Characteristics when mixed to fluid consistency, 25 to 30 seconds (Flow Cone Method CRD C-79), as follows:
  - 1. No visible bleeding and/or settlement up to 2 hours on 1/4 to 1/2 gal. grout poured into gallon can, covered with glass plate to prevent evaporation. Grout shall meet the requirements of Paragraph 4.1 of Corps of Engineers CRD C 588-76.
  - 2. Maintain firm, full contact with underside of 4'x 4' x 1/2" steel plate firmly bolted to supports at quarter points at 1, 7 and 14 days, evidenced by tapping of plate and visual observation after stripping. Grout shall be cured in accordance with manufacturer's printed instructions.
  - 3. Provide strengths as specified in Paragraph 3.05 (2" x 2" cubes). Prepare specimens and test in accordance with ASTM C 109-73.

#### **2.02 MEMBRANE CURING COMPOUND**

- A. Membrane forming curing compound shall be in accordance with ASTM C 309-74.

#### **2.03 WATER**

- A. Water shall be suitable for drinking.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION FOR GROUTING**

- A. Remove laitance down to sound concrete.
- B. Surface to receive grout shall be rough and reasonably level.
- C. Surface shall be properly wet cured. DO NOT USE CURING COMPOUNDS. (See Section 03300).
- D. Clean surface of oil, grease, dirt, and loose particles.
- E. Clean bolt holes, bolts and underside of bed plate.
- F. Saturate concrete including bolt holes for 24 hours prior to grouting. Blow out excess water with oil free compressed air, or siphon prior to grouting.

### **3.02 FORMWORK**

Formwork shall be compatible with proposed method of placing grout. Design for rapid, continuous and complete filling of space to be grouted.

- A. Build strong, tight forms braced so they will not leak or buckle under weight of fluid grout. On placing side, slant form at 45° angle and pour grout directly on slanted face. On other sides, place form ½" or more from base of bed plate and 1" or more higher than underside of the plate.
- B. Caulk forms with grouting material being used on inside or a sand-cement mortar outside to prevent leakage and loss of "head." Use expanded polystyrene or other means to caulk between foundation and portions of the bed plate and equipment to seal off areas where grout is not desired.

### **3.03 PREPARATION OF GROUT**

Preparation of grout shall be in paddle-type mortar mixer suitable mechanical mixer. DO NOT MIX BY HAND.

- A. Mix grout adjacent to area being grouted, have sufficient manpower and equipment available for rapid and continuous mixing and placing. DO NOT ADD CEMENT, SAND OR PEA GRAVEL ADDITIVES.
- B. Avoid a consistency that produces bleeding. Mix materials for a minimum of 3 minutes and place immediately. DO NOT RETEMPER. DO NOT USE MIXING WATER ABOVE 80°F. (27°C).

### **3.04 PLACING**

Placing of grout shall be at a temperature of 65-75 degrees F. (18-24 degrees C.) for foundation, bed plate and grout material. Maintain for 24 hours following installation, hereafter above 40

degrees F. (4 degrees C.) until strength exceed 4,000 psi (280 kg/cm<sup>2</sup>.) DO NOT USE COKE-FIRED SALAMANDERS.

- A. Place grout quickly and continuously; avoid surface of overworking material and segregation. DO NOT VIBRATE GROUT. DO NOT OVERWORK GROUT.
- B. Field service representative of the manufacturer shall be available during initial planning for installation to suggest recommended procedures and at start of placement for further suggestions.
  - 1. A minimum of three (3) days notice shall be given by the Contractor to the manufacturer prior to use of the product.

### 3.05 FINISHING AND CURING

Follow manufacturer's printed instructions for the brand and type of grout being used.

- A. The grout shall meet the following strengths:

	<u>Plastic Mix</u>	<u>Flowable Mix</u>
1-day	4,000 psi	2,000 psi
3-days	6,000 psi	3,000 psi
7-days	8,000 psi	5,000 psi
28-days	10,000 psi	7,000 psi

END OF SECTION

**DIVISION 5**

**METALS**



## **SECTION 05120 - STRUCTURAL STEEL**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services for furnishing and installing the structural steel as shown on the Drawings and specified herein.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Metal Fabrications: Section 05500
- B. Cast-In-Place Concrete: Section 03300

#### **1.03 SUBMITTALS**

- A. Complete shop and erection drawings shall be submitted for review. Shop drawings shall be submitted in accordance with Section 01340. All welds shall be indicated by standard welding symbols of the AWS.
- B. Templates shall be furnished, together with instructions for the setting of anchors, anchor bolts, and bearing plates. The Contractor shall ascertain that the items are properly set during the progress of the work.

#### **1.04 APPLICABLE PUBLICATIONS**

The current issue of the following publications form a part of this specification to the extent indicated by the reference thereto:

- A. American Institute of Steel Construction publications: (AISC):
  - 1. Code of Standard Practice for Steel Buildings and Bridges.
  - 2. Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.
  - 3. Manual of Steel Construction - Ninth Edition.
- B. American Welding Society Publication (AWS): Structural Welding Code, D1.1-82.
- C. Research Council on Riveted and Bolted Structural Joints (RCRBSJ) of the Engineering Foundation Publication: Specifications for Structural Joints Using ASTM A 325 or a 490 Bolts.

## 1.05 GENERAL REQUIREMENTS

- A. Except as otherwise specified hereinafter, the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings shall govern the Work. Welding shall be in accordance with AWS Code D1.1. High-strength bolting shall be in accordance with RCRBSJ Specifications for structural joints using ASTM A 325 or A 490 Bolts.
- B. Design of members and connections for any portion of the structures not indicated on the Contract Drawings shall be completed by the fabricator and indicated on the shop drawings.
- C. Substitution of sections or modification of details, or both, and the reasons therefor shall be submitted with the shop drawings for review. Approved substitutions, modifications, and necessary changes in related portions of the work shall be coordinated by the Contractor and shall be accomplished at no additional cost to the Owner.
- D. Responsibility for Errors: The Contractor shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural member.
- E. Storage of Materials: Materials shall be stored out of contact with the ground in such a manner and location which will minimize contamination and deterioration.

## PART 2 - PRODUCTS

### 2.01 MATERIAL

- A. Material shall conform to the following:
  - 1. Wide Flange Shapes ASTM A992
  - 2. Steel Plates, Channels, S-shapes, and HP-shapes ASTM A36
  - 3. Rectangular and Round Hollow Structural Sections ASTM A500, Grade B
  - 4. Steel Pipes ASTM A53
  - 5. Crane Rails ASTM A759
  - 6. Bolts ASTM A325
  - 7. Anchor Bolts ASTM F1554
  - 8. Rolled Steel Floor Plates ASTM A786
  - 9. Steel Castings ASTM A27, Grade 65-35
  - 10. Tension-control Twist-off type Bolt Assemblies ASTM F1852
  - 11. Hardened Steel Washers ASTM F436
- B. Welding electrodes shall conform to requirements shown in Table 4.1.1 of AWS D1.1 and shall be E70XX or F7XEXXX.

## PART 3 - EXECUTION

### 3.01 FABRICATION

- A. Structural material shall be fabricated and assembled in the shop to the greatest extent possible. Shearing, flame cuttings, and chipping shall be done carefully and accurately. Sheared and flame cut edges shall be finished smooth by grinding, chipping, or planing. The radii of re-entrant flame cut fillets shall be not less than one inch and as much larger

as practicable. Sole plates of beams and girders shall have full contact with the flanges. Where shown or required, stiffeners shall be fitted neatly between the flanges of beams and girders and, where tight fits are required to transmit bearing, the ends of stiffeners shall be milled or ground to secure an even bearing against the flanges or shall be grooved and fully butt-welded to the flanges. The corners of stiffener plates shall be cut to clear fillets of beams. The clearance between the ends of spliced web plates shall not exceed 1/4 inch. Assembled pieces shall be taken apart, if necessary, for the removal of burrs and shavings produced by the reaming operation. Structural steelwork shall be prepared for painting in accordance with the AISC specification and primed with paint materials hereinafter specified.

- B. Connections shall be as shown or, if connection details are not shown on the Drawings, the connects shall be designed for the reactions shown on the Drawings. Where connection details or reactions are not shown on the Drawings, the connections shall be designed for a shear equal to one-half of the allowable uniform load for simple beams, laterally supported, for the spans indicated, as tabulated in the AISC manual of steel construction, plus 5000 pounds. Connections shall be designed in accordance with the recommendations given in the AISC manual of steel construction, Eighth Edition. One-sided or other types of eccentric connections will be permitted only where shown on the Contract Drawings or accepted by the Engineer.
- C. Steel work to be encased in concrete, including surfaces of top flanges of members supporting concrete slabs shall, after fabrication, be cleaned of all oil or grease by solvent cleaners and, after erection, be cleaned of dirt and foreign material by thoroughly sweeping with a stiff fiber brush or other approved method.

### **3.02 ERECTION**

- A. The erection of structural steel shall be in accordance with the applicable provisions of the AISC specification.
- B. Anchor bolts and anchors shall be properly located and built into connecting work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.
- C. Column base and bearing plates shall be provided under all columns, and other members resting on walls or footings. Base and bearing plates may be attached or loose as noted on the shop drawings. Base plates and bearing plates shall be supported and aligned on steel wedges or shims. After the supported members have been plumbed and properly positioned and the anchor nuts tightened, the entire bearing area under the plate shall be filled solid with nonshrinking grout. Wedges and shims shall be cut off flush with edges of column base and bearing plates, and shall be left in place.
- D. Holes, except for turned and ribbed bolts, shall not be enlarged more than 1/16 inch greater than the specified hole size without the approval of the Engineer.
- E. Lockwashers shall be provided under all A 307 nuts. Threading shall be excluded from the shear planes for all a 307 and a 325 bearing-type bolted connections
- F. Driftpins may be used only to bring together the several parts and shall not be used in such manner as to distort or damage the metal.
- G. Gas Cutting: The use of a gas-cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. The use of gas-

cutting torch will be permitted only on minor members, when the member is not under stress, and then only after the approval of the Engineer has been obtained.

### 3.03 PAINTING

- A. All steel work shall be painted with one shop coat in accordance with Section 09900 "Painting", with the exception of the following:

Steel work encased in concrete and contact surfaces of welded and/or bolted connections not conforming to Paragraph 3 (C) of RCRBSJ Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts shall not be painted.

- B. After erection, a prime coat shall be applied to all bolts, connections, damaged spots and areas which have been omitted in shop painting. Field painting shall be in accordance with Section 09900 "Painting."

### 3.04 QUALITY CONTROL

- A. Engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.
- B. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviation therefrom.
- C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
- D. Testing agency may inspect structural steel at plant before shipment.
- E. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as necessary to reconfirm any noncompliance or original work and to show compliance of corrected work.
- F. Bolted Connections: Inspect or test in accordance with AISC specifications.
- G. Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
  2. Perform tests of welds (Ultrasonic Inspection: ASTM E 164).

END OF SECTION

## **SECTION 05500 - METAL FABRICATIONS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services for furnishing and installing the metal fabrications as shown on the Drawings and specified herein.
- B. Metal fabrications include items made from iron and steel shapes, plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

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

#### **1.03 SUBMITTALS**

Refer to Section 01340 for submittal requirements.

- A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

#### **1.04 QUALITY ASSURANCE**

- A. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Ferrous Metals: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Steel Plates, Shapes and Bars: ASTM A 992.
- C. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

- D. Structural Steel Sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1, of grade required for design loading.
- E. Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
- F. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
- G. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- H. Grout: Non-Shrink Non-Metallic Grout, Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.

I. Fasteners:

General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

1. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
2. Lag Bolts: Square head type, FS FF-B-561.
3. Machine Screws: Cadmium plated steel, FS FF-S-92.
4. Wood Screws: Flat head carbon steel, FS FF-S-111.
5. Plain Washers: Round, carbon steel, FS FF-W-92.
6. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
7. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
8. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

J. Paint:

1. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats prolonged exposure; complying with performance requirements of FS TT-P-645.
2. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships) or SSPC-Paint-20.

## 2.02 FABRICATION, GENERAL

- A. Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- C. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
- D. Form exposed connection with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts.
- E. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- F. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
- G. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, and conform to ASTM A 153 requirements for galvanizing iron and steel hardware.
- H. Fabricate joints, which will be exposed to weather, in a manner to exclude water. Provide weep holes where water may accumulate.
- I. Shop Painting: Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PAL "Paint Application Specification No. 1" for shop painting.
- J. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
  - 1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning".
  - 2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

## 2.03 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division-6 sections.

- B. Fabricate items to sizes, shapes and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

**2.04 STAIR SAFETY NOSINGS**

- A. Step safety nosings shall be 4-inch wide, aluminum grit, crosshatched surface, complete with screws, nuts and wing anchors for anchoring to concrete, pre-drilled to admit anchor screws, Wooster WP4T Alumogrit as manufactured by Wooster Products Company, Wooster, Ohio; Style AXPF Nosing by SAFE-T-METAL Company; or equal. Nosings shall be furnished for all new interior concrete steps only.

**2.05 GALVANIZED STEEL GRATING STAIR TREADS**

- A. Provide hot-dip galvanized steel heavy-duty steel grating (1-1/2 inch x 1/8 inch bearing bars) for stair treads where metal stairs are shown on the Drawings.

**2.06 LOOSE STEEL LINTELS**

- A. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than 6" bearing at each side of openings, unless otherwise indicated.

<u>Wall Width</u>	<u>Opening Range</u>	<u>Lintel</u>
4"	9" to 60"	ST 3 x 6.25
6"	9" to 36"	2- L2-1/2 x 2-1/2 x 1/4
6"	37" to 60"	2- L2-1/2 x 3 x 1/4
8"	9" to 36"	2- L3-1/2 x 3 x 1/4
8"	37" to 60"	2- L3-1/2 x 3-1/2 x 1/4
12"	9" to 36"	3- L3-1/2 x 4 x 1/4
12"	37" to 60"	3- L3-1/2 x 5 x 1/4

**2.07 MISCELLANEOUS FRAMING AND SUPPORTS**

- A. Provide miscellaneous steel framing and supports, which are not a part of structural steel framework, as required to complete work.
- B. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes and plates and steel bars of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.
- C. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Except as otherwise indicated, space anchors 24" O.C. and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.

## **2.08 SHELF ANGLES**

- A. Provide structural steel shelf angles of sizes indicated for attachment to concrete framing. Provide slotted holes to receive 3/4" bolts, spaced not more than 6" from ends and not more than 24" O.C., unless other wise indicated.

## **2.09 STRUCTURAL STEEL DOOR FRAMES FOR OVERHEAD DOORS**

- A. Fabricate steel doorframes from structural shapes and bars of size and to dimensions indicated, fully welded together, with 5/8 inch x 1-1/2 inch steel bar stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than ten (10) inches O.C., Reinforce frames and drill and tap as required to accept finish hardware.
- B. Provide steel strap anchors for securing doorframes into adjoining concrete or masonry, using 1/8 inch x 2 inch straps of the length required for a minimum 8 inch embedment, unless otherwise indicated. Weld anchors to frame jambs no more than 12 inches from both bottom and head of frame and space anchors not more than 30 inches apart.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

### **3.02 INSTALLATION**

- A. General Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in form work for items which are to be built into concrete masonry or similar construction.
- C. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units, which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.
- E. Bar Gratings: Comply with recommendations of NAAMM Metal Bar Grating Manual for installation of gratings, including installation clearances and standard anchoring details. Secure removable units to supporting members with type and size clips and fasteners indicated, or if not indicated as recommended by grating manufacturer for type of installation conditions shown. Secure non-removable units to supporting members by welding where both materials are the same, otherwise fasten by bolting as indicated above. Attach toe plates to gratings by welding, at locations indicated.

### **3.03 ADJUSTING AND CLEANING**

- A. Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 of these Specifications
- B. For galvanized surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

## **SECTION 05520 - HANDRAILS AND RAILINGS**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Extent and dimensions of handrails and railings are indicated on Drawings and include miscellaneous handrails and railing systems not included in other Sections of these Specifications.
- B. Type of handrails and railing systems in this Section is aluminum pipe handrails and railing systems.
- C. Products furnished but not installed under this Section include inserts and anchors preset in masonry and concrete for anchorage of hand rails and railing systems.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to Work of this Section.
- B. Metal Fabrications: Section 05500
- C. Structural Steel: Section 05120

#### **1.03 SUBMITTALS**

- A. Product Data: Manufacturer's technical data for products and processes used in handrails and railing systems, including finishes and grout.
- B. Shop Drawings: Shop details of fabrication and installation for each type and material of handrail and railing system required including plans, elevations, sections, profiles of rails, fittings, connections, and anchors.
- C. Samples: Prepare samples of each type of metal finish required on metal of same thickness and alloy indicated for final work. Where finish involves normal color and texture variations, include sample sets composed of two (2) or more units showing limits of such variations expected in completed work. Include 6" long samples of each distinctly different railing member including handrails, top rails, posts, and samples of fittings and brackets.

#### **1.04 DEFINITIONS**

- A. Definitions in ASTM E 985 for railing-related terms apply to this Section.

## 1.05 SYSTEM DESCRIPTION

- A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
1. Top Rail of Guardrail Systems: Concentrated load of 200 lbf (890 N) applied at any point and in any direction and a uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with a uniform load of 100 lbf per linear foot (1460 N/m) applied vertically downward. Concentrated and uniform loads need not be assumed to act concurrently.
  2. Handrails Not Serving as Top Rails: Concentrated load of 200 lbf (890 N) applied at any point and in any direction and a uniform load of 50 lbf per linear foot (730 N/m) applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently.
  3. Infill Area of Guardrail Systems: Horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in the system including gates, panels, intermediate rails, balusters, or other elements composing the infill area. Loads on infill area need not be assumed to act concurrently with loads on top rails.
- B. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- C. Material for rails and gates shall be a minimum of 1-1/2" diameter Schedule 40 and for posts, a minimum of Schedule 80.

## 1.06 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.
- B. Design Responsibility: Engage a qualified professional engineer to prepare or supervise the preparation of structural computations for handrails and railing systems to determine compliance with structural performance requirements indicated.

## 1.07 STORAGE

- A. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind. Cover with waterproof paper, tarpaulin, or polyethylene sheeting; allow for air circulation inside the covering.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Subject to compliance with requirements, provide handrails and railing systems of one of the following, or an approved equal. Handrail System shall be equal to "TUFRAIL" as manufactured by Thompson Fabricating Company.
  - 1. Thompson Fabricating Company, Inc., Birmingham, Alabama.
  - 2. Superior Railing Company
  - 3. Alumaguard

### **2.02 METALS**

- A. General: Comply with standards indicated for forms and types of metals indicated or required for handrail and railing system components.
- B. Aluminum: Provide alloy and temper recommended by aluminum producer or finisher for type of use and finish indicated, and with not less than the strength and durability properties of the alloy and temper designated below for each aluminum form required.
  - 1. Extruded Bar and Shapes: ASTM B 221, 6063-T6.
  - 2. Extruded Pipe and Tube: ASTM B 429, 6063-T6.
  - 3. Plate and Sheet: ASTM B 209, 6061-T6.
  - 4. Die and Hand Forgings: ASTM B 247, 6061-T6.
  - 5. Castings: ASTM B 26, 356-T6.

### **2.03 MISCELLANEOUS MATERIALS**

- A. Nonshrink Nonmetallic Grout: Pre-mixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
- B. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded, complying with applicable AWS Specifications, and as required for color match, strength, and compatibility in fabricated items.
- C. Fasteners: Use fasteners of stainless steel for aluminum components, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.
- D. Provide concealed fasteners for interconnection of handrail and railing components and for their attachment to other work except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated.

- E. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- F. Anchors and Inserts: Provide anchors of type, size, and material required for type of loading and installation condition shown, as recommended by manufacturer, unless otherwise indicated. Use nonferrous metal of hot-dipped galvanized anchors and inserts for exterior locations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.
- G. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel: Sherwin-Williams Zinc-Clad Galvanizing Compound #143-0255 or equal.
- H. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).
- I. Zinc Chromate Primer for Galvanized Metals: Sherwin-Williams Galvite, B50W3 or equal; for Ferrous Metals: Sherwin-Williams KemKromik Universal, B50Z Series or equal

## 2.04 FABRICATION

- A. General: Fabricate handrails and railing systems to design, dimensions and details shown. Provide handrail and railing members in sizes and profiles indicated, with supporting posts and brackets of size and spacing shown, but not less than required to comply with requirements indicated for structural performance. Handrail systems which use fittings which are glued or pop-riveted will not be acceptable.
- B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Nonwelded Connections: Fabricate railing systems and handrails for interconnection of members by means of railing manufacturer's standard concealed mechanical fasteners and fittings unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
- D. Welded Connections for Aluminum Pipe: Fabricate aluminum pipe handrails and railing systems for interconnection of members by concealed internal welds, which eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- E. Form changes in direction of railing members by bending members, insertion of prefabricated elbow fittings, radius bends, or by mitering
- F. For handrails and railing systems with nonwelded connections which are exposed to exterior or to moisture from condensation or other sources, provide weepholes or other means for evacuation of entrapped water in hollow sections of railing members.
- G. Toe Boards: Where required by O.S.H.A. and where indicated on the Drawings, provide toe boards at railing systems around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details shown or, if not shown, use manufacturer's standard detail. Toe boards shall be 4" high.

- H. Brackets, Flanges, Fittings and Anchors: Provide manufacturer's standard wall brackets, flanges, hinges, miscellaneous fittings and anchors for interconnection of handrail and railing members to other work, unless otherwise indicated.
- I. Furnish inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work. Fabricate anchorage devices which are capable of withstanding loadings imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
- J. For railing posts set in concrete provide preset sleeves of steel, not less than 6" long and inside dimensions not less than 1/2" greater than outside dimensions of post, with steel plate forming bottom closure.
- K. Provide slip-fit metal sockets to receive removable railing posts. Fabricate sockets for a close fit with posts and to limit deflection of post without lateral load, measured at top, not to exceed 1/12 of post height. Design and fabricate socket covers to resist accidental dislodgement.
- L. Gates: Provide gates of equal structural properties of railing system, with toe board. Hinges shall be capable of providing a swing of 180 degrees. Provide positive latching device which shall be operable from both sides of gate.

## **2.05 METAL FINISHES, GENERAL**

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations and designations of finishes, except as otherwise indicated.
- B. Class I Clear Anodized Finish: AA-M10C22A41 (medium satin directional textured mechanical finish; chemical etch, medium matte; 0.7 mil min. thick clear anodic coating) complying with AAMA 607.1.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, which are to be embedded in concrete as masonry construction. Coordinate delivery of such items to project site.
- B. Field Measurements: Take field measurements prior to fabrication.

### **3.02 INSTALLATION, GENERAL**

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installation of handrails and railing systems. Set work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Do not weld, cut or abrade surfaces of handrails and railing components which have been coated or finished after

fabrication, and are intended for field connection by mechanical means without further cutting or fitting.

- C. Field Welding: Comply with applicable AWS Specification for procedures of manual shielded metal-arc welding, for appearance and quality, of welds made, and for methods used in correcting welding work. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed welded joints smooth and restore finish to match finish of adjacent rail surfaces.
- D. Corrosion Protection: Coat concealed surfaces of aluminum, which will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint or zinc chromate primer.
- E. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at 5'-0" o.c. MAX but not more than that required by design loadings.

### **3.03 ANCHORING POSTS**

- A. Anchor aluminum handrail posts to concrete with manufacturer's base flange assembly (3 anchors per base) for top and side mount brackets recommended for meeting the design criteria. Base flanges and side mount brackets will not be welded to the post but will be mechanically fastened so as to achieve a rigid construction without annealing the post. All connections to concrete will be made using stainless steel wedge anchors, which are to be sized and furnished by the handrail manufacturer as an integral part of their handrail system. Anchor post on new concrete shall be side mounted except where shown otherwise on the drawings.
- B. Anchor posts to metal surfaces with manufacturer's standard fittings designed for this purpose unless otherwise indicated.
- C. Provide removable railing sections as indicated, using slip-fit metal sockets. Accurately locate sockets to match post spacing.

### **3.04 RAILING CONNECTIONS**

- A. Nonwelded Connections: Use manufacturer's standard mechanical joints for permanently connecting railing components. Components that are glued or pop riveted at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of handrails and railing systems.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.

### **3.05 ANCHORING RAILING ENDS**

- A. Anchor railing ends into concrete or masonry with manufacturer's standard fittings designed for this purpose, unless otherwise indicated.
- B. Anchor railing ends to metal surfaces with manufacturer's standard fittings using concealed fasteners, unless otherwise indicated.
- C. Expansion Joints: Provide expansion joints at locations indicated or, if not indicated, at intervals not to exceed 40 feet. Provide slip-joint internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side, locate joint within 6" of post

### **3.06 ATTACHMENT OF HANDRAILS TO WALLS**

- A. General: Secure handrails to walls with manufacturer's standard wall brackets and end fittings, unless otherwise indicated.
- B. For concrete and solid masonry, use drilled-in expansion shields and concealed hanger bolts, unless otherwise indicated.
- C. For hollow masonry anchorage, use toggle bolts with square heads, unless otherwise indicated.

### **3.07 PROTECTION**

- A. Protect finishes of railing systems and handrails from damage during construction period by use of temporary protective coverings approved by railing manufacturer. Remove protective covering at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items which cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units as required.

END OF SECTION



## **SECTION 05530 - GRATING**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment and services required to furnish and install metal bar grating in accordance with the Drawings and specified herein.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to the work of this section.
- B. Miscellaneous Metals and Fasteners are included in Section 05500.

#### **1.03 SUBMITTALS**

Comply with Section 01340 as well as the requirements specified herein.

- A. Submit shop drawings to the Engineer for review before fabrication.
- B. Indicate areas to receive grating, grating details and dimensions, and material specifications.
- C. Show anchorage details and locations.
- D. Indicate coordination with equipment suppliers where openings for such equipment are required.

#### **1.04 REFERENCE STANDARDS**

- A. Design, fabrication and installation of grating shall be in accordance with Standard Specifications and Voluntary Code of Practice in Metal Bar Grating Manual, 1979 Edition, published by National Association of Architectural Metal Manufacturers, Chicago, Illinois (ANSI A 202.1).

### **PART 2 - PRODUCTS**

#### **2.01 DESIGN CRITERIA**

Gratings shall meet or exceed the following design criteria:

- A. Support uniform live load of 100 psf.
- B. Deflection not to exceed span of bearing bars (in inches) divided by 360.
- C. Maximum fiber stress: 12,000 psi.

## 2.02 BASIC DESIGN

The basic design requirements are listed below:

- A. Shape: Rectangular.
- B. Type Construction: Pressure locked.
- C. Bar Sizes, unless otherwise shown on the Drawings:
  - 1. Bearing Bars: 1-1/2" x 3/16".
  - 2. Cross Bars: 1" x 1/8".
- D. Maximum Bar Spacing:
  - 1. Bearing Bars: 1-3/16" c-c.
  - 2. Cross Bars: 4" c-c.
- E. Banding Bars:
  - 1. Same thickness as bearing bars to which they are attached.
  - 2. At free ends: Same depth as bearing bars.
  - 3. At supported ends: 1/8" less in depth than bearing bars.
- F. Bearing and crossbars shall be flush at surface.
- G. All free and supported bar ends around perimeter and around cutouts shall be banded.
- H. Provide removable sections of grating with suitable end bearing where noted on the Drawings or otherwise required.

## 2.03 MATERIALS

- A. Aluminum Grating:

The materials of construction shall meet the following requirements:

- 1. Bearing Bars: ASTM B 221, 6061-T6 or 6063-T6, aluminum.
- 2. Cross Bars: ASTM B 221 (extruded) or ASTM B 210 (drawn) aluminum.
- 3. All steel fasteners used with aluminum grating shall be galvanized.
- 4. Finish: Aluminum mill finish (as fabricated).
- 5. Anchors: Saddle clips of manufacturer's standard design, galvanized.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Grating shall be fabricated as indicated by shop drawings which have been revised to reflect actual field measurements.
- B. Grating shall be set with full and uniform end bearing to preclude rocking; do not use wedges or shims.
- C. Provide 1-inch minimum bearing with maximum erection clearance of 1/4-inch all around.
- D. Anchor grating with saddle clips in accordance with manufacturer's recommendations or as detailed on the Drawings.
- E. Provide cutouts for the passage of pipe, valve and equipment operators, conduit, stems and similar work; cutouts for circular obstructions shall be at least 2" larger in diameter than the obstruction.
- F. Protect all surfaces of angles and frames to be in contact with concrete or dissimilar metals with two (2) coats of Fed. Spec. TT-V-51F Asphalt Varnish.

END OF SECTION



**DIVISION 8**

**DOORS & WINDOWS**



## **SECTION 08370 - ACCESS HATCHES**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Provide all labor, materials, equipment, and service required for the complete installation of the access hatches as specified herein and shown on the Drawings.

#### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Cast-in-Place Concrete: Section 03300
- B. Precast Concrete: Section 03400
- C. Valves and Piping Section 02516

#### **1.03 SUBMITTALS**

- A. Submit product literature material specifications, dimension prints, and installation recommendations for Engineer review.
- B. Comply with all provisions of Section 01340.

#### **1.04 ACCEPTABLE MANUFACTURERS**

- A. Access hatches shall be as manufactured by the Bilco Company, New Haven, Connecticut; Babcock-Davis Associates, Inc., Arlington, Massachusetts; Milcor Division Inryco, Inc., Milwaukee, Wisconsin; or equal.

### **PART 2 - PRODUCTS**

#### **2.01 ACCESS HATCH FOR VALVE VAULT**

- A. Access hatch shall be double leaf, aluminum, gutter type, watertight, roof scuttle design. Door leaves shall be 11 gauge aluminum diamond pattern plate to withstand a live load of 300 pounds per sq. ft. Channel frames shall be 14 gauge galvanized steel with an anchor flange around the perimeter. Provide 1-1/2 inch female NPT threaded aluminum drainage coupling welded under frame at right front corner for connection of drain pipe.
- B. Door shall be equipped with heavy forged brass or stainless steel hinges, a lockable hasp for use with a padlock, stainless steel pins, spring operator for easy operation and an automatic hold-open arm with grip handle release. Provide inside stainless steel snap locks with removable wrench lift handle outside. Furnish threaded aluminum plug to seal lock aperture. Hardware shall be cadmium plated.
- C. Doors and frames shall be mill finish with red oxide primer applied to the exterior of the frame. Hatches shall have an odor resistant gasket.

- D. Size of hatch shall be properly sized to accommodate valve vault, approximately 10'-0" by 7'-0".

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Installation shall be in accordance with manufacturer's instructions. Paint interior and exterior of primer coated door frames.
- B. Manufacturer shall guarantee against defects in material of workmanship for a period of five years.
- C. Unit shall be set with slight pitch toward drain. Furnish and install 1" diameter schedule 80 PVC plastic drainage pipe and fittings to connect to gutter drainage coupling, set in concrete and run outside vault to daylight.

END OF SECTION

DIVISION 9

FINISHES



## SECTION 09960 - HIGH PERFORMANCE PAINTS AND COATINGS

### PART 1 - GENERAL

#### 1.01 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment and services for furnishing and installing the finishes as indicated on drawings and schedules, and as herein specified.
- B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.
- C. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated. In addition, the Contractor shall provide for the use of deep tone colors to be applied in selected areas as wall graphics, stripes and visual accents. The areas and colors shall be selected by the Architect-Engineer and shall not exceed 15% of the total wall surface area to be painted.
- D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- E. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect-Engineer will select these from standard colors or finishes available
- F. Following categories of work are not included as part of field- applied finish work.
  - 1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, and finish mechanical and electrical equipment, including light fixtures, switchgear, and distribution cabinets.
  - 2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces, and duct shafts.
  - 3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
  - 4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.

- G. Following categories of work are included under other sections of these specifications.
1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
  2. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these Specifications.
- H. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.
- I. PVC plastic process piping shall not be painted, but shall be stenciled and labeled or tagged for identification surfaces. Each type of process piping using PVC pipe shall be installed using the same color pipe.
- J. Repainting of existing structures, tanks, piping, and all other existing items shall not be part of this Contract unless otherwise noted. Areas that have been directly altered or damaged by construction shall be repainted to match existing conditions using the appropriate painting system.

## **1.02 RELATED DOCUMENTS**

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

## **1.03 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.
- B. Samples: Prior to beginning work, submit color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect-Engineer's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

## **1.04 QUALITY ASSURANCE**

- A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- B. Coordination of Work: Review other sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coatings systems for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

## 1.05 DELIVERY AND STORAGE

- A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:
  - 1. Name or title of material.
  - 2. Fed. Spec. number, if applicable.
  - 3. Manufacturer's stock number, batch number, and date of manufacturer.
  - 4. Manufacturer's name.
  - 5. Contents by volume, for major pigment and vehicle constituents.
  - 6. Thinning instructions.
  - 7. Application instructions.
  - 8. Color name and number.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

## 1.06 JOB CONDITIONS

- A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C), unless otherwise permitted or restricted by paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 degrees F (35 degrees C), unless otherwise permitted or restricted by paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted or restricted by paint manufacturer's printed instructions. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.
- D. Paint only when the surface temperature is at least 5 degrees F above the dew point, unless otherwise permitted by paint manufacturer's printed instructions.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
1. Tnemec Company, Inc. (Tnemec)
  2. The Sherwin-Williams Company

### **2.02 MATERIALS**

- A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.
- B. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.
- C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
1. Lead content in pigment, if any, is limited to contain not more than 0.06% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.
- B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

### **3.02 SURFACE PREPARATION**

- A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

1. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect-Architect-Engineer in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
  2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
  3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning per SSPC SP-1. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
  4. Abrasives for blasting shall be sharp, washed, salt free, angular, and free from feldspar or other constituents that tend to breakdown and remain on the surface.
  5. Concrete floors shall be dry as indicated by testing in accordance with ASTM D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- B. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, and other foreign substances by solvent cleaning per SSPC SP-1. Mechanical cleaning shall be in accordance with SSPC-SP6 Commercial Blast Cleaning specifications for non-immersion surfaces and SSPC-SP10 Near White Metal Blast Cleaning for immersion in potable or non-potable water.
- C. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent
- E. Shop Primed Surfaces: Prepare shop-applied prime coats wherever damaged or bare as required by other sections of these Specifications. Clean and touch-up with same type shop primer.

### **3.03 MATERIALS PREPARATION**

- A. Mix and prepare painting materials in accordance with manufacturer's directions.
- B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

### **3.04 APPLICATION**

- A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
  1. Painting requirements, surface treatments, and finishes, are indicated in

"schedules" of the contract documents and as noted in Paragraph 3.10 hereinafter.

2. Provide finish coats which are compatible with prime paints used.
  3. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently- fixed equipment or furniture with prime coat only before final installation of equipment.
  5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
  6. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
  7. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.
  8. Sand lightly between each succeeding enamel or varnish coat.
  9. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
- B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer. **NOTE: PA-2 is only for large flat surfaces.**
- D. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.
1. Mechanical items to be painted include, but are not limited to, the following:
    - a. Piping, pipe hangers, supplementary steel and supports except galvanized surfaces.
    - b. Motor, mechanical equipment, and supports.
    - c. Accessory items.
  2. Electrical items to be painted include, but are not limited to, the following:
    - a. Conduits and fittings except galvanized surfaces.

- b. Switchgear.
  - c. Hanger and support except galvanized surfaces.
- E. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
- F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable. Holiday test coated steel in immersion areas in accordance with NACE International RP 0188-90.
- G. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.
- H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

### **3.05 FIELD QUALITY CONTROL**

- A. The right is reserved by Owner to invoke the following material testing procedure at any time, and any number of times during period of field painting:
  - 1. Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.
  - 2. Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.
- B. If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

### **3.06 CLEAN-UP AND PROTECTION**

- A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
- B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

- C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect-Architect-Engineer. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

### 3.07 PAINTING SYSTEMS

The coating product names/numbers are based on Tnemec products.

#### A. Ferrous Metals - Structural, Tanks, Pipes and Equipment

1.	Exterior, Non-Immersion	<u>Dry Mils</u>
	Sur. Prep.: SSPC-SP6 Commercial Blast Cleaning	
	1st Coat: 1 PurplePrime	2.5 - 3.5
	2nd Coat: 66 Epoxoline	4.0 - 6.0
	3rd Coat: 1074- Endura-Shield	2.0 - 3.0
2.	Interior, Non-Immersion	<u>Dry Mils</u>
	Sur. Prep.: SSPC-SP6 Commercial Blast Cleaning	
	1st Coat: 1 PurplePrime	2.5 - 3.5
	2nd Coat: 66 Epoxoline	4.0 - 6.0
	Finish Coat: 1074- Endura-Shield	2.0 - 3.0
3.	Immersion, Potable or Non-Potable Water	
	Sur. Prep.: SSPC-SP10 Near-White Blast Cleaning	
	1st Coat: 1 PurplePrime	2.5 - 3.5
	2nd Coat: 20-1255 Potapox	4.0 - 6.0
	3rd Coat: 20-11WH Potapox	4.0 - 6.0
4.	Factory Primed Interior (Refer to Piping Specifications)	
	Sur. Prep.: Surface shall be clean and dry	
	Int. Coat: 66 Epoxoline	4.0 - 6.0
	Finish Coat: 1074- Endura-Shield	2.0 - 3.0
5.	Factory Primed, Exterior (Refer to Piping Specifications)	
	Sur. Prep.: Surface shall be clean and dry	
	1st Coat: N69 Epoxoline II	4.0 - 6.0
	2nd Coat: 1074- Endurashield	2.0 - 3.0
6.	Primed Steel (Doors, Frames, etc.)	
	Touch up: 1 Purpleprime	
	1st Coat: 66 Epoxoline	4.0 - 6.0
	2nd Coat: 1074- Endura-Shield	2.0 - 3.0

B. Galvanized Steel - Pipe and Miscellaneous Fabrications

1. Exterior, Non-Immersion

Sur. Prep.:	SSPC-SP1 Solvent Cleaning	
1st Coat:	66 Epoxoline	4.0 - 6.0
2nd Coat:	1074-Color Endura-Shield	2.0 - 3.0

2. Interior, Non-Immersion (Doors, Frames, etc.)

Sur. Prep.:	SSPC-SP1 Solvent Cleaning	
One Coat:	66 Epoxoline	4.0 - 6.0
2nd Coat:	1074-Color Endura-Shield	2.0 - 3.0

3. Immersion, Potable or Non-Potable Water Dry Mils

Sur. Prep.:	SSPC-SP1 Solvent Cleaning	
1st Coat:	20-1255 Potapox	4.0 - 6.0
2nd Coat:	20-11WH? Potapox	4.0 - 6.0

B. PVC Piping – Do Not Paint

**3.08 PIPING COLOR CODE**

To facilitate identification of piping in plants and pumping stations it is recommended that the following color scheme be utilized:

<u>WATER LINES</u>	
Raw Water	Olive Green
Settled Water	Light Blue
Filtered or Finished Water	Dark Blue

**3.09 STENCILING**

A. The Contractor shall supply all materials and labor necessary for stenciling of legends on pipes. The legend shall show the name of the contents. Review by the Architect-Engineer of legends will be required. Names shall be "plainly visible". Arrows showing direction of flow shall also be stenciled on pipes. The legends shall be located not more than 10 feet apart and, in general, at each valve and piece of equipment. The size and location of the legend shall be in general accordance with ANSI A13.1-1981 "Scheme for the Identification of Piping Systems". All visible piping 6" in diameter and larger shall be color-coded and stenciled. "Stick-on" labels are not acceptable.

**3.10 PAINT SCHEDULE**

All items at the Project site shall be painted in accordance with these Specifications and Drawings. The following paint schedule is provided only to assist the Owner and Contractor in selection of the appropriate paint system and is not intended to be a complete list of items to be painted.

A. Paint Application Schedule

	<u>Location and/or Description</u>	<u>System</u>
1.	Valve Vaults for Wells No. 10 & 11	
a.	Piping & Equipment	A. 1. (Exterior, Non-Immersion)

END OF SECTION

DIVISION 11

EQUIPMENT



## SECTION 11212 - VERTICAL TURBINE PUMPS

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and services for manufacturing, assembling, delivering, installing, testing, and placing in service all pumping equipment including pumps, motors, bases, and appurtenances.
- B. Unless otherwise specified, the pump manufacturer shall furnish each pumping unit complete with drive motor and all other components and shall be held entirely responsible for the compatibility in all respects of all components furnished.
- C. Pumping units shall be as specified herein, and shown on the Drawings.

#### 1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Submittals: Section 01340
- B. Concrete: Section 03300
- C. Precision Grouting: Section 03600
- D. Piping & Valves: Section 11290 and 11295
- E. Painting: Section 09900
- F. Electrical: Division 16
- G. Operating & Maintenance Data: Section 01780
- H. Precast Concrete: Section 03405
- I. Water Treatment Facilities Operating and Monitoring Systems: Section 13400

#### 1.03 DEFINITION

- A. When the term "pumping unit" is used hereinafter, it shall be deemed to mean a pump or pumps, complete with, but not limited to, drive motor, connecting shafting, bearings, couplings, accessories, appurtenances, and all associated equipment.

#### 1.04 CONTRACT DRAWINGS

- A. The contract drawings are intended to show a general arrangement of pumping equipment, drives, structural supports, foundations, connected piping and valves.
- B. The pump suction and discharges shown shall be considered minimum sizes unless otherwise specified.

## 1.05 MANUFACTURER

- A. Quality Assurance: All pumping units shall be of approved design and make products of manufacturers who have built equipment of similar type, size and capacity.
- B. 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.
- C. Replacement Parts Capability: Pumping units shall be the products of manufacturers who can 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.

Upon request, the Contractor shall submit full details of the proposed manufacturer's ability to promptly fill replacement orders.

- D. Manufacturer Information: All manufacturer information required by the specifications shall be submitted by the Contractor within thirty (30) calendar days of the date of receipt of the Notice to Proceed.

Any additional information or data, specifically requested by the Engineer, concerning manufacturers capabilities (especially relating to requirements described hereinbefore), shall be submitted by the Contractor within fourteen (14) calendar days of the receipt of the written request therefore, unless otherwise specified.

Approval of manufacturers or suppliers will not be given until all information required by the specifications or requested by the Engineer has been submitted and acceptable.

- E. Disqualification of Manufacturer:
  - 1. Failure to successfully comply with the provisions of subparagraphs A through D, inclusive, will constitute grounds for disqualification of pump manufacturer.
  - 2. 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.

## 1.06 SUBMITTALS (SHOP DRAWINGS)

- A. General: The Contractor shall comply with the provisions of 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 Owner or the Engineer. Where applicable, submit separate data for each pump.
  - 1. Descriptive Literature:
    - a. Dimensions
    - b. Materials of Construction (including required coating).

- c. Performance Data.
  - (1) Size of Pump
  - (2) GPM
  - (3) TDH
  - (4) BHP
  - (5) Overall pump efficiency (inlet through discharge head)
  - (6) RPM
  - (7) Performance curves showing overall pump efficiencies
  - (8) NPSH curve (if applicable)
  - (9) Shutoff head
  - (10) Weight of pump
  - (11) Head
  - (12) Rated HP of motor
  - (13) Weight of motor

- 2. Installation Information: Submit drawings and information necessary for final design of foundations, connecting piping and valves, pump drip and drainage piping, electrical connections, starting, speed regulating and protective equipment, and auxiliary equipment.

Submit details for mechanical seal assemblies.

Submit drawings showing locations, size and full details of foundation bolts for all components for all pumping units.

For all pumping units, a dimensioned and scaled assembly outline drawing or drawings of the complete pump, drive, and all associated equipment furnished shall be submitted for approval. Such drawing or drawings shall show plan, elevation, and any other views or sections requested.

For all pumping units, a scaled cross-sectional drawing of the assembled pump showing full details and materials of construction shall be submitted for approval.

The Contractor shall submit all other drawings, material lists and other information specified, requested and/or necessary to show complete compliance with all details of the contract documents.

- 3. Maintenance and Operations 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.

## 1.07 TESTS

### A. Field Tests:

The field tests shall be made by the Contractor in the presence of and as directed by the Engineer. Testing shall be done in accordance with the Hydraulic Institute Standards.

Field tests shall be made on each pumping unit. Included therein, each pump shall be run at maximum rated speed for at least three (3) rates of flow corresponding to minimum rate, design rate, and maximum rate of flows specified as evidenced by the corresponding total dynamic head shown by the pump gages; simultaneous ammeter readings shall be taken. Variation of the rate of flow shall be made by throttling the discharge valve (where applicable). The rated motor nameplate current and power shall not be exceeded at any rate of flow within the specified range.

Before any pump is rotated, the Contractor shall make certain that no debris is present in suction well, pumps or pipe lines. Any internal damage done to equipment while starting up shall be assumed to be caused by debris and shall be replaced at the Contractors expense. No pump shall be rotated under power unless filled with liquid.

When water can be pumped, the Contractor shall commence pumping and shall have representatives from the pump manufacturer to start the pumps. When flow conditions are favorable, the Contractor or pump manufacturer shall in the presence of the Engineer, run a series of tests to establish the adequacy of the pumping program.

- B. Failure of Tests: Any defects in the equipment or failure to meet the guarantees or requirements of the specifications shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails or refuses to make these corrections or if the improved equipment, when tested, shall fail again to meet the guarantees of specified requirements, the Owner notwithstanding its having made partial payment for work and materials which have entered into the manufacture of said equipment, may reject said equipment and order the Contractor to remove it from the premises at his own expense.

In case the Owner rejects said equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him for said rejected equipment on progress certificates or otherwise on account of the lump sum prices herein specified, and upon the receipt of said sum of money the Owner will execute and deliver to the Contractor a bill of sale of all its rights, title, and interest in and to said rejected equipment; provided, however, that said equipment shall not be removed from the premises of the Owner until the Owner obtains from other sources the equipment to take the place of the rejected. The Owner hereby agrees to obtain said other equipment within a reasonable time and the Contractor agrees that the Owner may use the equipment furnished by him without rental or other charge until said other new equipment is obtained.

- C. Responsibility During Test: The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

- D. Manufacturers Representative: For all pumping units, the Contractor shall furnish the services of accredited representatives of the pump manufacturer who shall supervise the installation, adjustment, and field tests of each pumping unit and give instructions to the

operating personnel. As one condition necessary to acceptance of any pumping unit, the Contractor shall submit a certificate from the manufacturer, 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.

#### **1.08 IDENTIFICATION - NAMEPLATES**

- A. Each piece of equipment shall be provided with a substantial nameplate, securely fastened in place and clearly inscribed with the manufacturers name, year of manufacture, serial number and principal rating date.

#### **1.09 GUARANTEE PERIOD**

- A. After successful completion of tests and trials under operating conditions on all equipment, the Contractor shall guarantee all equipment and materials from undue wear and tear from mechanical and electrical defects, and from any failure whatever except those resulting from proven carelessness or deliberate actions of the Owner, for a minimum of one (1) year. This one (1) year minimum shall not replace a standard manufacturer's guarantee if it exceeds one (1) year.

#### **1.10 PUMP WARRANTY**

- A. The Contractor guarantees and warrants that during the first one year after approval of the final pay estimate, the pumps will operate satisfactorily and continuously according to the pump schedule specified herein, and that after due notice has been given by the Owner, he or the pump manufacturer will proceed, within a reasonable time, to adjust, regulate, repair and renew at his own expense or perform such work as is necessary to maintain the guaranteed capacities, efficiencies and performances.

### **PART 2 - PRODUCTS**

#### **2.01 VERTICAL TURBINE PUMPS**

- A. General
  - 1. The pumping units required under this section shall be complete including suction barrels and pumps with proper alignment and balancing of the individual units. All parts shall be so designed and proportioned as to have liberal strength, stability, and stiffness and to be especially adapted for the service to be performed. Ample room for inspection, repairs and adjustment shall be provided.
  - 2. All necessary anchor bolts, nuts and washers shall be furnished by the pump manufacturer for installation by the Contractor. Anchor bolts, nuts and washers shall be 316 stainless steel. A molybdenum disulfide anti-seize agent shall be supplied for use with all stainless steel bolts.
  - 3. Stainless steel nameplates giving the name of the manufacturer, the rated capacity, head, speed and all other pertinent data shall be attached to each pump, motor variable frequency drive and control panel.

4. Each pumping unit and its driving equipment shall be designed and constructed to withstand the maximum turbine run-away speed of the unit due to back flow through the pump with the maximum TDH specified available at the pump discharge flange. The maximum reverse runaway speed shall not exceed 180 percent of the design pump maximum operating speed. A statement of compliance with this requirement must be furnished with the Shop Drawings submittal.

B. Pumps

1. General

- a. The pumps shall be of the vertical turbine type. Each unit shall include a bowl assembly (strainer), column and open line shaft, enclosed impeller, discharge head and driver as specified. Water lubricated line shafts shall be provided. The raw water pump shall be equipped with an anti-vortex baffle to be mounted inside the basket strainer.
- b. The pumps shall be built to standard dimensions such that parts will be interchangeable between like units and all units shall be supplied by the same manufacturer.
- c. The pumps shall be as manufactured by Floway, Peerless or equal.

2. Performance Requirements

- a. When operating at the maximum output speed of the motor, each pump shall have a characteristic performance curve and which meets all the minimum conditions listed in the Vertical Turbine Pump Schedule. The pumps and drive motors shall be capable of operating satisfactorily under the full range of conditions as defined by the Pump Schedule. Motors shall be non-overloading throughout the range of operation.
- b. Each pump shall be capable of continuous adjustable speed operation over the speed range from 100 percent to 60 percent of pump design speed. There shall be no significant change in vibration and noise level.
- c. Maximum motor speeds shall not exceed those listed in the Vertical Turbine Pump Schedule to satisfy the specified hydraulic duty requirements. The pump design speed shall be the maximum output speed of the motor furnished, when operating at the pump's design capacity and head at 60 Hertz on utility power (full motor speed).
- d. With the pumping units operating at full motor speed, the maximum brake horsepower required by the pumps shall not exceed the maximum horsepower listed in the Vertical Turbine Pump Schedule.
- e. The pumps shall meet the requirements as listed in the table, and shall be the model numbers as manufactured by Floway, Peerless or equal.

- f. Each pump shall be designed for the conditions of service tabulated in the following Pump Schedule. The Contractor shall furnish, install and place into operation new vertical turbine pumps at the following locations, as shown on the Drawings:

**VERTICAL TURBINE PUMP SCHEDULE**

Parameter	Wells No. 12 & 13
Number of Pumps	2
Design Flow (GPM)	1,400
TDH (feet)	110
Shutoff Head (feet)	207
Operating Point	1,400 gpm@ 110 TDH
Operating Point at Runout	1,800 gpm @ 60 TDH
Speed Type	Constant
Horsepower (Per Pump)	60
Efficiency at Operating Point	82%
Max Speed (rpm)	1,770
Manufacturer	Floway, or equal
Model No.	12FKL-M
Impeller	7.000"±
No. of Stages	3
Column/Discharge Size (Flanged)	10"
Min. Pump Shaft Diameter (In.)	1-11/16"
Min. Impeller Eye Area (In <sup>2</sup> )	32.2
Min. Bowl Weight -1st Stage (lbs)	297

3. Pump Construction

- a. The discharge head shall be of close grain, cast iron, ASTM A48 Class 30, free of sand holes and other defects, accurately machined and with a surface discharge. Discharge flange shall be machined and drilled to ANSI standards for 125 lb rating and shall be 6 inches nominal inside diameter. The top of the discharge head shall have a rabbet fit to accurately locate the vertical hollow shaft driver, and have a diameter equal to the drivers base diameter and no less than 16 inches. Head shall be in all respects equal to Floway Type A size 16-1/2 x 8.

- b. The standard cast iron stuffing box shall be rated for 150 lb discharge pressure and shall be fitted with graphited acrylic packing and have either a lantern ring or grease chamber below the first packing ring. Throttle bearing shall be of high lead bronze ASTM B505 alloy C84400. The packing gland shall be of bronze ASTM B584 alloy C83800 with stainless steel bolting and with brass or stainless steel adjusting nuts. Sealing between the stuffing box and the discharge head shall be accomplished by means of an "O" ring.
- c. The top line shaft shall be of ASTM A582 Grade 416 stainless steel and shall not exceed 10 feet in length. Impeller adjustment shall be provided at the top of the head shaft by means of a bronze adjusting nut of ASTM B584 alloy C83800 which shall be positively locked in position.
- d. The line shafts shall be of ASTM A582 grade 416 SS, turned and ground. They shall be furnished in interchangeable sections not over 10 feet in length.
- e. The butting faces shall be machined square to the axis of the shaft, with maximum permissible axial misalignment of the thread axis with the shaft axis 0.002" in 8". The size of the shaft shall be no less than that determined by ANSI/AWWA-E101 Specifications, Section 5.5 for C1045 line shaft and shall be such that elongation due to hydraulic thrust will not exceed the axial clearance of the impellers in the pump bowls. Maximum runout in 10 shall not exceed 0.005".
- f. The line shaft bearing shall be of 70 minimum shore hardness, neoprene, snap-in type, internally spiral-grooved and mounted in ductile iron A536 Gr. 60-40-18 bearing retainers held in position in the column coupling by means of the butted ends of the column pipe. Bearing spacing shall not exceed 10.
- g. The outer column pipe shall be of ASTM A53 grade B steel pipe in interchangeable sections not over 10 in length with the ends of each section faced parallel and machined with 8 straight threads per inch permitting the ends to butt and insuring alignment when connected by standard mill steel couplings. The weight of the column pipe shall be no less than that stated in ANSI Specification E101, Section 5.1 "Standard Specifications for Discharge Column Pipe
- h. The column size shall be such that friction loss will not exceed 5 per 100, based on the rated capacity of the pump. Column size shall also be such as to provide a velocity of not less than 5 per second at the rated capacity.
- i. Top and bottom sections of column pipe for product lubricated pumps shall not exceed 5 in length.
- j. The pump bowl assembly shall be Floway Pump type 12FKL-M or equal.
- k. The pump bowls shall be of close grain, cast iron ASTM A48 Class 30. The water passages on bowl sizes 4" through 20" shall be lined with porcelain enamel and larger sizes shall be Heresite or fusion epoxy-lined to reduce friction losses, shall be free of blow holes, sand holes and other

detrimental defects, and shall be accurately machined and fitted. The impellers shall be of bronze ASTM B584 alloy C83800, (enclosed) and statically balanced. Impellers shall be securely fastened to the shaft with taper split bushings of stainless steel. Impellers shall be adjusted vertically by an external means.

- l. The pump shaft shall be of A582 grade 416 stainless steel, turned, ground and polished. It shall be supported by bronze bearings of ASTM B505 alloy C84400 above and below each impeller. The suction case bearing shall be grease lubricated and protected by a bronze sand collar of ASTM B584 alloy C83800. The size of the shaft shall be no less than that determined by ANSI/AWWA Specifications E101, Section A4.3 paragraph 4.3.3.
- m. The discharge case shall be threaded on the outside for column sizes of up to 14 inches and fitted with a cast iron ASTM A48 Class 30 column adaptor of the proper size to connect to the column selected. Likewise, the suction case shall also be threaded on the O.D. and fitted with a cast iron or steel suction and the pump bowls shall be constructed of ASTM A-48 Class 30 cast iron having a minimum tensile strength of 30,000 psi free from blow holes, sand holes, and all other faults. The pump bowls shall be of sufficient thickness to withstand stresses and strains at full operating pressure. The bowls shall be subjected to a hydrostatic test 150 percent of that specified at the intermediate design condition. The bowls shall be designed and manufactured with open and smooth water passages to assure efficient, reliable operation.

#### 4. Motors

##### A. General

- (1) The motors for the pumps shall be of the vertical, hollow shaft squirrel cage induction type, 60 HP 1775 RPM, 3 phase (60) hertz 460 volts with non-reverse ratchet, P-base, squirrel-cage induction design. Motor frames shall have Class B or Class F insulation with temperature rise as specified by NEMA standards for class of insulation used and shall have a 1.15 service factor.
- (2) Thrust bearings shall be chosen to handle the continuous down thrust as specified by the pump manufacturer with an AFBMA B-10 one year minimum or five year average life under design conditions. Provisions shall be made for momentary upthrust equal to 30% of rated down thrust.
- (3) The motor rating shall be such that at design it will not be loaded beyond nameplate rating and at no place on the pump curve shall the loading exceed the service factor.
- (4) Motors shall conform to all requirements stipulated in PART 1 - GENERAL of this Section of the Specifications and with the specifications for motors included in Division 16.
- (5) The motors shall be compatible with the pumps.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Coordinate with other trades, equipment and systems to the fullest extent possible.
- B. Take all necessary measurements in the field to determine the exact dimensions for all work and the required sizes of all equipment under this contract. All pertinent data and dimensions shall be verified by the Contractor.

### **3.02 INSTALLATION**

- A. Installation shall be in strict accordance with the manufacturers instructions and recommendations in the locations shown on the Drawings. Anchor bolts shall be set in accordance with the manufacturers recommendations and setting plans.
- B. Qualified supervisory services, including manufacturers engineering representatives, shall be provided for a minimum of 4 man-days to insure that the work is done in a manner fully approved by the respective equipment manufacturer. The pump manufacturer's representatives shall specifically supervise the installation and alignment of the pump with the driver, the grouting, the alignment of the connection piping and the installation of the field-installed mechanical seal. If there are difficulties in the start-up or operation of the equipment due to the manufacturers design or fabrication, additional service shall be provided at no cost to the Owner. Services of the manufacturers representatives and training shall be provided when the first pump is started, with follow-up visits upon start-up of each subsequent pump.
- C. Connection of piping to pumps shall be done in presence of the Engineer. All piping connections to the pump shall be done without bending and/or twisting the piping to mate with the pump flange connections.
- D. A certificate from each equipment manufacturer shall be submitted stating that the installation of his/her equipment is satisfactory, that the equipment is ready for operation and that the operating personnel have been suitably instructed in the operation, lubrication and care of each unit.

### **3.03 FIELD TESTS**

- A. In the presence of the Engineer, such tests as necessary to indicate that the pumps, motors, and variable speed drives generally conform to the efficiencies and operating conditions specified shall be performed. A thirty-day operating period of the pumps will be required before acceptance. If a pump performance does not meet the Specifications, corrective measures shall be taken or the pump shall be removed and replaced with a pump which satisfies the conditions specified. All test procedures shall be in accordance with Hydraulic Institute Standards certified results of tests shall be submitted. Provide, calibrate and install all temporary gauges and meters, shall make necessary tapped holes in the pipes, and install all temporary piping and wiring required for the field acceptance tests. Written test procedures shall be submitted to the Engineer for approval 30 days prior to testing.

### 3.04 TRAINING

- A. A factory representative shall provide a minimum of two (2) man-hours of training to the Owners operations staff concerning the recommended operation and maintenance of the equipment. Training shall be performed after substantial completion of the project with the use of operating equipment.

END OF SECTION



DIVISION 13

SPECIAL CONSTRUCTION



## SECTION 13400 -WATER TREATMENT FACILITIES OPERATING AND MONITORING SYSTEMS

### PART 1 - GENERAL

#### 1.01 WORK INCLUDED

- A. The CONTRACTOR shall furnish all materials, labor, tools, equipment, supplies and services necessary to install all control equipment complete as specified herein and shown on the Drawings. The CONTRACTOR shall be responsible for the expense of changing Drawings or structures, or any other expense necessitated by reason of installing alternative equipment. The CONTRACTOR will assume the responsibility for the satisfactory operation of any and all equipment offered.
- B. The following equipment specification is included to establish the quality of equipment to be obtained. It is the intent of these Specifications to obtain industrial quality instrumentation and control equipment. Equipment furnished shall be accepted by the ENGINEER, prior to purchase by the CONTRACTOR.
- C. Auxiliary and accessory devices necessary for system operation or performance, such as transducers or relays to interface with existing equipment or equipment provided under other Sections of this Specification, shall be included whether specified or not, at no extra cost.
- D. Equipment shall be fabricated, assembled, installed, and placed in proper operating condition in full conformity with detail drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer as accepted by the ENGINEER.
- E. The Scope of Work includes modifications to existing SCADA system programming at the water treatment plant master unit to accommodate the relocation of the RTU and additional points, data, and control functions. The existing system is manufactured by MicroComm, and all system modifications shall be performed by an authorized MicroComm service technician. As noted on the Drawings, the existing S3000 RTU at well no. 2 shall be relocated to well no. 10. As the existing RTU currently handles only one pump station, I/O may be required to accommodate the additional inputs and outputs for control and monitoring of two well pumps. In addition, additional I/O may be required to accept the two flow input signals. The existing SCADAview software at the water treatment plant shall be modified to provide operator interface for control of each pump, running indication, and flow indication for wells 10 and 11, and removal of operator interface and indications associated with well no. 2 which will be removed this Contract.

#### 1.02 RELATED WORK

- A. The following Divisions of these Specifications contain requirements on equipment furnished by other suppliers that must interface with the instrument system, or on methods and materials to be performed/used in the installation and/or wiring of the instrumentation system.

DIVISION 1 - GENERAL REQUIREMENTS  
DIVISION 11 - EQUIPMENT  
DIVISION 16 - ELECTRICAL

**1.03 QUALITY ASSURANCE**

- A. The system supplier shall have in his employ the capable personnel for detail engineering, coordination, drafting, procurement and expediting, scheduling construction, testing inspection, installation, start-up service for calibration and commissioning, and warranty compliance for the period specified.

**1.04 REFERENCES**

- A. The CONTRACTOR is referred to Standards and Practices for Instrumentation published by the Instrument Society of America, for terminology, symbols, methods and practices used or described herein or on the Drawings.

**1.05 SUBMITTALS**

A. General

1. Complete detail Drawings of the instrumentation system components shall be submitted to the ENGINEER for review. They shall include installation instructions, operation and maintenance instructions, descriptive literature, connection drawings, and parts list for each item as well as individual control schematic drawings for each item.
2. Should any system submitted in the shop drawings not meet with the ENGINEER'S acceptance as to conformity with requirements of the Drawings and Specifications, it shall be the responsibility of the successful CONTRACTOR to make whatever changes are necessary for acceptance at no extra cost to the OWNER.

B. Detailed Requirements

1. Detailed information for each instrument or control device shall be submitted, including manufacturer's descriptive literature and a specific data sheet for each device which shall include as a minimum:
  - a. Product (item) name used herein and on the Contract Drawings.
  - b. Manufacturer's complete model number.
  - c. Input - output characteristics.
  - d. Range, size, and graduations.
  - e. Physical size with dimensions, enclosure NEMA classification, and mounting details.

- f. Materials of construction of all components.
  - g. Instrument or control device sizing calculations where applicable.
  - h. Certified calibration data on all flow metering devices.
2. Submit a detailed loop diagram, for each monitoring or control loop, each on a single 8 ½ in. X 11 in. sheet. The format shall be the Instrument Society of America, Standard for Instrument Loop Diagrams, ISA-S5 4.
  3. The data sheets shall be provided with an index and proper identification and cross-referencing. Partial submittals will be rejected.
  4. Exceptions to the Specifications or Drawings shall be clearly defined by the system supplier. Data shall contain sufficient details so a proper evaluation may be made by the ENGINEER.
  5. Prior to final acceptance, the final shop drawing submittal, which is to include Installation, Operation, and Maintenance instructions, shall be updated to reflect "As Constructed" status, and shall provide at least the following as a minimum:
    - a. A complete "As Constructed" set of accepted shop drawings.
    - b. A complete list of the equipment supplied, including serial numbers, ranges, and pertinent data.
    - c. Full specifications on each item.
    - d. System schematic drawings "As Constructed", illustrating all components, piping and electrical connections of the systems supplied under this Section.
    - e. Detailed service, maintenance, and operation instructions for each item supplied.
    - f. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
    - g. Complete parts lists with stock numbers and name, address, and telephone number of the local supplier.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

### **A. Shipping Precautions:**

1. After completion of shop assembly, factory test, and acceptance, all equipment, shall be packed in protective packaging to provide complete protection from damage, dust, and moisture.
2. Special instructions for proper field handling, storage and installation required by manufacturer for proper protection, shall be securely attached to each piece of equipment proper to packaging and shipment.

B. Identification:

1. Each component shall be tagged to identify its location, tag number and function in the system. Identification shall be prominently displayed on the outside of the package.
2. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment supplied under this Section.

C. Storage:

1. Equipment shall not be stored out-of-doors. Equipment shall be stored in dry permanent shelters including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the CONTRACTOR at his own cost and expense. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such tests as directed by the ENGINEER. This shall be at the cost and expense of the CONTRACTOR, or the apparatus shall be replaced by the CONTRACTOR at his own expense.

## 1.07 WARRANTY

- A. A written instrument warranty shall be provided to the OWNER, executed by the system supplier as a part of the work under this Section. The warranty include all labor, parts, and on-site response within 48 hours, for a period of one year after the date of final acceptance of the system. The system supplier shall have full responsibility for the corrective maintenance including replacing of defective components, and calibration of all components under this section, all at no cost to the OWNER.
- B. The costs for the one-year warranty shall be included in the Contract price.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. All instrumentation supplied shall be of the manufacturer's latest design and shall produce or be activated by signals which are established standards for the water industry.
- B. All electronic instrumentation shall be of the solid-state type and shall utilize linear transmission signals of 4 to 20 mAdc (milliampere direct current), however, signals between instruments within the same panel or cabinet may be 0-10 V.d-c (volts direct current), or other manufacturer standard.
- C. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero based signals will be allowed for remote transmission.

- D. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks as shown on the Drawings or as required.
- E. All indicators and LED readouts shall be linear, direct reading in process units, unless otherwise noted. Percentage scales and indicators are prohibited.
- F. All transmitters shall be provided with either integral indicators or conduit mounted indicators in process units, accurate to two percent, unless otherwise noted.
- G. Electronic equipment shall be of the manufacturer's latest design, utilizing printed circuitry and suitably coated to prevent contamination by dust, moisture and fungus. Solid state components shall be conservatively rated for their purpose, to assure optimum long term performance and dependability over ambient atmosphere fluctuations and 0 to 95 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.
- H. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single manufacturer, in-so-far as possible, and shall consist of equipment models which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.
- I. All equipment shall be designed to operate on a 60 Hertz alternating current power source at a nominal 115 volts, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.
- J. All analog transmitter and controller outputs shall be 4-20 milliamperes into a load of 0-750 ohms, unless higher load capacity is required
- K. All switches shall have double-pole double-throw contacts rated at a minimum of 600 VA, unless specifically noted otherwise.
- L. Materials and equipment used shall be UL listed wherever such listed equipment and materials are available.
- M. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored.
- N. All circuit boards in instruments mounted in damp locations or mounted outdoors shall be fungus proofed. All field transmitters mounted outside shall be equipped with sun shields and shall be capable of operation to -20° Fahrenheit.

## 2.02 INSTRUMENTS AND ACCESSORY EQUIPMENT

### A. Product Descriptions

#### I. Transient/Lightning Suppressors:

- a. Lightning protectors shall be of 2 types - those for protection d-c wires (current protectors) and those for protecting a-c wires.
  - b. The d-c protectors shall be of the fast-acting metal oxide varistor type (MOV) designed to fit and protect all typical 4-20 mA, field mounted transmitters from damaging transients induced by lightning or heavy electrical equipment, and shall provide protection each line to ground, and line-to-line.
  - c. The a-c protectors shall be the fast-acting MOV type in combination with a gas tube type secondary protector designed to provide protection against lightning and other high voltage surges for any a-c line-to-ground system.
  - d. The lightning protectors shall be installed at each end of each metering loop, and on all power supplies.
2. Loop Isolator/Signal Converter:
    - a. Loop isolators or signal converters shall be furnished and installed where indicated, to isolate signals or to increase the load capacity of a system required to have many devices in the loop. The device shall also provide transmitter excitation, 24 VDC. Isolators shall provide 3 way isolation, and shall have a power supply voltage of 115 VAC unless otherwise indicated. Two wire style isolators are not acceptable. Isolators shall be Moore FCT-TX, AGM, or equal, enclosed as appropriate for the application, or as indicated.
3. Altitude and Pressure Gauges:
    - a. All indicating gauges are pipe mounted with male and brass threaded pipe connections. Gauges shall be 4 ½ inch liquid filled for maximum vibration and corrosion protection. Gauges shall have phosphor bronze Bourdon tubes, white laminated phenol dials. Gauges shall have micrometer adjustment of pointers and black phenol, black cast iron, brass, or aluminum case and ring, original rotary gear design, corrosion resistant, stainless steel movement, blowout protection, and bronze socket with wrench flats. Accuracy shall be within ½ of 1 percent of the scale range. They shall be as manufactured by Helicoid Gage Division, "410"; James P. Marsh Corporation, "Master Gauge"; Marshalltown; Ashcroft; U.S. Gauge; or equal.
    - b. All gauges shall be piped with provisions for venting pressure to allow calibration (zero) checks. Valves for gauge shutoff and zeroing shall be 1/4 turn ball valves with lever handle, corrosion-resistant.
  4. Turbine Meter
    - a. The turbine meter shall be constructed of two basic assemblies, the maincase the measuring chamber. The maincase shall include stainless steel straightening vanes. The measuring chamber assembly shall include the rotor, adjusting vane, and a hermetically sealed, direct reading register.

- b. The turbine meter shall operate on the following principle. Water flowing through the meter shall cause the rotor to turn. As the rotor turns, a ceramic driver magnet which is embedded in the rear face of the rotor shall pass a flux carrier with three legs. The magnetic force is then transmitted through the flux carrier leg to a cylindrical follower magnet which is attached to the gear train shaft inside the register's magnet well. The magnetic force shall cause the register shaft to rotate. The rotor assembly shall be the only moving part.
  - c. The rotor shall be manufactured of thermoplastic, with a ceramic bearing. The shaft shall be stainless steel. The maincase and measuring chamber shall be bronze. A bronze strainer with stainless steel screen shall be installed ahead of the meter. Operating pressure rating shall be 150 psi, with ANSI B 16.1 Class 125 flanges.
  - d. Operating range shall be 55-5500 gpm, continuous. Accuracy shall be  $\pm 1.5\%$  of actual thruput. For this project, meter shall be calibrated to 1400 gpm maximum.
  - e. The meter shall be furnished with a signal converter which converts the meter's magnetic drive signal to a 4-20 mA DC current output proportional to the measured flowrate. The signal converter shall use a sensor to pick up the magnetic pulses generated by the meter's drive magnetics. The signal converter shall be a loop powered device, 24VDC, with primary cable between the meter and the signal converter furnished by the manufacturer. The Contractor shall be responsible for determining the required cable length.
  - f. All electronics at the meter shall be sealed to prevent water entry, and suitable for prolonged submersion.
  - g. The meter and transmitter shall be as manufactured by Sensus Technologies, Inc, or equal.
5. LED Indicator/Totalizer
- a. An LED indicator shall be provided for display of measured and totalized flow. The indicator shall have a six digit, LED or LCD display, and shall be calibrated and displayed in engineering units.
  - b. The indicator shall accept a 4-20 mA, 0-20 mA, 0-5V, or 0-10V input, field selectable. Scale and calibration shall be accomplished using a signal button on the front of the unit. EEPROM memory shall store the settings when power is removed.
  - c. Input power to the device shall be 115VAC, 60 Hz.
  - d. The indicator/totalizer shall be furnished with a NEMA 4X enclosure.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION/APPLICATION/ERECTION**

- A. Instrumentation and accessory equipment shall be installed in accordance with the manufacturer's instructions. The locations of equipment, transmitters, alarms and similar devices shown on the Drawings are approximate only. Exact locations shall be as accepted by the ENGINEER during construction. Obtain in the field all information relevant to the placing of process control work, proceed as directed by the manufacturer and furnish all labor and materials necessary to complete the work in an acceptable manner.
- B. The instrumentation installation details on the Drawings indicate the designed installation for the instruments specified. Where specific installation details are not specified or shown on the Drawings, the manufacturer's recommended practice shall be followed.
- C. All work shall be executed in full accordance with codes. Should any work be performed contrary to said codes and/or regulations, the CONTRACTOR shall bear full responsibility for such violations and assume all costs arising therefrom.
- D. Unless specifically shown in the Contract Documents, direct reading or electrical transmitting instrumentation shall not be mounted on process piping. Instrumentation shall be mounted on instrument racks or stands. All instrumentation connections shall be provided with shutoff and drain valves
- E. All piping to and from field instrumentation shall be provided with necessary unions, test tees, couplings, adaptors, and shut-off valves.
- F. Field instruments requiring power supplies shall be provided with local electrical shut-offs and fuses as required.
- G. Brackets and hangers required for mounting of equipment shall be provided. They shall be installed in a workmanlike manner and not interfere with any other equipment.
- H. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded as directed by the manufacturer of the instrumentation equipment but in no case shall more than one ground point be employed for each shield.
- I. The system supplier, acting through the CONTRACTOR, shall coordinate the installation, the placing and location of system components, their connections to the process equipment panels, cabinets and devices, subject to the ENGINEER'S acceptance. He shall be responsible to ensure that all field wiring for power and signal circuits are correctly done in accordance with best industry practice and provide for all necessary system grounding to ensure a satisfactory functioning installation. The CONTRACTOR hereunder shall schedule and coordinate his work under this Section with that of the electrical work specified under applicable Sections of Division 16.

### **3.02 FIELD QUALITY CONTROL**

- A. After equipment and materials have been shipped to the job site, the Supplier shall furnish the services of a factory-trained service technician or engineer to assist and advise

the CONTRACTOR during installation and to provide calibration/adjustment at initial startup.

- B. Following installation, checkout, and final adjustment of all panels, instruments, meters, monitoring, and control devices, the CONTRACTOR shall schedule a performance test in the presence of the ENGINEER on all equipment. The CONTRACTOR shall furnish the services of the system supplier's servicemen, all special tools, calibration equipment, and labor to perform the tests.
- C. Meters shall be tested at 0 percent, 25 percent, 50 percent, 75 percent, and 100 percent of scale, if possible. All status and alarm switches as well as all monitoring and control functions shall also be checked. Testing shall be done from the signal source to the final element or device including all field wiring. Results of all testing shall be submitted to the ENGINEER in writing.
- D. If, during running of the tests, one or more points appear to be out by more than the system accuracy statement, the system supplier's servicemen shall make such adjustment or alterations as are necessary to bring equipment up to specification performance. Following such adjustment, the tests shall be repeated for all specified points to ensure compliance.

**3.03 ADJUSTING AND CLEANING**

- A. All equipment furnished under this Section of the Specifications shall be adjusted/calibrated as defined elsewhere this Section.
- B. All instruments and equipment shall be left free from shipping stickers, paint splatter, dirt, grease, etc., and shall be clean and in like new condition at final acceptance. Touch-up paint shall be furnished as needed to repair blemishes and scratches in finish paint on panels and enclosures, which shall be corrected by the CONTRACTOR.

**3.04 SCHEDULES**

- A. Gauge Schedule

<u>Location</u>	<u>Range Combination</u>			<u>Accessories</u>	<u>No. Required</u>
	<u>Size</u>	<u>PSI</u>	<u>Ft.</u>		
Well Pump No. 10 Discharge	4½	0-100	0-230	A,B	1
Well Pump No. 11 Discharge	4½	0-100	0-230	A,B	1

Pressure Gauge Accessory Code:

A - Gauge Liquid Filled

B - Ball Valves for Shutoff and Vent

END OF SECTION



## SECTION 13452 – TELEMETRY CONTROL SYSTEM

### PART 1 - PROJECT DESCRIPTION

#### 1.01 DESCRIPTION

##### A. DESCRIPTION OF WORK

1. The work to be accomplished under this section shall consist of furnishing the equipment necessary for a complete control system to function as specified herein and as shown on the drawings. The system integrator's shall furnish a completely integrated all solid-state hardwired/radio telemetry based control system. It shall be the system integrator's responsibility to supply a system that is compatible with the existing Micro-Comm equipment. The complete system shall be designed, fabricated, programmed, tested, started up, and warranted by a single supplier to insure a single source of responsibility.

##### B. SCOPE OF WORK

1. This section covers the required modifications the existing radio telemetry based control system including:
  - a. Well Pump Remote Units (Wells 12 & 13)
  - b. Central Unit Computer Modifications. (Adding monitoring/control of the proposed Remote Units).

##### C. SYSTEM INTEGRATOR/CONTRACTOR SHALL SUPPLY

1. Shop drawings prior to installation.
2. All labor for installation of the system (Installation is to be by General Contractor)
3. All the paper works and fees necessary to obtain a license in the name of the Owner.
4. All labor for start-up & training of the system.
5. All equipment required by schedule.
6. All ancillary equipment, hardware, software, and appurtenances needed for proper installation and operation of equipment.
7. Operations and maintenance manuals as detailed below.

##### D. OWNER SHALL SUPPLY

1. Access and easements as needed for all sites.
2. 120VAC power at all sites.
3. Pressure sensing taps for all sensing points in the system.

## 1.02 QUALITY ASSURANCE

### A. Manufacturer's Qualifications

1. The system specified herein shall be the product of a manufacturer who can demonstrate at least ten (10) years of satisfactory experience in furnishing and installing comparable radio telemetry/control systems for water and wastewater installations.
2. The manufacturer of this system shall maintain a 24-hour available inventory of all replaceable modules to assure the Owner of prompt maintenance service and a single source of responsibility

### B. Codes & Standards

1. The control system and its components shall comply will all applicable requirements of the following:
  - a. Electrical Code Compliance (National & Local)
  - b. NEMA Compliance
  - c. IEEE Compliance
  - d. EIA Compliance
  - e. FCC Compliance

### C. Approved System Integrators

1. Micro-Comm, Inc. Olathe, Kansas.

## 1.03 SUBMITTALS

### A. Complete submittal shall be provided to the engineer for approval prior to equipment fabrication. The submittal data shall include the following:

1. Product Data
  - a. Provide product data sheets for each instrument and component supplied in the system. The data sheets shall show the component name as used on reference drawings, manufacturer's model number or other product designator, input and output characteristics, scale or ranges selected, electrical or mechanical requirements, and materials compatibility. Certified calibration data on all flow metering devices shall be provided with or on the data sheets.

### B. Shop Drawings

1. Provide drawings for each panel showing the wiring diagrams for control circuits and interconnections of all components. The drawings shall include wiring diagrams for all remote devices connected to the panel. In addition a detailed loop diagram, for each monitoring or control loop, each on a single 8 ½ in. X 11 in. sheet in a format acceptable by the Instrument Society of America, Standard for Instrument Loop Diagrams, ISA-S5.4 shall be provided.

- C. Panel Layout Drawings
  - 1. A front panel and sub-panel layout shall be included as part of each control panel drawing. Components shall be clearly labeled on the drawing.
- D. Installation Drawings
  - 1. Typical installation drawings applicable to each site in the system shall be included.

#### **1.04 MAINTENANCE INFORMATION**

- A. Maintenance Data Manuals
  - 1. Submit maintenance manuals and "as built" drawings on all items supplied with the system. The manuals and drawings are to be bound into one or more books as needed. In addition to "as built" engineering submittal data and drawings, the manual shall include:
    - a. Trouble Shooting Guides.
    - b. Maintenance and calibration data for all adjustable items.

#### **1.05 JOB CONDITIONS**

- A. All instruments and equipment shall be designed to operate under the environmental conditions where they are to perform their service. The equipment shall be designed to handle lightning and transient voltages as normal environmental hazards. The environmental conditions are as follows:
  - 1. Outdoor
    - a. The equipment will be exposed to direct sunlight, dust, rain, snow, ambient temperatures from -20 to +120 degrees F, relative humidity of 10 to 100 percent, and other natural outdoor conditions. The installations shall be hardened to with stand normal vandalism.
  - 2. Indoor
    - a. The equipment will be capable of operating in ambient temperatures of +32 to +130 degrees F and relative humidity of 20 to 100 percent.

#### **1.06 DELIVERY, STORAGE, & HANDLING**

- A. All items shall be stored in a dry sheltered place, not exposed to the outside elements, until ready for installation. All items shall be handled with appropriate care to avoid damage during transport and installation.

## 1.07 SEQUENCING & SCHEDULING

### A. Coordination

1. The Systems Integrator shall coordinate with other electrical and mechanical work including wires/cables, raceways, electrical boxes and fittings, controls supplied by others, and existing controls, to properly interface installation and commissioning of the control system.

### B. Sequence

1. Sequence installation and start-up work with other trades to minimize downtime and to minimize the possibility of damage and soiling during the remainder of the construction period.

## PART 2 - PRODUCTS

### 2.01 DISTRIBUTED CONTROL OPERATION DESCRIPTION

#### A. General

1. The control system shall use "smart-programmable" Remote Terminal Units (RTUs) to provide a "distributed intelligence" type control system. The software programs used at all locations shall be stored in non-volatile EEPROM or Flash type memories that are field re-programmable using software detailed later in these specifications. The system shall be "self-initializing" and not require operator intervention after power interruptions, transients from lightning storms, or component changes. All units in the system shall include "watch-dog" circuitry to insure automatic restarts of the system. Each remote site in the system shall be assigned a unique digital address.
2. The control system shall support peer-to-peer (i.e. RTU to RTU) communications to provide completely automatic control. In the event a Central Unit is added to the system, the RTU shall be capable of operation without software or hardware modifications. Each Water Tower remote shall be able to automatically communicate with its respective Booster Pump Station remotes with level data and discrete data. Each pump station remote shall be able to generate its own pump stop/start commands to maintain its water tower's level. All sites in the system shall have a "Telemetry Control" lamp to indicate that the site is functioning normally and in communication with its respective water tower.

#### B. RTU Control Software Features

1. Provide for High Discharge Cut-off and Low Suction Cut-off control of pumps from locally entered setpoints at RTUs equipped with suction and discharge pressure transmitters and/or from existing pressure switches.
2. Booster Station RTUs shall provide for back-up pressure control by comparing the discharge pressure transmitter (if required by these specifications) to locally stored setpoints for back-up pressure control or automatically switching to existing back-up pressure controls.

3. Operator input shall be accomplished by front panel Keypad & Display (if required by these specifications) or notebook computer.

## 2.02 RADIO MODEM DATA OPERATION

### A. General

1. The control system shall be specifically designed for radio channel data communications. All of the equipment required for operation of the system shall be directly owned by the Owner and included as part of this contract. Systems using third party repeaters, trunking masters, or leased equipment will not be allowed.

### B. Communications

1. The control system shall operate in a half-duplex mode over the single existing VHF (154.47125MHz) radio frequency using "point-to-point" communication techniques. The RTUs shall monitor for the channel to avoid data collisions with other RTUs during peer-to-peer communications. The system shall be capable of sharing the radio channel with other radio telemetry system.
2. All data transmitted shall be in digital word form using FSK (frequency shift keying) transmission. All transmissions shall include the address of the sender and the receiver, and be subject to check sum, parity, and framing error checks, to insure a minimum data reliability of 1 error in 1,000,000,000 bits. Any transmissions that fail the data checking will be retried until correct. No data correction methods will be allowed. A plug-in RS232C data port shall be provided at all locations in the system to allow the use of a standard data terminal to view data exchanges between the sites and to provide a means of extensive debugging.

### C. Radio Channel Operation

1. The system shall be capable of operation on the narrow band splinter frequencies of the Private Land Mobile Radio Services within the Federal Communications Commissions (FCC) rules and regulations regarding these telemetry channels. The manufacture shall guarantee operation under co-channel conditions with other radio systems without interference to this system. FSK tones, data baud rates, transmitter output power, transmitter deviation, antenna gain, and antenna height shall be chosen to comply with the FCC requirements Part 90 - Subpart 90.35 and 90.238 for the Industrial/Business frequency pools. The radio system shall specifically meet the operating requirement that the sum of the highest FSK frequency and the amount of deviation shall not exceed 1.7 kHz for 3F2 emission (or 2.8 kHz for 6F2 emission) as detailed by the FCC for the specific frequency assigned.
2. The overall system design and operation shall provide a 20db pad over the minimum required for operation on all primary data paths (primary paths may include data relays) to insure a 98% reliability of communications. Remote sites required to support peer-to-peer back-up control shall provide 30db of pad to insure operation under all weather conditions and provide a 99.9% communications reliability. The 20db and 30db pad requirements and FCC rule compliance shall be demonstrated (at no additional cost) to the Engineer at his

request. The testing shall be accomplished using an IFR AM/FM 1000S communications analyzer or equal equipment.

D. FCC Licensing

1. The system manufacturer/supplier shall be responsible for collecting all information, generating all paper work, and paying all fees required obtaining a license on behalf of the Owner.

E. Antenna Lightning Protection

1. Coaxial connection to remote and central unit enclosures shall be by means of a coaxial type bulkhead lightning arrestor. The units shall be rated at 1 kilowatt with a minimum 500V and maximum 2000V-breakdown voltage. Coaxial lightning arrestors shall be a PD-593 or PolyPhaser IS-B50LN-C1.

F. Antenna & Coaxial Cable

1. The radio antennas at all locations shall be a five element Yagi, constructed with 3/8" diameter aluminum rod elements and 1-1/16" diameter aluminum pipe element support with a type N coaxial connector. The antenna shall have a minimum 8.0db forward gain with a 20.0db front-to-back ratio. The antenna shall be wind rated for a 100-MPH wind speed. The VHF antennas shall be MC-Yagi, Decibel Products DB292, or Celwave PD390S. The UHF antennas shall be MC-Yagi or Celwave PD688S.
2. Antennas shall be cabled to the transmitter enclosure connection by a RG/8U low loss (less than 1.8db per 100ft @ 100MHz) coaxial cable with cellular polyethylene (foam) dielectric. The coaxial cable shall have a braided copper shield coverage of 97% and a long life weather resistant polyvinyl chloride jacket. The antenna coaxial cable connection shall be a constant impedance weatherproof Type N connector, taped with a weather resistant electrical tape to insure a lifetime watertight assembly. The coaxial cable shall be Belden 8214 or Amphenol TWB 4001 cable.

G. Antenna Lightning Protection

1. Coaxial connection to remote and central unit enclosures shall be by means of a coaxial type bulkhead lightning arrestor. The units shall be rated at 1 kilowatt with a minimum 500V and maximum 2000V-breakdown voltage. Coaxial lightning arrestors shall be a PD-593 or PolyPhaser IS-B50LN-C1.

H. Antenna Mounting Systems

1. Antennas shall be mounted at a height above ground that is consistent with FCC rules and regulations and provides adequate signal fade margin as described earlier. Antennas must be a minimum of 20 feet above ground and mounted as directed by the engineer and as follows:
  - a. Wooden Pole: The antenna shall be mounted on a 20' high Class II power pole with a 10' long X 1-1/2" galvanized mast secured to the side of the pole and extending 5' above the pole or a 20' high free-standing antenna tower. A 3/4" rigid conduit with a weather-head shall be provided from the below ground vault to a location 10 feet up the power pole for the coaxial cable.

- b. Antenna Towers (>20feet): A bracketed antenna tower shall be supplied where specifically noted on the plans or in the RTU & CTU site descriptions. The tower shall be assembled from 10 sections built on a 12-1/2" (or 18" for ROHN 45G) equilateral triangle design. Tower sections shall be constructed of 1-1/4" steel tubing with continuous solid steel rod "zigzag" cross bracing electrically welded to the tubing. The entire 10' sections shall be Hot-Dip Galvanized after fabrication for long life. The antenna towers shall be ROHN Model 25G (for unsupported heights of up to 33 feet) or ROHN Model 45G (for unsupported heights less than 45 feet).

## 2.03 INSTRUMENTATION & ACCESSORIES

### A. General

1. All items in the control system (electronic cards, power supplies, radios, time delays, relays, etc.) shall be of plug-in construction, make use of a plug-in wiring harness, use plug-in terminal blocks, and be interchangeable without recalibration. To insure field repair-ability by non-technical personnel, equipment that must be un-wired for replacement will not be accepted.
  - a. The following instrumentation devices and techniques shall be used as specifically called for in the RTU input/output sections of this specification.

### B. Power Supplies

1. The DC power supplies shall provide  $\pm 0.1\%$  line and load regulation with  $\pm 10\%$  input variations. They shall have a temperature coefficient of  $\pm 0.02\%$  per degree C. The input/output isolation shall be 100 Mohms DC (900Volts AC) with output transient response of 50 microseconds maximum. The power supplies shall be sized to operate the remote unit equipment with or without the back-up battery in place. Power Supplies shall be a Power One Series MAP130, Sola SLS, or approved equal.

### C. Battery Back-up Operation

1. The remote units indicated shall be supplied with battery back-up operation. The rechargeable batteries shall be the sealed solid gelled electrolyte types, designed for float or standby service. Unless noted otherwise in the RTU descriptions, batteries shall be sized to maintain 24-hour service at water tower remotes and 8 hour service at booster pump stations and other remotes. The remote shall include a charging module to recharge the battery when power is resumed, maintain the charge between outages, and provide a low voltage cut-off to protect the battery from excessive discharge during prolonged outages. All discrete, analog, and pulse inputs (i.e. switch closures, pressure, level, flows, etc.) shall continue to function on battery back up. Batteries shall be Globe Gel/Cell or approved equal.

D. Single Phase 120VAC Power Line Lightning Protection

1. Every site in the system shall be equipped with AC line filtering and lightning protection. The equipment shall provide 2-stage lightning/transient protection including inductive and capacitive filtering and MOV over-voltage protection.

E. Level & Pressure Transducers

1. Level & pressure transducers shall be of the all solid-state two-wire transmitter type with a 4-20mA output from a 10.5-24VDC excitation. The units shall be powered from the RTU power supply. The transducers shall have a combined error (linearity and hysteresis) of  $\pm 0.25\%$  full scale and be temperature compensated to  $\pm 2.5\%$  per 100 degrees Fahrenheit. Zero and span adjustments shall be standardized so that transducers are interchangeable without recalibration. All exposed or wetted parts shall be series 316 stainless steel, PVC, or Buna-N. The units shall be capable of a three times full scale over pressure with out damage or change of calibration.
2. The transducers shall be mounted at the sensing point and wired to the enclosure. The transducers shall have a 1/4" or 1/2" NPT process pressure connection. Transducers for above ground mounting shall have a 1/2" conduit connection for cable entry. Transducers at water towers (and other outside locations) shall be mounted below grade and below frost line to prevent freezing. Below grade mounted units shall have factory signal cabling and be suitable for a minimum of 100' submerged duty.
3. Pressure/Level transducers shall be Micro-Comm L5N series, Consolidated A300 Model 221GEE, or Ametek Model 57S.

F. Altitude and Pressure Gauges

1. All indicating gauges are pipe mounted with male and brass threaded pipe connections. Gauges shall be 4 1/2 inch liquid filled for maximum vibration and corrosion protection. Gauges shall have phosphor bronze Bourdon tubes, white laminated phenol dials. Gauges shall have micrometer adjustment of pointers and black phenol, black cast iron, brass, or aluminum case and ring, original rotary gear design, corrosion resistant, stainless steel movement, blowout protection, and bronze socket with wrench flats. Accuracy shall be within 1/2 of 1 percent of the scale range. They shall be as manufactured by Helicoid Gage Division, "410"; James P. Marsh Corporation, "Master Gauge"; Marshalltown; Ashcroft; U.S. Gauge; or equal.
2. All gauges shall be piped with provisions for venting pressure to allow calibration (zero) checks. Valves for gauge shutoff and zeroing shall be 1/4 turn ball valves with lever handle, corrosion-resistant.

G. Turbine Meter

1. The turbine meter shall be constructed of two basic assemblies, the maincase the measuring chamber. The maincase shall include stainless steel straightening vanes. The measuring chamber assembly shall include the rotor, adjusting vane, and a hermetically sealed, direct reading register.

2. The turbine meter shall operate on the following principle. Water flowing through the meter shall cause the rotor to turn. As the rotor turns, a ceramic driver magnet which is embedded in the rear face of the rotor shall pass a flux carrier with three legs. The magnetic force is then transmitted through the flux carrier leg to a cylindrical follower magnet which is attached to the gear train shaft inside the register's magnet well. The magnetic force shall cause the register shaft to rotate. The rotor assembly shall be the only moving part.
4. The rotor shall be manufactured of thermoplastic, with a ceramic bearing. The shaft shall be stainless steel. The maincase and measuring chamber shall be bronze. A bronze strainer with stainless steel screen shall be installed ahead of the meter. Operating pressure rating shall be 150 psi, with ANSI B 16.1 Class 125 flanges.
5. Operating range shall be 55-5500 gpm, continuous. Accuracy shall be  $\pm 1.5\%$  of actual thruput. For this project, meter shall be calibrated to 1400 gpm maximum.
6. The meter shall be furnished with a signal converter which converts the meter's magnetic drive signal to a 4-20 mADC current output proportional to the measured flowrate. The signal converter shall use a sensor to pick up the magnetic pulses generated by the meter's drive magnetics. The signal converter shall be a loop powered device, 24VDC, with primary cable between the meter and the signal converter furnished by the manufacturer. The Contractor shall be responsible for determining the required cable length.
7. All electronics at the meter shall be sealed to prevent water entry, and suitable for prolonged submersion.
8. An LED indicator shall be provided for display of measured and totalized flow. The indicator shall have a six digit, LED or LCD display, and shall be calibrated and displayed in engineering units.
9. The indicator shall accept a 4-20 mA, 0-20 mA, 0-5V, or 0-10V input, field selectable. Scale and calibration shall be accomplished using a signal button on the front of the unit. EEPROM memory shall store the settings when power is removed. Input power to the device shall be 115VAC, 60 Hz.
10. The indicator/totalizer shall be furnished with a NEMA 4X enclosure. Or the indicator/totalizer may be displayed on the front of the RTU on the RTU keypad and display.
11. The meter and transmitter shall be as manufactured by Sensus Technologies, Inc, or equal.

## PART 3 - REMOTE TERMINAL UNIT EQUIPMENT

### 3.01 GENERAL

- A. The Remote Terminal Units (RTUs) shall be "smart" Programmable Logic Control units at all locations. The core software program used at all locations shall be identical and stored in non-volatile FLASH type ROM memories that can be upgraded in the field by the owner using configuration software supplied as part of this contract. The core RTU software shall provide the basic operational logic including communication with other sites in the system. In the event a CTU is added the RTUs shall respond to control commands from the CTU, and provide back-up peer-to-peer control in the event of a CTU failure.
- B. Program and configuration data shall normally be stored in battery-back or flash type memory for use by the CPU. In addition, this data shall also be stored in a plug-in operator interchangeable EEPROM memory module. This module shall be fully enclosed with no exposed electrical leads, similar to the Allen-Bradley M11 memory module, providing protection against damage due to handling and static electricity. The module shall be programmed via the CPU and without the use of external adapters. The RTUs shall include "watch-dog" circuitry and be "self-initializing" without operator intervention. In the event that the program or configuration data is corrupted, the CPU shall reload the program and configuration data from the EEPROM memory module.
- C. The RTUs shall be fully online programmable while the RTU continues to communicate with the rest of the system and performs its assigned control tasks. The RTUs shall support "fill-in-the-blank" type configuration for basic operation and to set-up common features such as COM port set-up, peer-to-peer data collections, local back-up control set points, input and output setup, output on/off time delay settings, front panel display setup, etc. The RTU shall also support a process script language or ladder logic type programming for site-specific customizations including special input and output manipulations, local sequential control, and math functions. The RTU shall support both mathematical and PID control algorithms. Both the fill-in-the-blank configuration and programming shall be stored in the operator removable program module.

### 3.02 CONSTRUCTION

- A. The RTU shall use modular construction. The base unit shall be composed of the power supply, CPU, communications modules, and basic inputs and outputs. The unit shall have expandable inputs and outputs via either a card rack design or integrated high-performance serial I/O bus. All terminations on the RTU or expanded I/O shall use removable, NEMA-style "finger-safe" terminal blocks on the controller and I/O.
- B. The RTU shall be capable of being powered from AC, DC, or solar sources. DC and solar powered RTUs shall have an integral battery charging circuit that protects the external battery from over and under voltage conditions and provides automatic charging of the battery after power failures. The back-up power supply shall provide for the necessary 12VDC to run the radio and 24VDC to power external sensors while on battery power or recharging. Back-up batteries shall be rechargeable sealed lead-acid type batteries as manufactured by PowerSonic or equal. The back-up battery shall provide for 24 hours of back-up operation at water tower remote units and 3 hours at all other sites.
- C. The RTU shall support multiple communications ports. The first shall be used primarily for CTU-RTU and RTU-RTU communications. It shall support baud rates of 110-9600

baud and have a plug-in standard 25 pin sub-D connector that provides both full RS232 interface and radio modem interface for use with either "data" radios or standard business band type radios (i.e. radios with out internal modems). This port shall also have a 9 pin sub-D connector to allow monitoring of the communications activity. The second communications port shall provide for multi-drop type communications with operator interfaces, external inputs and outputs (I/O), and programming terminals. The port shall provide for both 2 and 4 wire RS485 interface with data rates to 9600 baud. The communications ports shall include LED's to show the status of all control lines.

- D. The RTU shall provide for sufficient installed and configured spare inputs and outputs (I/O) to meet the site requirements as detailed and provide for 25% spares of each type. The unit shall have a minimum of 8 discrete inputs (DI), (4) analog inputs (AI), and (1) high speed pulse input (PI). The analog and pulse inputs shall provide for sensor excitation with separate fuses for each input. The fuses may be the self-resetting type. The RTU inputs, outputs, and operator interface shall be as follows:
- a. Discrete Outputs - The discrete outputs shall be isolated relay outputs rated at 5.0A continuous @ 240VAC. LEDs on the front of the RTU base unit or expansion module shall indicate the status of each output point. Interposing relays shall be provided if the voltage or current of the external load on a contact exceed the 5.0A 240VAC ratings. Each output shall be provided with operator settable software ON and OFF time delays
  - b. Discrete Inputs - The discrete inputs shall be optically isolated and provide for 24VDC excitation to remote sensors and switches. LEDs on the front of the input module shall indicate the status of each input point.
  - c. Analog Inputs - The analog inputs shall provide filtered and scalable analog to digital conversion of input signals. The analog inputs shall be switch selectable from 0-5VDC to 0-20mADC and provide a minimum of 0.3% resolution and 0.5% accuracy over the temperature range of 0-70°C. The RTU shall provide separately fused 24VDC excitations to the remote sensors.
  - d. Analog Outputs - The analog inputs shall provide a 0-5VDC signal to RTU panel mounted devices or 4-20mA isolated signals if sent to other panels as specified.
  - e. Pulse Inputs - The high-speed counter/pulse inputs shall provide for pulse rates up to 1KHz direct from flow meter transmitter heads without interposing equipment. The pulse input shall include fused 12VDC excitation to the meter transmitter.
  - f. Power Supply - Each RTU assembly shall include an integral power supply. Power supplies shall be designed for 12VDC or 24VDC input power and suitable for use in battery back-up operations.
  - g. Keypad & Display Unit - The optional keypad & display unit shall have a 4x20 back-lighted LCD display to display the status of all local inputs and the tank level of the associated control water tower level. The 5x5 keypad shall provide for operator input of set points and timer settings. The operator interface shall be menu driven and provide for dedicated keys for cursor position and input functions. The operator interface shall provide for up to 50 screens of data display. The keypad & display unit shall be supplied and mounted on the front of the RTU enclosure if detailed in the specific RTU I/O requirement list. The keypad & display unit shall maintain the Nema 4 rating of the RTU enclosure.

## E. Enclosures

1. The remote unit enclosures for indoor mounting shall meet all the requirements for NEMA Type 12 enclosures. The enclosures body shall be made of a minimum 14 gauge steel with continuously welded seams and be furnished with external mounting feet. The enclosure door shall be made of a minimum 16 gauge steel with have a 14 gauge steel hinge. Enclosures larger than 16x14 shall have a rolled lip on 3 sides of the door for added strength. The door opening shall have a rolled edge on 4 sides to protect the door gasket. The door gasket shall be heavy neoprene and attached to the door with oil resistant adhesive. Sub-panels shall be 14-gauge steel for 16x14 enclosures and 12 gauge for larger enclosures. The enclosure finish shall be gray polyester powder coating inside and out over phosphatized surfaces. The subpanels shall be finished in white. Nema 12 enclosures shall be Hoffman "CH" or "CONCEPT" wall mount enclosures.
2. Remote site installations requiring equipment to be mounted outside shall have a double box enclosure with the remote unit enclosure mounted inside a lockable NEMA 3R enclosure. The double enclosure shall be required to control vandalism, provide complete weather protection, reduce the heating effects of the sun, and prolong the life of the equipment. The NEMA 3R enclosure shall be constructed of 14 gauge galvanized steel, with a drip shield top and seams free sides front and back, and a stainless steel hinge pin. The enclosure finish shall be gray polyester powder coating inside and out over phosphatized surfaces. The NEMA 3R enclosure shall be Hoffman Bulletin A-3.
3. The remote unit enclosures mounted in damp corrosive areas (such as concrete meter vaults) shall be NEMA Type 4X rated enclosures. The enclosures shall be made of molded fiberglass polyester and be furnished with external mounting feet. The door shall have a seamless foam-in-place gasket and corrosion-resistant hinge pin and bails. Sub-panels shall be 14-gauge steel for 16x14 enclosures and 12 gauge for larger enclosures. The enclosure finish shall be a light gray inside and out. The subpanels shall be finished in white. Nema 4X enclosures shall be Hoffman "Fiberglass Hinged Cover".

*Refer to Appendix for specific enclosure requirements.*

## F. Local Control Functions

1. In general the RTU shall be programmed to provide generic control functions as detailed earlier and to work in concert with the CTU. The integrator shall be responsible to meet with the owner and the engineer to develop the automatic control strategy required for the system.

*Refer to Appendix for specific input and output control functions.*

## **PART 4 - EXECUTION**

### **4.01 EQUIPMENT EXAMINATION**

- A. The control system shall be completely tested prior to shipment. The entire control system shall be "Burned In" at the factory for a period of at least 20 days. The component equipment shall be computer tested and temperature cycled at zero degrees and at fifty degrees centigrade.

### **4.02 SYSTEM START-UP**

- A. The manufacturer shall supply "Factory" personnel for start-up service as needed to insure satisfactory operation. Subsequent trips to the job site to correct defects shall be made at no charge to the Owner during the warranty period.

### **4.03 TRAINING**

- A. The system manufacturer shall supply "factory" personnel to conduct an on-site training session; a minimum of one day of training is required.

### **4.04 SUBSTANTIAL COMPLETION**

- A. The Engineer will grant substantial completion only after completion of the start-up and initial training phase of the project. The Engineer shall make an inspection of the system to determine the status of completion. Substantial completion will be awarded only when the system is providing usable service to the Owner. If the system is commissioned in phases, the Contractor may request substantial completion for the completed phases.

### **4.05 WARRANTY/SUPPORT PROGRAM**

- A. The control system manufacturer shall supply a **three (3)** year parts and labor warranty and comprehensive support program for all new RTU's supplied under this section (except as noted below). Power surges and lightning damage shall be included as part of the warranty.
- B. The warranty shall begin from the time of "substantial completion" as issued by the engineer. The manufacturer shall provide a 24-hour response to calls from the Owner. The manufacturer, at his discretion, may dispatch replacement parts to the Owner by next-day delivery service for field replacement by the Owner. Any damage to the control system caused by the actions of the Owner in attempting these field replacements shall be the sole responsibility of the manufacturer. If, during the warranty period, satisfactory field repair can not be attained by field replacement of parts by the Owner, the manufacturer shall dispatch "factory" personnel to the job site to complete repairs at no cost to the Owner.
- C. Flow meters, control valves and gauges supplied, as part of this contract shall be covered by a one- (1) year warranty beginning with "substantial completion".

- D. The support program shall begin from the time of “substantial completion” as issued by the engineer. The support program shall include free updating of all software as needed and providing free phone support from the integrator throughout the warranty period.

## **PART 5 - APPENDIX: DETAILED EQUIPMENT DESCRIPTION**

### **5.01 WELL RTU'S 12 & 13 REQUIREMENTS:**

#### **A. Installation Requirements:**

1. Site: New Well Remote Unit's at Wells 12 & 13 (separate stand alone RTU's)
2. Telemetry Control and Pump Command outputs to other panels shall be dry isolated contacts on relays. Local pressure inputs shall be by two-wire transducers as specified with the transducer located at the sensing point.
3. The antenna shall be mounted on a 40' (30' with 10' mast) free standing antenna tower as noted on the plans with 3/4" rigid conduit and a weather-head run to the RTU enclosure as previously specified.

#### **B. Front Panel Display Requirements:**

1. Keypad & Display assembly to display all inputs and output status

#### **C. Discrete Outputs:**

1. Well CALL

#### **D. Discrete Inputs:**

1. Power Failure
2. WELL RUNNING
3. Low Water Cut-Off (dry contact by others)

#### **E. Analog Inputs:**

1. System/Discharge Pressure
2. Flow Rate (4-20Ma or pulse signal)
3. Spare

- F. Wells 12 & 13 will be controlled by the existing Plant Clearwell level or as directed by the engineer.

**5.02 SCHEDULES**

Gauge Schedule

<u>Location</u>	<u>Range Combination</u>			<u>Accessories</u>	<u>No. Required</u>
	<u>Size</u>	<u>PSI</u>	<u>Ft.</u>		
Well Pump No 12 Discharge	4½	0-100	0-230	A,B	1
Well Pump No. 13 Discharge	4½	0-100	0-230	A,B	1

Pressure Gauge Accessory Code:

A - Gauge Liquid Filled

B - Ball Valves for Shutoff and Vent

**5.03 CENTRAL UNIT MODIFICATION REQUIREMENTS:**

- A. Modification Requirements:  
Site: Existing WTP & Office CTU and Desktop Computer
  
- B. The SCADA view software shall be upgraded to latest version available and the new RTUs data shall be displayed. New graphical display pages shall incorporate the new Well sites and existing SCADA system.

END OF SECTION



DIVISION 16

ELECTRICAL



## SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.01 CONTRACTOR'S UNDERSTANDING

- A. Contractors bidding work under this Contract shall read and understand Division Zero and Division 1 - General Requirements. If any discrepancies are discovered between the Basic Electrical Materials and Methods and General Requirements, the above mentioned documents shall overrule this section. The Basic Electrical Materials and Methods are intended as a supplement to the above mentioned documents.
- B. The Contractor shall bid as outlined in the above mentioned Specifications and shall be governed by any alternates or unit prices called for in the form of proposal.
- C. 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.

#### 1.02 SCOPE OF WORK

- A. Work included in this section of the Specifications shall include the furnishing of all labor, material, tools, approvals, utility connection fees, excavation, backfill, and other equipment necessary to install the electrical system as shown on the Contract Drawings and as specified herein.
- B. This work also includes installation and connection of all electrical utilization equipment included in this Contract but furnished by other contractors or suppliers.
- C. It is the general intent that all motors shall be furnished with the particular equipment they drive.
- D. The Contractor shall furnish and install all conduit, wire, disconnect switches and miscellaneous material to make all electrical connections to all items of utilization equipment or wiring devices except as otherwise specified.
- E. Equipment connections shall be made with flexible or rigid conduit as required. Controllers for motors, disconnect switches, and all control, protective and signal devices for motor circuits, except where such apparatus is furnished mounted and connected integrally with the motor driven equipment, shall be installed, connected and left in operating condition. The number and size of conductors between motors and control or protective apparatus shall be as required to obtain the operation described in these Specifications, and/or by the Contract Documents, and/or as shown in manufacturer furnished, Engineer reviewed Shop Drawings.
- F. All devices and items of electrical equipment, including those shown on the Contract Drawings but not specifically mentioned in the Specifications or those mentioned in the Specifications but not shown on the Contract Drawings, are to be furnished under this section of the specifications. Any such device or item of equipment, if not defined in quality, shall be equal to similar equipment and/or devices specified herein.

- G. All devices and items of equipment mentioned in this section of the Specifications whether electrical or not or whether furnished under this or other Division of the Specifications, shall be installed under this Division of the Specifications, unless specifically indicated otherwise.
- H. Where wiring diagrams are not shown on the Contract Drawings, they are to be provided by the supplier of the equipment served and such diagrams shall be adhered to except as herein modified.
- I. The following is a list of items that may not be defined clearly on the Contract Drawings or in other parts of these Specifications. The list is meant to be an aid to the Contractor and is not necessarily a complete list of all work to be performed under this Contract:
  - 1. Connect all motors and accessories furnished by equipment suppliers.
  - 2. Furnish, install, and connect all motor controls.
  - 3. Furnish, install, and connect lighting, indoor and outdoor.
  - 4. Furnish, install, and connect power and signal lines to all instrumentation equipment, and accessories.
  - 5. Furnish, install, and connect all electrical conduit, duct and cables.
  - 6. Furnish, install, and connect all power distribution equipment.

**1.03 SHOP DRAWINGS, DESCRIPTIVE LITERATURE, INSTALLATION, OPERATION AND MAINTENANCE INFORMATION**

- A. Shop Drawings including descriptive literature and/or installation, operation and maintenance instructions shall be submitted in the amount of 8 copies for this Division. All Shop Drawings shall be submitted in loose-leaf three-ring cardboard reinforced vinyl binders.
- B. Shop Drawings shall be submitted on the following materials specified in this Division:
  - 1. Conduit - all types and sizes, including liquid-tight flexible.
  - 2. Boxes - all types and sizes.
  - 3. Coal tar epoxy paint.
  - 4. Wiring devices.
  - 5. Device plates.
  - 6. Metal framing system (Strut type channel).
  - 7. Conduit fittings, expansion joints, support hardware.
  - 8. Motor control equipment - including individually mounted items.
  - 9. Power distribution equipment - including individually mounted items.
  - 10. Wire - all types and sizes.
  - 11. Light fixtures - all types.
  - 12. Wire markers, signs and labels.
  - 13. Lightning/transient suppressors.
  - 14. Motors.
- C. The Engineer reserves the right to make modifications to motor control and power distribution equipment ratings after Shop Drawing review, if the Shop Drawings are submitted prematurely (prematurely meaning submitted before all utilization equipment has been reviewed and accepted). Cost of modifications shall be the Contractor's responsibility.

**1.04 SYMBOLS AND ABBREVIATIONS**

- A. The symbols and abbreviations generally follow standard electrical and architectural 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. The minimum standard for all work shall be the latest revision of the Kentucky Building Code (KBC), and the National Electrical Code (NEC). Whenever and wherever state and/or local laws or ordinances and/or regulations and/or the Engineer's design require a higher standard than the current NEC or KBC, then these laws and/or regulations and/or the design shall be followed.
- B. Following is a list of applicable Standards or Codes:

1.	Kentucky Building Code	KBC
2.	National Electrical Code	NEC
3.	National Electrical Safety Code	NESC
4.	Underwriters Laboratories, Inc.	UL
5.	Factory Mutual System	FM
6.	National Fire Protection Association	NFPA
7.	National Electrical Manufacturers Association	NEMA
8.	Occupational Safety and Health Administration	OSHA
9.	Insulated Cable Engineers Association, Inc.	ICEA
10.	Illuminating Engineering Society of North America	IESNA
11.	Instrument Society of America	ISA
12.	Institute of Electrical and Electronic Engineers, Inc.	IEEE
13.	Certified Ballast Manufacturers Association	CBM
14.	American National Standards Institute, Inc.	ANSI
15.	Anti-Friction Bearing Manufacturers Association, Inc.	AFBMA
16.	Joint Industry Council	JIC
17.	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.	ASHRAE
18.	Federal Communications Commission	FCC
19.	American Society for Testing and Materials	ASTM
20.	American Wood Preservers Association	AWPA
21.	USDA Rural Development Electric Program	RUS

**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. The Contractor shall notify the electrical inspector in writing, immediately upon notice to proceed, and a copy of the notice shall be submitted to the Engineer.

- B. At the time of completion of the project, there shall be furnished to the Owner a certificate of compliance, from the agency having jurisdiction pursuant to all electrical work performed. The Engineer shall also receive a photostatic copy.
- C. All costs incurred by the Contractor to execute the above mentioned requirements shall be paid by the Contractor at no extra cost to the Owner.
- D. All permits necessary for the complete electrical system shall be obtained by the Contractor from the authorities governing such work. For further information, See Division I.

#### **1.08 STORAGE**

- A. All work, equipment, and materials shall be protected against dirt, water, or other injury during the period of construction.
- B. Sensitive electrical equipment such as light fixtures, motor starters, controls, and panelboards, delivered to the job site, 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 to 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. Electrical equipment other than boxes and conduit shall not be installed until the structure is under roof with doors and windows installed.

#### **1.09 MATERIALS**

- A. All materials used shall be new and at least meet the minimum standards as established by the NEC and/or National Electrical Manufacturers Association (NEMA). All materials shall be UL listed for the application, where a listing exists. Additional requirements are found in Division I. 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. Further requirements on this subject may be found in the General Requirements, Division 1.
- 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. Date of acceptance shall be considered to be the date on which all "punch list" items are completed ("punch list" is defined to be the written listing of work that is incomplete or deficient that must be finished or replaced/repared before the Contractor receives final payment).
- 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.
- C. Lamps shall bear the manufacturer's warranty.

## **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 and/or equipment manufacturers prior to placing power on the equipment.
- C. Tests may be performed by the Engineer to determine integrity of insulation on wiring circuits selected by the Engineer at random.

- D. 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 completed as soon as possible after the electrical installation is complete. All electrical equipment shall be free of shipping tags, stickers, etc. All painted equipment shall be left free of scratches or other blemishes, such as splattered or blistered paint, etc. All light fixture diffusers shall be clean and the interior of all motor controls, etc., shall be free of dust, dirt, wire strippings, etc. Surplus material, rubbish and equipment resulting from the work shall be removed from the job site by the Contractor upon completion of the work.
- B. During construction, cover all Owner equipment and furnishings subject to mechanical damage or contamination in any way.

### 1.14 CUTTING AND PATCHING

- A. Cutting and patching shall be held to an absolute minimum and such work shall be done only under the direction of the Engineer or Owner. The Contractor shall be responsible for and shall pay for all openings that may be required in the floors or walls, and he shall be responsible for putting said surfaces back in their original condition. Every attempt shall be made to avoid cutting reinforcing steel bars when an opening is required in a reinforced concrete wall or floor slab.

### 1.15 EXCAVATION AND BACKFILL

- A. Excavation
  - 1. 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. 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 noted on the Contract Drawings. The cost of solid rock excavation shall be included in the lump sum bid with no extra pay allowed (unclassified).
- B. Backfill
  - 1. 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 3/4 inches in diameter.

### 1.16 POWER COMPANY COORDINATION

- A. The Contractor is responsible for coordinating all activities onsite by the power company.
- B. All power company metering equipment shall be electrically located "upstream" of any manual/automatic transfer equipment on projects requiring onsite emergency power generation equipment.

- C. Any special provisions required by the serving electrical utility shall be as outlined on the Contract Drawings or as advised by the utility at the time of construction, and work required by these special provisions shall be executed with no extra cost to the Owner. Owner shall approve any contribution-in-aid-to-construction.

#### **1.17 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. Temporary power is also addressed in Division 1.

#### **1.18 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.
- B. The Contractor shall submit to the Engineer actual nameplate data from motors shipped to the site, stating motor identification as well as characteristics. Overload relay thermal unit selection tables shall accompany the motor data. The Engineer will select thermal unit sizes from this data for use by the Contractor in ordering proper thermal units.

#### **1.19 AS BUILT 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.

#### **1.20 GROUNDING AND BONDING**

- A. All metallic conduit, cabinets, equipment, and service shall be grounded in accordance with the latest issue of the National Electrical Code. All supporting framework and other metal or metal clad equipment or materials which are in contact with electrical conduit, cable and/or enclosures, shall be properly bonded and grounded to meet code requirements.

#### **1.21 RELATED SPECIFICATION DIVISIONS**

- A. The following divisions contain Specifications on utilization equipment, equipment accessories, and procedures related to execution of the electrical work, and are included here for the Contractor's information. Bids shall still be based on complete Contract Documents.

Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract  
Division 1 - General Requirements  
Division 11 - Equipment

**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.
- B. Any details not shown on the Drawings or written in the Specifications pertaining to the service entrance shall be per power company requirements. It is the Contractor's responsibility to contact the utility prior to bidding and obtain any special requirements or costs they require. Those costs shall be included in the bid.

**1.23 CONTRACTOR LICENSING**

- A. The Contractor performing the electrical work on this project shall be locally licensed, if required by local law or ordinance. If the Contractor has passed the State test, it may not be necessary to meet local testing requirements. It shall be the Contractor's responsibility to investigate these requirements and comply with same.

**1.24 ANCHORING/MOUNTING**

- A. Electrical conduits and/or equipment shall be rigidly supported. Anchors used shall be metallic expansion type, or if appropriate to prevent spalling concrete, epoxy set type. Plastic or explosive type anchors are prohibited.
- B. Since this project is in Seismic Zone 1, the Contractor shall ensure that all supports are consistent with the KBC requirements in this regard.

**PART 2 - PRODUCTS**

Not Applicable.

**PART 3 - EXECUTION**

Not Applicable.

END OF SECTION

## **SECTION 16060 - SECONDARY GROUNDING**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. Grounding shall be done in accordance with the NEC, as described in these Specifications, and as shown on the Contract Documents.

### **PART 2 - PRODUCTS**

#### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Grounding equipment shall be ERICO (Cadweld), Continental Industries (Thermoweld) Thomas & Betts (Blackburn), or equal.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION/APPLICATION/ERECTION**

- A. Grounding shall utilize a supplemental driven ground rod system in a bed to achieve the design ground resistance.
- B. The ground system shall be continuous with all structures on a common ground. This can be accomplished by bonding all conduits together and bonding to the ground bus at each motor control center. Bonding jumpers shall be required at all pull boxes, and at all motor casings.
- C. Ground rods shall be 3/4" x 10'-0" copper clad type. Where multiple rods are driven, they shall be separated by at least 10 feet.
- D. Ground resistance between rod, pipe, or plate electrodes and ground shall not exceed 5 ohms.
- E. All grounding and grounding electrode systems shall be as required by the NEC .
- F. All grounding electrode system connections shall be made using exothermic welds, Cadweld, or equal. No splices are allowed in the grounding electrode conductor.
- G. Should ground rods be impractical for use due to rocky conditions, then grounding electrode plates may be used after acceptance by the Engineer on a case-by-case basis.

### 3.02 FIELD QUALITY CONTROL

#### A. Testing

1. The Contractor shall be required to provide all labor, tools, instruments, and materials as necessary to perform testing of the grounding electrode system. Results shall be submitted in writing to the Engineer. The testing shall be done to determine the effectiveness of the selected grounding scheme and to see that it conforms with resistance specified (5 ohms maximum).
2. The testing should be done using a fall-of-potential method test at the point of grounding electrode conductor connection to main power distribution equipment. The test shall be performed no sooner than 48 hours after a rainfall event.
3. The written report should contain the following information:
  - a. Type of ground Grounding Electrode System.
  - b. Type of instrument used.
    - (1) Manufacturer
    - (2) Model Number
    - (3) Confirm fall-of-potential test
    - (4)\* Serial Number
    - (5)\* Where instrument was obtained

\* These 2 items are required so that the same instrument may be utilized should reproduction of the test be necessary due to unsatisfactory readings/instrument miscalibration.

- c. Ground resistance readings obtained at various test distances.
- d. Ground resistance/distance curve.
- e. Value of Grounding Electrode Resistance at knee of curve.
- f. Sketch showing setup of instrumentation and location of grounding electrode and test probes.
- g. Proposed method to achieve the specified resistance, should an unacceptable reading be obtained.
- h. Ground resistance readings obtained (if applicable) after modifications incorporated.

END OF SECTION

## **SECTION 16070 - SUPPORTING DEVICES**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. All electric equipment shall be rigidly mounted, and installed using supporting devices as indicated on the Contract Drawings, as required by the work, and described herein.

### **PART 2 - PRODUCTS**

#### **2.01 ACCEPTABLE MANUFACTURERS**

- A. "Kindorf," "Unistrut," or equal.

#### **2.02 MATERIALS**

- A. All mounting brackets and strut used outside shall be aluminum. Fasteners used to mount equipment outside shall be stainless steel.

### **PART 3 - EXECUTION**

**Not Applicable**

END OF SECTION



## **SECTION 16075 - ELECTRICAL IDENTIFICATION**

### **PART 1 - GENERAL**

#### **1.01 EQUIPMENT LABELING**

- A. All starters, feeder units in panelboards, disconnects, instruments, etc. shall be marked to indicate the motor, outlet, circuit they control, or variable monitored. Marking is to be done with engraved laminated nameplates and shall bear the designation shown on the Contract Drawings where this information is given. Nameplates shall be fastened to equipment with stainless steel screws, minimum of one each side. In no way shall the installation of mounting screws void the NEMA enclosure rating of the equipment in which they are installed. If there is more than one identical unit, they shall be given consecutive numbers or other descriptions as designated by the Engineer. Nameplate background color shall be white, with black engraved letters, unless otherwise noted.
  
- B. Individual railing mounted starters and disconnect switches shall be labeled with vinyl self-adhesive signs that warn of "High Voltage" (state the specific voltage). Main service entrance conduits, where exposed, shall be labeled with the voltage of the service they carry. Other major equipment such as transformers, transfer switches, generator sets, pump control panels, etc., shall be labeled. The type of labels to be used shall have orange as the basic color to conform with OSHA requirements, letters shall be black. The labels shall be of proper size to fit flatly on the surface of the enclosure to make a neat appearance and not interfere with the operating function of the device. These labels shall be manufactured by the Brady Identification Systems Division, Safety Sign Company, or equal.
  
- C. All feeder and branch circuit conductors shall be color-coded as per Section 16120 of these specifications and 2005 NEC, Article 210.5(c).

### **PART 2 - PRODUCTS**

Not applicable

### **PART 3 - EXECUTION**

Not applicable

END OF SECTION



## **SECTION 16120 - CONDUCTORS AND CABLES**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. All wire and cable shall conform to the requirements of the latest edition of the NEC and shall meet all ASTM/UL specifications. Wire and cable shall be new; shall have size, grade of insulation, voltage rating and manufacturer's name permanently marked on the outer covering at regular intervals. Complete descriptive literature shall be submitted to the Engineer for review and acceptance prior to installation.
- B. Building wire shall be applied based on a 75 degree Celsius operating temperature at 30 degrees Celsius ambient temperature.

#### **1.02 DELIVERY, STORAGE AND HANDLING**

- A. Wire and cable shall be suitably protected from weather and damage during storage and handling and shall be in first class condition when installed.

### **PART 2 - PRODUCTS**

#### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Building Wire (types "THHN and "THWN"-cu.) – "American," "General Cable (Carol)," "KRIS-TECH," "Phelps Dodge", "Southwire", or equal.
- B. Self Supporting Aerial Power Cables (600V, 5KV, or 15 KV) – "Okonite," "American," or equal.
- C. Instrumentation Cables (Shielded) 600V mx. – "American," "Belden," "Okonite," or equal.

#### **2.02 MATERIALS**

- A. General
  - 1. In general, all conductors shall be 98 percent conductive, annealed copper unless otherwise noted on the Contract Drawings.
  - 2. Conductors shall be type THHN/THWN insulation. Conductor size shall be AWG (American Wire Gauge) Standard. Minimum conductor size shall be AWG number 12. Minimum voltage rating shall be 600 volts. Conductors for small branch circuits may be solid (i.e. lighting, receptacles), but conductors for control work shall be stranded.

3. Conductors with high temperature rated insulations and special construction shall be used where required in connecting to light fixtures or appliances that have special requirements.

## PART 3 - EXECUTION

### 3.01 INSTALLATION/APPLICATION/ERECTION

#### A. General

1. Conductors shall be continuous from outlet to outlet and no splices shall be made except where accessible in junction or outlet boxes. Wire connectors of insulating material or solderless pressure connectors, properly taped, and shall be used for all splices in wiring.
2. Conductors shall be color coded in accordance with the following schedule:

	480 Volt 3 Phase	240/120 Volt Single Phase
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	
Neutral (Grounded)		White
Grounding	Green	Green
Remote Energized Conductors (Control)		Yellow
Control	Std. Code	

3. Conductors shall be pulled into raceways in strict accordance with manufacturer's recommendations.
4. Ample slack in conductors shall be allowed at each terminal point, and pull or junction box, to permit installation with ease and without crowding.
5. All conductors terminating at terminal blocks shall be identified with numbers and/or letters identical to circuit or control identification.
6. Overhead, pole-line supported conductors shall be sagged in accordance with the manufacturer's tables provided for that purpose.
7. No conductors shall be pulled into conduits until all work which may cause wire or cable damage is completed. Wire pulling shall be accomplished utilizing machinery and accessories intended for the purpose.
8. All connections and splices shall be made in accordance with conductor manufacturer's recommendations, and as written herein.

9. In general, feeder sizes shown are based on no more than three current carrying conductors in a conduit. Multiple small branch circuit feeders may be combined in a common conduit, provided conductors are derated in accordance with NEC article 310-15.
10. Neutrals may be shared only with similar branch circuits of different phases.

B. Feeders

1. All feeders are of the secondary type, below 600 volts, unless otherwise noted. Secondary feeder voltage shall be 480 volt as noted in the Contract Drawings.
2. Wire shall be factory color coded for each phase and neutral, with green used for the grounding conductor. As far as practical, all feeders shall be continuous from origin to panel termination without splices in intermediate pull boxes

C. Instrument Cable

1. General

- a. All signal lines should be constructed of individually twisted pairs, including thermocouple extension leads. Cables should be made of twisted pairs, with all lays and pairs twisted in the same direction for maximum flexibility.
- b. Wire size is #16 AWG minimum for single pair runs under 5,000 feet in length. Wire size shall be #16 - #20 AWG for multi-pair cable runs under 5,000 feet in length.
- c. Stranded tinned copper conductor shall be used for all wiring other than thermocouple extension leads.
- d. Insulation resistance at 68 degrees Fahrenheit between conductors and between conductors and ground should be at least 500 megohms per 1,000 feet.
- e. Multi-pair cable should be jacketed with poly-vinyl-chloride, polyethylene or Teflon at least 0.045" thick. Voltage rating shall be 600 volts.

2. Signal Wiring

- a. Low level analog (less than 500 millivolt d-c). Use twisted pairs which may be cabled with other pairs carrying similar voltage levels. Foil wraps or equivalent shielding is required for each cable with the shield grounded on one end.
- b. High level analog (greater than 500 millivolts d-c) shall use twisted pairs which may be cabled with other pairs carrying similar voltage levels and current levels less than 100 ma. Shielding is required.
- c. Analog outputs (normally 0-4 d-c or 4-20 ma). Same as b.
- d. Contact inputs - use twisted pairs and run in separate conduit
- e. Contact outputs - same as d.

- f. Pulse inputs - same as d.
3. Signal and Shield Grounding
- a. All shields must be grounded at one point only as close as possible to the signal source.
  - b. Thermocouples may be grounded or ungrounded.
  - c. Analog signals shall be grounded as near the signal source as possible.
  - d. Resistance bulbs should not be grounded.
4. Signal and Wiring Separation
- a. High level analog signals may share the same conduit or run with contact or pulse signals.
  - b. Thermocouple and low level signals should be run in a separate conduit.
  - c. A minimum separation of 12 inches between analog signal leads and AC power leads should be maintained. For AC power leads carrying 100 amps or greater, a 24 inch separation shall be maintained. Parallel runs should be limited to less than 500 feet. Perpendicular runs may be as close as 6 inches.

END OF SECTION

## SECTION 16130 - RACEWAYS

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- A. This section of the Technical Specifications includes all raceways for accommodation of electrical conductors, communications conductors, and sleeves for underground electrical installations, conduit stubs for future installations, fittings, and accessories.
- B. All raceways shall be marked with the manufacturer's name or trademark as well as type of raceway and size. This marking shall appear at least once every 10 feet and shall be of sufficient durability to withstand the environment involved. All raceways shall be furnished and installed as outlined under Part 3 of this Specification.
- C. All raceways and fittings shall be painted to match existing or surrounding surfaces except in mechanical spaces.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Tubular Raceways
  - 1. Rigid Metal Conduit (RMC) – Allied Tube & Conduit Corp., Wheatland Tube Co or equal.
  - 2. Rigid PVC Conduit - Schedule 40 or Schedule 80 – Cantex, Carlon, or equal.
  - 3. Liquidtight Flexible Metal Conduit – Alflex, Anaconda, Thomas & Betts or equal.
- B. Raceway Fittings
  - 1. Conduit fittings – Appleton, Crouse-Hinds, OZ Gedney, Thomas & Betts or equal.
  - 2. Non-metallic conduit fittings – Arlington, Carlon, Thomas & Betts or equal.
  - 3. Flexible conduit fittings – Arlington, Raco, T & B, OZ Gedney, or equal.

#### 2.02 MATERIALS

- A. Rigid Metal Conduit (RMC)
  - 1. Rigid metal conduit and fittings shall be of mild steel piping, galvanized inside and out. Conduit and fittings shall be listed and labeled by UL. The galvanized coating of zinc shall be of uniform thickness applied by the hot-dipped process. It shall be further dipped in a chromic acid bath so as to chemically form a corrosion resistant protective coating of zinc chromate which has a characteristic

yellow-green color. Each piece of conduit shall be straight, free from blisters and other defects, cut square, and taper reamed. It shall be delivered with plastic protectors on the threads.

B. Polyvinylchloride (PVC) Conduit

1. PVC conduit and fittings shall be Schedule 40, 80 heavy wall, or thinwall, as indicated in these Specifications. It shall be listed and labeled by UL. It shall have at least the same temperature rating as the conductor insulation. Expansion joints shall be used as recommended by the manufacturer in published literature. PVC systems shall be 90 degrees Celsius minimum, UL listed and labeled, and comply to NEMA Specifications.

C. Flexible Metal Conduit (FMC)

1. Flexible metal conduit shall be constructed from flexibly or spirally wound electro-galvanized steel. Connections shall be by means of galvanized malleable iron squeeze type fittings or tomic twist-in type in sizes not exceeding 3/4 inch. Liquidtight conduit shall be light gray in color and have sealtight fittings, type UA. All flexible conduit for this project shall be liquidtight.

D. Conduit Fittings

1. Rigid Metal Conduit Fittings

- a. Standard threaded couplings, locknuts, bushings, and elbows made only of steel or malleable iron are acceptable.
- b. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
- c. Bushings: 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.
- d. Erickson (union-type) and set screw type couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
- e. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, installed fittings in flush steel boxes with blank coverplates having the same finishes as that of other electrical plates in the room.

2. Expansion and Deflection Couplings

- a. Accommodate 1.9 cm (0.75 inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
- b. Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with NEC code tables for ground conductors.

- c. Watertight, seismically qualified, corrosion-resistant, threaded for and compatible with rigid or intermediate metal conduit.
- d. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material and stainless steel jacket clamps.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Exterior underground metallic conduits shall be degreased, pretreated, and coated with 2 coats of Carboline 888 epoxy, or equal. Other finishes may be acceptable upon the Engineer's review.

### **3.02 INSTALLATION**

- A. Conduit
  - 1. All conduit shall be installed in a first class workmanship manner. It shall be installed in horizontal and vertical runs in such a manner as to ensure against trouble from the collection of trapped condensation and shall be arranged so as to be devoid of traps wherever possible. Special care shall be used in assuring that exposed conduit runs are parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. No open wiring is allowed.
  - 2. Fittings or symmetrical bends shall be required wherever right angle turns are made in exposed work. Bends and offsets shall be avoided wherever possible, but where necessary, they shall be made with an approved conduit bending machine. All conduit joints shall be cut square, reamed smooth and drawn up tight, using couplings intended for the purpose.
  - 3. Conduits shall be securely fastened to all sheet metal outlets, junction and pull boxes with double galvanized locknuts and insulating-grounding bushings as required by the NEC. Conduit crossings in insulating roof fill will require both conduits to be secured to the roof deck, and these crossings can only be made where the insulating fill is a minimum of 3 inches deep. Runs of exposed conduit shall be supported in accordance with the NEC using cast aluminum or malleable iron one hole pipe straps with spacers to provide an air space behind the conduit. Stainless steel minerallac, one piece conduit clamps shall be acceptable where located such that building occupants are not in danger of inadvertent contact, since this type fitting has several sharp edges. In general terms, they may be considered in areas such as on or above ceilings, or high on walls. All conduit in walls and slabs shall be securely braced, capped (wooden plugs are prohibited), and fastened to the forms to prevent dislodgement during vibration and pouring of concrete.

4. During construction, all conduit work shall be protected to prevent lodgement of dirt, plaster or trash in conduits, fittings or boxes. Conduits which have been plugged shall be entirely freed of accumulations or be replaced. All conduits in floors or below grade shall be swabbed free of debris and moisture before wires are pulled. Crushed or deformed conduit shall not be permitted.
5. The final section of conduit connecting each motor or piece of utilization equipment subject to vibration shall be of the flexible type. Type "UA" shall be used in all process areas and in outdoor or wet locations.
6. In certain situations, conduit expansion joints shall be required to ensure against conduit and/or cable damage due to settling or thermal expansion and contraction. These expansion joints shall be required where required by the manufacturer or the Contract Drawings and shall be installed per manufacturer's instructions.
7. PVC conduit installed underground for low voltage application shall be schedule 80 without encasement. Where PVC conduit is installed, transition shall be made to RMC conduit at bends where wire pulling could cut conduit.
8. All metal raceway systems shall be conductive, solidly bonded throughout, and grounded in accordance with NEC requirements and/or as noted on the Contract Drawings. In addition, all raceway systems shall be provided with separate grounding conductors.
9. **Minimum conduit size shall be 3/4 inch.** The following table shows the minimum burial depth required for all exterior conduit or cable:

Rigid Metal Conduit	24"
Schedule 80 PVC	36"
10. Wire pulling shall be facilitated by the use of a UL approved pulling compound in pulls over 30 feet in length or where there are 2 or more 90 degree bends. Only polypropylene, nylon, or manila pulling ropes will be permitted. **Standard industry recognized wire pulling equipment shall be used.**
11. All conduits entering and leaving instrument enclosures shall be sealed around the wires with silicone caulk.
12. All conduit shall have an insulated ground wire pulled to all equipment and receptacles.
13. All raceway runs are shown diagrammatically to outline the general routing of the raceway. The installation shall be made to avoid interference with pipes, ducts, structural members or other equipment. Should structural or other interference prevent the installation of the raceways, or setting of boxes, cabinets, or the electrical equipment, as indicated in the Drawings, deviations must be approved by the Owner, and after approval, shall be made without additional charges and shown on the Record Drawings.
16. All runs of flexible conduit shall be supported in accordance with NEC requirements.

END OF SECTION

## SECTION 16131 - BOXES

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- A. Outlet and junction boxes shall be furnished and installed where indicated on the Contract Drawings, and/or as required by the work in accordance with the NEC.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Boxes – “Queen,” “Wiegmann,” “Appleton,” “Raco,” “Bauers,” “Crouse-Hinds,” “Hoffman,” “Robroy Industries,” “Cloud Concrete Products,” “Spring City,” “Carlton,” “Sedco,” or equal.

#### 2.02 GENERAL

- A. Junction and/or pull boxes for wet or damp locations shall be cast metal, rust and corrosion resistant (NEMA 4X), with at least 5 1/2 full threads for each conduit opening, and shall be suitable for flush or surface mounting as required with drilled external, cast mounting extensions (bossed to provide at least 1/8" between back of box and mounting surface for drainage). Box covers shall be hinged or cap screw retained as required, of the same material as the box and provided with stainless steel (rustproof) hardware.
- B. NEMA 4X junction and/or pull boxes shall be stainless steel, non-metallic, or cast aluminum if called for on the Contract Drawings.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION, APPLICATION, AND ERECTION

- A. General
  - 1. Outlets shall be installed in the locations shown on the Contract Drawings. When necessary, the Contractor shall relocate outlets so that when fixtures or other fittings are installed, they will not interfere with other work or equipment.
  - 2. All supports for outlet boxes shall be furnished and installed by the electrical trades.
- B. Openings in Electrical Boxes
  - 1. All openings in electrical equipment, enclosures, cabinets, outlet and junction boxes shall be by means of welded bosses, standard knockouts, or shall be sawed, drilled, or punched with tools specially made for the purpose. The use of a cutting torch is prohibited. Unused openings shall be plugged per the NEC.

END OF SECTION  
BOXES



## SECTION 16150 - WIRE CONNECTIONS AND CONNECTING DEVICES

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- A. Wire connection and connecting devices shall be as herein specified.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Connectors, Lugs, etc. - "T & B," "Anderson," "Burndy," or equal.
- B. Termination and splice connectors - "3M Scotchlok," "Anderson," "T & B," "Burndy," or equal.

#### 2.02 MATERIALS

- A. Wire Splicing and Terminations (600 Volts and Below)
  - 1. Electrical Terminal and Splice Connectors (#22 AWG- #4 AWG)
    - a. Terminals and splice connectors from #22 AWG- #4 AWG shall be compression types 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.
    - b. Connectors shall be manufactured from high conductivity copper and entirely tin plated. Terminal barrels shall be serrated on the inside surface and have a chamfered conductor entry. Terminals shall have funnel entry construction to prevent strand fold-back. All barrels shall be brazed seam or seamless construction.
    - c. Spade type terminals shall be sized for the appropriate stud and shall be locking type that snap firmly onto studs with a close fit for maximum retention. Spade type terminals shall be insulated with an insulation suitable for maintaining a high dielectric strength when crimped and be made from nylon, PVC, or equal.
  - 2. Electrical Lugs and Connectors (#6 AWG – 1,000 Kcmil)
    - a. Lugs and splice connectors from #6 AWG – 1,000 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 be UL listed and labeled for the intended purpose. All lugs above 4/0

AWG shall have 2 hole lugs with NEMA spacing. The lugs shall be of closed end construction to exclude moisture migration into the cable conductor.

3. Twist-on Wire Connectors (#22 AWG - #10 AWG)
  - a. All twist-on wire connectors must have a corrosion resistant spring that is free to expand. The connector must be insulated with a flexible vinyl jacket capable of withstanding 105 degrees Celsius ambient temperatures and of sufficient length to cover wires that are inadvertently overstripped.
  - b. Each connector size must be listed by UL for the intended purpose and color coded to assure that the proper size is used on the wire combinations to be spliced. The connectors must be compatible with all common rubber and thermoplastic wire insulations.
4. Solderless/re-usable lugs shall be used only when furnished with equipment such as control panels, furnished by others, where specification of compression type lugs is beyond the Contractor's control. In the event their use is necessary, the Contractor shall be responsible for assuring that they are manufactured to NEMA standards, with proper number and spacing of holes and set screws.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION, APPLICATION, & ERECTION**

#### **A. Insulation of Splices and Connections**

1. Connections/splices with a smooth even contour shall be insulated with a conformable 7 mil thick vinyl plastic insulating tape which can be applied under all weather conditions and is designed to perform in a temperature environment up to 105 degrees Celsius. The tape shall have excellent resistance to abrasion, moisture, alkalies, acids, corrosion, and varying weather conditions (including sunlight). The tape shall be equal to Scotch 33+ and shall be applied in conformance with manufacturer's recommendations. In addition, it shall be applied in successive half-lapped layers with sufficient tension to reduce its width to 60% of its original width. The last inch of the wrap shall not be stretched.
2. Connections/splices with irregular shapes or sharp edges protruding shall first be wrapped with 30 mil rubber tape to smooth the contour of the joint before being insulated with 33+ insulating tape specified in the previous paragraph. The rubber tape shall be high voltage corona-resistant, based on self-fusing ethylene propylene rubber and be capable of operation at 130 degrees Celsius. The tape must be capable of being applied in either the stretched or unstretched condition without any loss in either physical or electrical properties. The tape must not split, crack, slip, or flag when exposed to various environments. The tape must be compatible with all synthetic cable insulations. The tape must have a dissipation factor of less than 5 percent at 130 degrees Celsius, be non-vulcanizing, and have a shelf life of a least 5 years. The rubber tape shall be applied in successive, half-lapped wound layers and shall be highly elongated to eliminate voids. Other manufacturer's recommendations on installation shall be

adhered to. The rubber tape shall be equal to Scotch 23 or 130C electrical splicing tape.

3. Splices made in wet or damp locations shall be made submersible and watertight with special kits made for the application and compatible with type of cables employed.

B. Connection Make-up

1. Connections of lugs to bus bars, etc., shall be made up with corrosion resistant steel bolts having non-magnetic properties with matching nuts, and shall utilize a Belleville spring washer (stainless steel) to maintain connection integrity. Connections shall be torqued to the proper limits. Prior to bolting up the connection, electrical joint compound shall be brushed on the contact faces of the electrical joint.
2. All motor lead connections shall be made up to match the type of lead furnished on the motor. If the lead is not lugged, then twist-on wire connectors may be used. To prevent possible vibration problems, twist-on connectors shall be taped after installation.
3. All lugged motor lead connections (motors under 200 horse-power) shall be made up using ring tongue compression lugs with proper size stainless steel nuts and bolts. Belleville type spring washers shall be used to maintain tension on the connections. The connections shall then be insulated using the procedure described for irregular shapes, utilizing rubber tape in conjunction with vinyl electrical tape.
4. At the time of final inspection, the Engineer may request the Contractor to disassemble 3 randomly selected motor lead connections in the Engineer's presence, to assure conformance with these Specifications.
5. The Contractor shall include all necessary tools, materials, and labor in his bid for disassembly of the connections and for remaking them with new insulating materials after inspection.

END OF SECTION



## SECTION 16220 - MOTORS

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- A. Motors are to be furnished with driven equipment except where otherwise noted on the Contract Drawings or elsewhere in this Division of the Specifications. All motors shall conform to the following Specifications and any special requirements of the driven equipment. Special requirements of the driven equipment shall take precedence over these Specifications should a discrepancy occur. Starting torque and slip ratings shall conform to the requirements of the driven equipment. All motors 25 horsepower and larger (480 volt) shall be started via soft start-soft stop motor controller.
- B. Polyphase motors shall be of the squirrel cage induction type and single phase of the capacitor start-induction run type except as otherwise noted. Conduit boxes shall be tapped for the size conduit shown on the Contract Drawings.
- C. All motors shall be manufactured and installed in accordance with applicable NEMA standards and NEC provisions, latest revisions.

#### 1.02 DELIVERY, STORAGE, & HANDLING

- A. All electrical motors shall be protected against the accumulation of moisture, dust and debris and physical damage during the course of installation of the job.

### PART 2 - PRODUCTS

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Motors – “Baldor/Reliance,” “General Electric,” “Gould,” “Lincoln,” “Reliance,” “Siemens,” “U.S. Motors,” or equal.

#### 2.02 EQUIPMENT

- A. Motors 200 Horsepower and Under for Service Under 600 Volts
  - 1. Ratings and Electrical Characteristics
    - a. Time: All motors shall be rated for continuous duty.
    - b. Temperature: Based on NEMA standards for a maximum ambient temperature of 40 degrees Celsius and an altitude of 3,300 feet or less, according to service factor and insulation class employed.

- c. Voltage: All polyphase motors rated 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 a-c motors shall be rated for 60 Hz operation. All motors shall be capable of normal operation at frequencies 5 percent above or below the nominal rating of 60 Hz.
- e. Horsepower: Horsepower of the motors shall be as given in the Specification Division on the driven equipment or as shown on the Contract Drawings. In many cases, the horsepower specified is a minimum requirement and certain alternate manufacturers may require larger horsepower motors. The larger motor shall be furnished at no extra cost to the Owner.
- f. Locked Rotor Current: Locked rotor current shall be in accordance with NEMA standards.
- g. Efficiency and Power Factor: Efficiency and power factor shall be given consideration during Shop Drawing review. The ratings at 100, 75 and 50 percent load shall be compared to similar motors manufactured by acceptable suppliers listed in these Specifications. Excessive variation shall be considered grounds for rejection.
- h. Speed: Synchronous speed of motors shall correspond to standard NEMA ratings. Actual speed shall be as given in the Specification Division on the driven equipment. Slip shall not exceed 5 percent at full load.
- i. Service Factor: The service factor shall be 1.0 unless requirements of the driven load necessitate a higher service factor.
- j. Insulation Class: Insulation shall be NEMA Class B, except as otherwise noted. Submersible motors shall be Class F, and motors to be operated at variable speed shall be Class F. Class F insulated motors shall operate at a Class B rise at nameplate horsepower loading.
- k. Design Level: Motors shall be NEMA design B, except as otherwise noted.
- l. Enclosure: All motors for process equipment larger than 2 HP shall be TEFC (totally enclosed fan cooled), suitable for use indoors or outdoors, except as otherwise noted.
- m. Frame Size: Frame designations shall be in accordance with NEMA standards.
- n. Winding Over temperature 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 deenergization should overheating threaten.

## 2. Mechanical Characteristics

### a. Integral Horsepower Motor Construction

- (1) Motor frames for vertical motors shall be cast iron, heavy fabricated steel, or extruded aluminum (alloy 6063-T4 or 6063-T6). End shields for vertical motors **must** be cast iron.
- (2) If an aluminum frame is used, the end shields and/or all other steel hardware must be plated with zinc or cadmium and coated with grease before assembly to minimize the galvanic action between the steel and aluminum.
- (3) Motor frames and end shields shall be of such design and proportions as to hold all motor components rigidly in proper position and provide adequate protection for the type enclosure employed. Lifting lugs of all motors shall conform to NEMA standards.
- (4) Windings shall be random or form wound, adequately insulated and securely braced to resist failure due to electrical stresses and vibration. If the windings are aluminum, there shall be a cold welded aluminum-copper transition joint at the termination of the windings to permit the use of standard copper to copper connection techniques by the electrician and to prevent galvanic action between the copper power wires and the aluminum windings.
- (5) The motor shaft shall be made of high grade machine steel or steel forging of size and design adequate to withstand the load stresses normally encountered in motors of that particular rating. Bearing journals shall be ground and polished.
- (6) Rotors shall be made from high grade steel laminations adequately fastened together and to the shaft. Rotor cage windings may be cast aluminum of bar type construction with brazed end rings.
- (7) Integral horsepower motors shall be equipped with cone, roller, or ball bearings made to AFBMA standards, Grade 1 and shall be of ample capacity for the motor ratings. The bearing housing shall be large enough to hold sufficient lubricant to minimize the need for frequent relubrication (ten years normal operation without lubrication), but facilities shall be provided for adding new lubricant and draining out old lubricant without motor disassembly. The bearing housing shall have long, tight running fits or rotating seals to protect against the entrance of foreign matter into the bearings or leakage of lubricant out of the bearing cavity.
- (8) See the specification division relating to each piece of motor driven equipment for additional motor requirements to those listed above.

3. Tests, Nameplates, and Shop Drawings

a. Tests

- (1) 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.
- (2) Tests will be in accordance with IEEE test procedures.

b. Nameplates

- (1) 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.

c. Shop Drawings

- (1) Shop Drawings shall consist of motor dimensions, nameplate data from each motor and tests as outlined above. Also included shall be efficiency and power factor at 100, 75, and 50 percent load. Operation, maintenance, and lubrication information (including bearing catalog numbers) shall be submitted with Shop Drawings for review.

4. 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	84.0	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

Open Motors where specified shall also comply with NEMA efficiency minimums.

- b. Motors shall be energy efficient type to comply with requirements of the Energy Policy Act of 1992.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION/APPLICATION/ERECTION

- A. Installation of motors shall comply with motor manufacturer instructions as well as applicable NEMA recommendations and requirements of the driven equipment OEM (original equipment manufacturer).
- B. Motors shall be aligned to acceptable tolerances and shall not vibrate excessively.
- C. Motors shall not be energized until they have been accepted by the OEM start up personnel.

END OF SECTION



## **SECTION 16280 - TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)**

### **PART 1 - GENERAL**

#### **1.01 WORK INCLUDED**

- A. Provide Transient Voltage Surge Suppressor (TVSS) as indicated on the drawings for a 480 volt, three-phase, three-wire, ungrounded Delta System.

#### **1.02 RELATED DOCUMENTS**

- A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to this section.

#### **1.03 DESCRIPTION**

- A. General: Transient voltage surge suppression (TVSS) is the description and equipment required for the protection of all AC electrical circuits and electronic equipment from the effects of lightning induced voltages, external switching transients and internally generated switching transients.

#### **1.04 REFERENCE STANDARDS AND PUBLICATIONS**

- A. General: The latest edition of the following standards and publications shall comply to the work of this section:
  1. ANSI/IEEE C84 1-1989, American National Standard for Electric Power Systems and Equipment - Voltage Ratings (60 Hertz)
  2. ANSI/IEEE C62.41-1991, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits
  3. ANSI/IEEE C62.45-1992, IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits
  4. Underwriters Laboratories UL 1449 Second Edition, Standard for Safety - Transient Voltage Surge Suppressors
  5. Underwriters Laboratories, UL 1283, Standard for Safety - Electromagnetic Interference Filters
  6. National Fire Protection Association, NFPA 70 - National Electrical Code
  7. IEEE Standard 142-1991, IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book)
  8. ANSI/IEEE Standard 141-1999, IEEE Recommended Practice for Electric Power Distribution for Industrial Plants (IEEE Red Book)
  9. IEEE Standard 1100-1999, IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (IEEE Emerald Book)
  10. FIPS Pub 94, Federal Information Processing Standards Publication - Guideline on Electrical Power for ADP Installations
  11. National Electrical Manufacturer's Association LS-1, 1992 (NEMA MIL Standard 220A Method of Insertion-loss Measurement)

## 1.05 MANUFACTURER QUALIFICATIONS

- A. In order to establish a level of quality for these Construction Documents, **Eaton's Innovative Technology** shall be the basis of design. All products submitted shall comply with the specifications of the Eaton's Innovative Technology model type specified herein. Manufacturers requesting product approval must meet or exceed the written specification contained herein.
- B. Manufacturer shall be ISO 9001 certified.
- C. The Manufacturer must be regularly engaged in the manufacture of surge suppression products for the specified categories for no less than ten (10) years.
- D. All surge protective devices for service entrance shall be equipped with Eaton's Innovative Technology **Power Event Monitor** integral to the TVSS and capable data highway interface.

## 1.06 WARRANTY

- A. The TVSS for all main, distribution and sub-panels shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of **ten (10) years** from the date of substantial completion of service and activation of the system to which the suppressor is attached. All individual equipment shall be protected with no less than a ten (10) warranty for unit.
- B. Any TVSS that shows evidence of failure or incorrect operation during the warranty period shall be replaced free of charge (complete unit). Since "Acts of Nature" or similar statements typically include the threat of lightning to which the TVSSs shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this section.
- C. **Exclusions and prorating warranties will not be allowed.** Warranties extended in excess of the manufacturer's standard warranty are not acceptable for the purpose of the specification.

## 1.07 COMPLIANCE REQUIREMENTS

- A. A TVSS shall be listed in accordance with UL 1449 Second Edition, Standards for Safety, Transient Voltage Surge Suppressors and UL 1283, Standard for Safety, Electromagnetic Interference Filters. **Submittal of current UL File number is required.**
- B. ANSI/IEEE C62.41-1991 Measured Limiting Voltage (Let-Thru) shall be reported with measurements taken from zero reference per NEMA LS-1.
- C. TVSS shall have a response time of equal or less than 1 nanosecond, and be of non-deteriorating design.
- D. Repetitive surge withstanding capabilities for ANSI/IEEE Category 3 shall be no less than 18,000 pulse life. For main switchgear 300ka and higher, and no less than 18,000 for distribution and sub panels.

## 1.08 SUBMITTALS

- A. Submit product data and shop drawings with complete description of material components.
- B. Manufacturer's certified test data indicating the ability of the product to meet or exceed requirements of this specification.
- C. Drawings, with dimensions, indicating TVSS mounting arrangement and lead length configuration, and mounting arrangement of any optional remote diagnostic equipment and assemblies.
- D. All submittals for approved equals must be made ten (10) days prior to bid date.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. The TVSS shall protect all modes and there shall be discrete suppression circuits for 480 volt, three-phase, three-wire, ungrounded Delta System.
- B. Each TVSS must be in a NEMA 4x stainless steel enclosure, and be of a no-power consuming design, except for indicator light.
- C. The TVSS shall be equal to Eaton's Innovative Technology PTX080-NN400 with 10 year warranty.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. The installing contractor shall install the parallel TVSS with **short and straight conductors** as practically possible.
- B. The contractor shall follow the TVSS manufacturer's recommended installation practice as found in the equipment installation instructions (to be included in package with each unit).
- C. The installation shall apply to all applicable codes.
- D. All conductors associated with TVSS devices shall be installed in conduit.

END OF SECTION



## SECTION 16440 - COMBINATION SOFT START CONTROLLERS

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- A. These specification requirements are for solid state reduced voltage motor controllers herein referred to as soft starters.
- B. They are for use with NEMA design B, AC motors to reduce the current in-rush as well as mechanical shocks that can result from starting or stopping a motor across the line.
- C. The manufacturer shall provide the starters in open style to a custom panel fabricator.

#### 1.02 QUALITY ASSURANCE

- A. The electronic "soft starter" shall be listed by an independent testing laboratory in accordance with UL 508 - Industrial Control Equipment.
- B. The soft start shall carry the CE mark for indication of compliance to low voltage and EMC directives in accordance with EN / IEC 60947-4-2.
- C. The manufacturer shall be a certified ISO 9002 facility.

#### 1.03 WARRANTY

- A. A twelve-month warranty shall be provided on materials and workmanship from date of final acceptance.

### PART 2 - PRODUCT

#### 2.01 GENERAL DESCRIPTION

- A. The soft starter shall be provided by the manufacturer open style for mounting by others.
  - 1. Manufacturer shall provide a door mounted digital keypad (mounted by others) for adjusting the soft starter parameters and viewing process values and viewing the motor and soft starter status without opening the enclosure door.
- B. The product shall be provided complete with one of the following overcurrent protective devices (OCPDs) for Type 1 short circuit protection:
  - 1. Circuit breaker disconnect means. Short circuit withstand rating shall be 25K or 30K AIC.
- C. The motor must be automatically protected from solid state component failure by the following means:

- I. Isolation contactor that opens when the motor is stopped or when the controller detects a fault condition including a shorted SCR.
- D. The soft starter shall utilize an SCR bridge consisting of at least two SCRs per phase to control the starting and stopping of industry standard motors.
- E. The soft start shall provide torque control for linear acceleration independent of motor load or application type without external feedback. The gating of the SCRs will be controlled in such a manner to ensure stable and linear acceleration ramp.
- F. The soft starter shall be controlled by a microprocessor that continuously monitors the current and controls the phasing of the SCRs. Analog control algorithms shall not be allowed.
- G. All soft starter power ratings will utilize the same control board/module.
- H. A shorting contactor shall be standard on soft starters. Protective features and deceleration control integral to the soft starter shall be available even when the shorting contactor is engaged.
- I. The equipment shall be an Altistart 48 Enclosed Soft Start Starter by Square D / Schneider Electric or an approved equal.

## 2.02 MOTOR DATA

- A. The soft starter shall be designed to operate a NEMA design B motor with a nameplate rating of 60 horsepower at 460 volts +/- 10%.

## 2.03 RATINGS

- A. The soft start shall be designed to operate in an ambient temperature -10°C to 40°C (14°F to 104°F). For ambient temperatures between 40°C and 60°C (104°F and 140°F), derate the current by 2% per °C above 40°C (104°F). A cabinet heater shall be provided for low ambient temperatures and high humidity.
- B. Storage temperature range shall be -25°C to 70°C (-13°F to 158°F).
- C. Maximum relative humidity shall be 95%, non-condensing or dripping water, conforming to IEC 60947-4-2. Enclosure shall have resistance heat for humidity control.
- D. The soft starter shall be designed to operate in altitudes up to 1000m (3300 ft).
- E. The soft starter shall be capable of operation between + / - 10% of nominal voltage rating.
- F. The soft start shall automatically adapt for operation at 60 Hz, with a frequency tolerance of +/- 5%. By configuration, it will have to be capable of operation at a supply line frequency that can vary by +/- 20% during steady state operation.
- G. The soft start shall be capable of supplying 400% of rated full load current for 23 seconds at maximum ambient temperature. The soft starter shall also be capable of 10 evenly spaced starts per hour at 400% of full rated current for 12 seconds per start.

- H. The SCRs shall have a minimum P.I.V. rating of 1,800 Vac. Lower rated SCRs with MOV protection are not acceptable.

## 2.04 ADJUSTMENTS AND CONFIGURATIONS

- A. All programming/configuration devices, display units, and field control wiring terminals shall be accessible on the front of the control module. Exposure to control circuit boards or electrical power devices during routine adjustments is prohibited.
- B. Digital indication shall provide, as a minimum, the following conditions:
  - 1. Soft starter status - ready, starting/stopping, run.
  - 2. Motor status - current, torque, thermal state, power factor, operating time, power in kW.
  - 3. Fault status - Motor thermal overload, soft starter thermal fault, loss of line or motor phase, line frequency fault, low line voltage fault, locked rotor fault, motor underload, maximum start time exceeded, external fault, serial communication fault, line phase reversal fault, motor overcurrent fault.
- C. The soft starter must be preset to the following for adjustment-free operation in most applications:
  - 1. Linear (torque-controlled) acceleration ramp of 15 seconds.
  - 2. Current limitation to 400% of the motor full load current rating.
  - 3. Class 10 overload protection.
  - 4. Motor current preset per NEC / NFPA 70 table 430.150 for standard hp motors.
- D. A digital keypad shall be utilized to configure the following operating parameters as required:
  - 1. Motor full load amps adjustable from 40 to 130% of the soft starter's rating.
  - 2. Current limitation on starting adjustable from 150 to 700% of the motor current rating, not to exceed 500% of the soft starter rating.
  - 3. Linear (torque-controlled) acceleration ramp adjustable from 1 to 60 seconds.
  - 4. Initial torque adjustable from 10 to 100% of nominal motor torque.
  - 5. Torque limit adjustable from 10 to 200% of nominal motor torque.
  - 6. Maximum start time adjustable from 10 to 999 seconds.
  - 7. Voltage boost adjustable from 50 to 100% of the nominal supply voltage.
  - 8. Selection of freewheel, soft stop or braking
  - 9. Linear (torque-controlled) deceleration ramp time adjustable from 1 to 60 seconds.
  - 10. Threshold to change to freewheel from a controlled deceleration ramp to freewheel stop: adjustable from 0 to 100% of the nominal motor torque.
  - 11. Braking torque level adjustable from 0 to 100% effectiveness.
  - 12. Selection of Class 2, 10, 10A, 15, 20, 25 or 30 motor thermal overload protection.
- E. A digital keypad shall be utilized to configure the following controller parameters as required:
  - 1. Selectable automatic reset operation.
  - 2. Adjustment of the stator loss estimation for specialty motors.
  - 3. Assignment of soft starter inputs and output control terminals.
  - 4. Activation of line phase reversal protection.

5. Reset of motor thermal state
  6. Return to factory settings.
  7. Activation of test mode for use with low power motors.
  8. Indication of elapsed time in hours of starting, running and stopping.
- F. Output relays shall provide the following status indications:
1. One Form A (N.O.) minimum for indication of fault.
  2. One Form A (N.O.) for indication that acceleration ramp is complete and current is below 130% motor FLA (end of start).
  3. One Form A (N.O.) assignable to one of the following functions: motor thermal alarm, motor current level alarm, and motor underload alarm.
- G. Additional inputs and outputs shall be available to provide the following status indications:
1. Two assignable control inputs for the following functions: force to freewheel stop, external fault input, disable serial link control, external motor overload reset or general fault reset.
  2. Two assignable logic-level signal outputs for the following functions: motor thermal overload alarm, "motor powered" signal, motor overcurrent alarm, or motor underload alarm.
  3. One analog output shall be available for 0 to 10 volts or 4 to 20 milliamp indication of motor current, motor torque, motor power, motor thermal state, or power factor.
- H. Relay and I/O functions listed above must be isolated with respect to common.

## 2.05 PROTECTION

- A. A microprocessor-based thermal protection system shall be included which continuously calculates the temperature-rise of the motor and soft starter and provides:
1. A motor overload pre-alarm that indicates by relay contact or logic output that the motor windings have exceeded 130% of its rated temperature rise. This function shall be for alarm only.
  2. A motor overload fault will stop the motor if the windings have exceeded 140% of temperature-rise.
  3. An electronic circuit with a time-constant adjustable to the motor's thermal cooling time-constant ensuring the memorization of the thermal state even if power is removed from the soft starter.
- B. The soft starter shall provide line and motor phase loss, phase reversal, underload, stall, and jam protection.
- C. The integral protective features shall be active even when the shorting contactor is used to bypass the SCRs during steady state operation.

## 2.06 CONTROL OPTIONS

- A. The soft starter control circuit shall be fed from the line supply and be completely independent of the power circuit and separate from the control logic.

- B. The peripheral soft starter control circuitry shall be operated at 120 Vac 60 Hz from a control power transformer included within the enclosure.
- C. Operator devices shall be door mounted and shall be:
  - 1. Red STOP and black START push buttons.
  - 2. Three position H-O-A switch which provides for manual (HAND) start or remote signal (AUTO) start from user-supplied relay contacts.
  - 3. Red RUN pilot light illuminated whenever the soft starter is provided a run command and no fault condition is present.
  - 4. Green OFF pilot light illuminated whenever the soft starter is supplied with control power and no run command is present
  - 5. All operator devices shall be remote-mounted using supplied 120 Vac control logic. Clearly labeled terminals shall be provided for field installation.
  - 6. Refer to control circuit drawing.

## **2.07 SHORTING CONTACTOR (STANDARD)**

- A. A microprocessor shall control the operation of the shorting contactor via an output relay.
- B. The shorting contactor shall close, shorting the SCRs after the acceleration ramp is complete and motor current is below 130% of motor FLA, and open on a stop command to allow a deceleration ramp.
- C. Overload protection integral to the soft starter shall continue to protect the motor when shorting is engaged.

## **2.08 FULL VOLTAGE BYPASS STARTER**

- A. A full voltage bypass starter with overload protection shall be included to provide motor operation in the case of soft starter failure.
- B. A "NORM/BYPASS" selector switch shall be mounted on the enclosure door.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. The soft start shall be installed per the manufacturer's specifications.
- B. A standard wiring diagram shall be included for making the appropriate electrical connections.

### **3.02 START UP OPTION**

- A. The services of a qualified manufacturer's service representative shall be available to install, test, and start up all soft starts furnished under this specification.

END OF SECTION



## **SECTION 16670 - LIGHTNING PROTECTION SYSTEMS (AIR TERMINALS)**

### **PART 1 - GENERAL**

#### **1.01 SCOPE OF WORK**

- A. The lightning protection system shall be furnished, installed, and connected as detailed on the Contract Drawings to provide a complete and functional system. Installation and equipment construction shall comply with Lightning Protection Institute Installation Code LPI-175, UL Master Label Code 96A, and NFPA 780.
- B. The Contractor shall provide shop drawings indicating location and installation of equipment for review of the Engineer before beginning installation.
- C. All equipment shall be of the same manufacturer, insofar as possible.
- D. Equipment specified herein supplements actual suppression devices specified in Section 16280.

### **PART 2 - PRODUCTS**

#### **2.01 ACCEPTABLE MANUFACTURERS**

- A. "Thompson Lightning Protection, Inc.," "Independent Protection Co., Inc.," or equal.

#### **2.02 EQUIPMENT**

- A. All equipment used in this installation shall be UL approved and labeled in accordance with UL procedures, with each air terminal bearing an "A" label and all main conductors bearing a "B" label at 10'-0" intervals.
- B. All equipment shall be new, and of design and construction to suit the application where it is used in accordance with accepted industry standards and LPI and UL code requirements and as per manufacturers recommendations.
- C. Downlead conductors from air terminal to ground shall be copper, of 28 strands, 17 gauge minimum.
- D. Air terminals shall be solid, round aluminum bar of 1/2" minimum diameter.
- E. Air terminal bases shall be of cast aluminum with bolted pressure cable connections and shall be securely mounted with stainless steel screws or bolts.
- F. Ground rods shall be a minimum of 3/4" in diameter and 10'-0" long. They shall be connected to the system using exothermic welds.
- G. Cable fasteners shall be substantial in construction, electrolytically compatible with the conductor and mounting surface and shall be spaced according to LPI and UL code requirements.

- H. Bonding devices, cable splicers and miscellaneous connectors shall be of cast aluminum with bolted pressure connections to cable. Cast or stamped crimp fittings are not acceptable.
- I. All miscellaneous bolts, nuts, and screws shall be stainless steel.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION/APPLICATION/ERECTION**

- A. The installation shall be accomplished by an experienced installer listed with Underwriters' Laboratories as qualified and who is also a Certified Master Installer of the LPI or working under the direct supervision of an LPI manufacturer as listed above or his authorized LPI Certified Master Installer representative.
- B. All equipment shall be installed in a neat workmanlike manner in the most inconspicuous manner possible.
- C. The limitations on areas of usage for aluminum cables and for copper and aluminum materials together as outlined in UL 96A and LPI 175 shall be observed. The lightning protection installer will work with other trades to ensure a correct, neat, and unobtrusive installation.
- D. It shall be the responsibility of the lightning protection installer to assure a sound bond to the metallic well housing and to assure interconnection with other ground systems, including electrical and also to ensure that proper arresters have been installed on the power service.
- E. The downlead conductor from air terminal to ground shall be protected from mechanical damage by conduit.
- F. The Contractor shall submit 2 copies of as built shop drawings.

END OF SECTION 16670

## SECTION 16900 - CONTROLS

### PART 1 - GENERAL

#### 1.01 SCOPE OF WORK

- A. Equipment controls shall be as specified herein and shown on the Contract Drawings. Legends for starter nameplates shall be taken from the one line diagram in the Contract Drawings.
- B. Certain equipment starters contain nonresettable elapsed time meters as shown in the Contract Drawings. Also, certain motor starters have remote control devices and require connections to operate these control devices as shown on starter schematics (control circuits).
- C. All starters contain red "on" lights, control transformers, and auxiliary contacts to operate as defined on the control circuits of the Contract Drawings. Reset pushbuttons shall also be provided for overloads built into the starters.

#### 1.02 CUSTOM CONTROL PANELS

- A. All control panels furnished under this Contract shall be manufactured in accordance with industry standards and as herein specified. Some control panels are specified to be furnished with the equipment controlled and others are to be furnished by the Contractor, as written elsewhere.
- B. Control panels shall be as manufactured by Control Interface, Inc., Sewell Electronics, or other panel vendor. Panel construction shall comply with OSHA and other code requirements as applicable, and may be attested to by UL listing the panels as an assembly. Otherwise, panel modifications as required by the Electrical Inspector shall be performed by the supplier at no extra cost to the Owner.
- C. Control panels to be furnished on this project shall be wired to function according to schematics shown on 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. Enclosures shall be dead front with all operators' devices accessible without opening the enclosure door. All relays, timers, terminal strips, etc., shall be mounted to a sub panel inside the enclosure. All wiring must be stranded and sized to be protected by a 20 A/IP circuit breaker. Supplemental overcurrent protection may be used in lieu of oversized wiring. All panels mounted outside shall have operators devices mounted on an inner door with an outdoor door that is blank.
- E. 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.

- F. Enclosures shall be provided with a locking hasp and any exterior hardware shall be stainless steel or other corrosion resistant material. Enclosures for interior use in dry areas shall be NEMA 12 enclosed, unless otherwise indicated. Wet location or outdoor mounted enclosures shall comply with Article 1.03 below.
- G. 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 shop drawings shall be furnished and stored in a pocket inside the enclosure.
- H. 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.

### 1.03 CONTROL PANEL ENCLOSURES FOR OUTDOOR/WET LOCATIONS

#### A. General

- 1. The purpose of this Specification is to provide details of an enclosure that protects internal equipment from rain, dust, vandalism, and other conditions found in an outdoor environment or otherwise harsh environment.
- 2. The manufacturer shall provide part numbers on all components for repair purposes. Enclosure shall be single or double door as required.
- 3. Control panel enclosure sizing shall be by supplier in accordance with appropriate standards and codes.

#### B. Performance

- 1. The enclosure(s) will meet or exceed the requirements of a NEMA 4X stainless steel rating and shall be UL listed.

#### C. Cabinet Construction

##### 1. General

- a. The cabinet and door or doors shall be constructed from stainless steel. All welds shall be neatly formed and free of cracks, blow holes and other irregularities
- b. All inside and outside edges of the cabinet shall be free of burrs.
- c. The door openings shall be double flanged on all 4 sides which increases strength around openings and keeps dirt and liquids from entering the enclosure when the door is opened.
- d. Door restraints shall be provided to prevent door movements in windy conditions.

##### 2. Door Hardware

- a. The cabinet door or doors will be a minimum of 80 percent of the front surface area and shall be hinged on the left side when facing the cabinet

(right and left outside edges for double door enclosures).

- b. Each door shall be furnished with a gasket that satisfies the physical properties as found in UL508 table 21.1 and shall form a weathertight seal between the cabinet and door.
- c. The hinges shall be continuous and bolted to the cabinet and door utilizing 3-20 stainless steel carriage bolts and ny-lock nuts.
- d. The hinges shall have a 3" open width with a 0.250 inch diameter stainless steel hinge pin.
- e. The hinge pin shall be capped top and bottom by weld to render it tamper proof.
- f. All bolt holes shall be gasketed.
- g. The latching mechanism shall be a 3-point draw roller type.
- h. The center catch and pushrods shall be cadmium plated, Type II, Class 1 or equal.
- i. Pushrods will be turned edgewise at the outward supports and shall be 0.250 inch by 0.750 inch steel, minimum.
- j. Rollers shall have a minimum diameter of 0.875 inch and will be made of nylon. The center catch shall be fabricated from 0.140 inch steel, minimum.
- k. An operating handle shall be furnished.
- l. The handle shall be stainless steel with a 1 inch diameter shank.
- m. The latch handle shall have a provision for padlocking in the closed position.
- n. A light/alarm bracket shall be provided.

### 3. Switch Compartment

- a. A switch compartment, with removable back panel, is to be supplied on the enclosure main door. It shall be large enough to include all operating devices.
- b. The switch compartment door opening shall be double flanged on all four sides for strength and to prevent liquids or dirt from dropping into the compartment when the door is open.
- c. The door shall be furnished with a gasket that satisfies the physical properties as found in UL508 Table 21.1 and will form a weathertight seal between cabinet and door.
- d. The switch compartment door shall have a tight key lock. Five keys shall be furnished with each lock.

- e. The switch compartment door hinge shall be 0.063 inch stainless steel with a 0.120 diameter stainless steel hinge pin.

D. Equipment Mounting

1. Adjustable Channels

- a. The enclosure shall be equipped with two adjustable "C" mounting channels on both side walls and back wall of the enclosure, allowing versatile positioning of shelves or panels.
- b. The mounting channels shall provide infinite vertical and horizontal adjustment and not limit the positioning of shelves or panels. All mounting hardware will be furnished.

2. Shelves

- a. If equipment is to be shelf mounted, the enclosure shall be provided with shelves fabricated from 5052-H32 aluminum having a thickness of 0.125 inch.
- b. The shelf depth shall be a minimum of 10.5 inches. The enclosure will have provision for positioning shelves or panels to within 4 inches of the bottom and to within 8 inches of the top of the enclosure.

3. Aluminum Back Panel

- a. If the equipment is to be panel mounted, the enclosure shall be provided with a 5052-H32 aluminum back panel having a thickness of 0.125 inch.
- b. The panel shall be natural finish. All mounting hardware will be furnished.

4. Print Storage Pocket

- a. A control panel shop drawing storage pocket shall be provided inside the enclosure at a convenient location.

E. Cabinet Finish

- 1. Unless otherwise specified, the outside surface of the cabinet shall have a smooth, uniform, natural stainless steel finish.

F. Cabinet Mounting

1. Pipe Mounted Enclosure

- a. Enclosures intended for pipe mounting shall be provided with stiffener plates with a thickness of 0.125 inch stainless steel welded to top and bottom of rear wall for added strength and rigidity.
- b. All mounting holes must be gasketed.

G. Acceptable Manufacturers

1. Cabinet is to be manufactured by Hennessy Products, Inc., or a UL listed equivalent.

**1.04 SYSTEM DESCRIPTION**

A. General

1. The systems description section of these Specifications is supplementary to the descriptions in other Divisions of the Specifications and to the Contract Drawings. Refer also to the equipment specifications and controls shown on the Contract Drawings.

B. Systems Common to Both Wells

1. Single Phase Sump Pump

- a. The sump pumps shall be served by separate molded case circuit breaker subfeeds from the control cabinet. The sump pumps shall be controlled by manual remote mounted switches. The sump pumps shall be provided under other Divisions of these Specifications. Switches, receptacles, conduit and wiring shall be furnished and installed under this Division.

2. Monitoring and Instrumentation

- a. The meter panel and instruments that require power shall be served by molded case circuit breaker subfeeds from the single phase panel. Voltages shall be as shown on the Contract Drawings. The meter panel and instrumentation shall be provided under Division 13 of these Specifications. The conduit and all power, control and signal wiring shall be furnished and installed under this Division to operate as described in Division 13 of these Specifications and as shown on the Contract Drawings.

**PART 2 - PRODUCTS**

Not Applicable.

**PART 3 - EXECUTION**

Not Applicable.

END OF SECTION

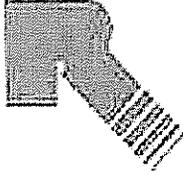


# APPENDIX



# **Test Well #1**





# **Test Drilling For Oldham Co. Water District**

(Roederer/Campisano Property)  
(5701 W. Highway 524)

Reynolds, Inc.  
1301-15 East Main Street  
Louisville, Kentucky 40206

**KENTUCKY WATER WELL RECORD**

Please read all instructions prior to completing this form. Do not write in shaded area. The original copy of this form must be submitted within 30 days of well completion to the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Water - Groundwater Branch, 14 Rolly Road, Frankfort, KY 40601. Telephone (502) 564-3410

**Attach Water Well Record**

**Identification Number Label Here**

(TYPE OR PRINT CLEARLY)

(If Applicable)

**GENERAL INFORMATION:**

Well Owner's Name <b>Oldham Co. Water District</b>	Owner's Phone ( ) None <b>( 502 ) 222-1690</b>	Date Received:
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Mailing Address <b>P.O. Box 51</b>	Well Address ( ) Same as owner's address <b>Highway 524</b>	(1) AKGWA NUMBER: □ □ □ □ - □ □ □ □
---------------------------------------	--	--

City <b>Buckner</b>	State <b>KY</b>	Zip Code <b>40010</b>	City <b>Westport</b>	State <b>KY</b>	Zip Code	(2) VARIANCE WELL: ( ) Yes (X) No
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(3) WELL LOCATION: <b>USGS Quadrangle Name: <u>Bechtelham, TN-KY</u></b>	County <b>Oldham</b>	Latitude	Longitude
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(4) GENERAL WELL CONSTRUCTION: Start Date: <b>05 / 20 / 05</b> Finish Date: <b>05 / 21 / 05</b> Drilling Method: Type of Work: ( ) Air Rotary ( ) New Well ( ) Mud Rotary ( ) Rework ( ) Cable ( ) Deepen (X) Auger (X) Plug ( ) Other ( ) Clean	(5) WELL TEST: <b>N/A</b> Date: Testing Method: ( ) Pump ( ) Blowing ( ) Bailor ( ) Other Well Yield: ( ) gpm ( ) gph Drawdown: ft after ( ) hrs ( ) min of pumping at ( ) gpm ( ) gph ft after ( ) hrs ( ) min of pumping at ( ) gpm ( ) gph	(6) PHYSIOGRAPHIC OR HYDROLOGIC REGION: ( ) Blue Grass (X) Ohio River Alluvium ( ) E. Coal Field ( ) W. Coal Field ( ) Miss. Plateau ( ) Jackson Purchase	(7) WELL SERVICE: Number of people served: Number of service connections:
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(8) WELL USE: ( ) Domestic ( ) Industrial ( ) Dry Hole ( ) Public ( ) Livestock ( ) Heat Pump ( ) Irrigation (X) Other <b>drill &amp; plug</b>
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(9) WATER QUALITY: Well was (X) pumped ( ) bailed ( ) blown ( ) not purged, for <b>4 (X) hrs ( ) min.</b> at <b>50</b> per (X) min ( ) hr before sampling. Appearance: Odor: (X) Clear (X) None ( ) Cloudy ( ) Musty ( ) Muddy ( ) Sulfur ( ) Other ( ) Other	Well Disinfectant: Type _____ Amount _____ Results of ( ) fecal ( ) total coliform analysis: ( ) 0 or < 1.0 ( ) TNTC ( ) Confluent ( ) # colonies/100 ml Sampling Date: _____ Analysis Date: _____ Lab Performing Test: _____	(10) SKETCH MAP: <b>W #1</b>  Ohio River Hwy 524 W #1
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Show well location and distances from permanent structures, septic drain fields, major roads (include name or number) and intersections. INDICATE NORTH WITH AN ARROW. Provide a photocopy of a topographic map with the well location clearly marked with an "X", the AKGWA number, and the well owner's name.

(11) WELL COMPLETION: Foot Below Surface Hole Casing Inside Casing Type From To Diameter (in) Diameter (in.)	(12) PUMP DATA: Was a pump installed?: ( ) Yes (X) No Date Installed: _____ Pump Type: ( ) Submersible Horsepower _____ ( ) Jet Rating (gpm) _____ Installed by: ( ) Driller ( ) Turbine Pump Intake set at _____ ( ) Pump Installer ( ) Hand feet below ground surface ( ) Home Owner ( ) Bailor/Bucket or Other ( ) Other _____
--	---

(13) LITHOLOGIC LOG: Foot Below Surface Description Water Quality and GPM From To
0 3 Topsoil
3 18 Silty Brown Clay
18 33 Soft Clay & Sand
33 48 Brown Sand
48 53 Medium Brown Sand
53 58 Medium-Coarse Brown Sand
58 63 Medium Brown Sand w/ Trace Gravel
63 98 Medium-Coarse Sand & Gravel
98 103 Medium Sand & Fine Gravel
103 113 Medium Sand & Gravel
113 118 Medium Sand
118 125 Medium Sand w/ Some Gravel
125 127 1/2 Medium Sand w/ Cobbles

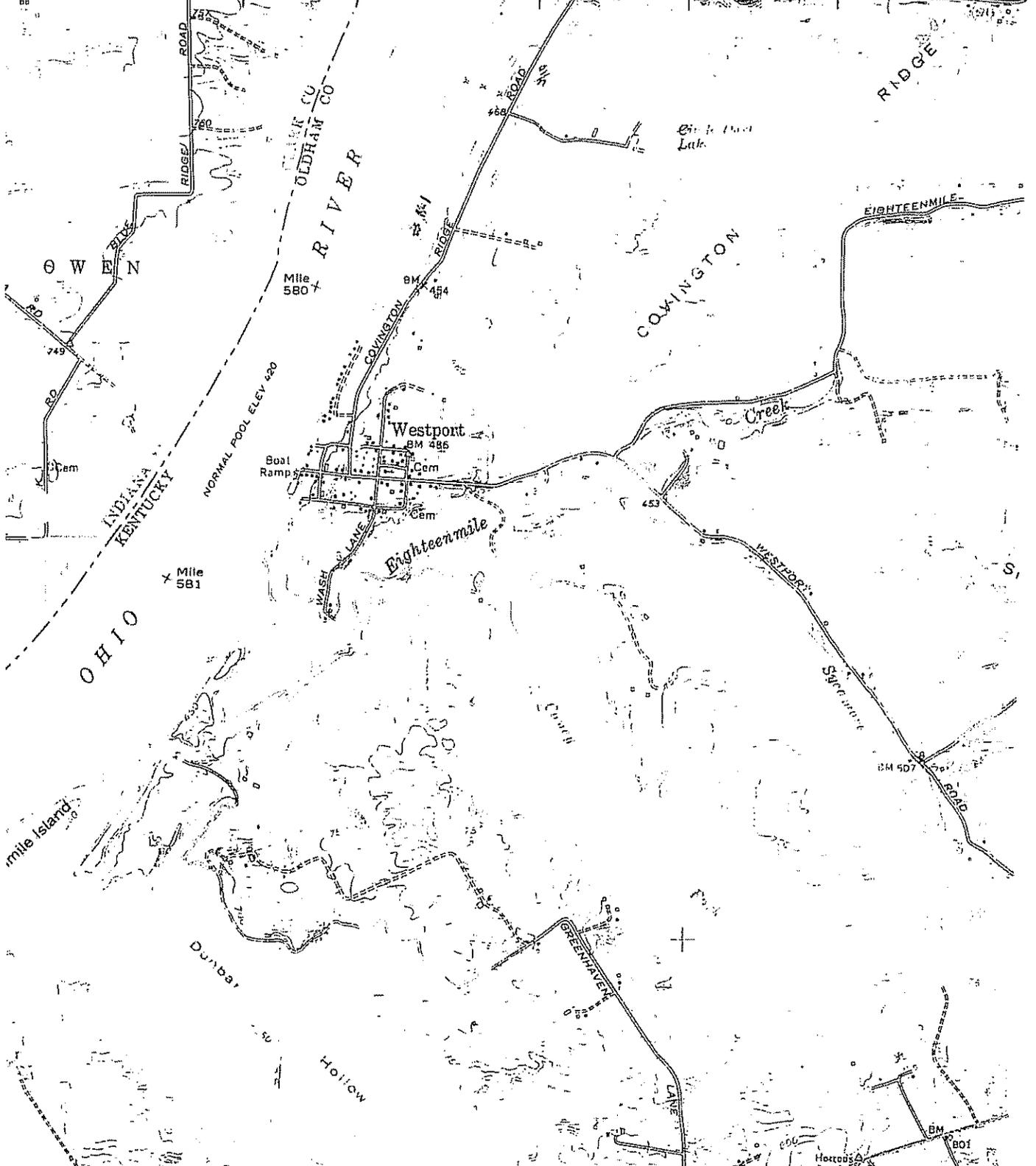
COMMENTS: **Well drilled, sampled, pumped, water sample taken and then abandoned. Investigating site for possible gas production well.**

(14) AFFIRMATION: This work described above was done under my supervision, and this report is true and correct to the best of my knowledge. NOTE: The water well driller is not responsible for natural groundwater quality or quantity encountered while drilling or completing this well.		
Well Driller's or Rig Operator's Name (Print or Type) <b>Harry Jay Burton</b>	State Certification Number or Rig Operator's Permit No. <b>0136-0327-00</b>	Signature of Responsible Certified Driller 
Company Mailing Address <b>1301-15 E. Main Street</b>	City <b>Louisville</b>	State <b>KY</b>
Zip Code <b>40206</b>	Date <b>06/21/05</b>	

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

STATE OF  
KENTUCKY  
UNIVERSITY

1:550 000 FEET (IND.) 633 634 27'30" 635





Date of Issue: June 01, 2005

Page 1 of 2

Reynolds Inc.  
1421 Mellwood Ave.  
Louisville, KYK 40206

RE: Analysis results for: Oldham Co. Water: TH#1.

**BECKMAR CERTIFICATE OF ANALYSIS # 150565**

Sample Date: 5/25/2005

Sample Time: 15:00

Sampled by: Mr. Jerri Mckenra

Parameter	Results	Units	Type	Method	Analyzed Date / Time	Analyst
HPC	142	cfu/1ml	G	SM9215b	5/25/2005 16:30	PDB

Remarks: This sample was analyzed using a 5-day room temperature study.

If you have any questions please call.

Thank you,

Joe P. Carney  
Quality Control Officer

JPC:dwt

ENVIRONMENTAL  
LABORATORY

Anttown Business Park

Kriegel Parkway

Anttown, KY 40299

56 6533

02 266 6446

## LABORATORY REPORT

 Reynolds, Inc. (Vendor #2720)  
 1301-15 E. Main Street  
 Louisville, KY 40206

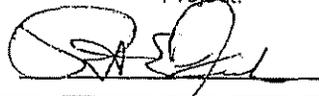
Attn: Ms. Jerri McKenna

Date Received: 05/25/2005 Report Date: 07/18/2005

Client Number: 085104 Order No: 2005050357

P.O. No:

Project:

 Released By: 

 Order No: 2005050357  
 COC No: 42717

## ANALYTICAL RESULTS

Page 1

### SAMPLE INFORMATION

SAMPLE NO: 1	Collection Date: 05/25/2005	Time: 15:00:	Sample Location: Oldham Col TH #1
Collected By: Client	Sample Matrix: Groundwater	Sample Type: Grab	
Special Instructions: See attached Target Organic and Quantitation Level List.			

### FIELD TESTS

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	QC ID/NO
Temperature	20	DEG.C		CLT	05/02/0505	Visual	

### METALS

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	QC ID/NO
Aluminum, total	0.158	mg/L	0.010	TLH	06/01/2005	EPA 200.7	509658
Antimony, total	<0.003	mg/L	0.003	TLH	06/06/2005	EPA 200.9	509668
Arsenic, total	<0.005	mg/L	0.005	TLH	06/01/2005	EPA 200.7	509658
Barium, total	0.021	mg/L	0.005	TLH	06/01/2005	EPA 200.7	509658
Beryllium, total	<0.001	mg/L	0.0010	TLH	06/01/2005	EPA 200.7	509658
Cadmium, total	<0.002	mg/L	0.002	TLH	06/01/2005	EPA 200.7	509658
Calcium, total	75.6	mg/L	0.100	TLH	06/01/2005	EPA 200.7	509658
Chromium, total	<0.003	mg/L	0.003	TLH	06/01/2005	EPA 200.7	509658
Copper, total	<0.005	mg/L	0.005	TLH	06/01/2005	EPA 200.7	509658
Iron, total	0.184	mg/L	0.005	TLH	06/01/2005	EPA 200.7	509658
Manganese, total	0.025	mg/L	0.005	TLH	06/01/2005	EPA 200.7	509658
Mercury, total	<0.0002	mg/L	0.0002	TLH	06/02/2005	EPA 245.1	509660
Nickel, total	<0.003	mg/L	0.003	TLH	06/01/2005	EPA 200.7	509658
Selenium, total	<0.002	mg/L	0.002	TLH	06/06/2005	EPA 200.9	509667
Silver, total	<0.002	mg/L	0.002	TLH	06/01/2005	EPA 200.7	509658
Sodium, total	2.26	mg/L	0.200	TLH	06/01/2005	EPA 200.7	509658
Thallium, total	<0.002	mg/L	0.002	TLH	06/06/2005	EPA 200.9	509666

# ANALYTICAL RESULTS

## SAMPLE INFORMATION

SAMPLE NO: 1 Collection Date: 05/25/2005 Time: 15:00: Sample Location: Oldham Col TH #1  
 Collected By: Client Sample Matrix: Groundwater Sample Type: Grab  
 Special Instructions: See attached Target Organic and Quantitation Level List.

## METALS

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	QC ID/NO
Zinc, total	<0.005	mg/L	0.005	TLH	06/01/2005	EPA 200.7	509658

## ORGANICS GC/MS

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	QC ID/NO
Volatile Organic Compounds	Detected	ug/L		STL	06/24/2005	EPA 524.2	

## PHYSICAL TESTS

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	QC ID/NO
Color	<5.0	CU	1.00	BKE	05/26/2005	EPA 110.2	1011584

## Sub Contract

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	QC ID/NO
Gross alpha & beta, total	SA			KNL	07/18/2005		
Iodine-131	SA			KNL	07/18/2005		
Radium 226 and 228	SA			KNL	07/18/2005		
Strontium 90	SA			KNL	07/18/2005		
Tritium	SA			KNL	07/18/2005		

SA = See Attachment

## WET CHEMISTRY

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	QC ID/NO
Alkalinity	245	mg/L	1.00	BKE	06/06/2005	EPA 310.1	1011576
Bicarbonate Alkalinity	245	mg/L	1.00	BKE	06/06/2005	SM 2320	1011577
Carbonate Alkalinity	<1	mg/L	1.00	BKE	06/06/2005	SM 2320	1011578
Chloride	16	mg/L	1.00	BKE	05/31/2005	EPA 325.3	1011565
Cyanide	0.007	mg/L	0.005	GMB	06/09/2005	EPA 335.2	109003
Fluoride (Natural)	0.097	mg/L	0.010	GMB	06/09/2005	EPA 340.2	109008
Hardness, total as CaCO3	305	mg/L	1.00	BKE	05/31/2005	EPA 130.2	1011566
Nitrate	3.50	mg/L	0.010	GMB	06/07/2005	EPA 4500	109000
Nitrite	<0.01	mg/L	0.010	GMB	05/26/2005	EPA 354.1	108969
Odor	ND	-0-		BKE	05/26/2005	EPA 140.1	1011579
Sulfate	41.9	mg/L	5.00	GMB	06/09/2005	EPA 375.4	109009
Surfactants (MBAS)	0.035	mg/L	0.010	GMB	05/27/2005	SM 5540-C	108974
Total Dissolved Solids	407	mg/L	10	BKR	05/31/2005	EPA 160.4	1011567

Order No: 2005050357  
COC No: 42717

# ANALYTICAL RESULTS

## SAMPLE INFORMATION

SAMPLE NO: 1	Collection Date: 05/25/2005	Time: 15:00	Sample Location: Oldham COFFIN
Collected By: Client	Sample Matrix: Groundwater	Sample Type: Grab	
Special Instructions: See attached Target Organic and Quantitation Level List.			

## WET CHEMISTRY

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	QC ID/NO
pH	7.37	SU		GMB	05/26/2005	EPA 150.1	108974



**Environmental  
Consultants, Inc.**

Professional Laboratory Services

### LABORATORY REPORT

Reynolds, Inc. (Vendor #2720)  
1301-15 E. Main Street  
Louisville, KY 40206

Attn: Ms. Jerri McKenna

Date Received: 06/01/2005 Report Date: 07/05/2005

Client Number: 085104 Order No: 2005060045

P.O. No.: Project:

Released By:

Order No: 2005060045

COC No: 42814

### ANALYTICAL RESULTS

Page 1

#### SAMPLE INFORMATION

SAMPLE NO: 1 Collection Date: 06/01/2005 Time: : : Sample Location: Oldham Co. TH#1  
Collected By: Client Sample Matrix: Groundwater Sample Type: Grab  
Special Instructions: Chain of Custody Record (COC) attached.

#### Sub Contract

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	QC ID#
COCs	SA			ACT	06/17/2005		

SA = See Attachment

Environmental Consultants, Inc.

Client Sample ID: 2005050357 OLD HM COL TH #1

GC/MS Volatiles

Lot-Sample #...: A5F170341-001    Work Order #...: HDWC31AA    Matrix.....: WG  
 Date Sampled...: 05/25/05    Date Received...: 06/11/05  
 Prep Date.....: 06/24/05    Analysis Date..: 06/24/05  
 Prep Batch #...: 5175358  
 Dilution Factor: 1    Method.....: SWB46 8260B

PARAMETER	RESULT	LIMIT	UNITS
Benzene	1.9	1.0	ug/L
Bromobenzene	ND	1.0	ug/L
Bromodichloromethane	ND	1.0	ug/L
Bromoform	ND	1.0	ug/L
Bromomethane	ND	1.0	ug/L
Carbon tetrachloride	ND	1.0	ug/L
Chlorobenzene	ND	1.0	ug/L
Dibromochloromethane	ND	1.0	ug/L
Chloroethane	ND	1.0	ug/L
Chloroform	ND	1.0	ug/L
Chloromethane	ND	1.0	ug/L
2-Chlorotoluene	ND	1.0	ug/L
4-Chlorotoluene	ND	1.0	ug/L
Dibromomethane	ND	1.0	ug/L
1,2-Dichlorobenzene	ND	1.0	ug/L
1,3-Dichlorobenzene	ND	1.0	ug/L
1,4-Dichlorobenzene	ND	1.0	ug/L
1,1-Dichloroethane	ND	1.0	ug/L
1,2-Dichloroethane	ND	1.0	ug/L
cis-1,2-Dichloroethylene	ND	1.0	ug/L
trans-1,2-Dichloroethylene	ND	1.0	ug/L
1,1-Dichloroethylene	ND	1.0	ug/L
1,2-Dichloropropane	ND	1.0	ug/L
1,3-Dichloropropane	ND	1.0	ug/L
2,2-Dichloropropane	ND	1.0	ug/L
cis-1,3-Dichloropropene	ND	1.0	ug/L
trans-1,3-Dichloropropene	ND	1.0	ug/L
1,1-Dichloropropene	ND	1.0	ug/L
Ethylbenzene	ND	1.0	ug/L
Methylene chloride	ND	1.0	ug/L
Methyl tert-butyl ether (MTBE)	ND	5.0	ug/L
Styrene	ND	1.0	ug/L
1,1,1,2-Tetrachloroethane	ND	1.0	ug/L
1,1,2,2-Tetrachloroethane	ND	1.0	ug/L
Tetrachloroethylene	ND	1.0	ug/L
Toluene	ND	1.0	ug/L
1,2,4-Trichloro- benzene	ND	1.0	ug/L

(Continued on next page)

Environmental Consultants, Inc.

Client Sample ID: 2005050357 OLD HM COL TH #1

GC/MS Volatiles

Lot-Sample #...: ASF170341-001 Work Order #...: HDWC31AA Matrix.....: WG

<u>PARAMETER</u>	<u>RESULT</u>	<u>REPORTING LIMIT</u>	<u>UNITS</u>
1,1,1-Trichloroethane	ND	1.0	ug/L
1,1,2-Trichloroethane	ND	1.0	ug/L
Trichloroethylene	ND	1.0	ug/L
1,2,3-Trichloropropane	ND	1.0	ug/L
Vinyl chloride	ND	1.0	ug/L
m-Xylene & p-Xylene	ND	2.0	ug/L
o-Xylene	ND	1.0	ug/L
Xylenes (total)	ND	2.0	ug/L

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
Dibromofluoromethane	101	(73 - 122)
1,2-Dichloroethane-d4	99	(61 - 128)
Toluene-d8	104	(76 - 110)
4-Bromofluorobenzene	100	(74 - 116)

FL DOH Certification #E84025  
Certified by US EPA Region 8 (Radiochemistry)



LABORATORY SERVICES  
2742 N. Florida Ave.  
P.O. Box 1833  
Tampa, Florida 33601  
(813) 229-2879  
Fax (813) 229-0002

Report Date: July 12, 2005

Environmental Consultants, Inc.  
391 Newman Avenue  
Clarksville, IN 47129

Field Custody: Client  
Client/Field ID: 2005050357

Sample Collection: 5-25-05

Lab ID No: 4027  
Lab Custody Date: 6-01-05  
Sample description: GW

CERTIFICATION OF ANALYSIS

Parameter	Results	Units	Method	Analysis Date	Detection Limit
Gross Alpha	0.3 ± 0.4	pCi/l	EPA 900.0	6-15-05/1600	0.8
Gross Beta	0.7 ± 0.6	pCi/l	EPA 900.0	6-15-05/1600	1.5
Radium-226	0.2 ± 0.1	pCi/l	EPA 903.1	6-15-05/1435	0.2
Radium-228	0.1 ± 0.7	pCi/l	EPA Ra-05	6-17-05/1330	1.0
Strontium-90	0.0 ± 0.4	pCi/l	EPA 905.0	6-14-05/1235	1.0
**Tritium	58.8 ± 87.9	pCi/l	EPA 906.0	6-10-05	142.7
**Iodine-131	0.3 ± 0.4	pCi/l	*Alt	6-04-05	0.6

Alpha Standard: Th-230  
Beta Standard: Co-137

\*Radiochemical Determination of I-131  
in Milk and Water (EPA Alternate  
Approved Procedure).

\*\*Analyzing laboratory FL DOH certification #E13800.

James W. Hayes  
Laboratory Manager

st results meet all requirements of the NELAC standards.  
Contact person: Jim Hayes (813) 229-2879.

**ANALYTICAL  
CONSULTING  
TECHNOLOGY, INC**

Certified Laboratory

US EPA CT-021  
CT PH-0518  
EMail actlabs@sbcglobal.net

168 Railroad Hill St., Waterbury, CT 06708 • (203) 757-3960 • Fax (203) 759-2155  
www.actlabs.biz  
Environmental Consultants Inc.  
Stephanie Tucker  
391 Newman Ave.

Clarksville, IN 47130

Report Date: 08/17/2005

ACT Number: 2005060053 - 1      Sample Date: 06/01/2005      Date Received: 06/03/2005  
Sample Type: Composite      Sample Time:      Project number  
Collected by: Client      Sample Matrix: Groundwater  
Location/ID: Oldham Co. TH#1  
Description:

Laboratory Test	Result	Units	Method	Analysis Date	Analyst
<i>Acid Extract</i>					
2,4,6-Trichlorophenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
2,4-Dichlorophenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
2,4-Dimethylphenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
2,4-Dinitrophenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
2-Chlorophenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
2-Methyl-4,6-dinitrophenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
2-Nitrophenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
4-Chloro-3-methylphenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
4-Nitrophenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Pentachlorophenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Phenol	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
<i>Base Neutrals</i>					
1,2,4-Trichlorobenzene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
1,2-Dichlorobenzene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
1,3-Dichlorobenzene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
1,4-Dichlorobenzene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
2,4-Dinitrotoluene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
2,6-Dinitrotoluene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
2-Chloronaphthalene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
3,3'-Dichlorobenzidine	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
4-Bromophenyl Phenyl Ether	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
4-Chlorophenyl Phenyl Ether	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Acenaphthene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Acenaphthylene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL

**ANALYTICAL  
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www.actlabs.biz

Environmental Consultants Inc.  
Stephanie Tucker  
391 Newman Ave.

Page 2

Clarksville, IN 47130

Report Date: 06/17/2005

ACT Number: 2005060053 - 1      Sample Date: 06/01/2006      Date Received: 06/03/2005  
Sample Type: Composite      Sample Time:      Project number  
Collected by: Client      Sample Matrix: Groundwater  
Location/ID: Oldham Co. TH#1  
Description:

Laboratory Test	Result	Units	Method	Analysis Date	Analyst
Anthracene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Benzidine	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Benzo (a) Anthracene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Benzo (a) pyrene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Benzo (b) fluoranthene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Benzo (ghi) Perylene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Benzo (k) Fluoranthene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Bis (2-Chloroethoxy) Methane	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Bis (2-Chloroethyl) Ether	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Bis (2-Chloroisopropyl) Ether	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Bis (2-Ethylhexyl) Phthalate	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Butyl Benzyl Phthalate	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Chrysene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Di-n-octyl phthalate	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Dibenz (a,h) Anthracene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Dibutyl phthalate	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Diethyl Phthalate	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Dimethyl phthalate	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Fluoranthene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Fluorene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Hexachlorobenzene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Hexachlorobutadiene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Hexachlorocyclopentadiene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Hexachloroethane	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Indeno(1,2,3-cd)pyrene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL

**ANALYTICAL  
CONSULTING  
TECHNOLOGY, INC**

Certified Laboratory

US EPA CT-021  
CT PH-0518  
EMail actlabs@sbcglobal.net

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Environmental Consultants Inc.  
Stephanie Tucker  
391 Newman Ave.

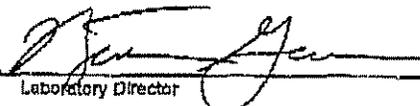
Page 3

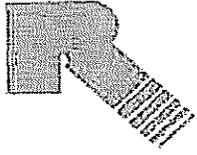
Clarksville, IN 47130

Report Date: 06/17/2005

ACT Number: 2005060053 - 1      Sample Date: 06/01/2005      Date Received: 06/03/2005  
Sample Type: Composite      Sample Time:      Project number  
Collected by: Client      Sample Matrix: Groundwater  
Location/ID: Oldham Co. TH#1  
Description:

Laboratory Test	Result	Units	Method	Analysis Date	Analyst
Isophorone	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
N-Nitrosodi-n-propylamine	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
N-Nitrosodimethylamine	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
N-Nitrosodiphenylamine	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Naphthalene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Nitrobenzene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Phenanthrene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL
Pyrene	<10	ug/L	EPA 625	06/10/2005 07:25:00 PM	JL

For Analytical Consulting Technology, Inc.  2005060053  
Laboratory Director



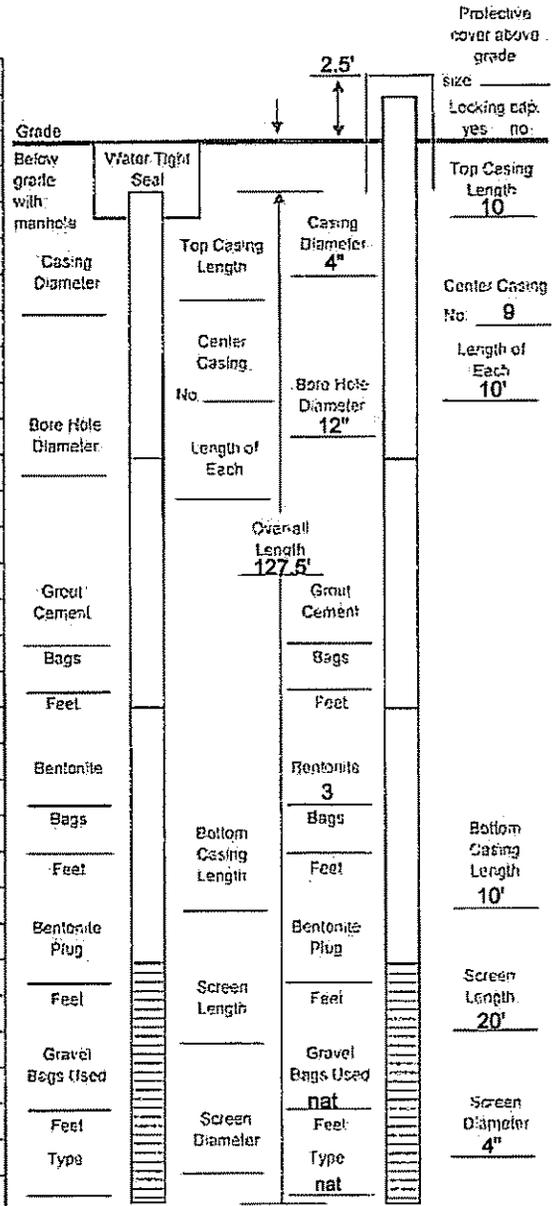
**Reynolds, Inc.**

**Drilling Log**

Job No. 47599 - Oldham Co.  
 Well No. TW# 1  
 Well Depth 127.5'  
 Size of Casing 4" Type pvc Slot 0.010  
 Length of Screen 20' I.D. 4"  
 I.D. of Augers Used 7-1/4"  
 Number of Split Spoons Taken \_\_\_\_\_  
 Development Time \_\_\_\_\_ hrs.  
 Steam Cleaning Time \_\_\_\_\_ hrs.  
 Class Level A B C D  
 Stand-By Time \_\_\_\_\_ hrs.  
 Reason \_\_\_\_\_  
static water level - 25'  
Roederer Property - South of House  
5701 W. Highway 524  
 Driller's Signature Tim Woods  
 Date 05/20/2005

Depth	Formation Log
0-3	top soil
3-18	silty brown clay
18-33	soft clay and sand
33-48	brown sand
48-53	medium brown sand
53-58	medium to coarse brown sand
58-63	medium brown sand w/trace gravel
63-68	medium sand w/coarse gravel and cobbles
68-73	medium sand and coarse gravel
73-78	medium to coarse sand and gravel
78-83	coarse sand and gravel w/some cobbles
83-88	medium to coarse sand and gravel

Depth	Formation Log
88-93	medium to coarse sand and gravel
93-98	medium sand w/med to coarse grav.
98-103	medium sand and fine gravel
103-108	medium sand and medium to fine gravel
108-113	medium sand w/trace gravel
113-118	medium sand
118-123	medium sand w/some gravel
123-125	medium sand w/trace gravel
126-	medium sand w/cobbles
127.5	
127.5	Refusal



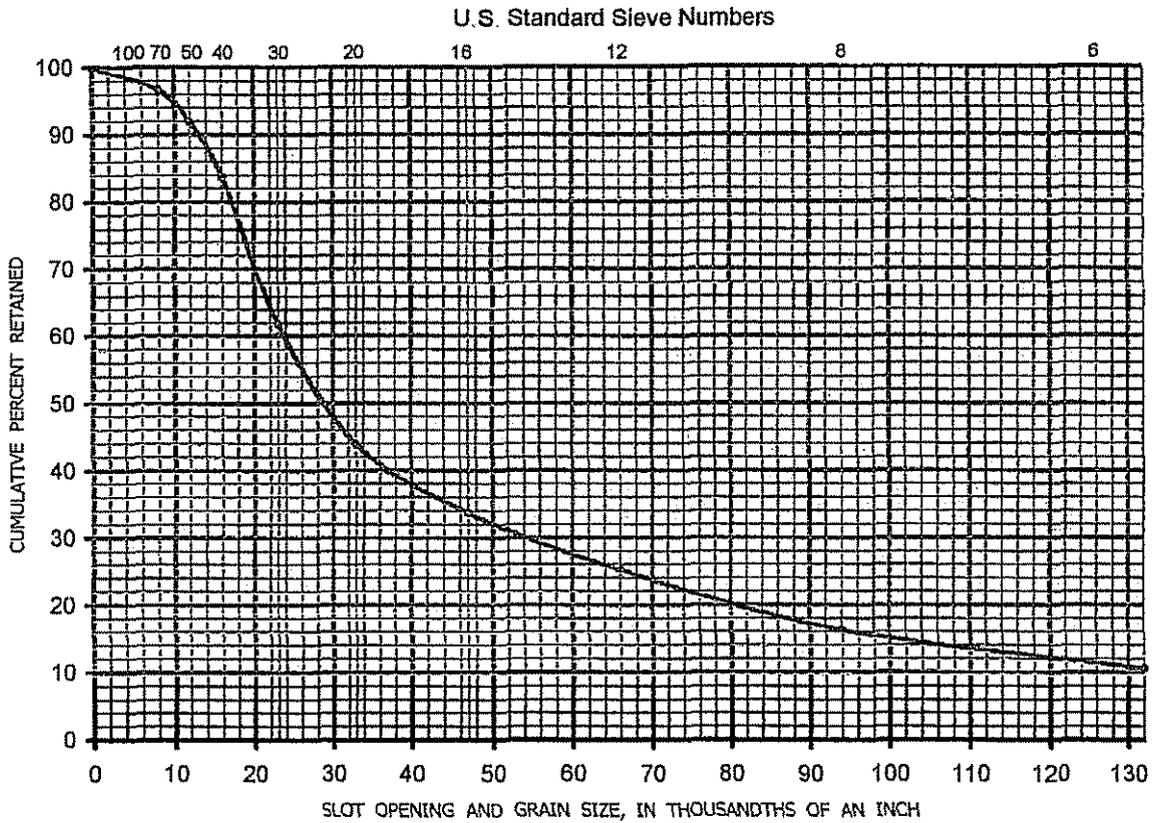


**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No.: TW 1

Job No.: 47599  
 Date: 6/6/2005  
 Depth: 73 - 75



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	11
8	0.094	2.38	16
12	0.066	1.68	25
16	0.047	1.19	34
20	0.033	0.84	44
30	0.023	0.60	62
40	0.016	0.42	84
50	0.012	0.30	92
70	0.008	0.21	97

Notes: Sample split on the 1/4" sieve.

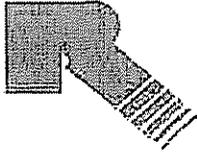
15% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.

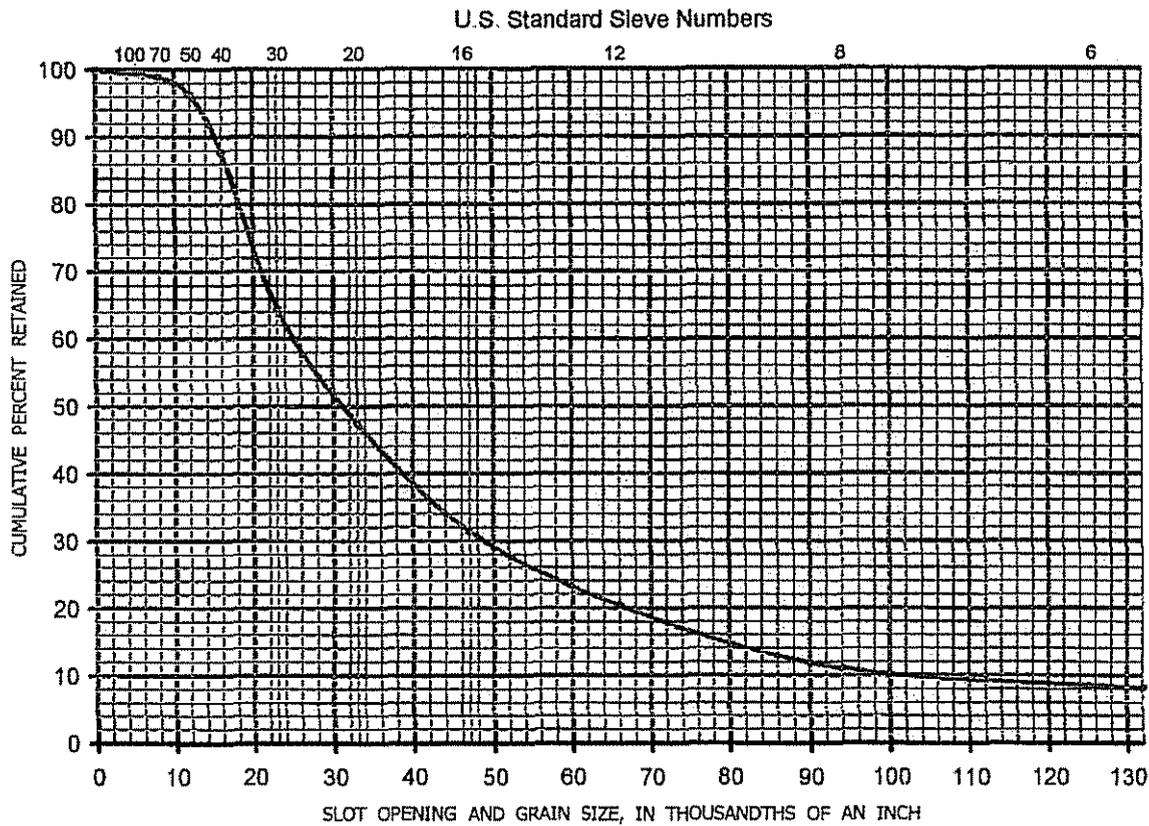


**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
**(FINE)**

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No.: TW 1

Job No.: 47599  
 Date: 6/6/2005  
 Depth: 77 - 80



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	8
8	0.094	2.38	11
12	0.066	1.68	20
16	0.047	1.19	31
20	0.033	0.84	47
30	0.023	0.60	64
40	0.016	0.42	88
50	0.012	0.30	96
70	0.008	0.21	99

Notes: Sample split on the 1/4" sieve.

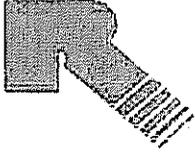
9% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.

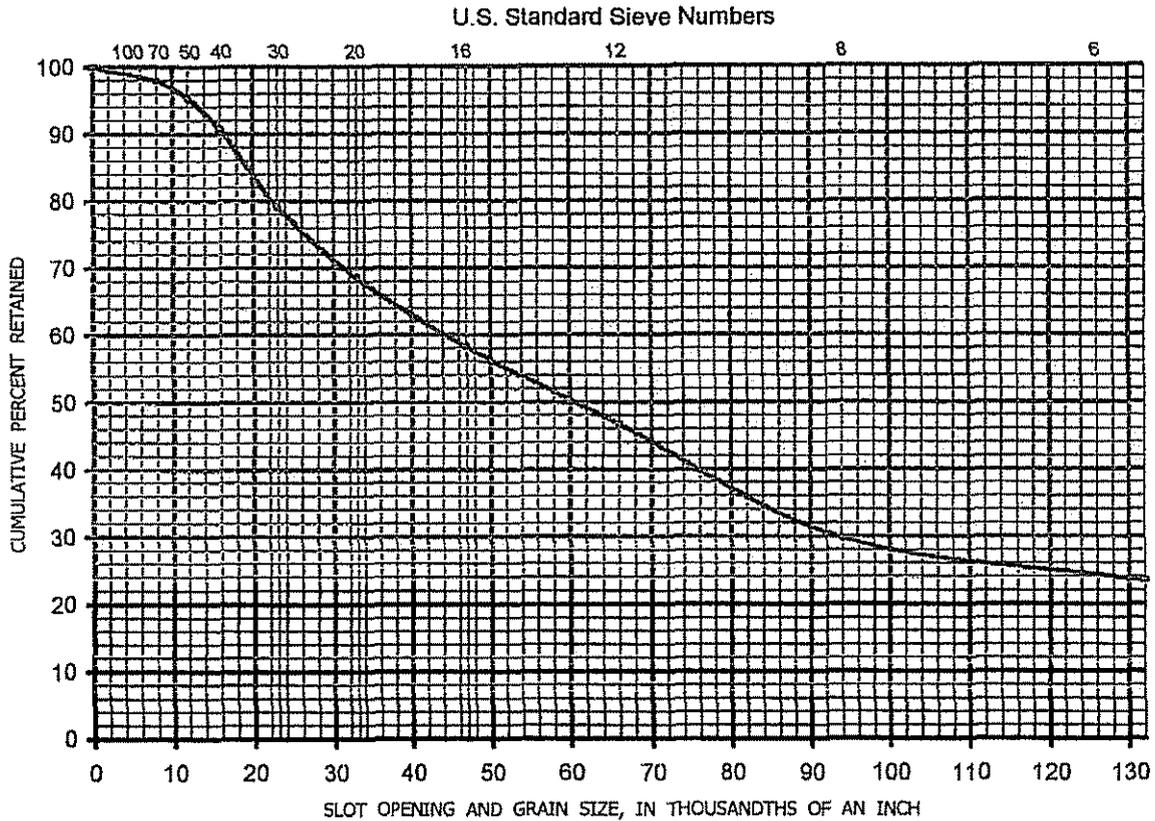


**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No.: TW 1

Job No.: 47599  
 Date: 6/6/2005  
 Depth: 83 - 85



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	23
8	0.094	2.38	30
12	0.066	1.68	47
16	0.047	1.19	58
20	0.033	0.84	69
30	0.023	0.60	79
40	0.016	0.42	91
50	0.012	0.30	95
70	0.008	0.21	98

Notes: Sample split on the 1/4" sieve.

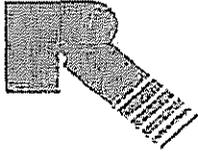
35% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

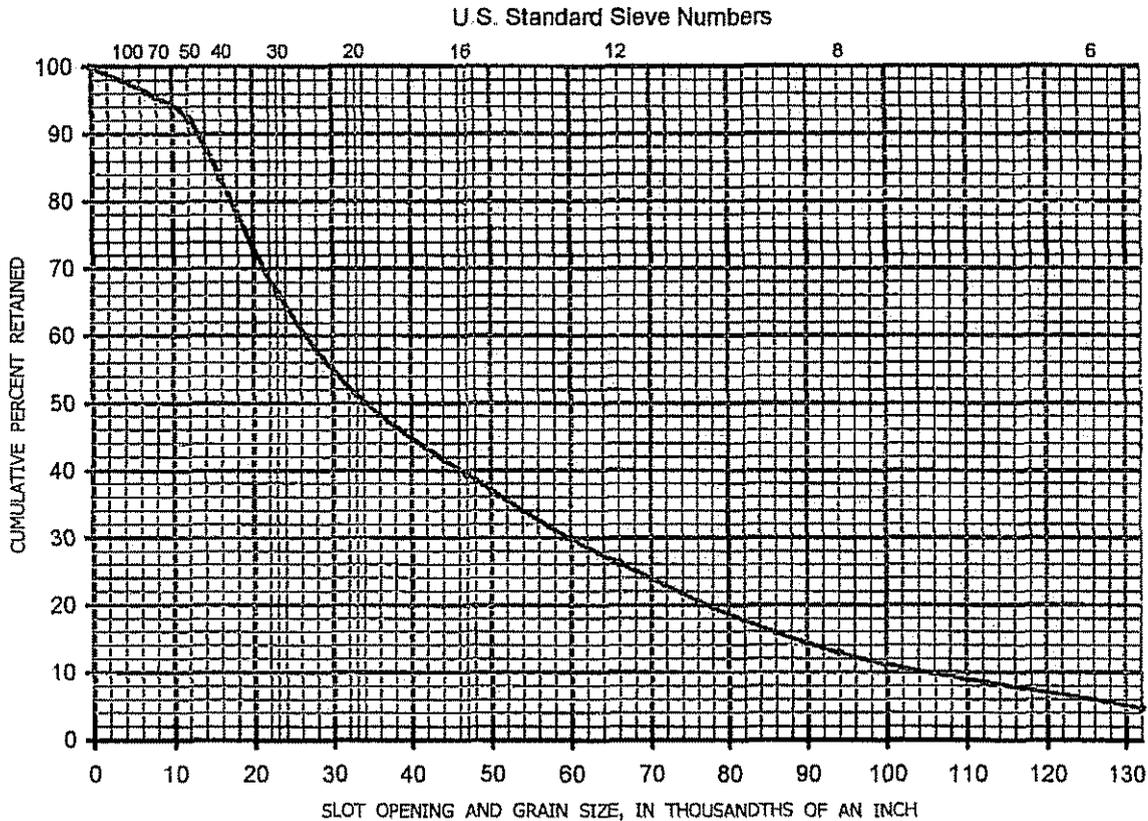
Length \_\_\_\_\_ ft.



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
**(FINE)**

Customer: Oldham County Water District Job No.: 47599  
 Address: Westport, Kentucky Date: 6/6/2005  
 Well No.: TW 1 Depth: 87 - 90



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	5
8	0.094	2.38	13
12	0.066	1.68	26
16	0.047	1.19	39
20	0.033	0.84	51
30	0.023	0.60	66
40	0.016	0.42	83
50	0.012	0.30	92
70	0.008	0.21	96

Notes: Sample split on the 1/4" sieve.

4% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.

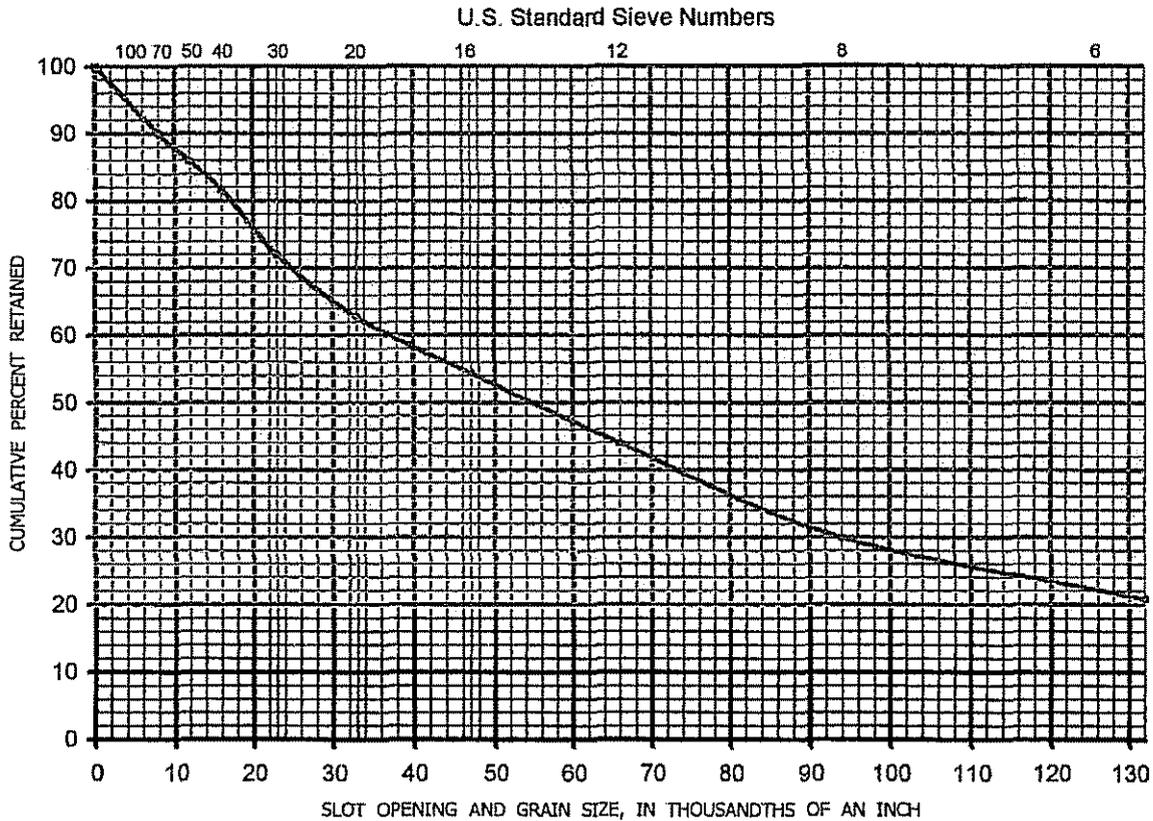


**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
**(FINE)**

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No.: TW 1

Job No.: 47599  
 Date: 6/6/2005  
 Depth: 93 - 95



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	21
8	0.094	2.38	30
12	0.066	1.68	44
16	0.047	1.19	54
20	0.033	0.84	63
30	0.023	0.60	72
40	0.016	0.42	82
50	0.012	0.30	86
70	0.008	0.21	90

Notes: Sample split on the 1/4" sieve.

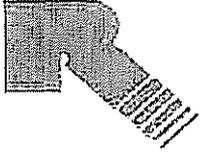
24% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.

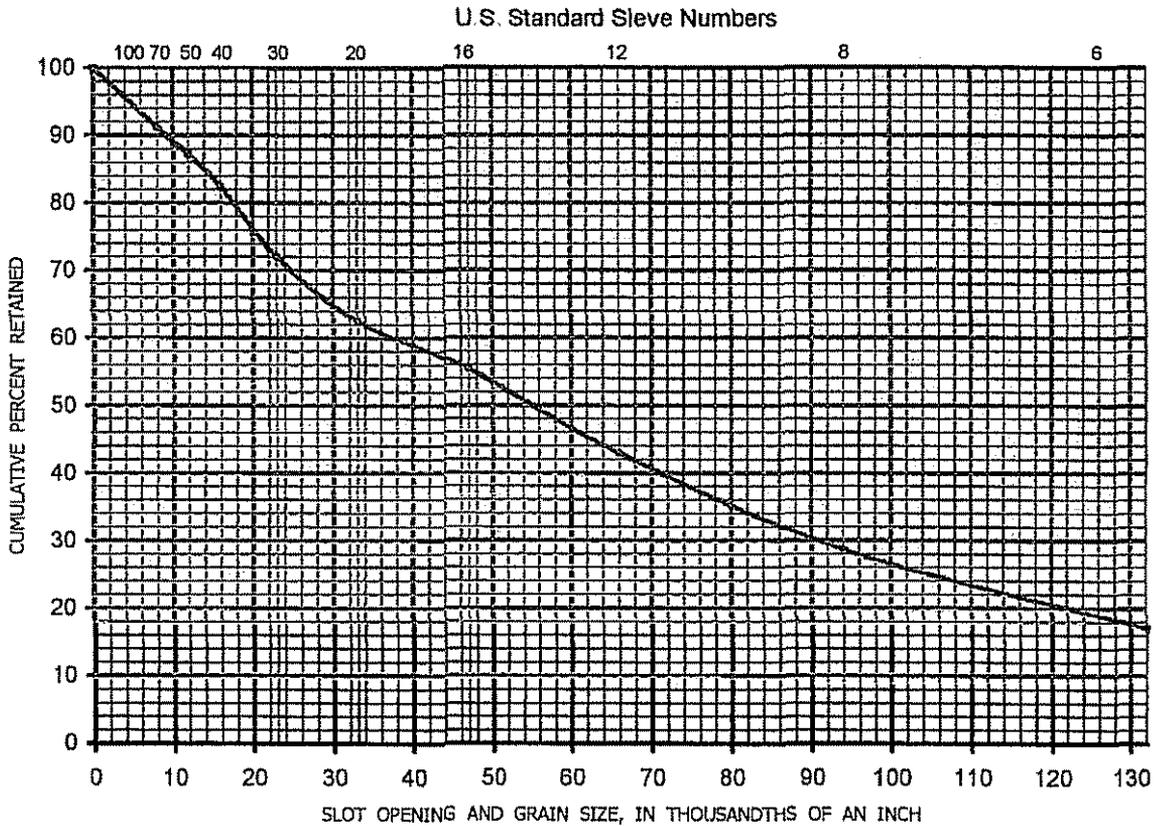


**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
**(FINE)**

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No.: TW 1

Job No.: 47599  
 Date: 6/6/2005  
 Depth: 97 - 100



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	17
8	0.094	2.38	29
12	0.066	1.68	43
16	0.047	1.19	55
20	0.033	0.84	63
30	0.023	0.60	72
40	0.016	0.42	82
50	0.012	0.30	87
70	0.008	0.21	91

Notes: Sample split on the 1/4" sieve.

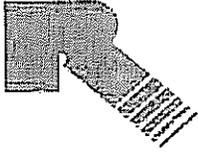
31% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.

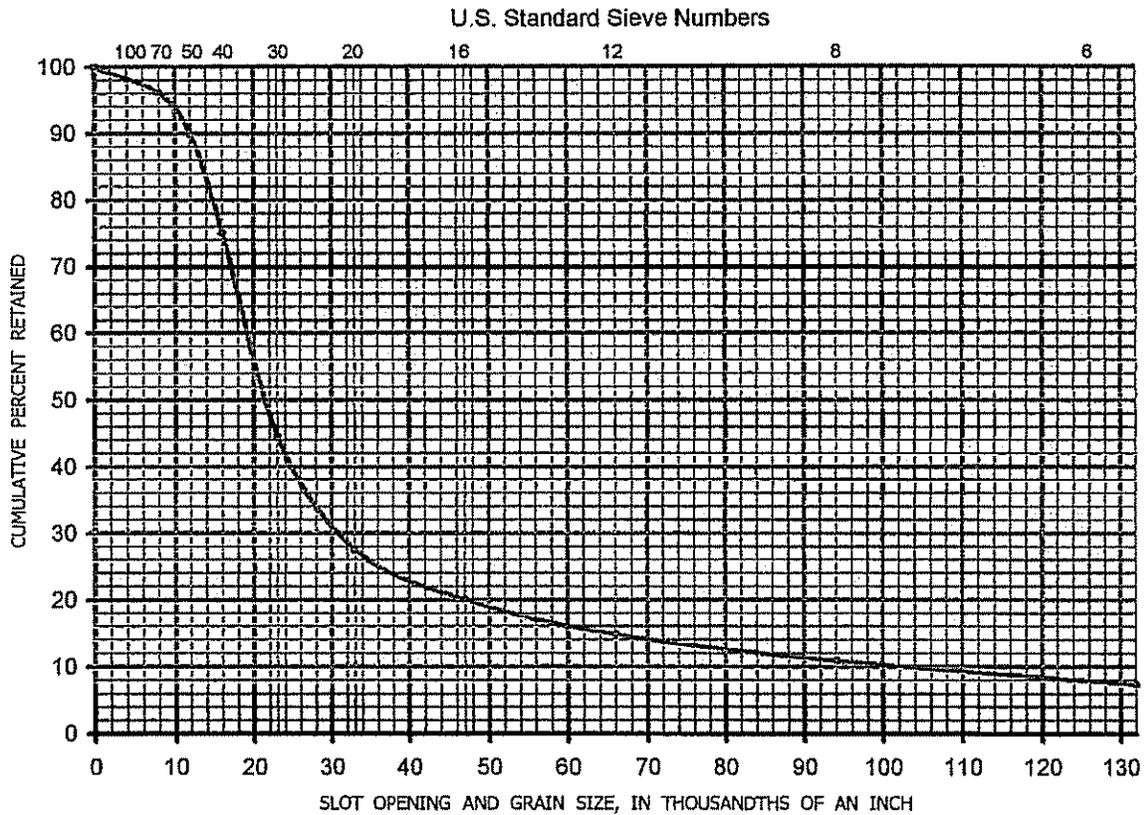


**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No.: TW 1

Job No.: 47599  
 Date: 6/6/2005  
 Depth: 103 - 105



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	7
8	0.094	2.38	11
12	0.066	1.68	15
16	0.047	1.19	20
20	0.033	0.84	28
30	0.023	0.60	45
40	0.016	0.42	75
50	0.012	0.30	90
70	0.008	0.21	96

Notes: Sample split on the 1/4" sieve.

16% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

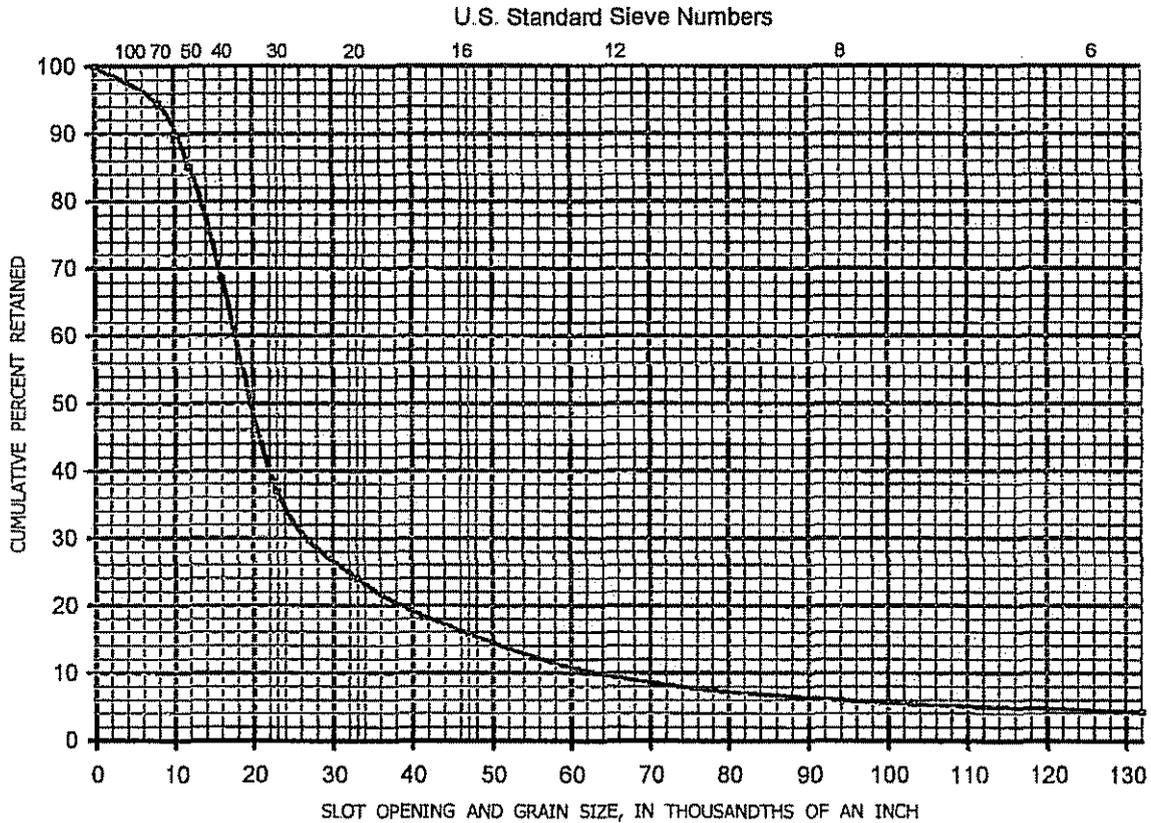
Length \_\_\_\_\_ ft.



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS  
 (FINE)**

Customer: Oldham County Water District Job No.: 47599  
 Address: Westport, Kentucky Date: 6/6/2005  
 Well No.: TW 1 Depth: 108 - 110



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	4
8	0.094	2.38	6
12	0.066	1.68	9
16	0.047	1.19	16
20	0.033	0.84	24
30	0.023	0.60	37
40	0.016	0.42	69
50	0.012	0.30	85
70	0.008	0.21	94

Notes: Sample split on the 1/4" sieve.

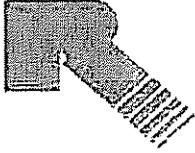
10% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
**(FINE)**

Customer: Oldham County Water District

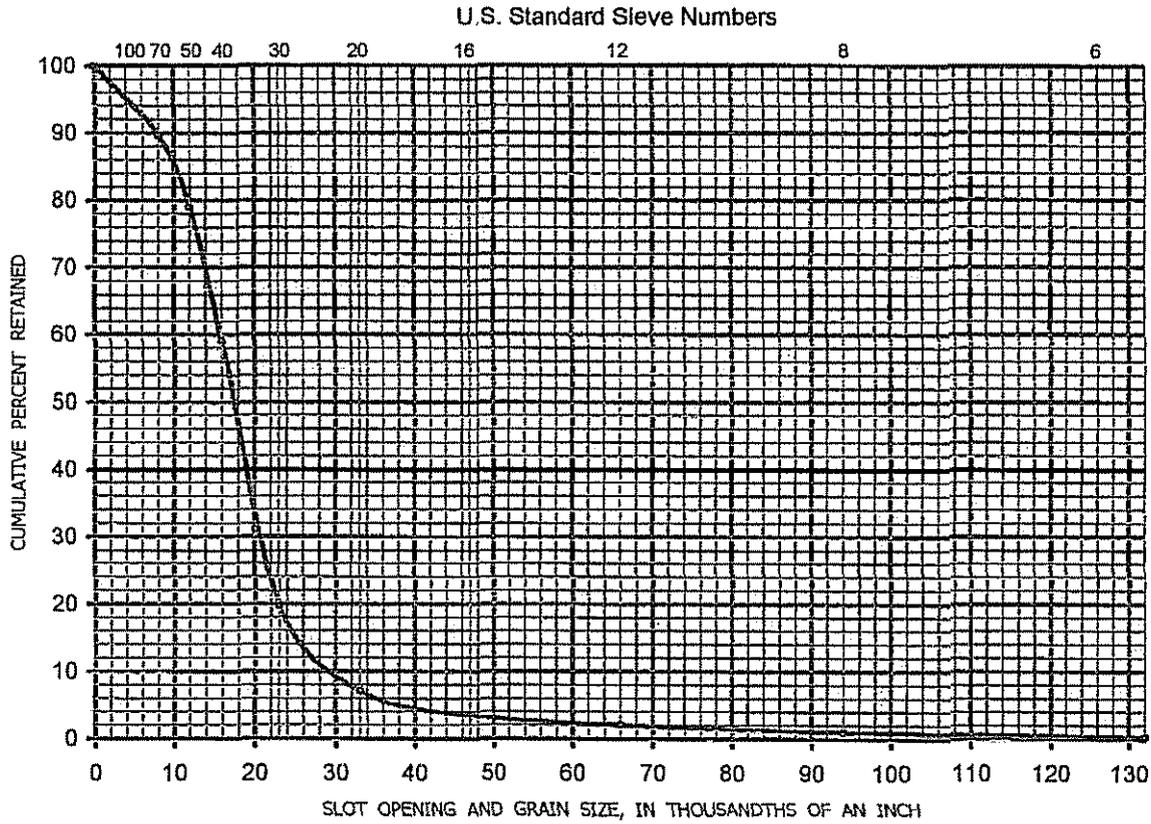
Job No.: 47599

Address: Westport, Kentucky

Date: 6/6/2005

Well No.: TW 1

Depth: 113 - 115



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	0
8	0.094	2.38	1
12	0.066	1.68	2
16	0.047	1.19	4
20	0.033	0.84	7
30	0.023	0.60	20
40	0.016	0.42	59
50	0.012	0.30	79
70	0.008	0.21	90

Notes: Sample split on the 1/4" sieve.

6% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.

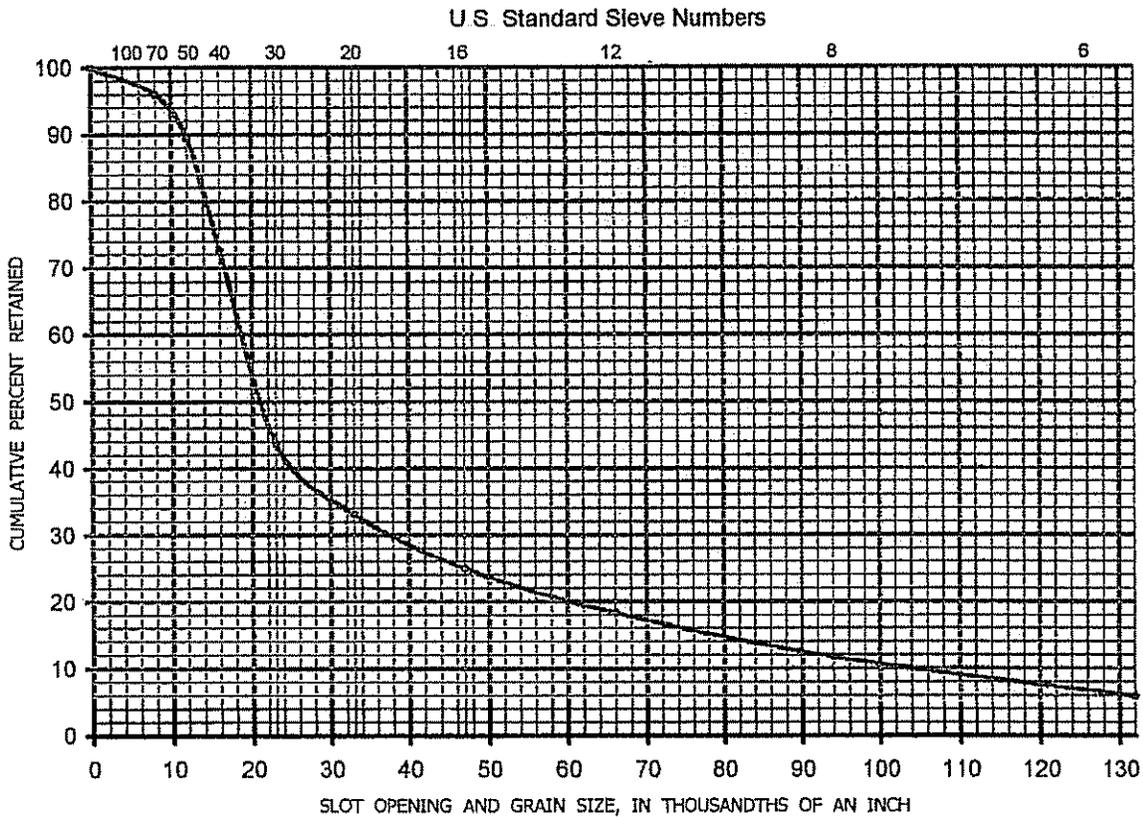


**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No.: TW 1

Job No.: 47599  
 Date: 6/6/2005  
 Depth: 118 - 120



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	6
8	0.094	2.38	12
12	0.066	1.68	18
16	0.047	1.19	25
20	0.033	0.84	33
30	0.023	0.60	44
40	0.016	0.42	73
50	0.012	0.30	89
70	0.008	0.21	96

Notes: Sample split on the 1/4" sieve.

3% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District

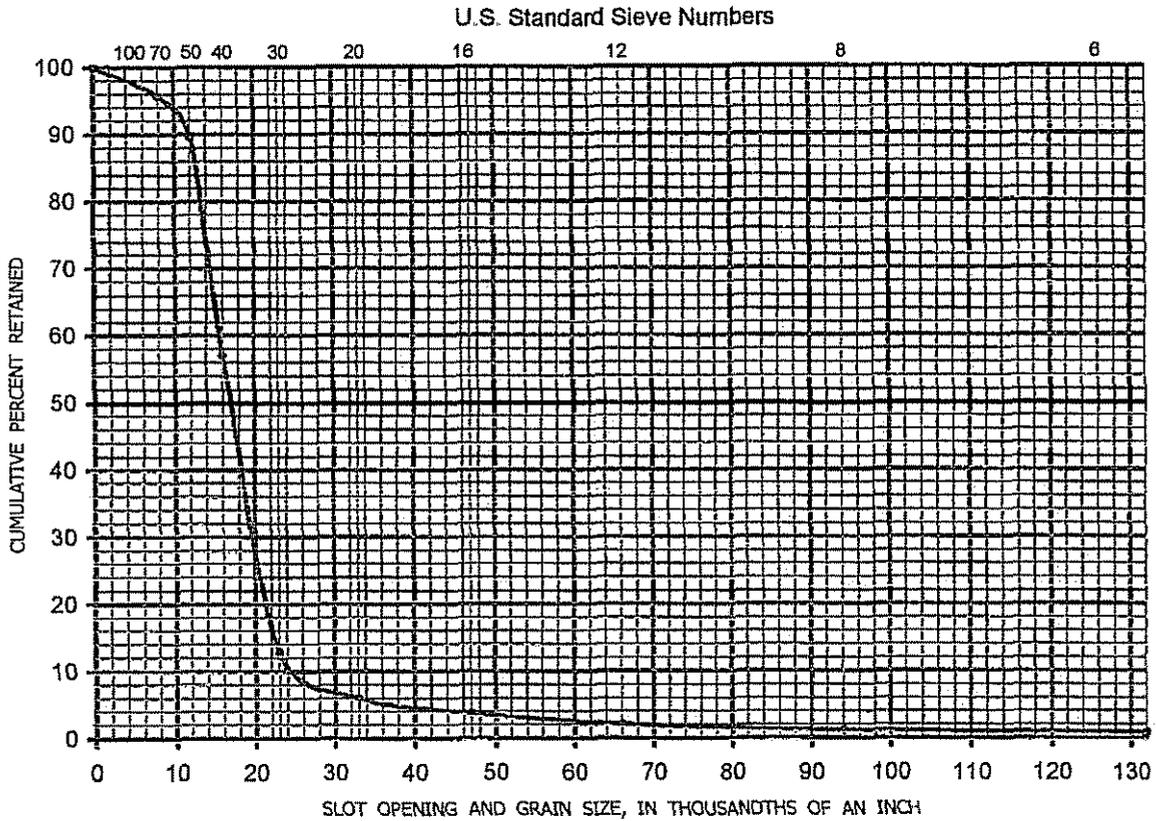
Job No.: 47599

Address: Westport, Kentucky

Date: 6/6/2005

Well No.: TW 1

Depth: 123 - 125



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	1
8	0.094	2.38	1
12	0.066	1.68	2
16	0.047	1.19	4
20	0.033	0.84	6
30	0.023	0.60	13
40	0.016	0.42	57
50	0.012	0.30	90
70	0.008	0.21	96

Notes: Sample split on the 1/4" sieve.

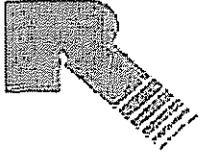
4% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

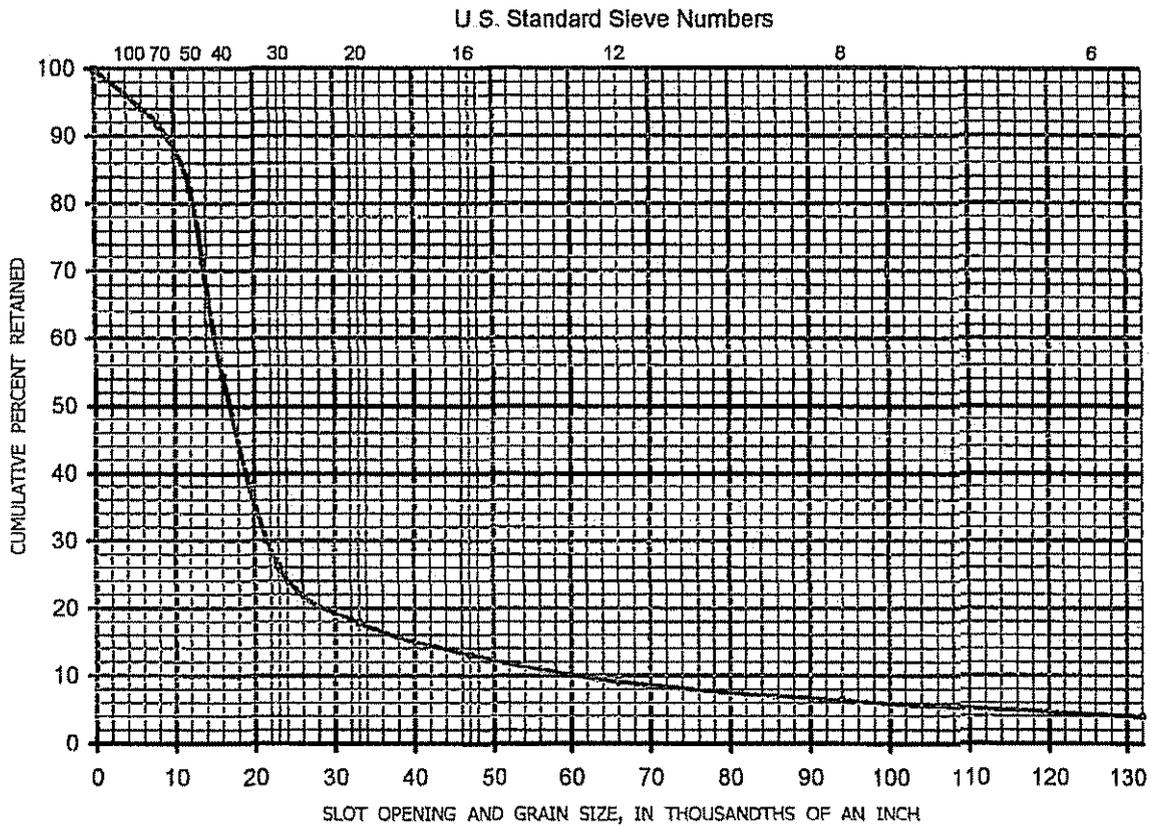
Length \_\_\_\_\_ ft.



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District Job No.: 47599  
 Address: Westport, Kentucky Date: 6/6/2005  
 Well No.: TW 1 Depth: 126 - 127.5



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	4
8	0.094	2.38	6
12	0.066	1.68	9
16	0.047	1.19	13
20	0.033	0.84	18
30	0.023	0.60	26
40	0.016	0.42	54
50	0.012	0.30	82
70	0.008	0.21	92

Notes: Sample split on the 1/4" sieve.

11% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.



# **Test Well #3**





# **Test Drilling For Oldham Co. Water District**

(Campisano Property)  
(5701 W. Highway 524)

TW #3

Reynolds, Inc.  
1301-15 East Main Street  
Louisville, Kentucky 40206

**KENTUCKY WATER WELL RECORD**

Please read all instructions prior to completing this form. Do not write in shaded area. The original copy of this form must be submitted within 30 days of well completion to the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Water - Groundwater Branch, 14 Holly Road, Frankfort, KY 40601. Telephone (502) 564-3410.

(TYPE OR PRINT CLEARLY)

Attach Water Well Record

Identification Number Label Here

(If Applicable)

**GENERAL INFORMATION:**

Well Owner's Name <b>Oldham Co. Water District</b> <small>Last First MI</small>		Owner's Phone ( ) None <b>( 502 ) 222-1690</b>	Date Received:
Mailing Address <b>P.O. Box 51</b>		Well Address ( ) Same as owner's address <b>Highway 524</b>	(c) AKGWA NUMBER: <b>0006-1848</b>
City <b>BUCKNER</b>	State <b>KY</b>	Zip Code <b>40010</b>	(d) VARIANCE WELL: ( ) Yes (X) No

(i) WELL LOCATION:	USGS Quadrangle Name <b>LaGrange, IN-KY</b>	County <b>Oldham</b>	Latitude <b>N</b>	Longitude <b>W</b>
--------------------	--	-------------------------	----------------------	-----------------------

(a) GENERAL WELL CONSTRUCTION: Start Date: <b>03 / 12 / 07</b> Finish Date: <b>05 / 07 / 07</b> Drilling Method: Type of Work: ( ) Air Rotary ( ) New Well ( ) Mud Rotary ( ) Rework ( ) Cable ( ) Deepen (X) Auger ( ) Plug ( ) Other ( ) Clean	(b) WELL TEST: <b>N/A</b> Date: / / Testing Method: ( ) Pump ( ) Blowing ( ) Bailor ( ) Other Well Yield: ( ) gpm ( ) gph Drawdown: ft. after ( ) hrs ( ) min of pumping at ( ) gpm ( ) gph ft. after ( ) hrs ( ) min of pumping at ( ) gpm ( ) gph	(c) PHYSIOGRAPHIC OR HYDROLOGIC REGION: ( ) Blue Grass (X) Ohio River Alluvium ( ) E. Coal Field ( ) W. Coal Field ( ) Miss. Plateau ( ) Jackson Purchase	(d) WELL SERVICE: Number of people served: Number of service connections:
--	---	--	---

Surface El.: <b>450</b> ft. Total Depth: <b>124</b> ft. Depth to Bedrock: <b>124</b> ft. Static Water Level: <b>24</b> ft.	Flowing Artesian Well: Shut-in Pressure: (psi) Discharge: ( ) gpm ( ) gph	(e) WATER QUALITY: Well was (X) pumped ( ) bailed ( ) blown ( ) not purged, for 4- (X) hrs ( ) min. at <b>50</b> per (X) min ( ) hr. before sampling. Appearance: Odor: (X) Clear (X) None ( ) Cloudy ( ) Musty ( ) Muddy ( ) Sulfur ( ) Other ( ) Other	Well Disinfectant: Type _____ Amount _____ Results of ( ) fecal ( ) total coliform analysis: ( ) 0 or <1.0 ( ) TNTC ( ) Confluent # colonies/100 ml Other _____ Sampling Date: / / Analysis Date: / / Lab Performing Test:	(f) SKETCH MAP: <b>TW #3</b>  * TW #3 5700 W Hwy 524
---	---	--	---	---

Show well location and distances from permanent structures, septic drain fields, major roads (include name or number) and intersections. INDICATE NORTH WITH AN ARROW. Provide a photocopy of a topographic map with the well location clearly marked with an 'X', the AKGWA number, and the well owner's name.

(g) WELL COMPLETION:	(h) PUMP DATA: Was a pump installed? ( ) Yes ( ) No
Feet Below Surface From To Hole Diameter (in.) Casing Inside Diameter (in.) Casing Type	Date Installed: / / Pump Type: ( ) Submersible Horsepower _____ ( ) Jet Rating (gpm) _____ ( ) Driller ( ) Turbine Pump Intake set at _____ ( ) Pump Installer ( ) Hand foot below ground surface ( ) Home Owner ( ) Baller/Bucket or Other ( ) Other
0 84 14 4 PVC casing 84 124 14 4 PVC screen	

(i) LITHOLOGIC LOG:
Feet Below Surface Description Water Quality and GPM
From To
0 3 Topsoil
3 15 Brown Clay
15 20 Wet Silty Clay
20 48 Sand & Gravel
48 60 Fine-Medium Sand
60 65 Fine-Coarse Sand w/ Gravel
65 83 Medium-Coarse Sand & Gravel
83 105 Fine-Coarse Sand & Gravel
105 115 Fine-Medium Sand w/ Trace Gravel
115 120 Fine-Coarse Sand & Gravel
120 124 Fine-Medium Sand w/ Trace Gravel
Casing joint: ( ) Glued (X) Threaded ( ) Welded ( ) No Joint ( ) Other
Well head (Casing Top) Seal: ( ) Well Cap (X) Sanitary Seal ( ) Other a pitless adapter installed? ( ) yes (X) no
Screen or Casing Perforation, if applicable: I.D. (in.) 4 From 84 To 124 ft. Type PVC Slot Size .020 I.D. (in.) From To ft. Type Slot Size
Annulus Fill and Seal: Feet Below Surface From To Material
0 25 bentonite 25 124 natural formation

(j) COMMENTS:

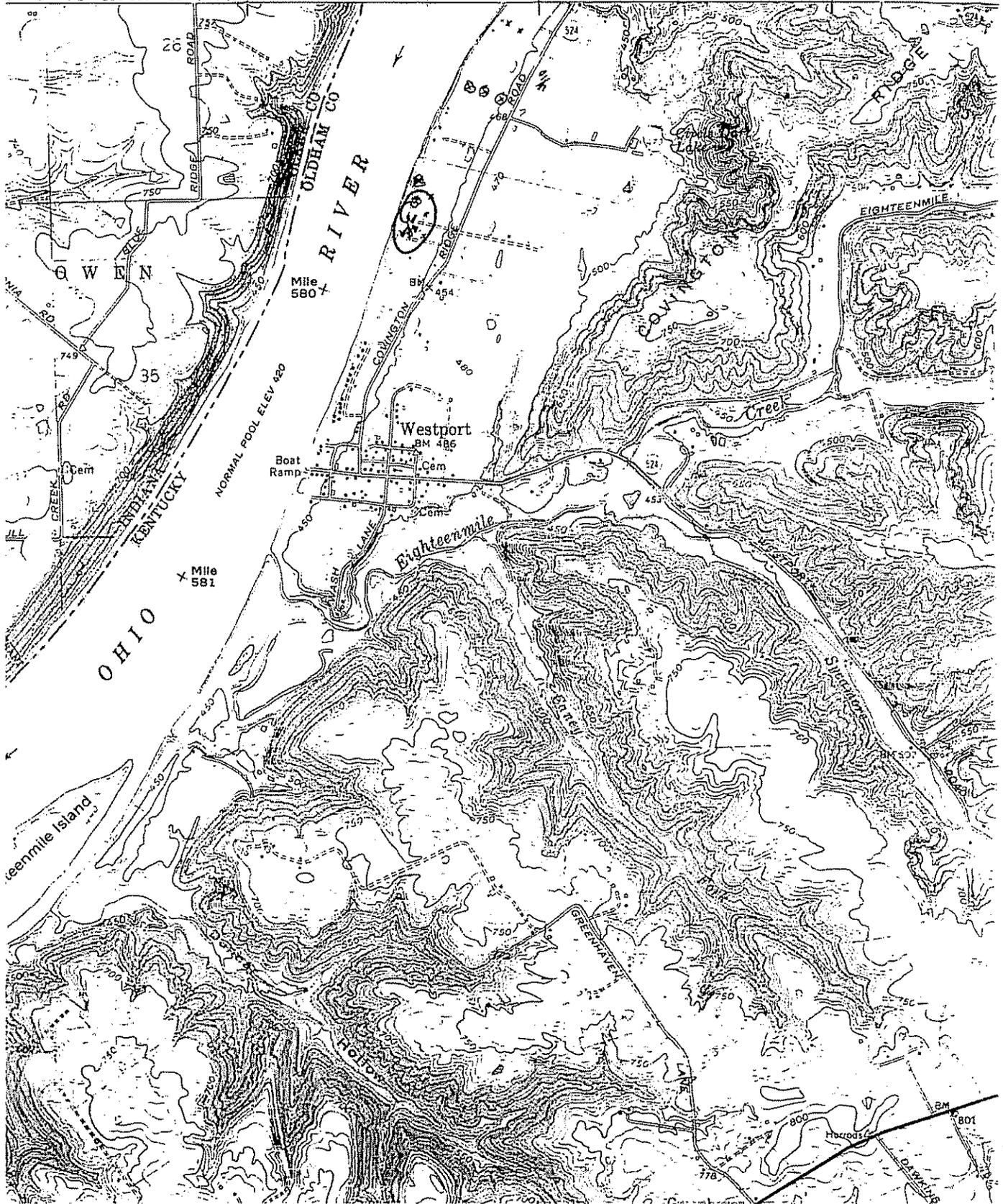
(k) AFFIRMATION: The work described above was done under my supervision, and this report is true and correct to the best of my knowledge. NOTE: The water well driller is not responsible for natural groundwater quality or quantity encountered while drilling or completing this well.

Well Driller's or Rig Operator's Name (Print or Type) <b>John B. Schmidt</b>	State Certification Number or Rig Operator's Permit No. <b>0136-0204-00</b>	Signature of Responsible Certified Driller 
Company Mailing Address <b>1301-15 E. Main Street</b>	City <b>Louisville</b>	State <b>KY</b>
Zip Code <b>40206</b>	Date <b>5/17/07</b>	

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

STATE  
KENTUCKY  
UNIVERS

Scale: 1:500,000 (IND.)  
633 | 634 | 27'30" | 635





Date of Issue: March 27, 2007

Page 1 of 2

Reynolds Inc.  
1301 E. Main St.  
Louisville, KY 40206

RE: Analysis results for: Oldham Co. - Campisano TW#3.

**BECKMAR CERTIFICATE OF ANALYSIS # 181803**

Sample Date: 3/13/2007

Sample Time: 13:00

Sampled by: Jerri McKenna

Parameter	Results	Units	Type	Method	Analyzed Date / Time	Analyst
Alkalinity	256	mg/l	G	SM2320b	3/16/2007 15:00	PJB
Chloride	6	mg/l	G	EPA 335.3	3/14/2007 8:45	PJB
Hardness, Total	301	mg/l	G	EPA 130.2	3/16/2007 13:00	PJB
Hardness, Ca	206	mg/l	G	EPA 200.7	3/16/2007 15:50	ALS
Ammonia	< 0.2	mg/l	G	EPA 350.3	3/16/2007 16:30	DKL
Nitrite	0.24	mg/l	G	SM4500No2b	3/14/2007 8:40	PJB
Nitrate	26.4	mg/l	G	SM4500No3d	3/13/2007 16:40	PJB
pH	7.30	S.U.	G	EPA 150.1	3/13/2007 16:30	DKL
TDS	342	mg/l	G	SM2540c	3/22/2007 16:30	DKL
Iron	< 0.003	mg/l	G	EPA 200.7	3/16/2007 15:00	ALS
Manganese	< 0.001	mg/l	G	EPA 200.7	3/16/2007 15:00	ALS

Remarks:

If you have any questions please call.

Thank you,

Joe P. Carney  
Quality Control Officer

JPC:dwt

ENVIRONMENTAL  
LABORATORY

Jeffersonton Business Park

3 Ruckriegel Parkway

Jeffersonton, KY 40299

502-266-6533

Fax 502-266-6446



Date of Issue: May 09, 2007

Page 1 of 2

Reynolds Inc.  
1301 E. Main St.  
Louisville, KY 40206

RE: Analysis results for: Oldham Co Water - TW#3.

**BECKMAR CERTIFICATE OF ANALYSIS # 184260**

Sample Date: 5/7/2007

Sample Time: 14:35

Sampled by: Mr. Sean Miquel

Parameter	Results	Units	Type	Method	Analyzed Date / Time	Analyst
Nitrate	0.44	mg/l	G	SM4500No3d	5/8/2007 9:42	PJB

Remarks:

If you have any questions please call.

Thank you,

Joe P. Carney  
Quality Control Officer

JPC:dwt

ENVIRONMENTAL  
LABORATORY

Jeffersontown Business Park

8000 Kuckjesel Parkway

Jeffersontown, KY 40299

502-766-6535

FAX 502-266-6446



**Environmental  
Consultants, Inc.**

Professional Laboratory Services

**LABORATORY REPORT**

Reynolds, Inc. (Vendor #2720)  
1301-15 E. Main Street  
Louisville, KY 40206

Attn: Ms. Jerri McKenna

Date Received: 05/07/2007 Report Date: 05/11/2007

Client Number: 085104 Order No: 2007050084

P.O. No :

Project:

Released By:

Order No: 2007050084

COC No: 51279

**ANALYTICAL RESULTS**

Page 1

SAMPLE INFORMATION

SAMPLE NO: 1 Collection Date: 05/07/2007 Time: 14:30: Sample Location: Oldham Co. Compisano TW#3  
Collected By: Client Sample Matrix: Groundwater Sample Type: Grab  
Special Instructions: Chain of Custody Record (COC) attached.

WET CHEMISTRY

PARAMETER	RESULT	UNITS	DETECTION LIMIT	ANALYST	DATE ANALYZED	METHOD	CC ID No
Nitrate	6.58	mg/L	0.010	REF	05/11/2007	EPA 4500	310195



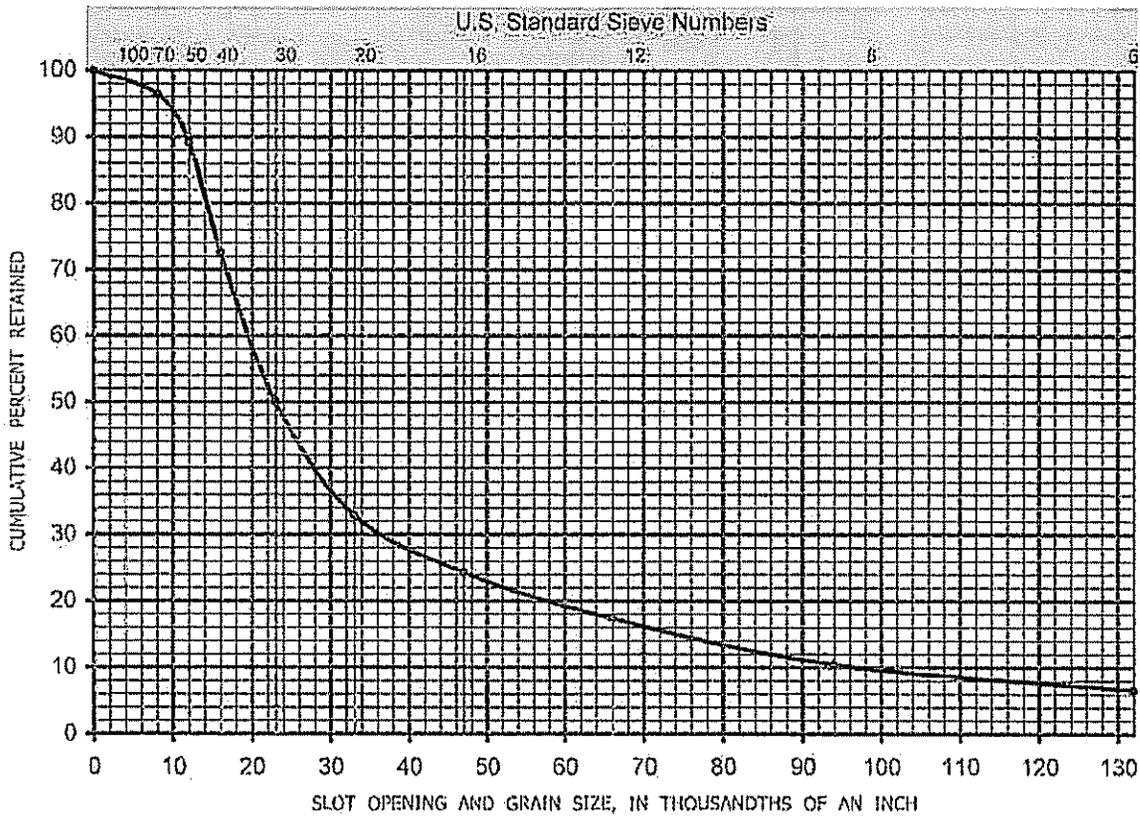




**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District Job No.: 48324  
 Address: Westport, Kentucky Date: 3/12/2007  
 Well No.: TW #3 Depth: 78 - 80



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM	
6	0.132	3.36	7
8	0.094	2.38	10
12	0.066	1.68	17
16	0.047	1.19	24
20	0.033	0.84	33
30	0.023	0.60	50
40	0.016	0.42	73
50	0.012	0.30	89
70	0.008	0.21	97

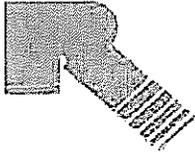
Notes: 2% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
**(FINE)**

Customer: Oldham County Water District

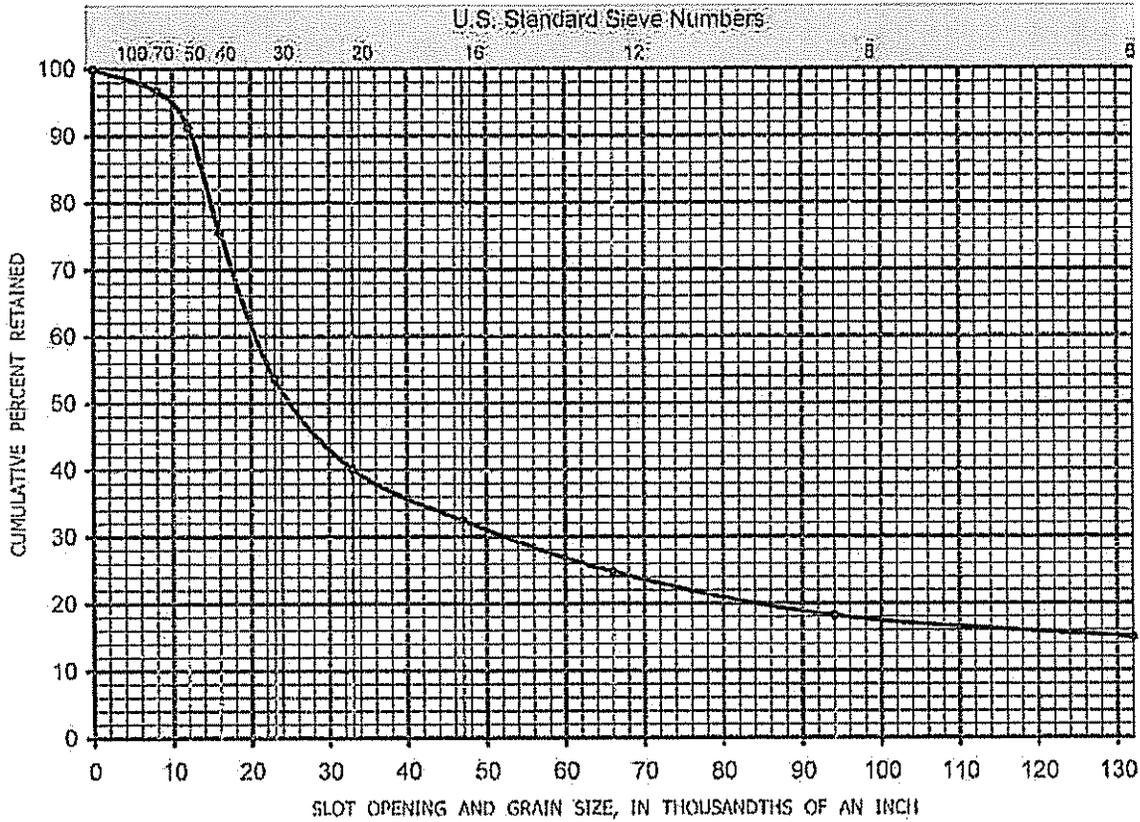
Job No: 48324

Address: Westport, Kentucky

Date: 3/12/2007

Well No.: TW #3

Depth: 83 - 85



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	15
8	0.094	2.38	18
12	0.066	1.68	25
16	0.047	1.19	32
20	0.033	0.84	40
30	0.023	0.60	54
40	0.016	0.42	76
50	0.012	0.30	91
70	0.008	0.21	97

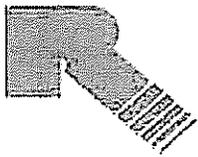
Notes: 20% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.



# REYNOLDS, INC.

Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

## SAND ANALYSIS (FINE)

Customer: Oldham County Water District

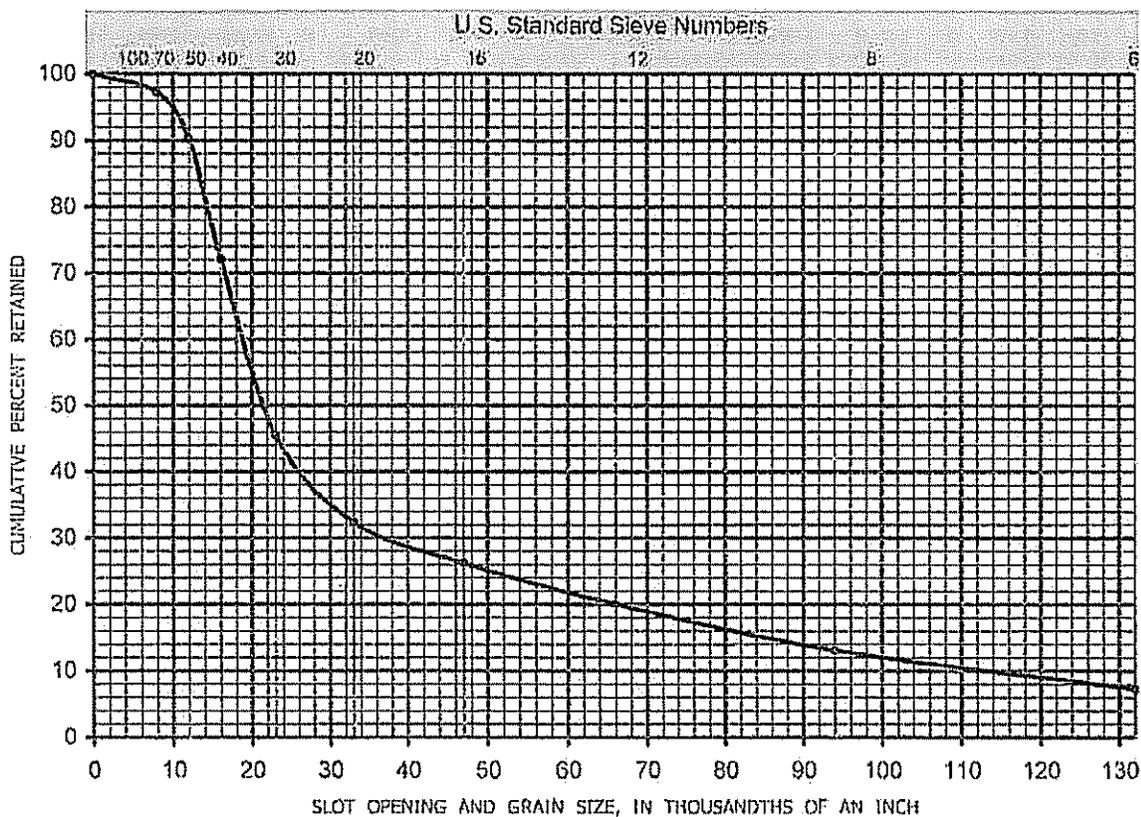
Job No.: 48324

Address: Westport, Kentucky

Date: 3/12/2007

Well No.: TW #3

Depth: 88 - 90



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.35	7
8	0.094	2.38	13
12	0.066	1.68	20
16	0.047	1.19	26
20	0.033	0.84	32
30	0.023	0.60	46
40	0.016	0.42	72
50	0.012	0.30	90
70	0.008	0.21	97

Notes: 14% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District

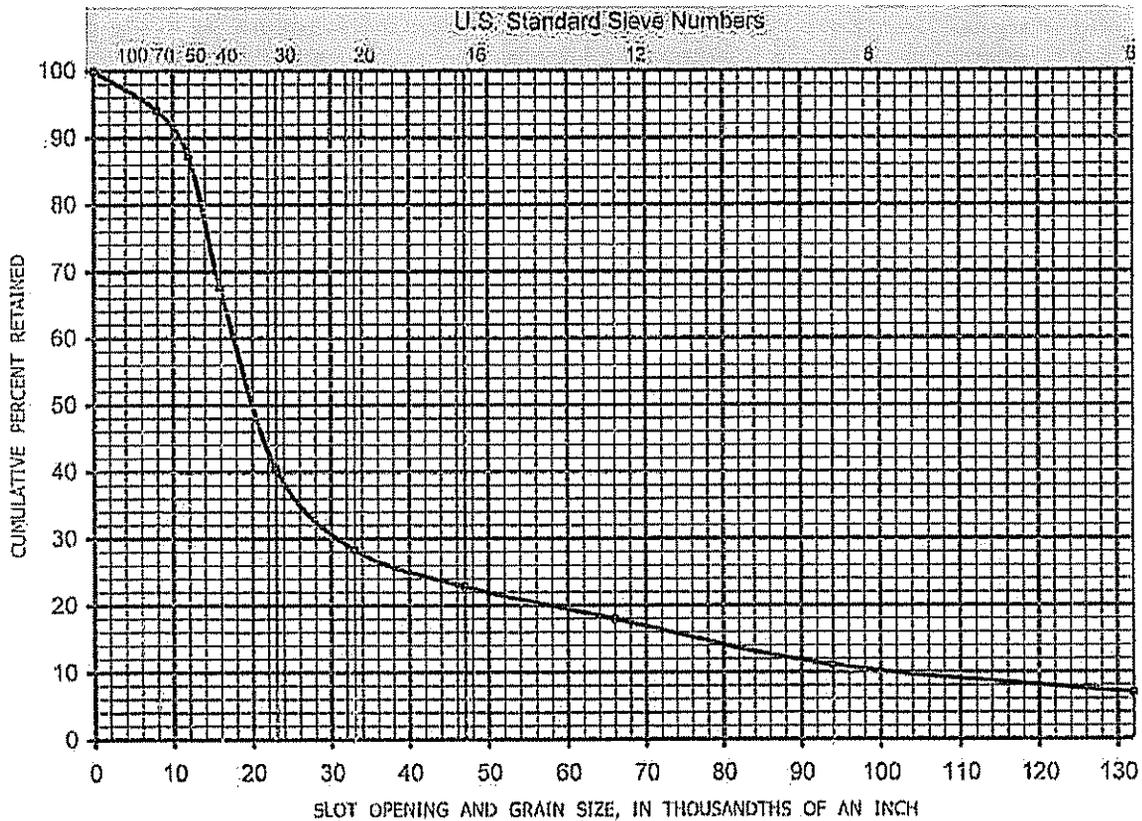
Job No.: 48324

Address: Westport, Kentucky

Date: 3/12/2007

Well No.: TW #3

Depth: 93 - 95



US Sieve No.	Sieve Opening Inches	Sieve Opening MM.	Cumulative % Retained
6	0.132	3.36	7
8	0.094	2.38	11
12	0.066	1.68	18
16	0.047	1.19	23
20	0.033	0.84	28
30	0.023	0.60	40
40	0.016	0.42	67
50	0.012	0.30	87
70	0.008	0.21	94

Notes: 17% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in

Length \_\_\_\_\_ ft



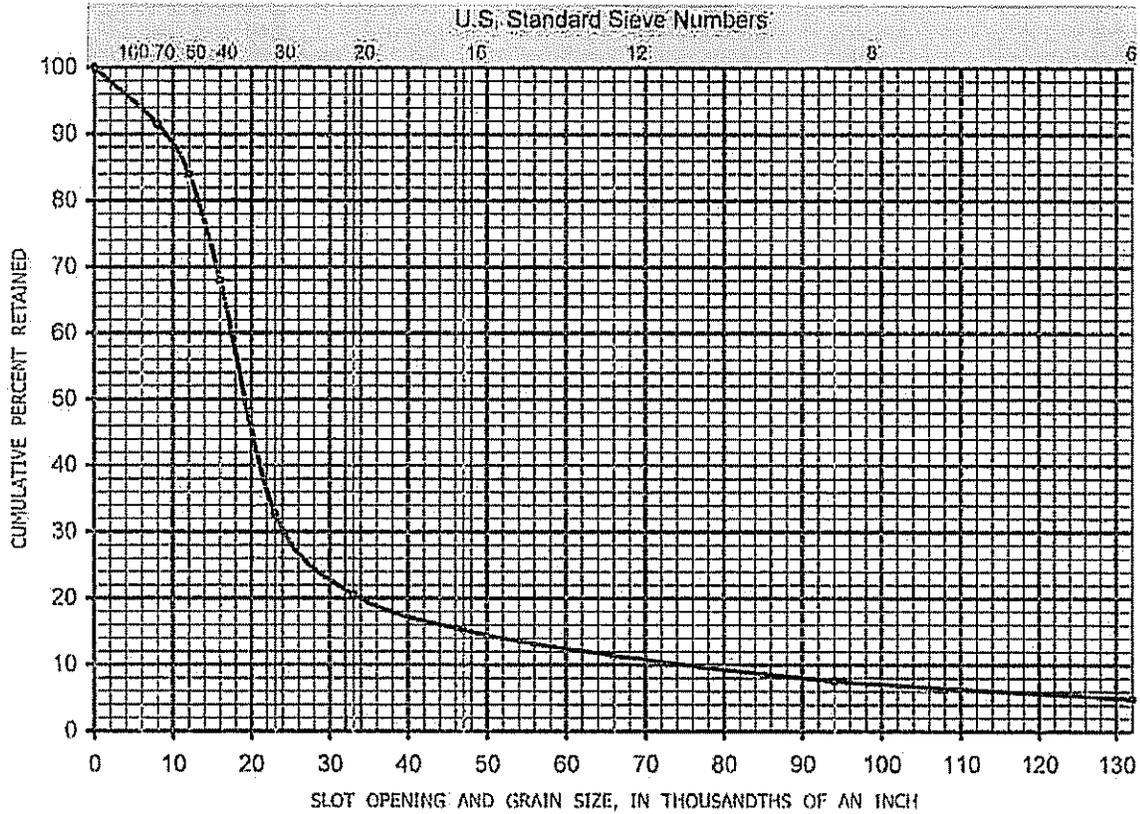
# REYNOLDS, INC.

Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

## SAND ANALYSIS (FINE)

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No.: TW #3

Job No.: 48324  
 Date: 3/12/2007  
 Depth: 98 - 100



US Sieve No.	Sieve Opening Inches	Sieve Opening MM	Cumulative % Retained
6	0.132	3.36	5
8	0.094	2.38	8
12	0.066	1.68	11
16	0.047	1.19	15
20	0.033	0.84	21
30	0.023	0.60	33
40	0.016	0.42	68
50	0.012	0.30	84
70	0.008	0.21	92

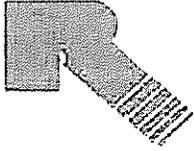
Notes: 4% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in

Length \_\_\_\_\_ ft



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
**(FINE)**

Customer: Oldham County Water District

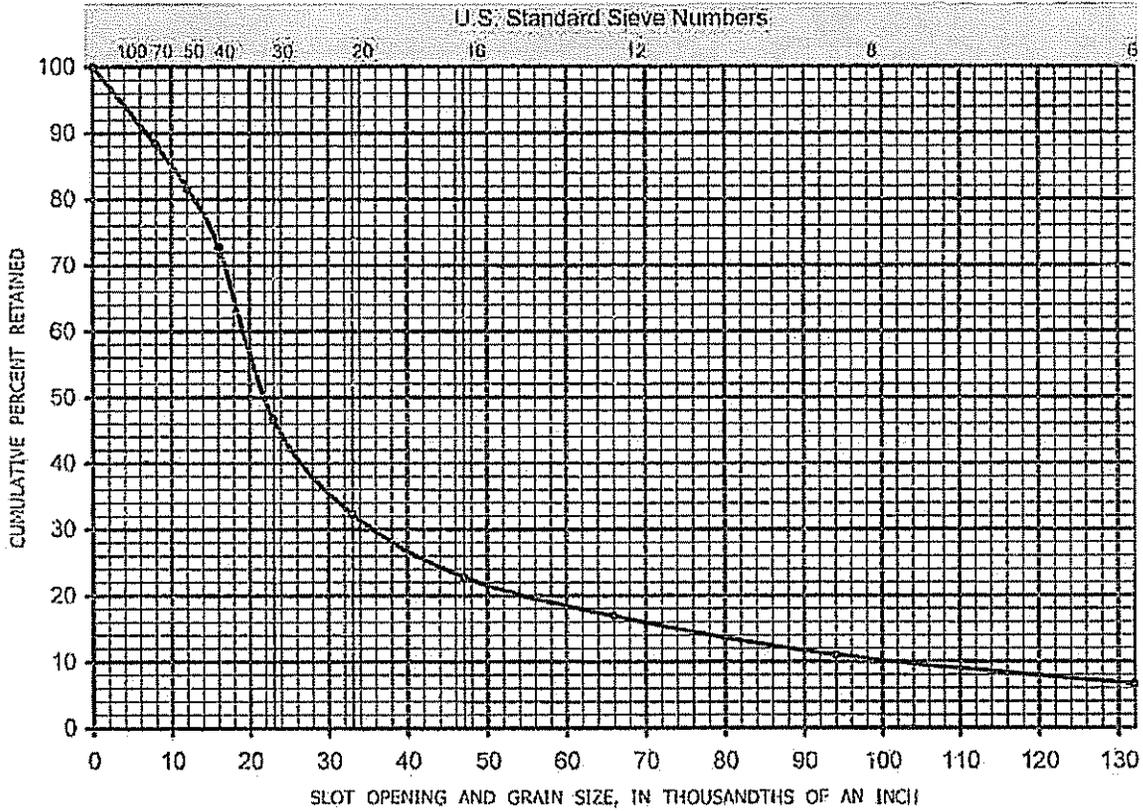
Job No.: 48324

Address: Westport, Kentucky

Date: 3/12/2007

Well No.: TW #3

Depth: 103 - 105



US Sieve No.	Sieve Opening Inches	Sieve Opening MM.	Cumulative % Retained
6	0.132	3.35	7
8	0.094	2.38	11
12	0.066	1.68	17
16	0.047	1.19	23
20	0.033	0.84	32
30	0.023	0.60	47
40	0.016	0.42	73
50	0.012	0.30	82
70	0.008	0.21	88

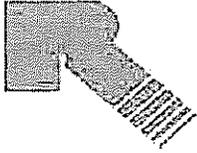
Notes: 3% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.

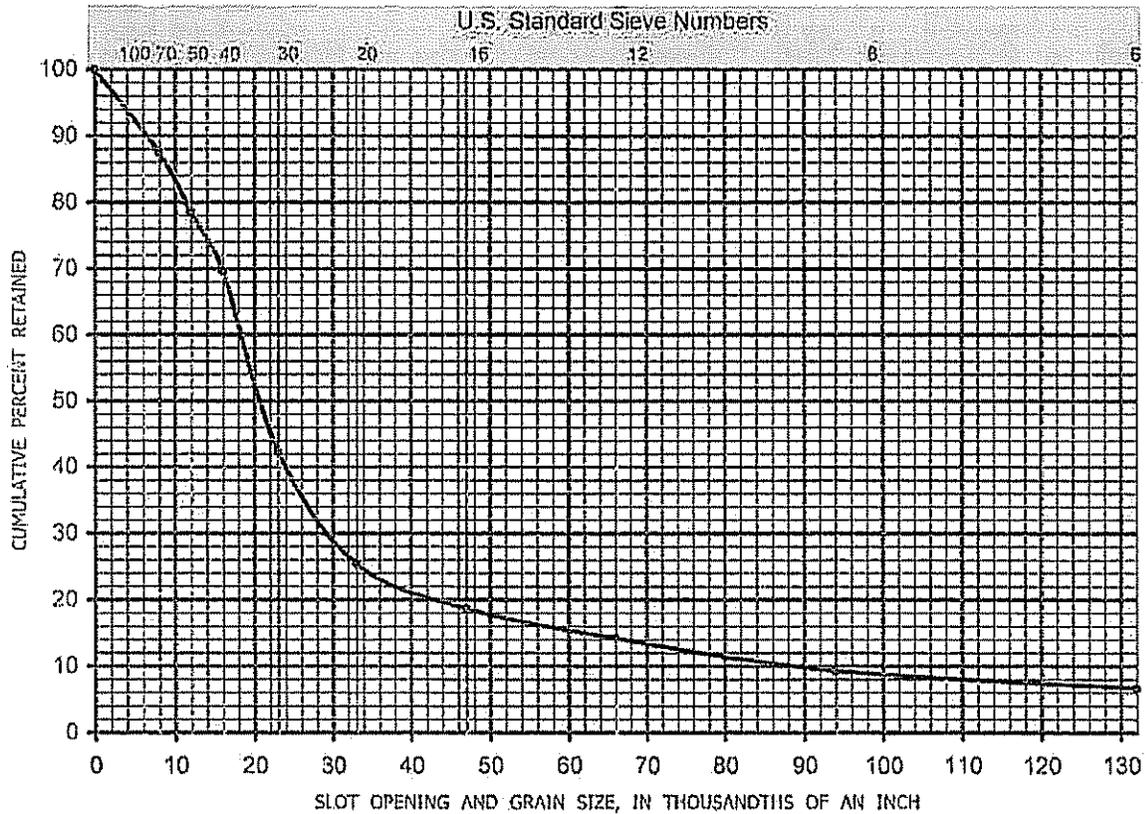


**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No: TW #3

Job No: 48324  
 Date: 3/12/2007  
 Depth: 108 - 110



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.36	7
8	0.094	2.38	9
12	0.066	1.68	14
16	0.047	1.19	19
20	0.033	0.84	25
30	0.023	0.60	42
40	0.016	0.42	70
50	0.012	0.30	79
70	0.008	0.21	88

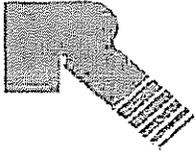
Notes: 7% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District

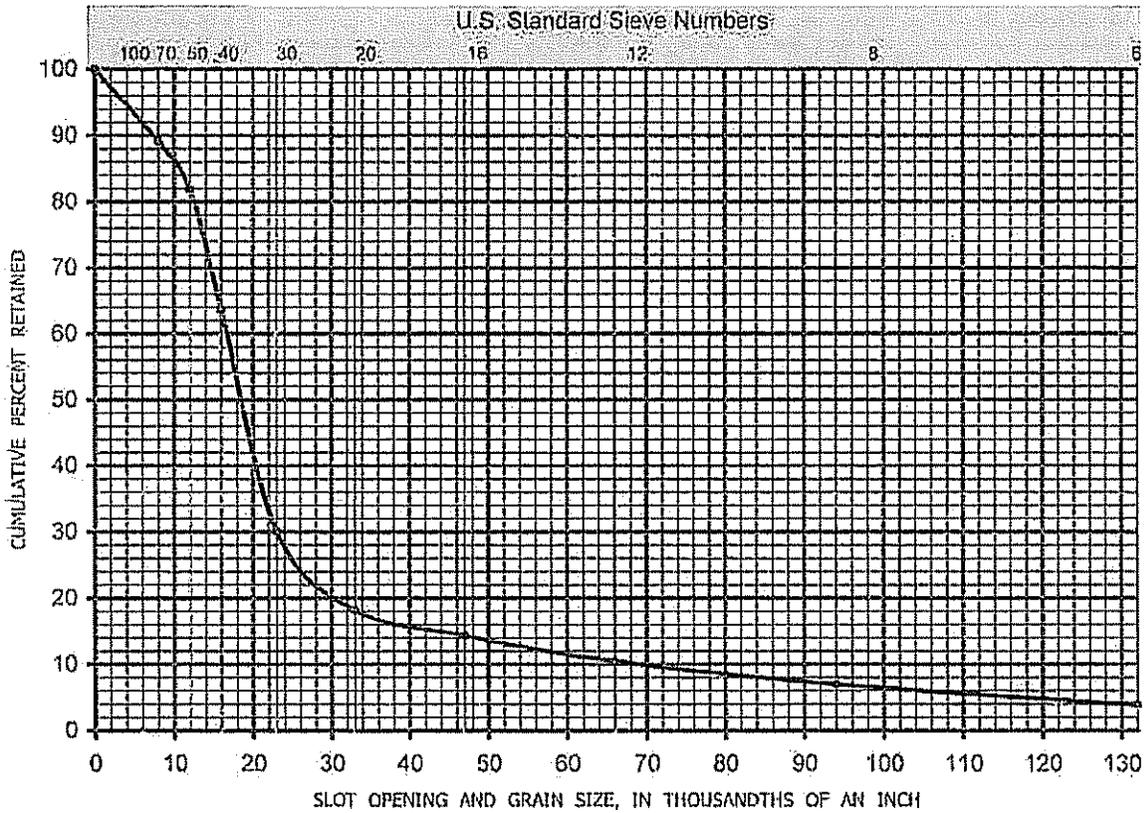
Job No.: 48324

Address: Westport, Kentucky

Date: 3/12/2007

Well No.: TW #3

Depth: 113 - 115



US Sieve No.	Sieve Opening Inches	Sieve Opening MM.	Cumulative % Retained
6	0.132	3.36	4
8	0.094	2.38	7
12	0.066	1.68	10
16	0.047	1.19	14
20	0.033	0.84	18
30	0.023	0.60	30
40	0.016	0.42	64
50	0.012	0.30	82
70	0.008	0.21	89

Notes: 2% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in

Length \_\_\_\_\_ ft

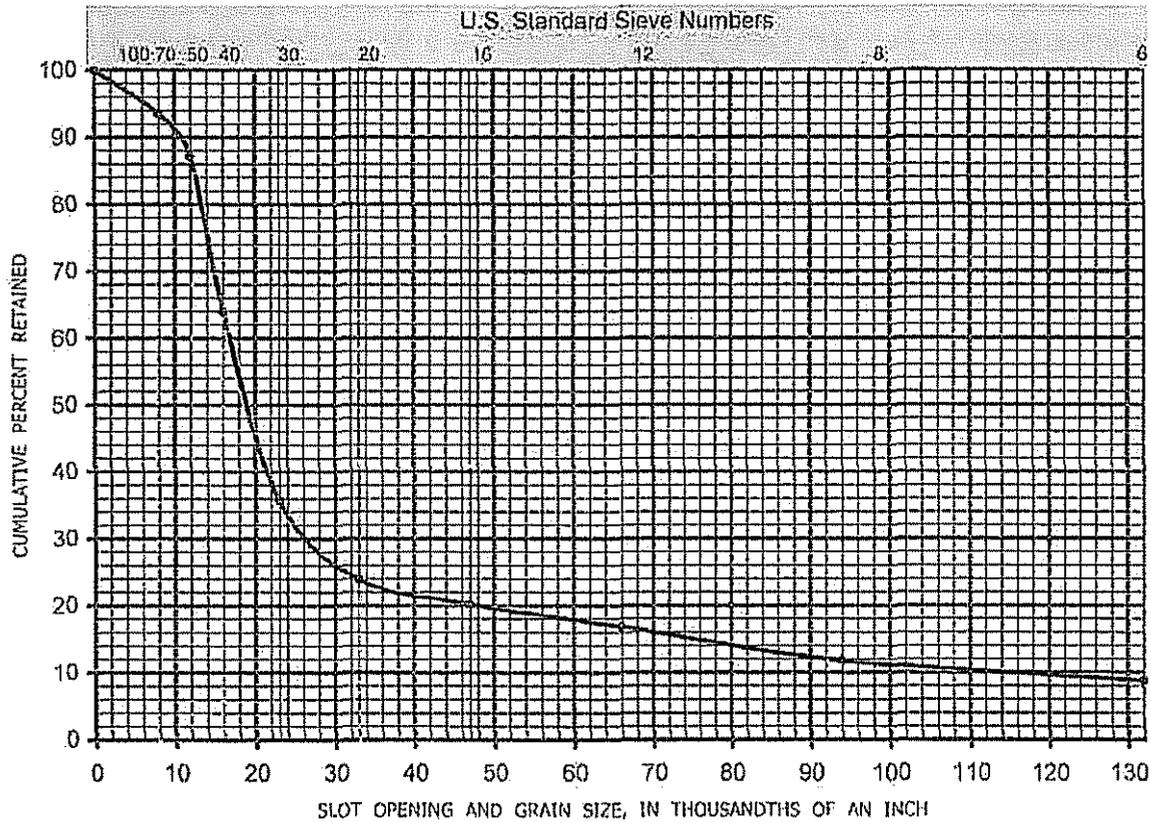


**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District  
 Address: Westport, Kentucky  
 Well No.: TW #3

Job No: 48324  
 Date: 3/12/2007  
 Depth: 118 - 120



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM	
6	0.132	3.36	9
8	0.094	2.38	12
12	0.066	1.68	17
16	0.047	1.19	20
20	0.033	0.84	24
30	0.023	0.60	35
40	0.016	0.42	64
50	0.012	0.30	87
70	0.008	0.21	94

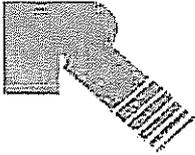
Notes: 15% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft.



**REYNOLDS, INC.**  
 Industrial Water Systems  
 1301-15 Main St.  
 Louisville, KY 40206  
 (502) 585-1241

**SAND ANALYSIS**  
 (FINE)

Customer: Oldham County Water District

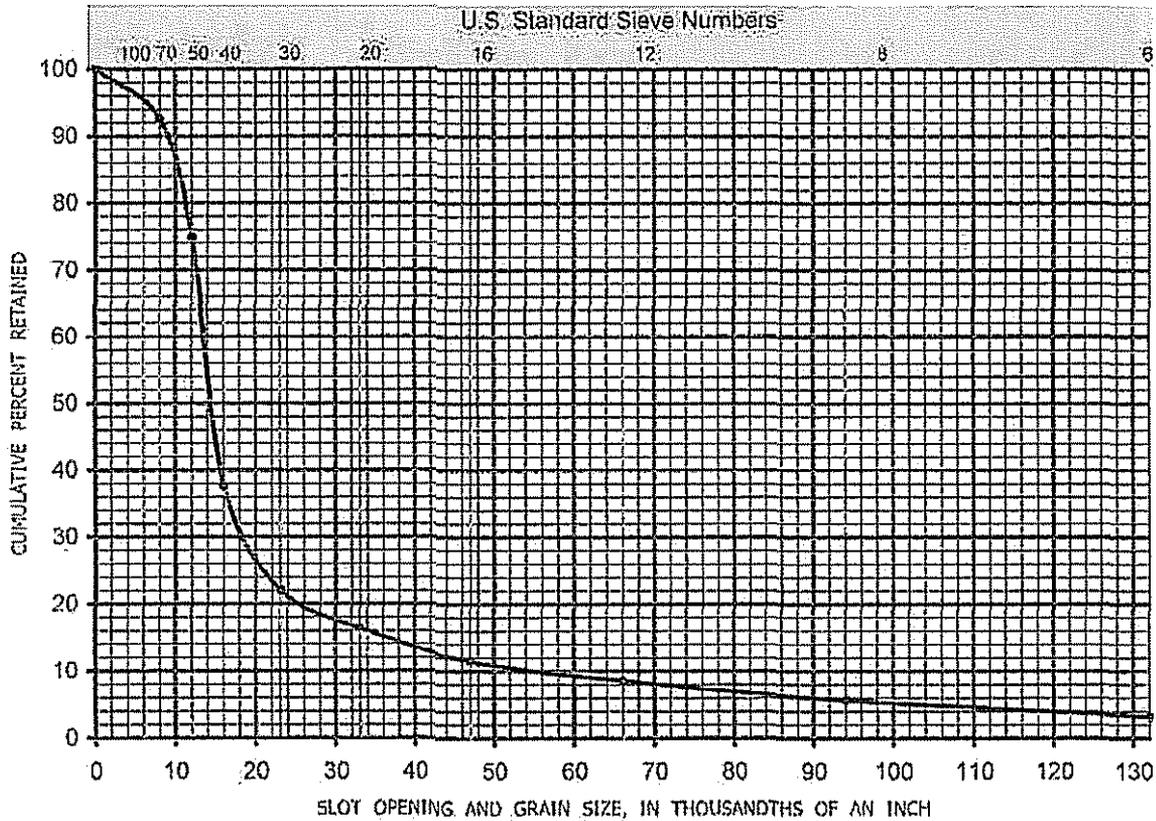
Job No.: 48324

Address: Westport, Kentucky

Date: 3/12/2007

Well No.: TW #3

Depth: 123 - 125



US Sieve No.	Sieve Opening		Cumulative % Retained
	Inches	MM.	
6	0.132	3.35	3
8	0.094	2.38	6
12	0.066	1.68	9
16	0.047	1.19	11
20	0.033	0.84	16
30	0.023	0.60	22
40	0.016	0.42	38
50	0.012	0.30	75
70	0.008	0.21	93

Notes: 13% retained on the 1/4" sieve.

Recommended Slot Opening: \_\_\_\_\_

Recommended Screen: \_\_\_\_\_

Diameter \_\_\_\_\_ in.

Length \_\_\_\_\_ ft