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Professional

Engineering

Services

Nolin River
Watershed
Sewer
Infrastructure

Contracts
1-2017, 2-2017,
3-2017, and
4-2017

Project Manual

Hardin County Water

District No. 2,

Elizabethtown, KY

Issued for Bid

August 16, 2017



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PLAN HOLDER: _____

Set No.: _____

PROJECT MANUAL

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
CONTRACTS 1-2017, 2-2017, 3-2017, AND 4-2017
HARDIN COUNTY WATER DISTRICT NO. 2
ELIZABETHTOWN, KENTUCKY



Prepared by:

STRAND ASSOCIATES, INC.®
325 West Main Street, Suite 710
Louisville, KY 40202
www.strand.com

Issued for Bid
August 16, 2017



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SECTION 00010

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CONTRACTS 1-2017, 2-2017, 3-2017, AND 4-2017
HARDIN COUNTY WATER DISTRICT NO. 2
ELIZABETHTOWN, KENTUCKY

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BIDDING AND CONTRACTING REQUIREMENTS

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SECTION 00100

ADVERTISEMENT TO BID

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
CONTRACTS 1-2017, 2-2017, 3-2017, AND 4-2017
HARDIN COUNTY WATER DISTRICT NO. 2
ELIZABETHTOWN, KENTUCKY

Hardin County Water District No. 2 (District) will receive sealed Bids for Nolin River Watershed Sewer Infrastructure, Contracts 1-2017, 2-2017, 3-2017, and 4-2017, or any combinations thereof, until 2 P.M., local time, Wednesday, September 13, 2017, at 360 Ring Road, Elizabethtown, KY 42701, at which time the Bids will be publicly opened and read aloud.

Contract 1-2017 consists of four pump stations, buildings, asphalt pavement, generators, odor control, short sections of force main and gravity sewer with manholes, and appurtenances thereto.

Contract 2-2017 consists of 29,690 linear feet of 16-inch PVC force main, 6,760 linear feet of 12-inch PVC force main, 6,760 linear feet of 10-inch force main, 16,170 linear feet of 8-inch PVC force main, and 15,140 linear feet of 6-inch PVC force main, and appurtenances, automatic air and vacuum release assemblies, and stream, county, and state highway crossings thereto.

Contract 3-2017 consists of 2,195 linear feet of 12-inch PVC gravity sewer, 6,415 linear feet of 10-inch PVC gravity sewer, 4,255 linear feet of 8-inch PVC gravity sewer, 1,631 linear feet of 6-inch PVC lateral pipe, 6,994 linear feet of 4-inch PVC lateral pipe, appurtenances, manholes, and railroad, stream, county, and highway crossings thereto. There are alternatives for Contract 3-2017 which may be added. See Section 00400–Bid for more information.

Contract 4-2017 consists of 1,465 linear feet of 24-inch PVC gravity sewer, 1,720 linear feet of 10-inch PVC gravity sewer, 11,160 linear feet of 8-inch PVC gravity sewer, 7,565 linear feet of 4-inch PVC force main, 785 linear feet of 6-inch PVC lateral pipe, 5,542 linear feet of 4-inch PVC lateral pipe, appurtenances, manholes, automatic air and vacuum release assemblies, and stream, county, state highway, and interstate crossings thereto.

Bids are to be addressed to the Hardin County Water District No. 2, 360 Ring Road, Elizabethtown, KY 42701, and shall be marked “Sealed Bid–Nolin River Watershed Sewer Infrastructure [With Appropriate Contract(s) Noted].”

Complete digital Project Bidding Documents are available at www.strand.com or at www.questcdn.com. Download the digital Bidding Documents for \$30 by inputting Quest project number 5313259 on the website’s Project Search page. Please contact QuestCDN.com at (952) 233-1632 or info@questcdn.com for assistance with free membership registration, downloading, and working with this digital project information.

Bidding Documents may be reviewed and paper copies may be obtained from the Issuing Office which is Strand Associates, Inc.®, 325 West Main Street, Suite 710, Louisville, KY 40202, (502) 583-7020. A nonrefundable fee of \$250 will be required (shipping and handling fees included). Overnight mailing of Bidding Documents will not be provided.

Bidding Documents may also be reviewed at the District office, 360 Ring Road, Elizabethtown, KY 42701.

COPY OF BID SET

All Bidders submitting a sealed Bid shall obtain the Bidding Documents from QuestCDN.com or from Strand Associates, Inc.®

Bidders who submit a Bid must be a Plan Holder of record at the Issuing Office. Bids from Bidders who are not on the Plan Holders List may be returned as not being responsive.

Plan Holders are requested to provide an e-mail address if they wish to receive addenda and other information electronically. Plan Holders are requested to designate whether they are a prime contractor, subcontractor, or supplier if they want this information posted on the project Plan Holders List.

The Bid must be accompanied by Bid security made payable to OWNER in an amount of 5% of the Bidder's maximum Bid price.

A wage rate determination is not a requirement of this project.

The District reserves the right to reject any or all Bids, to waive any technicality, and to accept any Bid which it deems advantageous. All Bids shall remain subject to acceptance for 85 days after the time set for receiving Bids. The District anticipates issuing the Notice of Award within 60 days after the time set for receiving Bids.

Contract awards shall be made based on the lowest responsive and responsible Bidder.

This Bid is subject to Kentucky Revised Statutes Section 45A.490 through 45A.494, which in general provides that a "resident bidder" of Kentucky is to be given a bidding preference over a "nonresident bidder" who is registered in a state that gives preference to its in-state resident bidders over a Kentucky resident bidder. The bidding preference is to be the same as that stipulated for the state of the "nonresident bidder." If the state of a "nonresident bidder" provides no specific preference, then "resident" and "nonresident bidders" are to be treated the same when evaluating Bids.

All taxes are the responsibility of the successful Bidder unless specifically exempted in the Bidding Documents.

A prebid conference will be held at 1 P.M., Local Time, on Wednesday, August 30, 2017, at the District office, 360 Ring Road, Elizabethtown, KY 42701. Bidders are encouraged to attend and participate in the conference.

The Strand Associates, Inc.® project manager is Mark Sneve, P.E., and can be contacted at Strand Associates, Inc.®, 325 West Main Street, Suite 710, Louisville, KY 40202, (502) 583-7020 regarding the project.

Published by Hardin County Water District No. 2, Elizabethtown, Kentucky
August 16, 2017 and August 25, 2017

END OF SECTION

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SECTION 00200

INSTRUCTIONS TO BIDDERS

- A. These Instructions to Bidders establish requirements for Bidding and Award of Contract.
- B. These articles are not necessarily numbered consecutively.
- C. Table of Contents

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ARTICLE 1–DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and the Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:

- A. Issuing Office–The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

ARTICLE 2–COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained digitally or by paper copy as stated in the Advertisement to Bid.

COPY OF BID SET

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither OWNER nor ENGINEER assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

2.04 Drawings and specifications for the project are being offered to Bidders in both paper copy and electronic form (.pdf format). Such Bidder must have Adobe Reader 6.0 or later to access the electronic files. Paper copies will be used for Contract execution.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, within five days of OWNER's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments and other such data as may be called for below.

3.02 Bidder must be prepared to submit evidence of Bidder's qualifications to do business in the state where the Project is located prior to award of the Contract.

3.03 In accordance with KRS 45A.395, prospective Bidder shall provide OWNER with a sworn statement made under penalty of perjury that it has not knowingly violated any provision of the campaign finance laws of the Commonwealth and that the award of a Contract to Bidder will not violate any provision of the campaign finance laws of the Commonwealth.

3.04 Bidders shall submit the documentation, if any, listed in Paragraph 7.01 of the Bid Form (Section 00400).

3.05 Bidder is advised to carefully review those portions of the Bidding Documents requiring Bidder's representations and certifications.

ARTICLE 4—EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA AND SITE

4.01 Subsurface and Physical Conditions

A. The Supplementary Conditions identify, if any,

1. Those reports known to OWNER of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the Bidding Documents.

2. Those drawings known to OWNER of physical conditions relating to existing surface and subsurface structures at the Site (except Underground Facilities).

B. Copies of reports and drawings referenced in Paragraph 4.01.A, which are not included with the Bidding Documents, will be made available by OWNER to any Bidder on request. Reports and drawings, whether included in the Bidding Documents or not, are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.02 of the General Conditions has been identified and established in Paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

COPY OF BID SET

4.02 Underground Facilities

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

4.03 Hazardous Environmental Condition

A. The Supplementary Conditions identify, if any, those reports and drawings known to OWNER relating to a Hazardous Environmental Condition identified at the Site.

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

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in Paragraph 4.06 of the General Conditions.

4.05 On request in advance and after submittal of Bidder’s evidence of insurance coverage meeting the requirements designated in the General and Supplementary Conditions, OWNER will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.06 OWNER-Related Items

A. Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by OWNER or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, OWNER will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

B. Paragraph 6.13.C of the General Conditions indicates that if an OWNER safety program exists, it will be noted in the Supplementary Conditions.

COPY OF BID SET

4.07 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents and any Addenda;

B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Paragraph 4.02 of the Supplementary Conditions, containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph 4.06 of the Supplementary Conditions as containing reliable "technical data";

E. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;

F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

G. become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. promptly give ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by ENGINEER is acceptable to Bidder; and

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by ENGINEER are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the work.

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ARTICLE 5—PREBID CONFERENCE

5.01 A prebid conference will be held at the time, date, and place indicated in the Advertisement or Invitation to Bid.

Representatives of OWNER and ENGINEER will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. ENGINEER will transmit to all prospective Bidders of record such Addenda as ENGINEER considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6—SITE AND OTHER AREAS

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

ARTICLE 7—INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to ENGINEER in writing. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Issuing Office as having received the Bidding Documents.

7.02 All requests for interpretation must be received at least seven days prior to the day set for receiving Bids. Addenda will be mailed not later than five days prior to the day set for receiving Bids. Failure of any Bidder to receive any such Addendum or interpretation shall not relieve such Bidder from any obligations under the Bid as submitted. All Addenda so issued shall become part of the Contract Documents.

7.03 Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.04 Addenda may also be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

7.05 Receipt of all addenda must be acknowledged in space provided in the Bid.

ARTICLE 8—BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to OWNER in an amount of 5 percent of the Bidder's maximum Bid price and in the form of a cashier's, certified, or bank check or a Bid Bond (on form attached) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, OWNER may annul the Notice of Award and the Bid security of the Bidder will be forfeited.

COPY OF BID SET

8.03 Bid security of Bidders will be retained unless requested to be returned and will not be returned until after Contract has been awarded or until the Bid hold period expires.

ARTICLE 9—CONTRACT TIMES

9.01 The numbers of days within which, or the dates by which Milestones are to be achieved and the Work is to be substantially completed and ready for final payment are set forth in the Agreement (or incorporated therein by reference to the attached Bid Form).

ARTICLE 10—LIQUIDATED DAMAGES

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

ARTICLE 11—SUBSTITUTE OR “OR EQUAL” ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without evaluation of possible substitute or “or equal” items. Whenever it is specified or described in the Bidding Documents that an Equipment Alternative listed in the Bid or that a substitute or “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 evaluated by ENGINEER until after the Effective Date of the Agreement.

ARTICLE 12—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to OWNER in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to OWNER a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entities if requested by OWNER. If OWNER or ENGINEER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity may, before the Notice of Award is given, request the apparent Successful Bidder to submit an acceptable substitute in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder’s Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and OWNER may consider such price adjustment in evaluating Bids and making the Contract award.

12.02 If apparent Successful Bidder declines to make any such substitution, OWNER may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for the forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity listed and against which OWNER or ENGINEER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06.B of the General Conditions.

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

COPY OF BID SET

ARTICLE 13–BID

13.01 The Bid Forms are included with the Bidding Documents.

13.02 All blanks on the Bid Form must be completed by printing in ink or by typewriter and the Bid signed in ink. A Bid price shall be indicated for each section, Bid item, alternative, adjustment unit price item or unit price item listed therein, or the words “No Bid,” “No Change,” or “Not Applicable” entered. Erasures or alterations shall be initialed in ink by the person signing the Bid Form.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or vice president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member, if the LLC is member-managed, or by a manager, if manager-managed, and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

13.06 A Bid by an individual shall show the Bidder’s name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid form. The official address of the joint venture shall be shown.

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

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

13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

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

13.12 All Bids shall be signed in the presence of and be notarized by a Notary Public or other Officer authorized to administer oaths.

13.13 Bidder shall identify whether the Bidder is a resident or nonresident bidder per KRS 45A.490 to 45A.494 and KAR 5:400. If Bidder is claiming it is a “resident bidder” as defined in KRS 45A.942(2), the Bidder shall so indicate in the Bid and complete the Notarized Affidavit attached to the Bid that affirms it meets the criteria to be considered a “resident bidder”. If requested by OWNER, Bidder shall provide documentation proving such “resident bidder” status. Failure to do so will result in the disqualification of the Bidder or in Contract termination.

13.14 If Bidder is a “nonresident bidder” as defined by KRS 45A.494(3), it shall so indicate in the Bid and provide its certificate of authority to transact business in the Commonwealth as filed with the

COPY OF BID SET

Commonwealth of Kentucky, Secretary of State. The location of the principal office identified therein will be deemed by OWNER as the state of residency for that Bidder. If the Bidder is not required by law to obtain said certificate, the state of residency for that Bidder will be deemed to be that which is identified in its mailing address as provided in its Bid.

ARTICLE 14—BASIS OF BID; EVALUATION OF BIDS

14.01 Lump Sum

A. Bidders shall submit a Bid for Contract 1-2017 on a lump sum basis as set forth in the Bid Form.

14.02 Unit Price

A. Bidders shall submit a Bid for Contract 2-2017 and 4-2017 on a unit price basis for each item of Work listed in the Bid schedule.

B. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions.

14.03 Computed Total Base Bid

A. Bidder shall submit a Bid for Contract 3-2017 on a computed total base bid basis. The price for all base bid items shall be included in the computed total base bid. Bidder shall include a separate price for each alternative described in the Contract Documents and as provided for in the Bid. The price for each alternative will be the amount to be added to or deducted from the price of the base bid if OWNER selects the alternative. Consideration of alternatives will be made prior to the Notice of Award.

B. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.

14.04 Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

14.05 For cash allowances the Contract Price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents as provided for in Paragraph 11.02 of the General Conditions. These costs shall not be included in the cash allowance. The final Contract Price will be adjusted to reflect actual costs on account of cash allowances.

14.06 The following cash allowances shall be included in the Bid for Contract 1-2017.

Unsuitable Foundation Material for	Section 02222—Excavation, Fill, Backfill and Grading
Structures and Roads	

Unsuitable Foundation Material for	Section 02222—Excavation, Fill, Backfill and Grading
Utility Trenches	

COPY OF BID SET

Soils Engineer

Section 02222–Excavation, Fill, Backfill and Grading

Radio Antenna Mounting

Section 16480–Motor Control

ARTICLE 15–SUBMISSION OF BIDS

15.01 Bids will be received for the following division of the Specifications and all other provisions of the Bidding Documents:

Contract 1–2017: Pump Stations

Shall include Divisions 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 15, 16, 20, 25, and 26

Contract 2–2017: Force Main from Industrial Pump Station No. 1 to Elizabethtown WWTP

Shall include Divisions 0, 1, 2 (only as referenced by Division 20), 9, and 20

Contract 3–2017: Gravity Sewer Located in and Around the Town of Glendale

Shall include Divisions 0, 1, 2 (only as referenced by Division 20), 9, and 20

Contract 4–2017: Gravity Sewer and Force Main Along and Near I 65

Shall include Divisions 0, 1, 2 (only as referenced by Division 20), 9, and 20

15.02 Bidder is furnished one copy of the Bidding Documents with one separate unbound copy of the Bid Forms and the Bid Bond. The Bidding Documents may be retained by Bidder. The unbound copy of the Bid Forms is to be completed and submitted with the Bid security along with any data required by the Bidding Documents to be attached to and made a condition of the Bid. Additional copies may be obtained from the Issuing Office.

15.03 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement or Invitation to Bid and shall be enclosed in an opaque sealed envelope, plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If the Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to place indicated in the Advertisement or Invitation to Bid. No relief will be provided for a mailed Bid not being received by the prescribed time. No Bid will be considered which is received after the time set for receiving Bids.

ARTICLE 16–MODIFICATION AND WITHDRAWAL OF BIDS

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time set for receiving Bids.

COPY OF BID SET

ARTICLE 17—OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the Advertisement to Bid and, unless obviously nonresponsive, read aloud publicly. An abstract of the amounts of the base bids and major alternatives and components, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 19—AWARD OF CONTRACT

19.01 OWNER reserves without limitation the right to reject any or all Bids, to waive any and all informalities not involving price, time or changes in the work and to negotiate Contract terms with the Successful Bidder; and the right to accept or reject all incomplete, nonconforming, nonresponsive, unbalanced, obscure, or conditional Bids, or Bids which contain additions not called for, erasures, alterations, or irregularities of any kind, or which do not comply with the Instructions to Bidders. OWNER reserves the right to 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, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by OWNER. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be nonresponsible.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, OWNER will consider whether or not the Bids comply with the prescribed requirements, and such alternatives, unit prices, and other data as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bids, OWNER will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions. OWNER also may consider the operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the work when such data is required to be submitted prior to the Notice of Award.

19.05.1 OWNER may conduct such investigations as OWNER deems necessary to assist in the evaluation of any Bid and 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 to OWNER's satisfaction within the prescribed time. Bidder shall furnish to OWNER all such information and data for this purpose as OWNER may request. OWNER reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy OWNER that such Bidder is properly qualified to carry out the obligations of the Contract Documents and to complete the work contemplated therein.

19.05.2 OWNER shall be satisfied that Bidder involved (1) maintains a permanent place of business, (2) has adequate plant and equipment to do the work properly and expeditiously, (3) has

COPY OF BID SET

a suitable financial status to meet obligations incident to the work, (4) has appropriate technical experience, and (5) can submit a satisfactory performance record.

19.06.1 If a Contract for Contract 1-2017, 2-2017, and/or 4-2017 is to be awarded, it will be awarded to the responsive and responsible Bidder with the lowest Bid whose evaluation by OWNER indicates to OWNER that the award will be in the best interests of the Project.

19.06.2.1 If a Contract for Contract 3-2017 is to be awarded, it will be awarded to the responsive and responsible Bidder with either the lowest computed total base bid or the computed total base bid plus any alternative(s) selected by OWNER whose evaluation indicates to OWNER that the award will be in the best interest of the Project. Bid from the successful Bidder for the computed total base bid plus any alternative(s) selected by OWNER may not necessarily be lower in price than the bid or bids for other alternative combinations.

19.06.2.2 Should OWNER wish to consider alternatives listed, Bidder may be required to provide additional information as listed in Article 6.05 of the General Conditions, prior to the Notice of Award. If an alternative is selected by OWNER, the awarded Contract price will include the selected alternative(s).

19.06.2.3 Should the CONTRACTOR offer and the OWNER wish to consider a Combined Total Lump Sum Bid for the award any combination of contracts, the deductive amount shall be split proportionally between the various contracts awarded. This proportion will be based on the original bid amounts for the individual contracts. For contracts based on unit prices, this deductive amount will take the form of a deductive line item added to the end of the schedule of values.

19.06.3 Once all responsive and responsible Bidders have been determined and ranked, the residency of each Bidder will be identified. A preference equal to the preference given to or required by the state of the highest evaluated "nonresident bidders" will then be given to all responsive and responsible "resident bidders". The bids will then be rescored and re-ranked to account for any applicable preferences to determine lowest responsive and responsible Bidder. In awarding a contract, "resident bidders" shall only receive preference against "nonresident bidders" residing in a state that gives a preference to bidders from that state. The preference will not be applied against "nonresident bidders" residing in states that do not give preference against Kentucky bidders. If a preference evaluation results in a tie between a "resident bidder" and a "nonresident bidder", preference will be given to the "resident bidder". The application of this regulation will not result in a "nonresident bidder" receiving preference over another "nonresident bidder".

19.07 If a Contract is to be awarded, OWNER will give the successful Bidder a Notice of Award within 60 days after the time set for opening Bids.

ARTICLE 20—CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth OWNER's requirements as to performance and payment bonds and insurances. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by the required performance and payment bonds and insurances.

ARTICLE 21—SIGNING OF AGREEMENT

21.01 When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with all other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter,

COPY OF BID SET

Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to ENGINEER with the required Bonds and insurances. Within 10 days after receipt of properly executed documents and Bonds and insurances which meet all requirements of the Contract Documents, ENGINEER will deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

ARTICLE 22—RETAINAGE

22.01 Provisions concerning retainage are set forth in the Agreement.

ARTICLE 23—LICENSES, FEES, AND TAXES

23.01 The Bid shall include all taxes in effect at the time the Bid is submitted, unless specifically exempted in the Bidding Documents. No change will be allowed for taxes from which OWNER is exempt. Bidders who are uncertain as to what items are subject to tax, or who require further explanation or clarification, are requested to contact the State of Kentucky Revenue Cabinet. Refer to the Supplementary Conditions SC-6.10 for additional information on taxes.

23.02 Successful Bidder for Contract 2-2017 must comply with City of Elizabethtown ordinances relating to Occupational License Fees, Business Licenses, payroll, and net profits, taxes and any other ordinances which may apply to the project while working in the City limits. Refer to the Supplementary Conditions SC-6.10 for additional information.

23.03 Successful Bidder must provide proof of having all such licenses or fees at or before the signing of the Contract.

ARTICLE 24—KICKBACK STATUTES

24.01 Bidders shall comply with Kentucky Statute KRS 45A.455 Prohibitions Against Conflicts of Interests, Gratuities, and Kickbacks. See Supplementary Conditions 6.09.

ARTICLE 25—OTHER BID REQUIREMENTS

25.01 Bidders shall complete the following documents attached to the Bid:

Campaign Finance Disclosure
Labor Law Disclosure

ARTICLE 26—LAWS, ORDINANCES, AND REGULATIONS

26.01 Bidder must familiarize itself with all laws, ordinances, and regulations by federal, state, city, or other governmental agency, which by reason of being neglected or violated may affect the Work contemplated and must secure and pay the fee required for any permits which may be necessary unless such fees are otherwise indicated to be paid in the Bidding Documents.

ARTICLE 27—INSURANCE

27.01 Before execution of Contract by OWNER, the successful Bidder shall furnish OWNER a certificate or certificates issued by or on behalf of insurers or a self-insurance program or group self insurance program, qualified to do business in the Commonwealth of Kentucky under KRS Chapter 304 or KRS Chapter 342, certifying that the successful Bidder complies with the Worker's Compensation laws of Kentucky and is insured or indemnified against public liability claims which may arise out of the performance of the Work under the proposed Contract.

COPY OF BID SET

ARTICLE 28—WAGE RATE DETERMINATION

28.01 A state wage rate determination is not a requirement of this Project.

28.02 Payment of Davis-Bacon wages (Federal Prevailing Wages) is not a requirement of this project.

ARTICLE 29—PERFORMANCE BOND FOR WAGES DUE

29.01 Successful Bidders, whether a corporation, partnership, or individual, who has not been doing business in the State of Kentucky for five consecutive years, shall comply with KRS 337.200.

END OF SECTION

COPY OF BID SET

SECTION 00400

BID

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
CONTRACTS 1-2017, 2-2017, 3-2017, AND 4-2017
HARDIN COUNTY WATER DISTRICT NO. 2
ELIZABETHTOWN, KENTUCKY

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ARTICLE 1–BID RECIPIENT

1.01 Bids to be received until 2 P.M. Local Time, Wednesday, September 13, 2017.

1.02 This Bid is submitted to: Hardin County Water District No. 2
360 Ring Road
Elizabethtown, KY 42701

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

ARTICLE 2–BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 85 days after the Bid opening or for such longer period of time that Bidder may agree to in writing upon request of OWNER.

2.02 Bidder will sign and deliver the required number of counterparts of the Agreement with the bonds, insurance certificates and other documents required by the Bidding Requirements within 15 days after the date of OWNER's Notice of Award.

COPY OF BID SET

ARTICLE 3—BIDDER’S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda (list addenda by addendum number and date), receipt of all which is hereby acknowledged:

Date:	Addendum Number:
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures if any, at the Site (except Underground Facilities) which have been identified in SC-4.02, as containing reliable “technical data” and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the site that have been identified in SC-4.06 as containing reliable “technical data.”

E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder’s safety precautions and programs.

F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by ENGINEER is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance of the Work for which this Bid is submitted.

COPY OF BID SET

ARTICLE 4—FURTHER REPRESENTATIONS

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and,

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. “corrupt practice” means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the Bidding process;

2. “fraudulent practice” means an intentional misrepresentation of facts made (a) to influence the Bidding process to the detriment of OWNER, (b) to establish bid prices at artificial noncompetitive levels, or (c) to deprive OWNER of the benefits of free and open competition;

3. “collusive practice” means a scheme or arrangement between two or more Bidders, with or without the knowledge of OWNER, a purpose of which is to establish bid prices at artificial noncompetitive levels; and

4. “coercive practice” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

COPY OF BID SET

ARTICLE 5–BASIS OF BID

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

The following abbreviations may be used in this Bid:

CIP	-	Complete in Place	LS	-	Lump Sum
CY	-	Cubic Yard	LT	-	Left
DI	-	Ductile Iron	MBF	-	Thousand Board Feet
DIA	-	Diameter	MFOB	-	Thousand Freight-On-Board
EA	-	Each	MH	-	Manhole
EST	-	Estimate(d)	RCP	-	Reinforced Concrete Pipe
EXCL	-	Excluding	RT	-	Right
FT	-	Feet	SF	-	Square Foot
GAL	-	Gallon	STA	-	Station
HERCP	-	Horizontal Elliptical RCP	SY	-	Square Yard
HRS	-	Hours	T	-	Ton
IN	-	Inch	VLf	-	Vertical Linear Foot
INCL	-	Including	W/	-	With
LBS	-	Pounds	W/O	-	Without
LF	-	Linear Foot			

BIDDERS SHOULD NOT ADD ANY CONDITIONS OR QUALIFYING STATEMENTS TO THIS BID OR THE BID MAY BE DECLARED IRREGULAR AS NOT BEING RESPONSIVE TO THE INSTRUCTIONS TO BIDDERS.

COPY OF BID SET

BID

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
CONTRACT 1-2017: PUMP STATIONS
HARDIN COUNTY WATER DISTRICT NO. 2
ELIZABETHTOWN, KENTUCKY

LUMP SUM BID:

_____ Dollars \$ _____
(Words) (Numbers)

See Section 01019–Contract Considerations for discussion of cash allowances to include in the Bid.

CASH ALLOWANCES

The following Cash Allowances shall be included in the Lump Sum Base Bid. The Cash Allowances for non-Lump Sum items shall be equal to the product of the quantity included in the Lump Sum Base Bid and the Unit Price. The Cash Allowances will be adjusted in the event that estimated quantities to be included in the Lump Sum Base Bid are different from final measured quantities. A single Unit Price shall be bid for each item. Failure to include one or more of the following Unit Price items may result in rejection of the entire Bid as nonconforming. For items with a quantity of 1, the Cash Allowance shall be adjusted based on actual final costs.

Item Number	Description	Quantity Included in the Lump Sum Bid	Unit	Unit Price	Total Amount Included in the Lump Sum Bid
1.	Unsuitable Foundation Material for Structures and Roads (Section 02222-Excavation, Fill, Backfill and Grading)	200	CY	\$	\$
2.	Unsuitable Foundation Material for Utility Trenches (Section 02222–Excavation, Fill, Backfill and Grading)	200	CY	\$	\$
3.	Soils Engineer (Section 02222-Excavation, Fill, Backfill and Grading)	1	LS	\$15,000.00	\$15,000.00
4.	Radio Antenna Mounting (Section 16480-Motor Control)	1	LS	\$15,000.00	\$15,000.00

COPY OF BID SET

BID

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 2-2017: FORCE MAIN FROM
 INDUSTRIAL PARK P.S. NO. 1 TO ELIZABETHTOWN WWTP
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

The following prices per item shall be for furnishing and installing the various items of material and work as specified and shown on the Drawings. Bidder agrees to perform the Work as shown on the Drawings and described in the Specifications for the following listed prices. Bidder acknowledges that unit prices have been computed in accordance with Paragraph 11.03.B of the General Conditions. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

NOTE: A price must be bid for each item in the Bid. Unbalanced or unreasonable unit prices may cause rejection of the Bid. All words and numbers shall be in ink.

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 2-2017: Force Main Ind. Park to EWWTP					
1.	16-IN PVC, SDR 21 with Class 2 Compaction, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	125	LF	\$	\$
2.	16-IN PVC, SDR 21 with Native Materials Compaction, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	29,140	LF	\$	\$
3.	12-IN PVC with Native Materials Compaction, SDR 21, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	6,760	LF	\$	\$
4.	10-IN PVC with Native Materials Compaction, SDR 21, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	6,760	LF	\$	\$
5.	8-IN PVC with Native Materials Compaction, SDR 21, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	15,915	LF	\$	\$
6.	6-IN PVC with Class 2 Compaction, SDR 21, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	100	LF	\$	\$
7.	6-IN PVC with Native Materials Compaction, SDR 21, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	15,045	LF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 2-2017: Force Main Ind. Park to EWWTP					
8.	Automatic Air and Vacuum Release Assembly and Vault, Precast, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	4	EA	\$	\$
9.	Automatic Air and Vacuum Release Assembly and Vault, CIP, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	3	EA	\$	\$
10.	Soil Filter Bed, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	7	EA	\$	\$
11.	Parshall Flume Structure INCL all electrical work, CIP. (Unclassified Excavation)	1	EA	\$	\$
12.	54-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. (sewer pipe not included). (Unclassified Excavation)	140	LF	\$	\$
13.	30-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. (sewer pipe not included). (Unclassified Excavation)	95	LF	\$	\$
14.	Stream crossing with PVC SDR 35 cover pipe, furnishing, trenching, laying, backfilling, bypass pumping, concrete cap, restoration, and live stacking. (Unclassified Excavation)	860	LF	\$	\$
15.	Pavement, INCL asphalt surface, asphalt base, DGA, and backfill with approved HCWD2 requirements, furnishing, and laying.	80	LF	\$	\$
16.	Pavement restoration for utility cut in driveway, material to be approved by HCWD2, furnishing, and laying.	230	LF	\$	\$
17.	Gravel restoration for utility cut in driveway, furnishing, and laying.	85	LF	\$	\$
18.	Tie-in to existing sewer manhole, furnishing, trenching, installing, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
19.	Stabilizing Power Poles	7	EA	\$	\$
20.	Silt Fence	73,720	LF	\$	\$
21.	Maintain Silt Fence	73,720	LF	\$	\$
22.	Construction Entrance Stone	506	Ton	\$	\$
23.	Construction Entrance Fabric	2,645	SY	\$	\$
24.	Final Seeding and Restoration	73,720	LF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 2-2017: Force Main Ind. Park to EWWTP					
25.	Water Pressure Test for Force Main	73,720	LF	\$	\$
26.	Unsuitable Foundation Material for Utility Trenches	100	CY	\$	\$
27.	Mobilization	1	LS	\$	\$
28.	Traffic Control	1	LS	\$	\$
29.	Clearing and Grubbing	1	LS	\$	\$
30.	Photo Documentation-Contract 2	1	LS	\$13,340.00	\$13,340.00
31.	Soils Engineer Allowance	1	LS	\$15,000.00	\$15,000.00

COMPUTED TOTAL BID CONTRACT 2-2017 (ITEMS 1 THROUGH 31)

_____ Dollars \$ _____
 (Words) (Numbers)

COPY OF BID SET

BID

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
CONTRACT 3-2017: GRAVITY SEWER LOCATED IN AND AROUND THE TOWN OF GLENDALE
HARDIN COUNTY WATER DISTRICT NO. 2
ELIZABETHTOWN, KENTUCKY

Contract award will be made based on the Computed Total Base Bid plus any Alternatives selected. The price for all Base Bid items shall be included in the Computed Total Base Bid. Alternative Bids will be added to or deducted from the Computed Total Base Bid, if they are accepted, prior to Contract award being made.

OWNER reserves the right to accept or reject any Alternatives to the Computed Total Base Bid. Should OWNER wish to consider Alternatives listed, Bidder may be required to provide additional information as listed in Article 6.05 of the General Conditions, prior to Notice of Award.

The following prices per item shall be for furnishing and installing the various items of material and work as specified and shown on the drawings. Bidder agrees to perform the Work as shown on the Drawings and described in the Specifications for the following listed prices. Bidder acknowledges that unit prices have been computed in accordance with Paragraph 11.03.B of the General Conditions. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

NOTE: A price must be bid for each item in the Bid. Unbalanced or unreasonable unit prices may cause rejection of the Bid. All words and numbers shall be in ink.

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Gravity Sewer, Glendale					
1.	12-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	750	LF	\$	\$
2.	10-IN PVC Pipe with Class 2 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	150	LF	\$	\$
3.	10-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	2,690	LF	\$	\$
4.	10-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) >20-FT in depth.	790	LF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Gravity Sewer, Glendale					
5.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 0-FT to 10-FT in depth.	60	LF	\$	\$
6.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	2,455	LF	\$	\$
7.	8-IN PVC Pipe with Class 2 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	1,205	LF	\$	\$
8.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	545	LF	\$	\$
9.	6-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	145	LF	\$	\$
10.	6-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	60	LF	\$	\$
11.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	810	LF	\$	\$
12.	4-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	320	LF	\$	\$
13.	10-IN by 10-IN by 6-IN Tee on 10-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	EA	\$	\$
14.	10-IN by 10-IN by 4-IN Tee on 10-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	11	EA	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Gravity Sewer, Glendale					
15.	8-IN by 8-IN by 6-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	9	EA	\$	\$
16.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	42	EA	\$	\$
17.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	41	EA	\$	\$
18.	5-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
19.	Lining of Manhole	5	EA	\$	\$
20.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	394	VF	\$	\$
21.	16-IN PVC, SDR 21 with Native Materials Compaction, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	555	LF	\$	\$
22.	8-IN PVC with Native Materials Compaction, SDR 21, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	555	LF	\$	\$
23.	Automatic Air and Vacuum Release Assembly and Vault, Precast, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
24.	42-IN steel casing pipe, furnishing, pits and access, installing under CSX railroad, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	120	LF	\$	\$
25.	20-IN steel casing pipe, furnishing, pits and access, installing under CSX railroad, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	165	LF	\$	\$
26.	Shut-Off Valves for Railroad Crossing, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	4	EA	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Gravity Sewer, Glendale					
27.	20-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	125	LF	\$	\$
28.	18-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	660	LF	\$	\$
29.	16-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	440	LF	\$	\$
30.	Pavement, INCL asphalt surface, asphalt base, DGA, and backfill with approved HCWD2 requirements, furnishing, and laying.	1,855	LF	\$	\$
31.	Pavement restoration for utility cut in driveway, material to be approved by HCWD2, furnishing, and laying.	150	LF	\$	\$
32.	Gravel restoration for utility cut in driveway, furnishing, and laying.	560	LF	\$	\$
33.	Sidewalk restoration for utility cut in sidewalk, furnishing, and laying.	25	LF	\$	\$
34.	Tie-in to existing sewer manhole, furnishing, trenching, installing, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
35.	Stabilizing Power Poles	13	EA	\$	\$
36.	Silt Fence	11,090	LF	\$	\$
37.	Maintain Silt Fence	11,090	LF	\$	\$
38.	Construction Entrance Stone	506	Ton	\$	\$
39.	Construction Entrance Fabric	2,645	SY	\$	\$
40.	Final Seeding and Restoration	11,090	LF	\$	\$
41.	CCTV	8,645	LF	\$	\$
42.	Water Pressure Test for Force Main	1,110	LF	\$	\$
43.	Mandrel and Air Test for Gravity Sewer	8,645	LF	\$	\$
44.	Manhole Test	42	EA	\$	\$
45.	Unsuitable Foundation Material for Utility Trenches	100	CY	\$	\$
46.	Mobilization	1	LS	\$	\$
47.	Traffic Control	1	LS	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Gravity Sewer, Glendale					
48.	Clearing and Grubbing	1	LS	\$	\$
49.	Photo Documentation-Contract 3	1	LS	\$7,250.00	\$7,250.00
50.	Soils Engineer Allowance	1	LS	\$15,000.00	\$15,000.00

COMPUTED TOTAL BID CONTRACT 3-2017 (ITEMS 1 THROUGH 50)

_____ Dollars \$ _____
 (Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 1

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE B
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line B					
1.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	185	LF	\$	\$
2.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	25	LF	\$	\$
3.	4-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	70	LF	\$	\$
4.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	EA	\$	\$
5.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
6.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	VF	\$	\$
7.	10-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	70	LF	\$	\$
8.	Stabilizing Power Poles	2	EA	\$	\$
9.	Silt Fence	280	LF	\$	\$
10.	Maintain Silt Fence	280	LF	\$	\$
11.	Construction Entrance Stone	22	Ton	\$	\$
12.	Construction Entrance Fabric	115	SY	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line B					
13.	Final Seeding and Restoration	280	LF	\$	\$
14.	CCTV	185	LF	\$	\$
15.	Mandrel and Air Test for Gravity Sewer	185	LF	\$	\$
16.	Manhole Test	1	EA	\$	\$
17.	Mobilization	1	LS	\$	\$
18.	Traffic Control	1	LS	\$	\$
19.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 1 (ITEMS 1 THROUGH 19)

_____ Dollars \$ _____
(Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 2

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE CONTRACT 3-2017: ALTERNATIVE LINE C HARDIN COUNTY WATER DISTRICT NO. 2 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line C					
1.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	235	LF	\$	\$
2.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	20	LF	\$	\$
3.	4-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	80	LF	\$	\$
4.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	3	EA	\$	\$
5.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
6.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	VF	\$	\$
7.	16-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	145	LF	\$	\$
8.	Silt Fence	335	LF	\$	\$
9.	Maintain Silt Fence	335	LF	\$	\$
10.	Construction Entrance Stone	22	Ton	\$	\$
11.	Construction Entrance Fabric	115	SY	\$	\$
12.	Final Seeding and Restoration	335	LF	\$	\$
13.	CCTV	235	LF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line C					
14.	Mandrel and Air Test for Gravity Sewer	235	LF	\$	\$
15.	Manhole Test	1	EA	\$	\$
16.	Mobilization	1	LS	\$	\$
17.	Traffic Control	1	LS	\$	\$
18.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 2 (ITEMS 1 THROUGH 18)

_____ Dollars \$ _____
(Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 3

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE D FROM MH-D-03 TO MH-D-05
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line D					
1.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	490	LF	\$	\$
2.	6-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	20	LF	\$	\$
3.	6-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	15	LF	\$	\$
4.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	40	LF	\$	\$
5.	4-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	60	LF	\$	\$
6.	8-IN by 8-IN by 6-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
7.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	3	EA	\$	\$
8.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	EA	\$	\$
9.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	11	VF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line D					
10.	10-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	60	LF	\$	\$
11.	Gravel restoration for utility cut in driveway, furnishing, and laying.	15	LF	\$	\$
12.	Stabilizing Power Poles	1	EA	\$	\$
13.	Silt Fence	625	LF	\$	\$
14.	Maintain Silt Fence	625	LF	\$	\$
15.	Construction Entrance Stone	22	Ton	\$	\$
16.	Construction Entrance Fabric	115	SY	\$	\$
17.	Final Seeding and Restoration	625	LF	\$	\$
18.	CCTV	490	LF	\$	\$
19.	Mandrel and Air Test for Gravity Sewer	490	LF	\$	\$
20.	Manhole Test	2	EA	\$	\$
21.	Mobilization	1	LS	\$	\$
22.	Traffic Control	1	LS	\$	\$
23.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 3 (ITEMS 1 THROUGH 23)

_____ Dollars \$ _____
 (Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 4

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE F
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line F					
1.	8-IN PVC Pipe with Class 2 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	175	LF	\$	\$
2.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	190	LF	\$	\$
3.	8-IN PVC Pipe with Class 2 Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) >20-FT in depth.	55	LF	\$	\$
4.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) >20-FT in depth.	90	LF	\$	\$
5.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	60	LF	\$	\$
6.	4-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	85	LF	\$	\$
7.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	5	EA	\$	\$
8.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	3	EA	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line F					
9.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	34	VF	\$	\$
10.	Pavement, INCL asphalt surface, asphalt base, DGA, and backfill with approved HCWD2 requirements, furnishing, and laying.	200	LF	\$	\$
11.	Stabilizing Power Poles	1	EA	\$	\$
12.	Silt Fence	655	LF	\$	\$
13.	Maintain Silt Fence	655	LF	\$	\$
14.	Construction Entrance Stone	44	Ton	\$	\$
15.	Construction Entrance Fabric	230	SY	\$	\$
16.	Final Seeding and Restoration	655	LF	\$	\$
17.	CCTV	510	LF	\$	\$
18.	Mandrel and Air Test for Gravity Sewer	510	LF	\$	\$
19.	Manhole Test	3	EA	\$	\$
20.	Mobilization	1	LS	\$	\$
21.	Traffic Control	1	LS	\$	\$
22.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 4 (ITEMS 1 THROUGH 22)

_____ Dollars \$ _____
 (Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 5

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE H FROM MH H-10 TO MH H-14
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line H					
1.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 0-FT to 10-FT in depth.	30	LF	\$	\$
2.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 0-FT to 10-FT in depth.	385	LF	\$	\$
3.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	140	LF	\$	\$
4.	8-IN PVC Pipe with Class 2 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	240	LF	\$	\$
5.	6-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	15	LF	\$	\$
6.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	55	LF	\$	\$
7.	8-IN by 8-IN by 6-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
8.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	3	EA	\$	\$
9.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	5	EA	\$	\$

Section 00400-22

5980.020/1-, 2-, 3-, and 4-2017

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line H					
10.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	14	VF	\$	\$
11.	Pavement, INCL asphalt surface, asphalt base, DGA, and backfill with approved HCWD2 requirements, furnishing, and laying.	200	LF	\$	\$
12.	Gravel restoration for utility cut in driveway, furnishing, and laying.	245	LF	\$	\$
13.	Silt Fence	865	LF	\$	\$
14.	Maintain Silt Fence	865	LF	\$	\$
15.	Construction Entrance Stone	44	Ton	\$	\$
16.	Construction Entrance Fabric	230	SY	\$	\$
17.	Final Seeding and Restoration	865	LF	\$	\$
18.	CCTV	795	LF	\$	\$
19.	Mandrel and Air Test for Gravity Sewer	795	LF	\$	\$
20.	Manhole Test	5	EA	\$	\$
21.	Mobilization	1	LS	\$	\$
22.	Traffic Control	1	LS	\$	\$
23.	Clearing and Grubbing	1	LS		

COMPUTED TOTAL ALTERNATIVE BID NO. 5 (ITEMS 1 THROUGH 23)

Dollars \$ _____

(Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 6

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE I
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line I					
1.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 0-FT to 10-FT in depth.	425	LF	\$	\$
2.	6-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	15	LF	\$	\$
3.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	80	LF	\$	\$
4.	8-IN by 8-IN by 6-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
5.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	5	EA	\$	\$
6.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	EA	\$	\$
7.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	5	VF	\$	\$
8.	Pavement restoration for utility cut in driveway, material to be approved by HCWD2, furnishing, and laying.	20	LF	\$	\$
9.	Gravel restoration for utility cut in driveway, furnishing, and laying.	435	LF	\$	\$
10.	Stabilizing Power Poles	3	EA	\$	\$
11.	Silt Fence	520	LF	\$	\$
12.	Maintain Silt Fence	520	LF	\$	\$
13.	Construction Entrance Stone	22	Ton	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line I					
14.	Construction Entrance Fabric	115	SY	\$	\$
15.	Final Seeding and Restoration	520	LF	\$	\$
16.	CCTV	425	LF	\$	\$
17.	Mandrel and Air Test for Gravity Sewer	425	LF	\$	\$
18.	Manhole Test	2	EA	\$	\$
19.	Mobilization	1	LS	\$	\$
20.	Traffic Control	1	LS	\$	\$
21.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 6 (ITEMS 1 THROUGH 21)

_____ Dollars \$ _____
(Words)
(Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 7

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE J
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line J					
1.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 0-FT to 10-FT in depth.	170	LF	\$	\$
2.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	480	LF	\$	\$
3.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	170	LF	\$	\$
4.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	11	EA	\$	\$
5.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	3	EA	\$	\$
6.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	11	VF	\$	\$
7.	Stabilizing Power Poles	4	EA	\$	\$
8.	Silt Fence	820	LF	\$	\$
9.	Maintain Silt Fence	820	LF	\$	\$
10.	Construction Entrance Stone	22	Ton	\$	\$
11.	Construction Entrance Fabric	115	SY	\$	\$
12.	Final Seeding and Restoration	820	LF	\$	\$
13.	CCTV	650	LF	\$	\$
14.	Mandrel and Air Test for Gravity Sewer	650	LF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line J					
15.	Manhole Test	3	EA	\$	\$
16.	Mobilization	1	LS	\$	\$
17.	Traffic Control	1	LS	\$	\$
18.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 7 (ITEMS 1 THROUGH 18)

_____ Dollars \$ _____
(Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 8

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE N
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line N					
1.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 0-FT to 10-FT in depth.	110	LF	\$	\$
2.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	290	LF	\$	\$
3.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	560	LF	\$	\$
4.	6-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	70	LF	\$	\$
5.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	60	LF	\$	\$
6.	8-IN by 8-IN by 6-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	3	EA	\$	\$
7.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	4	EA	\$	\$
8.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	6	EA	\$	\$
9.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	17	VF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line N					
10.	Gravel restoration for utility cut in driveway, furnishing, and laying.	45	LF	\$	\$
11.	Silt Fence	1,090	LF	\$	\$
12.	Maintain Silt Fence	1,090	LF	\$	\$
13.	Construction Entrance Stone	44	Ton	\$	\$
14.	Construction Entrance Fabric	230	SY	\$	\$
15.	Final Seeding and Restoration	1,090	LF	\$	\$
16.	CCTV	960	LF	\$	\$
17.	Mandrel and Air Test for Gravity Sewer	960	LF	\$	\$
18.	Manhole Test	6	EA	\$	\$
19.	Mobilization	1	LS	\$	\$
20.	Traffic Control	1	LS	\$	\$
21.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 8 (ITEMS 1 THROUGH 21)

_____ Dollars \$ _____
 (Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 9

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE O
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line O					
1.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	50	LF	\$	\$
2.	8-IN PVC Pipe with Class 2 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	115	LF	\$	\$
3.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	510	LF	\$	\$
4.	6-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	60	LF	\$	\$
5.	6-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	200	LF	\$	\$
6.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	60	LF	\$	\$
7.	8-IN by 8-IN by 6-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	5	EA	\$	\$
8.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	3	EA	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line O					
9.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	EA	\$	\$
10.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	11	VF	\$	\$
11.	14-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	200	LF	\$	\$
12.	Pavement restoration for utility cut in driveway, material to be approved by HCWD2, furnishing, and laying.	115	LF	\$	\$
13.	Gravel restoration for utility cut in driveway, furnishing, and laying.	30	LF	\$	\$
14.	Sidewalk restoration for utility cut in sidewalk, furnishing, and laying.	215	LF	\$	\$
15.	Stabilizing Power Poles	4	EA	\$	\$
16.	Silt Fence	995	LF	\$	\$
17.	Maintain Silt Fence	995	LF	\$	\$
18.	Construction Entrance Stone	22	Ton	\$	\$
19.	Construction Entrance Fabric	115	SY	\$	\$
20.	Final Seeding and Restoration	995	LF	\$	\$
21.	CCTV	675	LF	\$	\$
22.	Mandrel and Air Test for Gravity Sewer	675	LF	\$	\$
23.	Manhole Test	2	EA	\$	\$
24.	Mobilization	1	LS	\$	\$
25.	Traffic Control	1	LS	\$	\$
26.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 9 (ITEMS 1 THROUGH 26)

Dollars \$ _____

(Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 10

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE P
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line P					
1.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	695	LF	\$	\$
2.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) >20-FT in depth.	120	LF	\$	\$
3.	6-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	25	LF	\$	\$
4.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	20	LF	\$	\$
5.	4-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	70	LF	\$	\$
6.	8-IN by 8-IN by 6-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
7.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	3	EA	\$	\$
8.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	EA	\$	\$
9.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	14	VF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line P					
10.	16-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	435	LF	\$	\$
11.	Stabilizing Power Poles	3	EA	\$	\$
12.	Silt Fence	930	LF	\$	\$
13.	Maintain Silt Fence	930	LF	\$	\$
14.	Construction Entrance Stone	22	Ton	\$	\$
15.	Construction Entrance Fabric	115	SY	\$	\$
16.	Final Seeding and Restoration	930	LF	\$	\$
17.	CCTV	815	LF	\$	\$
18.	Mandrel and Air Test for Gravity Sewer	815	LF	\$	\$
19.	Manhole Test	2	EA	\$	\$
20.	Mobilization	1	LS	\$	\$
21.	Traffic Control	1	LS	\$	\$
22.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 10 (ITEMS 1 THROUGH 22)

_____ Dollars \$ _____

(Words) (Numbers)

COPY OF BID SET

ALTERNATIVE BID NO. 11

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 3-2017: ALTERNATIVE LINE U
 GLENDALE GRAVITY SEWER AND RAILROAD BORES
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line U					
1.	12-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	250	LF	\$	\$
2.	12-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	1,340	LF	\$	\$
3.	12-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) >20-FT in depth.	185	LF	\$	\$
4.	10-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	2,470	LF	\$	\$
5.	6-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	100	LF	\$	\$
6.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	230	LF	\$	\$
7.	4-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	790	LF	\$	\$
8.	12-IN by 12-IN by 6-IN Tee on 10-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$

Section 00400-34

5980.020/1-, 2-, 3-, and 4-2017

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line U					
9.	12-IN by 12-IN by 4-IN Tee on 10-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	8	EA	\$	\$
10.	10-IN by 10-IN by 4-IN Tee on 10-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	17	EA	\$	\$
11.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	27	EA	\$	\$
12.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	193	VF	\$	\$
13.	14-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. (sewer pipe not included). (Unclassified Excavation)	100	LF	\$	\$
14.	10-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	790	LF	\$	\$
15.	Stream crossing with PVC SDR 35 cover pipe, furnishing, trenching, laying, backfilling, bypass pumping, concrete cap, restoration, and live stacking. (Unclassified Excavation)	180	LF	\$	\$
16.	Pavement, INCL asphalt surface, asphalt base, DGA, and backfill with approved HCWD2 requirements, furnishing, and laying.	30	LF	\$	\$
17.	Pavement restoration for utility cut in driveway, material to be approved by HCWD2, furnishing, and laying.	55	LF	\$	\$
18.	Gravel restoration for utility cut in driveway, furnishing, and laying.	60	LF	\$	\$
19.	Stabilizing Power Poles	9	EA	\$	\$
20.	Silt Fence	5,365	LF	\$	\$
21.	Maintain Silt Fence	5,365	LF	\$	\$
22.	Construction Entrance Stone	44	Ton	\$	\$
23.	Construction Entrance Fabric	230	SY	\$	\$
24.	Final Seeding and Restoration	5,365	LF	\$	\$
25.	CCTV	4,245	LF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 3-2017: Alternative Line U					
26.	Mandrel and Air Test for Gravity Sewer	4,245	LF	\$	\$
27.	Manhole Test	27	EA	\$	\$
28.	Mobilization	1	LS	\$	\$
29.	Traffic Control	1	LS	\$	\$
30.	Clearing and Grubbing	1	LS	\$	\$

COMPUTED TOTAL ALTERNATIVE BID NO. 11 (ITEMS 1 THROUGH 30)

_____ Dollars \$ _____
 (Words) (Numbers)

COPY OF BID SET

BID

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
 CONTRACT 4-2017: GRAVITY SEWER AND FORCE MAIN ALONG AND NEAR I-65
 HARDIN COUNTY WATER DISTRICT NO. 2
 ELIZABETHTOWN, KENTUCKY

The following prices per item shall be for furnishing and installing the various items of material and work as specified and shown on the Drawings. Bidder agrees to perform the Work as shown on the Drawings and described in the Specifications for the following listed prices. Bidder acknowledges that unit prices have been computed in accordance with Paragraph 11.03.B of the General Conditions. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

NOTE: A price must be bid for each item in the Bid. Unbalanced or unreasonable unit prices may cause rejection of the Bid. All words and numbers shall be in ink.

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 4-2017: Gravity Sewer, I-65					
1.	24-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	1,220	LF	\$	\$
2.	24-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) >20-FT in depth.	250	LF	\$	\$
3.	10-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 0-FT to 10-FT in depth.	105	LF	\$	\$
4.	10-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	1,385	LF	\$	\$
5.	10-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) >20-FT in depth.	320	LF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 4-2017: Gravity Sewer, I-65					
6.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 0-FT to 10-FT in depth.	570	LF	\$	\$
7.	8-IN PVC Pipe with Class 1 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	220	LF	\$	\$
8.	8-IN PVC Pipe with Class 2 Compaction, ASTM D3034, SDR 35, furnishing, trenching, trench boxes, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	1,160	LF	\$	\$
9.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) 10-FT to 20-FT in depth.	7,800	LF	\$	\$
10.	8-IN PVC Pipe with Class 2 Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) >20-FT in depth.	320	LF	\$	\$
11.	8-IN PVC Pipe with Native Materials Compaction, ASTM D3034, SDR 35, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation) >20-FT in depth.	940	LF	\$	\$
12.	6-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	110	LF	\$	\$
13.	6-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	145	LF	\$	\$
14.	4-IN PVC Lateral Pipe on Same Side of Street as Sanitary Sewer, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	175	LF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 4-2017: Gravity Sewer, I-65					
15.	4-IN PVC Lateral Pipe on Opposite Side of Street as Sanitary Sewer, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2,395	LF	\$	\$
16.	8-IN by 8-IN by 6-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	8	EA	\$	\$
17.	8-IN by 8-IN by 4-IN Tee on 8-IN PVC Sanitary Sewer Pipe, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	30	EA	\$	\$
18.	4-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	52	EA	\$	\$
19.	5-FT Diameter Precast Manholes w/ Castings, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	9	EA	\$	\$
20.	Lining of Manhole	7	EA	\$	\$
21.	Additional Vertical Feet of Manhole, shall conform to ASTM C478, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	514	VF	\$	\$
22.	4-IN PVC with Native Materials Compaction, SDR 21, force main, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	7,565	LF	\$	\$
23.	Automatic Air and Vacuum Release Assembly and Vault, Precast, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	EA	\$	\$
24.	Soil Filter Bed, furnishing, trenching, laying, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	2	EA	\$	\$
25.	18-IN steel casing pipe, furnishing, pits and access, installing under I-65, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	315	LF	\$	\$
26.	36-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	50	LF	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 4-2017: Gravity Sewer, I-65					
27.	18-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	330	LF	\$	\$
28.	16-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	2,130	LF	\$	\$
29.	14-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	145	LF	\$	\$
30.	10-IN steel casing pipe, furnishing, pits and access, installing under state maintained roads, INCL boring and jacking. Sewer pipe not included. (Unclassified Excavation)	2,395	LF	\$	\$
31.	Stream crossing with PVC SDR 35 cover pipe, furnishing, trenching, laying, backfilling, bypass pumping, concrete cap, restoration, and live stacking. (Unclassified Excavation)	385	LF	\$	\$
32.	Pavement restoration for utility cut in driveway, material to be approved by HCWD2, furnishing, and laying.	100	LF	\$	\$
33.	Gravel restoration for utility cut in driveway, furnishing, and laying.	80	LF	\$	\$
34.	Stabilizing Power Poles	22	EA	\$	\$
35.	Tie-in to existing sewer manhole, furnishing, trenching, installing, INCL all associated appurtenances, and backfilling. (Unclassified Excavation)	1	EA	\$	\$
36.	Silt Fence	24,680	LF	\$	\$
37.	Maintain Silt Fence	24,680	LF	\$	\$
38.	Construction Entrance Stone	418	Ton	\$	\$
39.	Construction Entrance Fabric	2,185	SY	\$	\$
40.	Final Seeding and Restoration	24,680	LF	\$	\$
41.	CCTV	14,290	LF	\$	\$
42.	Water Pressure Test for Force Main	7,565	LF	\$	\$
43.	Mandrel and Air Test for Gravity Sewer	14,290	LF	\$	\$
44.	Manhole Test	61	EA	\$	\$
45.	Unsuitable Foundation Material for Utility Trenches	100	CY	\$	\$

COPY OF BID SET

Item No.	Description	Quantity	Unit	Unit Cost	Extension
Contract 4-2017: Gravity Sewer, I-65					
46.	Mobilization	1	LS	\$	\$
47.	Traffic Control	1	LS	\$	\$
48.	Clearing and Grubbing	1	LS	\$	\$
49.	Photo Documentation - Contract 4	1	LS	\$8,410.00	\$8,410.00
50.	Soils Engineer Allowance	1	LS	\$15,000.00	\$15,000.00

COMPUTED TOTAL BID CONTRACT 4-2017 (ITEMS 1 THROUGH 50)

_____ Dollars \$ _____
 (Words) (Numbers)

COPY OF BID SET

BID

NOLIN RIVER WATERSHED SEWER INFRASTRUCTURE
CONTRACTS 1-2017, 2-2017, 3-2017, AND 4-2017
HARDIN COUNTY WATER DISTRICT NO. 2
ELIZABETHTOWN, KENTUCKY

Separate Contracts may be awarded for 1-2017, 2-2017, 3-2017, and 4-2017.

Alternatively, Bidders may submit Bid(s) for any combination of Contracts up to and including a Bid for the entire Work. Should any Bidder elect to offer such Bid(s), the Bid(s) will be considered in determining successful Bidder(s).

Bidder shall list the multiple Contract numbers and names followed by the Combined Total Lump Sum Bid for the multiple Contract listed. Any quantity of different combinations of multiple Contract numbers and names, and corresponding Combined Total Lump Sum Bids may be bid.

Bidders bidding multiple Contracts which include Contract 1-2017 are reminded to complete respective Cash Allowance Prices in the respective Contract Bid Forms.

MULTIPLE CONTRACT NUMBERS AND NAMES:

COMBINED TOTAL LUMP SUM BID:

_____ Dollars \$ _____
(Words) (Numbers)

MULTIPLE CONTRACT NUMBERS AND NAMES:

COMBINED TOTAL LUMP SUM BID:

_____ Dollars \$ _____
(Words) (Numbers)

MULTIPLE CONTRACT NUMBERS AND NAMES:

COMBINED TOTAL LUMP SUM BID:

_____ Dollars \$ _____
(Words) (Numbers)

COPY OF BID SET

ARTICLE 6--TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within the following calendar days:

Contract 1-2017	Pump Stations	300 calendar days
Contract 2-2017	Force Main	360 calendar days
Contract 3-2017	Gravity Sewer for Glendale	360 calendar days
Contract 4-2017	Gravity Sewer and Force Main for I-65	360 calendar days

and completed and will be ready for final payment in accordance with Paragraph 14.07.B of the General Conditions within the following calendar days:

Contract 1-2017	Pump Stations	360 calendar days
Contract 2-2017	Force Main	420 calendar days
Contract 3-2017	Gravity Sewer for Glendale	420 calendar days
Contract 4-2017	Gravity Sewer and Force Main for I-65	420 calendar days

If up to four Alternative Bids are awarded in Contract 3-2017, an additional 30 calendar days will be added to both Substantial and Final Completion deadlines.

If more than four Alternative Bids are awarded in Contract 3-2017, an additional 60 calendar days will be added to both Substantial and Final Completion deadlines.

In addition to the required substantial and final completion times, there are milestones by which certain items of work must be completed. See General Requirements for milestone requirements.

Contract 1-2017

Milestone 1	Test 16-inch Force Main at Rose Run PS	240 calendar days
Milestone 2	Complete Rose Run Pump Station and Test Force Main	240 calendar days
Milestone 3	Test Force Mains at Industrial Park PS No. 2	270 calendar days
Milestone 4	Test Force Mains at Industrial Park PS No. 1	270 calendar days

Contract 2-2017

Milestone 1	Test Force Mains from Rose Run Bore to Elizabethtown WWTP and Parshall Flume	270 calendar days
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Contract 3-2017

Milestone 1	Install MH A-04, M-01, U-02	90 calendar days
Milestone 2	Complete Railroad Bores	180 calendar days
Milestone 3	Test Rose Run Force Main	255 calendar days
Milestone 4	Install MH M-12	270 calendar days

Contract 4-2017

Milestone 1	Install MH R-01 and T-01	90 calendar days
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6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times.

COPY OF BID SET

ARTICLE 7-ATTACHMENTS TO THIS BID

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

A. Required Bid security in the form of _____ in the
(Bond or Certified Check)
amount of _____ Dollars
(\$ _____) as required by the Instructions to Bidders.

B. Check the paragraph below that applies and provide the Organization Number, if applicable.

1. _____ Bidder is a "resident bidder" as defined in KRS 45A.494(2) of Kentucky's "resident bidder" reciprocal preference statute and submits with this Bid a properly executed and notarized Affidavit that affirms Bidder meets the "resident bidder criteria". Such Affidavit is hereby incorporated and made part of this Bid.

2. _____ Bidder is a "nonresident bidder" as defined in KRS 45A.493(3) of Kentucky's "resident bidder" reciprocal preference statute and the state of residency for the purposes of this administrative regulation shall be its principal office as identified in the Bidder's Certificate of Authority to transact business in Kentucky as filed with the Secretary of State of the Commonwealth of Kentucky, or if represents and covenants that it is not required to obtain a Certificate of Authority to transact business in the Commonwealth of Kentucky, its mailing address is:

3. Bidder's Organization Number from the Secretary of State of the Commonwealth of Kentucky is _____ [if applicable] and Bidder is qualified to transact business in the Commonwealth or Bidder hereby covenants it will obtain such qualifications prior to award of Contract.

C. Statement pursuant to Labor Law Disclosure (KRS 45A.343).

D. Campaign Finance Disclosure (KRS 45A.395).

E. Statement pursuant to (KRS 45A.395).

F. Required Affidavit for Bidders Claiming Kentucky Resident Bidder Status.

G. Conflict of Interest (KRS 45A.455).

ARTICLE 8-DEFINED TERMS

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

COPY OF BID SET

ARTICLE 9-COMMUNICATIONS

9.01 Communications concerning this Bid shall be addressed to the address of Bidder indicated below:

Name: _____

Street: _____

City, State, Zip Code: _____

Phone No.: _____ Fax No.: _____

E-mail address: _____

ARTICLE 10-BID SUBMITTAL

Submitted on _____

State Contractor License Number _____ (if applicable).

COPY OF BID SET

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____
(Individual's signature)

Doing business as: _____
Business address: _____

Phone No.: _____ Fax No.: _____

E-mail address: _____

A Partnership

Partnership Name: _____ (SEAL)

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

Name (typed or printed): _____
Business address: _____

Phone No.: _____ Fax No.: _____

E-mail address: _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

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

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____ (CORPORATE SEAL)

Attest _____
(Signature of Corporate Secretary)

Business address: _____

Phone No.: _____ Fax No.: _____

E-mail address: _____

Date of Qualification to do business in (State where the Project is located) is _____

Sworn and subscribed to before me this
_____ day of _____, _____

Notary Public or Other Officer
Authorized to Administer Oaths.
My Commission expires: _____

COPY OF BID SET

A Limited Liability Company (Note: If member-managed, an authorized member must sign; if manager-managed, the authorized manager must sign. Attach evidence of authority to sign on behalf of LLC).

(Fill in complete name of LLC)

State of Formation: _____

By: _____
(Signature)

_____, [Member] [Manager]
(Print Name)

Business Address: _____

Telephone.: _____

Email: _____

Fax: _____

COPY OF BID SET

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____(SEAL)

By: _____
(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

Phone No.: _____ Fax No.: _____

E-mail address: _____

Second Joint Venturer Name: _____(SEAL)

By: _____
(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

Phone No.: _____ Fax No.: _____

E-mail address: _____

Phone No., Fax No., and postal and E-mail address for receipt of official communications:

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

Sworn and subscribed to before me this
_____ day of _____, _____

Notary Public or Other Officer
Authorized to Administer Oaths.
My Commission expires: _____

END OF SECTION

COPY OF BID SET

SECTION 00430

5% 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: _____

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

SURETY

Surety's Name and Corporate Seal (Seal)

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

BIDDER

Bidder's Name and Corporate Seal (Seal)

By: _____
Signature and Title

Attest: _____
Signature and Title

Above addresses are to be used for giving required notice.

COPY OF BID SET

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to OWNER upon default of Bidder the penal sum set forth on the face of this Bond. Payment of penal sum is the extent of Surety's liability.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
 - 3.1 OWNER accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2 All Bids are rejected by OWNER, or
 - 3.3 OWNER fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from OWNER, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by OWNER and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety, and in no case later than one year after Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notice 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 prepaid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind 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 the Bond conflicts with any applicable provision of 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.

END OF SECTION

COPY OF BID SET

STATEMENT REQUIRED PURSUANT TO KRS 45A.343

The undersigned, as a duly authorized officer of _____
hereinafter called the company, pursuant to KRS 45A.343 states;

1. To the best of my knowledge, information and belief, the company has not been finally determined to have violated any of the provisions of KRS Chapters 136, 139, 141, 337, 338, 341, or 342 that apply to it within the five year period preceding this statement.

2. The company acknowledges that it will be required to be in compliance with those provisions of KRS Chapters 136, 139, 141, 337, 338, 341 and 342 that apply to it for the duration of the Contract to be entered into with Owner.

3. The company acknowledges that if it fails to reveal any final determination of violation of KRS Chapters 136, 139, 141, 337, 338, 341, or 342, or to comply with the applicable provision of those statutes for the duration of the aforesaid Contract, such shall be grounds for Owner to:

- a. Cancel its contract with the company, and,
- b. Disqualify the company from eligibility for future contracts awarded by Owner for a period of two years.

This the _____ day of _____, _____.

(Company Name)

By: _____
(Typed or printed name)

Title: _____

COPY OF BID SET

45A.395 Determination of responsibility–Right of nondisclosure.

- (1) A written determination of responsibility of a bidder or offeror shall be made, based on a reasonable inquiry conducted by the local public agency. The unreasonable failure of a bidder or offeror to promptly supply information upon request may be grounds for a determination of nonresponsibility of such bidder or offeror.
- (2) A written determination of responsibility of a bidder or offeror shall not be made until the bidder or offeror provides the local public agency with a sworn statement made under penalty of perjury that he has not knowingly violated any provision of the campaign finance laws of the Commonwealth and that the award of a contract to the bidder or offeror will not violate any provisions of the campaign finance laws of the Commonwealth. “Knowingly” means, with respect to conduct or circumstances described by a statute defining an offense, that a person is aware or should have been aware that his conduct is of that nature or that the circumstance exists.
- (3) Except as otherwise provided by law, information furnished by a bidder or offeror pursuant to this section may not be disclosed outside of the local public agency without prior written consent of bidder or offeror.

Effective: July 14, 1992

History: Amended 1992 Ky. Acts ch. 288, sec. 19.

COPY OF BID SET

STATEMENT REQUIRED PURSUANT TO KRS 45A.395

The provisions of KRS 45A.395 required that any bidder or offeror submit a sworn statement in conformity with such statute as a prerequisite to a determination that such bidder or offeror is a responsible bidder.

The undersigned, individually and as the _____
(Office or Title)

of _____
(Bidder or Offeror)

states under penalty of perjury that neither he (she), nor, to the best of his (her) knowledge, anyone acting on behalf of Bidder or Offeror, has knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky and that the award of a contract to the Bidder or Offeror will not violate any provision of the campaign finance laws of the Commonwealth. "Knowingly" means, with respect to conduct or to a circumstance described by a statute defining an offense, that a person is aware or should have been aware that his conduct is of that nature or that the circumstance exists.

This the _____ day of _____, _____.

(Company Name)

By: _____
(Typed or Printed Name)

(Signature)

Title: _____

COPY OF BID SET

Contract: _____

REQUIRED AFFIDAVIT FOR BIDDERS CLAIMING KENTUCKY RESIDENT BIDDER STATUS

FOR BIDS AND CONTRACTS IN GENERAL:

Bidder hereby swears and affirms under penalty of perjury that, in accordance with KRS 45A.494(2), Bidder is an individual, partnership, association, corporation, or other business entity that, on the date the Contract was first advertised or announced as available for bidding, Bidder:

1. Is authorized to transact business in the Commonwealth of Kentucky, and
2. Has for one year prior to and through the date of advertisement:
 - a. Filed Kentucky corporate income taxes,
 - b. Made payments to the Kentucky unemployment insurance fund established in KRS 341.490, and
 - c. Maintained a Kentucky workers' compensation policy in effect.

OWNER reserves the right to request documentation supporting a Bidder's claim of resident bidder status. Failure to provide such documentation upon request shall result in disqualification of the Bidder or contract termination.

Signature

Printed Name

Title (if signing on behalf of an entity)

Date

Company Name _____

Address _____

Subscribed and sworn to before me by _____
Affiant Title

of _____, this _____ day of _____, 201__.
Company Name

Notary Public

[Seal of Notary]

My commission expires: _____

COPY OF BID SET

45A.455 Conflict of interest—Gratuities and kickbacks—Use of confidential information.

- (1) It shall be a breach of ethical standards for any employee with procurement authority to participate directly in any proceeding or application; request for ruling or other determination; claim or controversy; or other particular matter pertaining to any contract, or subcontract, and any solicitation or proposal therefor, in which to his knowledge:
 - a. He, or any member of his immediate family has a financial interest therein; or
 - b. A business or organization in which he or any member of his immediate family has a financial interest as an officer, director, trustee, partner, or employee, is a party; or
 - c. Any other person, business, or organization with whom he or any member of his immediate family is negotiating or has an arrangement concerning prospective employment is a party. Direct or indirect participation shall include but not be limited to involvement through decision, approval, disapproval, recommendation, preparation of any part of a purchase request, influencing the content of any specification or purchase standard, rendering of advice, investigation, auditing, or in any other advisory capacity.
- (2) It shall be a breach of ethical standards for any person to offer, give, or agree to give any employee or former employee, or for any employee or former employee to solicit, demand, accept, or agree to accept from another person, a gratuity or an offer of employment, in connection with any decision, approval, disapproval, recommendation, preparation of any part of a purchase request, influencing the content of any specification or purchase standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceeding or application, request for ruling or other determination, claim or controversy, or other particular matter, pertaining to any contract or subcontract and any solicitation or proposal therefor.
- (3) It is a breach of ethical standards for any payment, gratuity, or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or higher tier subcontractor or any person associated therewith, as an inducement for the award of a subcontract or order.
- (4) The prohibition against conflicts of interest and gratuities and kickbacks shall be conspicuously set forth in every local public agency written contract and solicitation therefor.
- (5) It shall be a breach of ethical standards for any public employee or former employee knowingly to use confidential information for his actual or anticipated personal gain, or the actual or anticipated personal gain of any other person.

COPY OF BID SET

SUBCONTRACTORS REGISTRY PAGE

All subcontractors performing work in fulfillment of this Bid must be listed on this page with the information requested.

NAME AND ADDRESS

PHONE AND FAX

CRAFT

1.

2.

3.

4.

5.

6.

7.

8.

COPY OF BID SET

SECTION 00520

AGREEMENT

THIS AGREEMENT is by and between _____

(hereinafter called OWNER) and _____

(hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants set forth herein, agree as follows:

Article 1. WORK

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

Article 2. THE PROJECT

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

Article 3. ENGINEER

3.01 The Project has been designed by Strand Associates, Inc.®

3.02 OWNER has retained Strand Associates, Inc.® ("ENGINEER") to act as OWNER's representative, assume all duties and responsibilities, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

COPY OF BID SET

Article 4. CONTRACT TIMES

4.01 Time of the Essence

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

4.02 Dates for Substantial Completion and Final Payment

A. The Work will be substantially complete within the following calendar days:

Contract 1-2017	Pump Stations	300 calendar days
Contract 2-2017	Force Main	360 calendar days
Contract 3-2017	Gravity Sewer for Glendale	360 calendar days
Contract 4-2017	Gravity Sewer and Force Main for I-65	360 calendar days

and completed and will be ready for final payment in accordance with Paragraph 14.07.B of the General Conditions within the following calendar days:

Contract 1-2017	Pump Stations	360 calendar days
Contract 2-2017	Force Main	420 calendar days
Contract 3-2017	Gravity Sewer for Glendale	420 calendar days
Contract 4-2017	Gravity Sewer and Force Main for I-65	420 calendar days

If up to four Alternative Bids are awarded in Contract 3-2017, an additional 30 calendar days will be added to both Substantial and Final Completion dates.

If more than four Alternative Bids are awarded in Contract 3-2017, an additional 60 calendar days will be added to both Substantial and Final Completion deadlines.

In addition to the required Substantial and Final Completion times, there are milestones by which certain items of work must be completed. See General Requirements for milestone requirements.

Contract 1-2017

Milestone 1	Test 16-inch Force Main at Rose Run PS	240 calendar days
Milestone 2	Complete Rose Run Pump Station and Test Force Main	240 calendar days
Milestone 3	Test Force Mains at Industrial Park PS No. 2	270 calendar days
Milestone 4	Test Force Mains at Industrial Park PS No. 1	270 calendar days

Contract 2-2017

Milestone 1	Force Mains from Rose Run Bore to Elizabethtown WWTP and Parshall Flume	270 calendar days
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Contract 3-2017

Milestone 1	Install MH A-04, M-01, U-02	90 calendar days
Milestone 2	Railroad Bores	180 calendar days
Milestone 3	Test Rose Run Force Main	255 calendar days
Milestone 4	Install MH M-12	270 calendar days

Contract 4-2017

Milestone 1	Install MH R-01 and T-01	90 calendar days
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COPY OF BID SET

4.03 Liquidated Damages

A. CONTRACTOR and OWNER recognize that time is of the essence as stated in Paragraph 4.01 above and that OWNER will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as penalty):

1. Substantial Completion: CONTRACTOR shall pay OWNER \$1,400 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete. This amount is comprised of \$1,200 per day for engineering, construction administration services, construction observation services, and inspections and \$200 per day for administration, labor, expenses, and other costs that will be incurred by OWNER.

2. Completion of Remaining Work: After Substantial Completion, if CONTRACTOR shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, CONTRACTOR shall pay OWNER \$1,400 for each day that expires after such time until the Work is completed and ready for final payment. This amount is comprised of \$1,200 per day for engineering, construction administration services, construction observation services, and inspections and \$200 per day for administration, labor, expenses, and other costs that will be incurred by OWNER.

3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

4. Milestones: CONTRACTOR shall pay OWNER \$1,400 for each day that expires after the time (as duly pursuant to the Contract) specified above for achievement of each Milestone, until each Milestone is achieved.

Article 5. CONTRACT PRICE

5.01 OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds as follows:

A. For all Work, at the prices stated in CONTRACTOR's Bid, attached hereto as an exhibit. For Contract 3-2017, the awarded contract amount includes the Computed Total Base Bid plus Bid Alternatives.

B. All specific cash allowances are included in the Contract Price and have been computed in accordance with Paragraph 11.02 of the General Conditions.

COPY OF BID SET

Article 6. PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

A. CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

6.02 Progress Payments; Retainage

A. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as established at the preconstruction conference during performance of the Work as provided in Paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements:

1. Prior to Substantial Completion, OWNER will retain an amount equal to 10% of each progress payment application until 50% of the Work has been completed. At 50% completion, further progress payment applications shall be paid in full to the CONTRACTOR and no additional amounts will be retained unless the ENGINEER certifies to the OWNER that the job is not proceeding satisfactorily. Amounts previously retained shall not be paid to the CONTRACTOR until substantial completion of the Work. At 50% completion of the Work, or any time thereafter when the character and progress of the Work is not satisfactory to OWNER on recommendation of ENGINEER, additional amounts may be retained, but in no event shall the total retainage be more than 10% of the value of the work completed.

2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 98% of the Work completed, less such amounts as ENGINEER shall determine in accordance with Paragraph 14.02.B.5 of the General Conditions and less 100% of ENGINEER's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 Final Payment

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

Article 7. HIERARCHY

7.01 In resolving inconsistencies among two or more sections of the Contract Documents, precedence shall be given in the following order:

- | | |
|---------|--------------------------|
| First: | WRITTEN AMENDMENTS |
| Second: | AGREEMENT |
| Third: | CHANGE ORDERS |
| Fourth: | ADDENDA |
| Fifth: | SUPPLEMENTARY CONDITIONS |
| Sixth: | GENERAL CONDITIONS |

COPY OF BID SET

Seventh: SPECIFICATIONS
Eighth: DRAWINGS

Figure dimensions (numerical) on Drawings shall take precedence over dimensions measured utilizing a scale.

Article 8. CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

A. CONTRACTOR has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. CONTRACTOR has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress and performance of the Work.

D. CONTRACTOR has carefully studied (1) all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in Paragraph 4.06 of the General Conditions.

E. CONTRACTOR has obtained and carefully studied (or accepts consequences of not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site that may affect the cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents and safety precautions and programs incident thereto.

F. CONTRACTOR does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Contract Documents.

H. CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

COPY OF BID SET

I. CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that CONTRACTOR has discovered in the Contract Documents, and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

Article 9. CONTRACT DOCUMENTS

9.01 Contents

A. The Contract Documents consist of the following:

1. This Agreement (pages 00520-1 through 00520-____, inclusive);
2. Performance bond (pages to 00600-1 through 00600-3, inclusive);
3. Payment bond (pages 00600-4 through 00600-6, inclusive);
4. Other bonds
 - a. _____ (pages _____ to _____, inclusive);
 - b. _____ (pages _____ to _____, inclusive);
 - c. _____ (pages _____ to _____, inclusive);
5. General Conditions (pages 00700-1 through 00700-____, inclusive);
6. Supplementary Conditions (pages 00800-1 through 00800-____, inclusive);
7. Specifications as listed in the table of contents of the Project Manual;
8. Drawings-Sheets No. _____ through No. _____

inclusive incorporated herein by reference with each sheet bearing the following general title:

as well as drawings listed in the table of contents that are bound at the back of these specifications.

COPY OF BID SET

9. Addenda (_____).

10. Exhibits to this Agreement (enumerated as follows:)

a. CONTRACTOR's Bid (pages ____ to ____);

b. Documentation submitted by CONTRACTOR prior to Notice of Award

(_____);

c. (_____);

11. The following may be delivered or issued on or after the Effective Date of the Agreement:

a. Notice to Proceed (pages {_____} to {_____}, inclusive);

b. Work Change Directives (not attached to this Agreement);

c. Change Order(s) (not attached to this Agreement).

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

Article 10. MISCELLANEOUS

10.01 Terms

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

10.02 Assignment of Contract

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation, 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.

COPY OF BID SET

10.03 Successors and Assigns

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

10.04 Severability

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

10.05 Nonwaiver

A. No provision of the Contract Documents will be deemed waived by reason of one party failing to enforce the provision on one or more occasions. Any such waiver must be in writing.

10.06 Integration

A. The parties' entire agreement is contained in the Contract Documents, and the provisions of the Contract Documents supersede all prior discussions or writings between the parties.

COPY OF BID SET

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in triplicate. One counterpart each has been delivered to OWNER, CONTRACTOR, and ENGINEER. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or identified by ENGINEER on their behalf.

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

OWNER

_____ (Seal)

Signature and Title

ATTEST:

By:

Signature and Title

Address for Giving Notices:

Name:

Street:

City, State, Zip Code:

Phone:

Facsimile:

E-mail:

Designated Representative:

COPY OF BID SET

CONTRACTOR _____

Signature and Title

(Seal)

ATTEST:

By: _____

Signature and Title

Address for Giving Notices:

Name: _____

Street: _____

City, State, Zip Code: _____

Phone: _____

Facsimile: _____

E-mail: _____

Designated Representative: _____

License No.: _____

(Where applicable)

(If CONTRACTOR is a corporation, limited liability company, or a partnership, attach evidence of authority to sign.)

COPY OF BID SET

Approved as to form:

OWNER's Attorney

Date

Provision has been made to pay the liability that will accrue under this Agreement:

Countersigned:

OWNER's Comptroller or Treasurer

Date

INSTRUCTIONS FOR EXECUTING CONTRACT

The full name and business address of CONTRACTOR should be inserted and the Agreement should be signed with CONTRACTOR's official signature. Please have the name of the signing party printed under all signatures to the Agreement.

If CONTRACTOR is operating as a partnership, each partner should sign the Agreement. If the Agreement is not signed by each partner, there should be attached to the Agreement a duly authenticated power of attorney evidencing the signer's (signers') authority to sign such Agreement for and on behalf of the partnership.

If CONTRACTOR is an individual, the trade name (if CONTRACTOR is operating under a trade name) should be indicated in the Agreement and the Agreement should be signed by such individual. If signed by other than CONTRACTOR, there should be attached to the Agreement a duly authenticated power of attorney evidencing the signer's authority to execute such Agreement for and on behalf of CONTRACTOR.

If CONTRACTOR is operating as a limited liability company, and it is member-managed, each member should sign the Agreement, or an authorized member should sign. If the LLC is manager-managed, an authorized manager should sign. If the Agreement is not signed by each member, there should be attached to the Agreement a duly authenticated power of attorney evidencing the signer's (signers') authority to sign such Agreement for and on behalf of the LLC.

COPY OF BID SET

If CONTRACTOR is a corporation, the Secretary of the corporation should sign the certificate below. If the Agreement itself is signed by the Secretary of the corporation, the certificate below should be executed by some other officer of the corporation, under the corporate seal. In lieu of the following certificate, there may be attached to the Agreement copies of so much of the records of the corporation which will show the official character and authority of the officers signing, duly certified by the Secretary or Assistant Secretary under the corporate seal to be true copies.

I, _____, certify that I am the _____
(Print Name) *(Title of Officer Signing Certificate)*

of the corporation named as CONTRACTOR herein above; that _____,
(Print Name of Officer Signing Agreement)

who signed the foregoing Agreement on behalf of CONTRACTOR was then
_____ of said corporation; that said Agreement was duly signed
(Title of Officer Signing Agreement)

for and on behalf of said Corporation by authority of its governing body, and is within the scope of its corporate powers.

(Corporate Seal)

END OF SECTION

COPY OF BID SET

SECTION 00550

NOTICE TO PROCEED

Dated _____

TO: _____
(CONTRACTOR)

ADDRESS: _____

PROJECT: _____

OWNER'S CONTRACT NO. _____

CONTRACT FOR _____

(Insert name of Contract as it appears in the Bidding Documents)

You are notified that the Contract Time under the above Contract will commence to run on _____, _____. On or before that date, you are to start performing your obligations under the Contract Documents.

Before you may start any work at the site, Paragraph 2.01.B of the General Conditions provides that you must deliver to OWNER (with copies to ENGINEER and other identified additional insureds) certificates of insurance, copies of endorsements, and other evidence of insurance which you are required to purchase and maintain in accordance with the Contract Documents.

Also before you may start any work at the site, you must _____

(Add Other Requirements)

(OWNER)

By: _____
(Authorized Signature)

(Title)

END OF SECTION

COPY OF BID SET

SECTION 00551

EROSION CONTROL CERTIFICATION

Dated _____

TO OWNER: _____

ADDRESS: _____

PROJECT: _____

OWNER'S CONTRACT NO. _____

CONTRACT FOR _____

I certify under penalty of law that I understand the terms and conditions of the General National Pollutant Discharge Elimination System (NPDES) Permit that authorizes the stormwater discharges associated with industrial activities from the construction site and as may be detailed in the Contract Documents.

I agree to indemnify and hold OWNER harmless from any claims, demands, suits, causes of action, settlements, fines, or judgments and the costs of litigation, including, but not limited to, reasonable attorneys fees and costs of investigation and arising from a condition, obligation, or requirement assumed or to be performed by CONTRACTOR for storm water pollution and erosion control.

Fines and other costs incurred against OWNER for CONTRACTOR's failure to provide the required erosion control practices will be paid by CONTRACTOR.

(CONTRACTOR)

By: _____
(Authorized Signature)

(Title)

END OF SECTION

COPY OF BID SET

SECTION 00600

PERFORMANCE BOND

CONTRACTOR (Name and Address):

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

OWNER (Name and Address):

CONSTRUCTION CONTRACT

Effective Date of Agreement: _____

Amount: _____

Description (Name and Location): _____

BOND

Bond Number: _____

Date (Not earlier than Effective Date of Agreement of the Construction Contract): _____

Amount: _____

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

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

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

COPY OF BID SET

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:
 - 3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
 - 3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
 - 3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.
4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:
 - 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;
 - 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;
 - 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or
 - 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:
 - 5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
 - 5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

COPY OF BID SET

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

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

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

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

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

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

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

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

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

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

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

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

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

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

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

COPY OF BID SET

SECTION 00600

PAYMENT BOND

CONTRACTOR (Name and Address):

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

OWNER (Name and Address):

CONSTRUCTION CONTRACT

Effective Date of Agreement: _____

Amount: _____

Description (Name and Location): _____

BOND

Bond Number: _____

Date (Not earlier than Effective Date of Agreement of the Construction Contract): _____

Amount: _____

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

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

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

COPY OF BID SET

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
 - 5.1 Claimants who do not have a direct contract with the Contractor,
 - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2 Pay or arrange for payment of any undisputed amounts.
 - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

COPY OF BID SET

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. Definitions
 - 16.1 Claim: A written statement by the Claimant including at a minimum:
 1. The name of the Claimant;
 2. The name of the person for whom the labor was done, or materials or equipment furnished;
 3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 4. A brief description of the labor, materials, or equipment furnished;
 5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 7. The total amount of previous payments received by the Claimant; and
 8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
 - 16.2 Claimant: An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
 - 16.3 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
 - 16.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 16.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

END OF SECTION

COPY OF BID SET

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

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

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ACEC

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These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

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

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

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

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

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12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
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. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

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27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

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40. *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.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, 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.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

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addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

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

D. *Defective:*

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

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

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

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

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

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

2.02 *Copies of Documents*

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

2.03 *Commencement of Contract Times; Notice to Proceed*

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

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2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

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

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on

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Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 Intent

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

3.02 Reference Standards

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

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3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

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

B. *Resolving Discrepancies:*

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

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

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1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

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

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

4.01 *Availability of Lands*

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

4.02 *Subsurface and Physical Conditions*

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

- 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
- 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

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

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

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4.03 *Differing Subsurface or Physical Conditions*

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

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

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

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

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor’s cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and

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contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the

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

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

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

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

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

5.02 *Licensed Sureties and Insurers*

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

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

5.04 *Contractor's Insurance*

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

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

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

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members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.
- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

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1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

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

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

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

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interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

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

6.02 *Labor; Working Hours*

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

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

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- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. "*Or-Equal*" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

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- 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service.
- b. Contractor certifies that, if approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
2. *Substitute Items:*
- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
 - b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
 - c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
 - d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

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

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be

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required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- 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 a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner,

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

6.07 *Patent Fees and Royalties*

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

6.08 *Permits*

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

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6.09 *Laws and Regulations*

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

6.10 *Taxes*

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

6.11 *Use of Site and Other Areas*

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

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

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by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

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

6.12 *Record Documents*

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

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, 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

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shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

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

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required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

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

1. *Shop Drawings:*

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

2. *Samples:*

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

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

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

- a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
- b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
- c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

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2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

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

E. *Resubmittal Procedures:*

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

6.18 *Continuing the Work*

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

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6.19 *Contractor's General Warranty and Guarantee*

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

6.20 *Indemnification*

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

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- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

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

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- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

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

7.02 *Coordination*

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

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- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

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

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

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

8.03 *Furnish Data*

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

8.04 *Pay When Due*

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

8.05 *Lands and Easements; Reports and Tests*

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

8.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

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8.07 *Change Orders*

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

8.08 *Inspections, Tests, and Approvals*

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

8.09 *Limitations on Owner's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

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

8.11 *Evidence of Financial Arrangements*

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

8.12 *Compliance with Safety Program*

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

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

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

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or

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continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

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

9.03 *Project Representative*

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

9.04 *Authorized Variations in Work*

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

9.05 *Rejecting Defective Work*

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

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9.06 *Shop Drawings, Change Orders and Payments*

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

9.07 *Determinations for Unit Price Work*

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

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

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

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not

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exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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

9.10 *Compliance with Safety Program*

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

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- 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.

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10.02 *Unauthorized Changes in the Work*

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

10.03 *Execution of Change Orders*

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

10.04 *Notification to Surety*

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

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data

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shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

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

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

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

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1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of

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said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 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, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not

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limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
 1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance:*
 1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to

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the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

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

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

12.01 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (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).

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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 Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

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

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or

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neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

13.01 Notice of Defects

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

13.02 Access to Work

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

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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 Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

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.

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- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

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

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

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

13.08 *Acceptance of Defective Work*

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

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13.09 *Owner May Correct Defective Work*

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

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

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

14.02 *Progress Payments*

A. *Applications for Payments:*

- 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an

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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 of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or

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involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

- b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

1. Ten 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.

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D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

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

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before

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final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

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

14.06 *Final Inspection*

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

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

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

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying

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

C. *Payment Becomes Due:*

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

14.08 *Final Completion Delayed*

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

14.09 *Waiver of Claims*

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

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ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

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

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when

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so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days

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to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

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

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

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1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

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

17.03 *Cumulative Remedies*

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

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

17.06 *Headings*

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

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SECTION 00800

SUPPLEMENTARY CONDITIONS

A. These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract EJCDC C-700 (2007 Edition) 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.

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

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SC-1.01.A Defined Terms

Insert in the first sentence after the phrase “printed with initial capital letters” the following phrase:

“or with all capital letters”

SC-1.01.A.17 Drawings

The following Drawings are part of the Contract Documents:

Drawings titled “Nolin River Watershed Sewer Infrastructure, Contracts 1-2017, 2-2017, 3-2017, and 4-2017, Hardin County Water District No. 2,” Sheets No. 1 through No. 112, prepared by Strand Associates, Inc.® and Drawings listed in the table of contents that are bound at the back of these Specifications.

Electronic files were provided for the convenience of CONTRACTOR. The data on which CONTRACTOR may rely is limited to the paper copy.

SC-1.01.A.51 Work Change Directive

Amend the phrase “and signed by OWNER” in the first sentence of Paragraph 1.01.A.51 to read as follows:

“and signed by OWNER and CONTRACTOR.”

SC-1.01.A.52 Request for Information

Add the following new paragraph immediately after Paragraph 1.01.A.51:

52. Request for Information:

Written request submitted by CONTRACTOR to ENGINEER on a form supplied by ENGINEER requesting clarification, interpretation, or additional information pertaining to Contract Documents.

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SC-2.01 Delivery of Bonds and Evidence of Insurance

Delete Paragraph 2.01.A of the General Conditions in its entirety and insert the following in its place:

A. When CONTRACTOR delivers the executed counterparts of the Agreement to OWNER, CONTRACTOR shall also deliver to OWNER such bonds, insurance certificates, insurance endorsements, and other documents as CONTRACTOR may be required to furnish.

Delete Paragraph 2.01.B in its entirety and insert the following in its place:

B. Evidence of Insurance: Before OWNER's execution of the Contract, CONTRACTOR shall deliver to OWNER, with copies to each additional insured or loss payee identified in the Supplementary Conditions, OWNER-approved copies of certificates of insurance, copies of endorsements, and other evidence of insurance which either of them or any additional insured or loss payee may reasonably request, which CONTRACTOR is required to purchase and maintain in accordance with Paragraphs 5.04 and 5.06.

SC-2.02 Copies of Documents

Delete the first sentence of Paragraph 2.02.A in its entirety and insert the following in its place:

OWNER shall furnish to CONTRACTOR up to 3 printed or hard copies of the Drawings and Project Manual.

SC-2.03 Commencement of Contract Times; Notice to Proceed

In the last sentence of Paragraph 2.03.A, change "sixtieth day" to "eighty-fifth day."

SC-2.05 Before Starting Construction

Add the following subparagraph to Paragraph 2.05.A:

4. a proposed listing of subcontractors and major material and equipment suppliers. The list shall include any proposed substitutions in accordance with Paragraph 6.05.

SC-2.05, 2.06, 2.07 Schedules and Conferences

Add the following language to the end of Paragraph 2.05.A.3:

For Contracts 2-2017, 3-2017, and 4-2017, the Bid will be considered the Schedule of Values of the Work required by the General Conditions.

SC-2.07 Initial Acceptance of Schedules

Add the following language to the end of Paragraph 2.07.A.2:

The schedule for shop drawings shall show all submittals complete before 25% of completion of the Work and the schedule for maintenance manuals shall show all submittals complete before 50% of completion of the Work.

SC-3.03 Reporting Discrepancies

Add the following new paragraphs immediately after Paragraph 3.03.A.3:

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4. CONTRACTOR shall report apparent discrepancies to ENGINEER using a Request for Information form on a form supplied by ENGINEER. The Request for Information form shall:

- a. be submitted by CONTRACTOR only;
- b. be legible and complete;
- c. not be used for the purposes of only confirming or verifying issues; and,
- d. be prioritized by CONTRACTOR in the event that multiple Requests for Information are outstanding.

Requests for Information that are not in conformance with the requirements above shall be returned to CONTRACTOR without response.

5. CONTRACTOR shall not be relieved of its responsibility to coordinate the Work to prevent adverse impacts to CONTRACTOR's Project Schedule while submitting Requests for Information.

6. If CONTRACTOR believes the Scope of Work included in the Request for Information has a cost and/or time impact, CONTRACTOR should submit a claim in accordance with Article 12 of these General Conditions.

7. If CONTRACTOR proceeds with work when CONTRACTOR had actual knowledge or should have known that a conflict, error, ambiguity, or discrepancy existed as indicated above, correction of work constructed without such notification to ENGINEER shall be at CONTRACTOR's expense, (except in an emergency as authorized by Paragraph 6.16.A).

SC-4.02 Subsurface and Physical Conditions

Add the following new paragraph(s) immediately after Paragraph 4.02.B:

C. The following reports of explorations and tests of subsurface conditions at or contiguous to the Site are known to OWNER:

1. Report dated August 2014, prepared by American Engineers, Inc., of Glasgow, Kentucky, titled: Report of Geotechnical Exploration, for Hardin County Water District No. 2, consisting of 67 pages.

The technical data in the above report(s), upon which the CONTRACTOR may rely, consists of boring methods, level of subsurface water, boring logs, laboratory test methods and results, and boring locations all as of the date made.

ENGINEER accepts no responsibility for accuracy of the soil data or water level information. Soil information, included with these Contract Documents, was not obtained for the purposes of designing excavations and trenches. Soil information was used by ENGINEER for design purposes only. CONTRACTOR shall assure itself by personal examination as to subsurface conditions and shall provide its own investigations and make its own assumptions to comply with OSHA and any other applicable laws and regulations regarding excavation and trenching requirements.

D. The reports identified above are not part of the Contract Documents, but the "technical data" contained therein upon which CONTRACTOR may rely, as expressly identified and established above, are incorporated in the Contract Documents by reference. CONTRACTOR is not entitled to rely upon any other information and data known to or identified by OWNER or ENGINEER.

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E. *Drawings*: No drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to OWNER. CONTRACTOR shall conduct its own personal investigation to determine conditions at the site which may affect the Work.

SC-4.04 Underground Facilities

Add the following new paragraph immediately after Paragraph 4.04.B:

C. CONTRACTOR is referred to the General Requirements for requirements for keeping records of Underground Facilities and allowing facility owners to inspect.

SC-4.05 Reference Points

Add the following new paragraph immediately after Paragraph 4.05.A:

B. CONTRACTOR is referred to the General Requirements for additional requirements for laying out the work.

SC-4.06.A Hazardous Environmental Conditions

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

A. No reports or drawings related to Hazardous Environmental Conditions are known to OWNER.

B. Not Used.

SC-5.01 Performance and Payment Bonds

Add the following new paragraphs immediately after Paragraph 5.01.C:

D. The forms of the performance and payment Bonds attached hereto shall be used for the Contract. Note instructions thereon as to the form applicable. Each form contemplates one corporate surety only. In case co-sureties or individual sureties will be furnished, proper forms therefore shall be obtained. Besides the stipulations of Paragraphs 5.01 through 5.03, the surety on the Bonds shall provide a certificate indicating surety is licensed to underwrite contracts in the jurisdiction of the project location which shall be attached to the Bonds.

E. Every Bond must run to OWNER.

F. If the principal is an individual, his/her full name and residence shall be inserted in the body thereof, and he/she shall sign the Bonds with his/her usual signature on the line opposite the scroll seal. If the principals are partners, their individual names shall appear in the body of the Bonds, with the recital that they are partners comprising a firm, naming it, and all the members of the firm shall execute the Bonds as individuals.

G. The signature of a witness shall appear in the appropriate places, attesting the signatures of each individual party to the Bonds.

H. If the principal is a corporation, the name of the state in which incorporated shall be inserted in the appropriate place in the body of the Bonds, and said instrument shall be executed and attested under the corporate seal as indicated on the form. If the corporation has no seal, the fact shall be stated, in which case a scroll or adhesive seal shall appear following the corporate name. This also applies to execution by surety.

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I. The date of the Bonds must not be prior to the date of the Contract for which given.

J. The bond shall be signed by an individual authorized to sign on behalf of the surety and a power of attorney, authorizing the execution of the Bonds by an attorney-in-fact, or agent of the surety, shall be attached to one executed counterpart of the Bonds.

SC-5.02 Licensed Sureties and Insurers

Add the following new paragraph immediately after Paragraph 5.02.A:

B. CONTRACTOR's insurance shall be by insurers authorized to do business in the Commonwealth of Kentucky and have a current A.M. Best Rating of A- VII or better, unless otherwise approved by OWNER. Documentation that the insurance provider meets this criterion must be included with the Insurance Certificate. CONTRACTOR shall not be self-insured for any coverage required of this Contract, without prior approval of OWNER.

SC-5.04 CONTRACTOR's Liability Insurance

Add the following new paragraphs immediately after Paragraph 5.04.B:

C. The limits of liability for the insurance required by Paragraph 5.04 shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations. The types of insurance and the limits of liability indicated are the minimum required. Neither OWNER nor ENGINEER warrant the adequacy of the types of insurance or the limits of liability required. Any policy exclusions shall be indicated on the insurance certificate. CONTRACTOR shall provide verification of all coverages with or on the insurance certificate.

A.2: 1. Workers' Compensation, and related coverages under Paragraphs 5.04.A.1 and

a. State: Statutory

b. Applicable Federal (e.g., Longshoreman's): Statutory

c. Employer's Liability:

Bodily Injury by Accident:

Each Accident \$ 1,000,000

Bodily Injury by Disease:

Each Employee \$ 1,000,000

Policy Limit \$ 2,000,000

2. CONTRACTOR's General Liability under Paragraphs 5.04.A.3 through A.6 which shall be written on a commercial general liability form and which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of CONTRACTOR:

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a. Policy Limits:

- | | |
|---|--------------|
| 1) Each Occurrence Limit
(Bodily Injury and Property Damage) | \$ 1,000,000 |
| 2) Medical Expense Limit
(Any One Person) | \$ 5,000 |
| 3) Personal and Advertising Injury Limit
(Per Person/Organization) | \$ 1,000,000 |
| 4) General Aggregate Limit
(other than P-CO) | \$ 2,000,000 |
| 5) Products–Completed Operations
Aggregate Limit | \$ 2,000,000 |

b. Policy shall include as a minimum the following coverages:

- 1) Broad Form Property Damage Coverage.
- 2) An elimination of the exclusions with respect to property under the care, custody, or control of CONTRACTOR. In lieu of elimination of the exclusion, CONTRACTOR may provide Builder's Risk or Installation Floater coverage for property under the care, custody, or control of CONTRACTOR.
- 3) Explosion, Collapse, and Underground coverages where applicable under Property Damage Liability Insurance.
- 4) Contractual Liability Coverage.
- 5) Independent Contractor Coverage.
- 6) General Aggregate Limits specified above shall apply separately to this project by attachment of:

"Amendment of Limits of Insurance–Designated Location(s) General Aggregate Limit Endorsement (ISO Form No. CG 25040509) or "Designated Construction Project(s) General Aggregate Limit" Endorsement (ISO Form CG 25030509) or equivalent endorsement coverage.

3. Commercial Automobile Liability under Paragraph 5.04.A.6:

a. Policy Limits:

Bodily Injury:

- | | |
|---------------|--------------|
| Each Person | \$ 1,000,000 |
| Each Accident | \$ 1,000,000 |

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Property Damage:

- | | |
|---|--------------|
| Each Accident
or | \$ 1,000,000 |
| b. Combined Single Limit
(Bodily Injury and Property Damage) | \$ 1,000,000 |

c. Policy shall include contractual liability coverage and coverage on all owned, leased, nonowned and hired vehicles.

4. Umbrella Coverage:

a. Umbrella policy (pay on behalf form) with limits of \$1,000,000 for bodily injury, personal injury and property damage on a combined basis shall be provided with the stated underlying limits of Paragraphs 5.04.C.1, 5.04.C.2, and 5.04.C.3.

b. Policy shall include OWNER, ENGINEER, and any others required by Paragraph 5.04.B.1 as additional insureds.

5. Railroad Protective Liability Policy:

a. CONTRACTOR for Contract 3-2017 shall provide a Railroad Protective Liability Policy for bodily injury, property damage liability, and physical damage to property liability, per limits, duration, and conditions noted in the documents provided by the Railroad bound at the end of Division 1.

D. Regardless whether or not an Owners' and Contractors' Protective (OCP) policy or Project Management Protective Liability (PMPL) policy is furnished, insurance certificates for commercial general, automobile, umbrella, and builders risk shall specifically indicate by name the additional insureds which are to include OWNER and ENGINEER as well as other persons or entities so identified. Certificates shall be Acord 25-S or equivalent.

E. Additional Insured Endorsements/OCP policy/PMPL policy

1. CONTRACTOR shall purchase and maintain liability insurance, as described above, specifically naming as additional insureds OWNER and ENGINEER as well as other individuals or entities so identified (see the Supplementary Conditions), using Additional Insurance Endorsement Form CG 20 26 07 04, CG 81 11 05 06, CG 20 10 07 04, or equivalent form. General liability policies shall also be endorsed with Form CG 20 37 07 04 to include the "products-completed operations coverage."

2. As an alternative to providing Form CG 20 26 07 04, CG 81 11 05 06, or CG 20 10 07 04, CONTRACTOR may furnish to OWNER an OCP policy or a PMPL policy with OWNER as the named insured and ENGINEER as either an additional insured or a named insured. OCP policy or PMPL policy shall provide for bodily injury and property damage coverage equal to the sum of: the general aggregate limit for commercial general liability plus the amount specified for the umbrella coverage. OCP policy or PMPL policy shall provide coverage arising out of:

- i. operations performed by CONTRACTOR at the project location.
- ii. acts or omissions in connection with the general supervision, inspection and/or coordination of such operations.

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If an OCP or PMPL policy is provided, CONTRACTOR shall provide originals of the Final OCP or PMPL to all insured and additional insured parties.

F. Endorsements, OCP policy, PMPL policy, or General Liability policy shall not exclude supervisory or inspection services.

CONTRACTOR shall also provide an Additional Insured Endorsement for the automobile policy. Endorsement form shall be CA 20 48, or equal.

G. The specimen Insurance Certificate bound at the end of this section has been prepared as a guide to assist CONTRACTOR and CONTRACTOR's Insurance Agent when preparing the insurance submittal. This specimen certificate is included as a representation of what acceptable documents will look like. Specific project information must be included when preparing the actual document.

SC-5.04.B Additional Insureds Coverage

5.04.B.1 Additional Insureds

Delete from the first sentence of Paragraph 5.04 B.1 of the General Conditions, the phrase "(subject to any customary exclusion regarding professional liability)."

Revise the last phrase in Paragraph 5.04.B.1 to read "and the insurance afforded to these additional insureds shall provide primary and noncontributory coverage for all claims covered thereby;"

Add the following language at the end of Paragraph 5.04.B.1:

Policies of insurance shall also include CSX Railroad as additional insured under the provisions of Paragraphs 5.04.A.3 through 5.04.A.6.

5.04.B.4 Insurance Policies

Delete the phrase "materially changed" and insert the following in its place:

"materially changed with respect to coverage on the Project."

5.04.B.6 Products and Completed Operations Insurance

Amend in Paragraph 5.04.B.6 the phrase "completed operations coverage" to read "products and completed operations coverage."

Amend in Paragraph 5.04.B.6 the phrase "two years after final payment" to "three years after final payment."

SC-5.06.A CONTRACTOR's Installation Floater Insurance

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

A. CONTRACTOR shall purchase Installation Floater Insurance of the "all risk" type in the amount of the total value of the materials and equipment supplied under the Contract which will also include the interests of OWNER, Subcontractors, ENGINEER, 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 loss payee. Insurance certificate shall specifically indicate by name the loss payees which are to include OWNER, ENGINEER, and Subcontractors as well as other individuals or entities so identified. The materials and equipment shall be insured from the time CONTRACTOR takes possession of them until they are installed and tested by CONTRACTOR and the Project is

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accepted as complete by OWNER. The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with Paragraph 5.06.A shall comply with the requirements of Paragraph 5.06.C.

Policy shall also include CSX Railroad as loss payee under the provisions of Paragraph 5.06.A.

SC-5.06.B Equipment Breakdown and Additional Property Insurance

Delete Paragraph 5.06.B in its entirety.

SC-5.06.D Deductible Provisions

Delete the first sentence of Paragraph 5.06.D and insert the following in its place:

CONTRACTOR shall pay all deductible provisions of insurances. The maximum deductible shall be \$5,000.

SC-5.06.E Policies of Insurance

Delete Paragraph 5.06.E in its entirety.

SC-6.02 and 6.03 Labor, Working Hours, Services, Materials, and Equipment

Add the following new paragraph immediately after Paragraph 6.02.B:

- C. See the General Requirements for special requirements concerning scheduling.

SC-6.03.B Materials and Equipment Warranty

Add the following to the end of Paragraph 6.03.B:

Suppliers shall be deemed to impliedly warrant that their products and all component materials incorporated into them are suitable and fit for the intended use of such products and shall be free from defect in material, workmanship or design, such warranty to run to the benefit of OWNER and ENGINEER. The foregoing applies whether the products or their component materials are specified in the Contract Documents or are of Supplier's design.

SC-6.06 Concerning Subcontractors, Suppliers and Others

Add the following new paragraph immediately after Paragraph 6.06.G:

H. OWNER or ENGINEER may furnish to any Subcontractor or Supplier to the extent practicable, information about amounts paid to CONTRACTOR on account of Work performed for CONTRACTOR by a particular Subcontractor or Supplier.

SC-6.08 Permits

Delete last sentence of Paragraph 6.08.A and add the following in its place:

See General Requirements and technical specification sections for utility charge provisions.

Add Paragraph 6.08.B as follows:

- B. See General Requirements for additional permit information.

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SC-6.09 Laws and Regulations

Kickback Statutes—CONTRACTOR shall comply with the requirements of KRS 45A.455 with respect to gratuities and kickbacks among other matters.

Campaign Finance Disclosure—CONTRACTOR shall comply with requirements of KRS 45A.395 with respect to campaign finance laws.

Labor Law Disclosures—CONTRACTOR shall comply with requirements of KRS 45A.343 with respect to labor law disclosure.

Payment Bond for Wages Due—CONTRACTOR, whether a corporation, partnership, or individual, who have not been doing business in the State of Kentucky for 5 consecutive years, shall comply with KRS 337.200 which requires a Performance Bond to assure payment of wages.

SC-6.10 Taxes

Fees and Licenses—CONTRACTOR for Contract 2-2017 shall comply with City of Elizabethtown ordinances relating to Occupational License Fees, Business Licenses, payroll, and net profits, taxes and any other ordinances which may apply to the Work. Applies to Contract 2-2017 for work within the City of Elizabethtown.

CONTRACTOR for Contract 2-2017 shall have City of Elizabethtown business license prior to conducting work in the City.

SC-6.12 Record Documents

In Paragraph 6.12.A. delete last sentence and insert the following:

Upon completion of the Work, these record documents, samples, and shop drawings shall be delivered by CONTRACTOR to OWNER.

SC-6.13 Safety and Protection

Add the following new paragraph immediately after Paragraph 6.13.F:

G. The following OWNER safety programs are applicable to the Work: Hardin County Water District No. 2 Safety Program, latest edition. This safety program will be available for review at the prebid conference.

SC-6.14 Competent Person

Add the following new paragraph at the end of Paragraph 6.14.A:

B. CONTRACTOR shall keep at the Site at all times during the progress of the Work a competent person to comply with OSHA trenching and excavation requirements. The competent person shall be one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

SC-6.17 Shop Drawings

Add the following new paragraphs immediately after Paragraph 6.17.E:

F. CONTRACTOR shall furnish required submittals with sufficient information and accuracy

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in order to obtain required approval of an item with no more than three submittals. ENGINEER will record ENGINEER's time for reviewing subsequent submittals of Shop Drawings, samples or other items requiring approval and CONTRACTOR shall reimburse OWNER for ENGINEER's charges for such time.

G. In the event that CONTRACTOR requests a substitution for a previously approved item, CONTRACTOR shall reimburse OWNER for ENGINEER's charges for its review time unless the need for such change is beyond the control of CONTRACTOR.

SC-6.20 Indemnification

Add the following to the end of Paragraph 6.20.A:

In addition, CONTRACTOR shall indemnify, hold harmless, and pay for the defense of OWNER and ENGINEER from and against claims, losses, or damages in regard to any act or failure to act by OWNER or ENGINEER in connection with general supervision, inspection and/or coordination of CONTRACTOR's operations.

CONTRACTOR shall, at its own expense, appear, defend, and pay all fees of attorneys and all costs and other expenses arising therefrom or incurred in connection therewith; and, if any judgments shall be rendered against any individual or entity indemnified hereunder in any such action, CONTRACTOR shall, at its own expense, satisfy and discharge same. CONTRACTOR expressly understands and agrees that any Letter of Credit or insurance protection required by the Contract, or otherwise provided by CONTRACTOR, shall in no way limit the responsibility to indemnify, keep and, save harmless, and defend any individual or entity indemnified hereunder as herein provided.

Delete Paragraph 6.20.C.1 and 6.20.C.2. Insert new Paragraphs 6.20.C.1 and D:

1. the preparation of Drawings, Specifications, or Property Surveys.

D. For any matter for which OWNER and ENGINEER are indemnified under Paragraph 6.20.A, CONTRACTOR shall pay for OWNER's and ENGINEER's reasonable defense, 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 or awards until OWNER and ENGINEER are found negligent. If OWNER or ENGINEER are found negligent, OWNER or ENGINEER shall reimburse CONTRACTOR for the prorata extent of OWNER's or ENGINEER's negligence for the cost of OWNER's or ENGINEER's reasonable defense.

SC-6.21 Delegation of Professional Design Services

Add the following immediately after Paragraph 6.21.E:

F. The design professional providing the design calculations and design drawings shall be licensed in the State of the Project.

G. The design calculation and design drawings are not shop drawings, but shall be submitted to ENGINEER separately along with the required shop drawings for the system, material, or equipment specified. These calculations will be forwarded to OWNER for their records.

SC-7.01 Related Work at Site

CONTRACTOR(s) shall coordinate their work with the other CONTRACTOR(s). See paragraph SC-7.02.

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SC-7.02 Coordination

CONTRACTOR and its Subcontractors shall cooperate and coordinate their work with adjacent work and shall give due notice to other contractors and subcontractors of intersecting work to assure that all items are installed at an agreeable time and to facilitate general progress of the Work. CONTRACTOR for Contract 1-2017 shall coordinate all work by all contractors on the Project.

CONTRACTOR for Contract 1-2017 shall review the Contract times for all contracts, and shall cooperate as required for all contractors to meet their respective Contract times.

SC-7.04 Claims Between Contractors

Add the following new paragraphs immediately after Paragraph GC-7.03:

A. Should CONTRACTOR cause damage to the work or property of any other contractor at the Site, or should any claim arising out of CONTRACTOR's performance of the Work at the Site be made by any other contractor against CONTRACTOR, OWNER, ENGINEER, or the construction coordinator, then CONTRACTOR (without involving OWNER, ENGINEER, or construction coordinator) shall either (1) remedy the damage, (2) agree to compensate the other contractor for remedy of the damage, or (3) remedy the damage and attempt to settle with such other contractor by agreement, or otherwise resolve the dispute by arbitration or at law.

B. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless OWNER, ENGINEER, the construction coordinator 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, fees and charges of engineers, architects, attorneys, and other professionals and court and arbitration costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any other contractor against OWNER, ENGINEER, or the construction coordinator to the extent said claim is based on or arises out of CONTRACTOR's performance of the Work. Should another contractor cause damage to the Work or property of CONTRACTOR or should the performance of work by any other contractor at the Site give rise to any other Claim, CONTRACTOR shall not institute any action, legal or equitable, against OWNER, ENGINEER, consultants, or the construction coordinator or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from OWNER, ENGINEER, or the construction coordinator on account of any such damage or Claim.

C. If CONTRACTOR is delayed at any time in performing or furnishing Work by any act or neglect of another contractor, and OWNER and CONTRACTOR are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, CONTRACTOR may make a Claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be CONTRACTOR's exclusive remedy with respect to OWNER, ENGINEER, and construction coordinator for any delay, disruption, interference, or hindrance caused by any other contractor. This paragraph does not prevent recovery from OWNER, ENGINEER, or construction coordinator for activities that are their respective responsibilities.

SC-9.03 Resident Project Representative

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

B. The duties and responsibilities of the resident project representative include the following:

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1. Review schedules as required in Paragraph 2.05.A and amendment thereto.
2. Attend conferences and meetings with CONTRACTOR.
3. Serve as liaison between ENGINEER and CONTRACTOR and help ENGINEER serve as liaison between OWNER and CONTRACTOR.
4. Conduct on-site observation of the work.
5. Observe tests, equipment, and system startups.
6. Report to ENGINEER when clarifications and interpretations of the Contract Documents are needed. Consider, evaluate, and report to ENGINEER, CONTRACTOR's requests for modification.
7. Maintain orderly records, keep a daily log (when on a part-time basis, keep log for days visiting site), and furnish periodic reports to ENGINEER of the progress of the Work.
8. Before project completion, prepare final list of items to be completed or corrected and make recommendations to ENGINEER concerning acceptance of the Work.

The resident project representatives shall not:

1. Authorize any deviation from the Contract Documents or substitutions of materials or equipment.
2. Exceed limitations of ENGINEER's authority as set forth in the Contract Documents.
3. Undertake any of the responsibilities of CONTRACTOR, Subcontractor, Suppliers, or CONTRACTOR's superintendent.
4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences, or procedures of construction.
5. Advise on, issue directions regarding, or assume control over safety precautions and programs in connection with the Work.
6. Accept shop drawing or sample submittals from anyone other than CONTRACTOR.
7. Authorize OWNER to occupy the Project in whole or in part.
8. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by ENGINEER.

SC-10.04 Notification to Surety

Add the following language at the end of Paragraph 10.04.A:

CONTRACTOR shall be responsible for notifying the surety of any assignment, modification or change of the Contract, change in the work covered thereby, or extension of time for the completion of the project.

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Failure to provide notice to the surety of any such change shall not exonerate the surety from its obligations under the bond.

SC-11.03 Unit Price Work

Delete Paragraph 11.03.D in its entirety and insert the following in its place:

D. The unit price of an item of Unit Price Work included in Contracts 2-2017, 3-2017, or 4-2017 shall be subject to reevaluation and adjustment under the following conditions:

1. If the Bid price of a particular item of Unit Price Work amounts to 15% or more of the Contract Price and the variation in the quantity of that particular item of Unit Price Work performed by CONTRACTOR differs by more than 25% from the estimated quantity of such item indicated in the Agreement; and
2. If there is no corresponding adjustment with respect to any other item of Work; and
3. If CONTRACTOR believes that it has incurred additional expense as a result thereof; or
4. If OWNER believes that the quantity variation entitles it to an adjustment in the unit price,

either OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with Article 10 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

SC-12.01 Change of Contract Price

Clarification of Paragraph B.2: The overhead and profit allowance for lump sum work shall be in accordance with Paragraph 12.01.C.2 unless OWNER and CONTRACTOR agree that these allowances are not appropriate for the Work involved.

SC-13.02 Access To Work

Add the following paragraph after Paragraph 13.02.A.

B. Representatives of the Kentucky Department of Water (KDOW), Kentucky Heritage Council, Army Corps of Engineers, or any of their duly authorized representatives shall have full access to and the right to examine any pertinent books, documents, papers and records of CONTRACTOR involving transactions related to the project.

SC-13.03.A Tests and Inspections

Add the following to the beginning of Paragraph 13.03.A:

All Work is subject to testing to indicate compliance with Contract Document requirements. Duplicate copies of test results of all tests required shall be submitted to ENGINEER. Tests and inspection of work may be conducted by OWNER or an independent laboratory employed by OWNER. Tests may also be performed in the field by ENGINEER as a basis for acceptance of the Work.

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Add the following to the end of Paragraph 13.03.A:

Samples required for testing shall be furnished by CONTRACTOR at no cost to OWNER. In the event that completed Work does not conform to specification requirements during the initial test, the Work shall be corrected and retested for conformance. The entire cost of retesting completed Work shall be borne by CONTRACTOR. This shall include the extra cost for inspection to OWNER which will be deducted from the final amount due CONTRACTOR.

SC-13.07.A Correction Period

Delete in Paragraph 13.07.A the phrase "If within one year after the date of Substantial Completion" and insert in its place the following:

"If within one year of the date of final payment or from the date established by ENGINEER that the Work or portion thereof began operating or was used in a continuous, satisfactory manner for its intended purpose, whichever is earlier,"

SC-14.02.A Applications for Progress Payment

Add the following paragraph after Paragraph 14.02.A.3:

4. CONTRACTOR shall submit with each pay request CONTRACTOR's partial waiver of lien for the full amount of the requested payment. Beginning with the second pay request, and with each succeeding pay request, CONTRACTOR shall submit partial waivers of lien for each Subcontractor and Supplier showing that the amount paid to date to each is at least equivalent to the total value of Subcontractor's or Supplier's work, less retainage, included on the previous pay request. CONTRACTOR shall submit with each pay request a signed Waiver of Lien Log clearly documenting the following:

- a. The names of all Subcontractors/Suppliers on the project.
- b. Contract amounts for each Subcontractor/Supplier.
- c. Amount paid to date to each Subcontractor/Supplier.
- d. Lien waivers provided with current pay application for previous month's payments.
- e. Amount to be paid to each Subcontractor/Supplier included in the pending pay request.
- f. Remaining balance for each Subcontractor/Supplier.

5. CONTRACTOR shall submit one original and one copy on 8-1/2 by 11 paper of each lien waiver submitted.

6. CONTRACTOR shall submit five copies of each pay request for approval.

7. No advanced payment for shop drawing preparation will be made. Shop drawing costs will be paid when equipment and materials are delivered and suitably stored on the site.

COPY OF BID SET

8. All stored equipment and materials for which payment is requested shall have two copies of invoices included with the pay request. Equipment shall be identified thoroughly on the invoices, including serial numbers.

9. Payment for the stored equipment and material which are on the site shall not exceed the invoiced amount for each item, less the Contract retainage. The overhead and profit for the stored items shall not be invoiced until the item is installed.

10. Payment for off-site storage is normally reserved for sensitive or very large pieces of equipment that in ENGINEER's opinion would not be practical to have stored on the site. Payment for off-site stored items shall be limited to 75% of the invoiced value of the item, less Contract retainage. CONTRACTOR shall reimburse OWNER the cost of inspecting off-site stored items. When off-site storage is approved, CONTRACTOR shall provide Insurance Certificates and Document of Ownership to OWNER.

11. Payment for PLC and SCADA programming shall be limited to 75% of the invoiced time spent, less Contract retainage.

To allow this payment value, programming must be completed by area and system. CONTRACTOR must provide the following:

- a. Signed certification by an officer of CONTRACTOR and electrical subcontractor that work has been completed.
- b. Ladder diagram or function block dump with complete descriptive narrative in PDF format.
- c. Database cross reference report for graphics (if applicable).
- d. I/O partition list.
- e. Smart I/O (Devicenet, profibers, control net, Ethernet I/O, field bus, etc.) configuration report.
- f. Processor configuration report.
- g. Subroutine listing.

SC-14.05 Partial Utilization

Add the following new paragraph immediately after Paragraph 14.05.A.3, which is to read as follows:

4. OWNER may at any time request CONTRACTOR in writing to permit OWNER to take over operation of any part of the Work although it is not substantially complete. A copy of such request will be sent to ENGINEER, and within a reasonable time thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not object in writing to OWNER and ENGINEER that such part of the Work is not ready for separate operation by OWNER, ENGINEER will finalize the list of items to be completed or corrected and will deliver such lists to OWNER and CONTRACTOR together with a written recommendation as to the division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, utilities, insurance, warranties, and guarantees for that part of the Work which will become binding upon OWNER and CONTRACTOR at the time when OWNER takes over such operation (unless they shall have otherwise agreed in writing and so informed ENGINEER). During such operation and prior to Substantial Completion of such part

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of the Work, OWNER shall allow CONTRACTOR reasonable access to complete or correct items on said list and to complete other related Work.

Paragraph 14.05.A.4 shall be renumbered to 14.05.A.5.

SC-15.02 OWNER May Terminate for Cause

Replace Paragraph 15.02.B.3 with the following:

3. complete the Work as OWNER may deem expedient at the expense of CONTRACTOR and surety;

Add the following new paragraphs immediately after Paragraph 15.02.B.3:

4. apply the amounts retained from partial payments to the completion of the Work;
and

5. authorize the surety to complete the steps in Paragraphs 15.02.B.1 through 4 above.

SC-15.03 OWNER May Terminate for Convenience

Add the following paragraph after Paragraph 15.03.B:

C. CONTRACTOR shall require similar provisions contained in Paragraph 15.03 in each of its subcontracts to protect CONTRACTOR from claims by subcontractors arising from OWNER's termination for convenience, or to minimize claims by such subcontractors. The remedy provided to CONTRACTOR under this Paragraph 15.03 shall be CONTRACTOR's sole remedy in the event of termination for convenience by OWNER.

SC-16 Dispute Resolution

Delete Paragraph 16.01 and replace it with the following:

SC-16.01 Methods and Procedures

A. Subject to the provisions of Paragraph 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.

END OF SECTION

COPY OF BID SET

CONTRACTOR'S AFFIDAVIT AND WAIVER OF LIEN ACKNOWLEDGEMENT OF PAYMENT

_____, contractor, having a Contract with the _____, Client, on the _____ project, dated _____, _____, has performed work and/or furnished materials, equipment and/or machinery or has fabricated materials especially for the project, during the period from _____ to _____.

For and in consideration of \$ _____, being the total of payments hereby acknowledged; _____, contractor, certifies that the cost and expense for all Labor, payroll taxes, materials, equipment and/or machinery including but not limited to, all amounts owed to all subcontractors and providers of materials, incurred on or before _____, for the _____ project, have been paid in full.

_____, contractor, hereby certifies that with this payment all monies due said contractor have been paid in full to date.

_____, contractor, hereby waives and releases all rights to liens and claims against the Client and any surety for the payment of his contract from its inception through _____, and further states that no other person has any right to a lien or claim against the client the Client on account of work performed or for material, equipment, and/or machinery, or for materials especially fabricated for the project.

_____ (name), being _____ (title) of _____ (contractor) hereby acknowledges the foregoing in full and certifies that this is a true and accurate statement.

CONTRACTOR

BY: _____

TITLE: _____

STATE OF KENTUCKY _____ COUNTY

SUBSCRIBED, SWORN TO AND ACKNOWLEDGED before me by _____, of _____, on this the _____ day of _____, _____.

Notary Public

My Commission Expires: _____

COPY OF BID SET

SUBCONTRACTOR'S AFFIDAVIT AND WAIVER OF LIEN ACKNOWLEDGEMENT OF PAYMENT

_____, subcontractor, has performed work and/or furnished materials, equipment and/or, machinery or has fabricated materials especially for the _____ project, during the period from _____ to _____.

_____, subcontractor does hereby certify that it have been paid in full for all said materials, equipment or services.

For and in consideration of \$ _____, being the total amount due, _____, subcontractor, hereby releases and waives all rights to assert any claim or lien against the Client, and any surety. The undersigned further states that he or she knows of no other person, firm or corporation that has any right to any claim or lien against the Client due to work performed or material, equipment and/or machinery supplied concerning this project.

_____ (name), being _____ (title) of _____ (subcontractor) hereby acknowledges the _____ foregoing in full and certifies that this is a true and accurate statement.

SUBCONTRACTOR

BY: _____

TITLE: _____

STATE OF KENTUCKY
_____ COUNTY

SUBSCRIBED, SWORN TO AND ACKNOWLEDGED before me by _____, of _____, on this the _____ day of _____, _____.

Notary Public

My Commission Expires: _____

COPY OF BID SET

SPECIFICATIONS

COPY OF BID SET

SECTION 01010

SUMMARY OF WORK

PART 1—GENERAL

1.01 DIVISION ONE

- A. The requirements of Division 1 apply to all sections of the Contract(s).

1.02 PROJECT SCOPE

- A. CONTRACTOR shall provide all items, articles, materials, operations or methods mentioned or scheduled on the Drawings or herein specified: including all labor, supervision, equipment, incidentals, taxes and permits necessary to complete the Work as described within the Contract Documents. CONTRACTOR shall install all items provided by OWNER as mentioned or scheduled on the Drawings or herein specified.

1.03 CONTRACT DOCUMENTS—INTENT AND USE

A. Intent of Documents:

1. Singular notations and specifications shall be considered plural where application is reasonably inferred.
2. Mention or indication of extent of work under any division or Specification section is done only for convenience of CONTRACTOR and shall not be construed as describing all work required under that division or section.
3. Some individual sections may contain a list of related sections. The list of related sections in individual sections is provided for the convenience of CONTRACTOR and is not necessarily all-inclusive. CONTRACTOR may not rely upon this listing for determination of scope of work. Other sections of the Specifications, not referenced in individual sections shall apply as required for proper performance of the Work.
4. Command type sentences may be used in the Contract Documents. These sentences refer to and are directed to CONTRACTOR.
5. Symbols for various elements and systems are shown on the Drawings. Should there be any doubt regarding the meaning or intent of the symbols used, a written interpretation shall be obtained from ENGINEER.

B. Use of Documents:

1. CONTRACTOR shall examine all Specifications and Drawings for the Work, including those that may pertain to Work CONTRACTOR does not normally perform with its own forces.
2. CONTRACTOR shall use all of the Project Drawings and Specifications:
 - a. For a complete understanding of the Project.
 - b. To determine the type of construction and systems required.
 - c. For coordination with other contractors.
 - d. To determine what other work may be involved in various parts or phases.
 - e. To anticipate and notify others when work by others will be required.
 - f. And all other relevant matters related to the project.
3. CONTRACTOR is also bound by all requirements of the Contract Documents which are applicable to, pertain to, or affect its Work, as may be shown or inferred by the entire set of Project Drawings and Specifications.

COPY OF BID SET

C. Sequence of Contracts:

1. Contract 1-2017:
 - a. Refer to the milestones in the construction contract.
 - b. Construct each pump station and connect influent sewers to each station. Other contractors will construct the connection manholes within the time allowed for their milestones to not delay work of this contract.
 - c. Construct and test force mains on each pump station site in accordance with the testing plan outlined below.
 - d. Rose Run pump station shall be ready to start-up first, see Milestones.
2. Contract 2-2017:
 - a. Refer to the milestones in the construction contract.
 - b. Construct and test force mains in accordance with the testing plan outlined below.
 - c. Rose Run pump station force main shall be ready to start-up first, see Milestones.
3. Contract 3-2017:
 - a. Refer to the milestones in the construction contract.
 - b. Construct connection manholes for each pump station within the time allowed to not delay work of Contract 1-2017.
 - c. Construct railroad bores and force mains by milestone date. Test force mains in accordance with the testing plan outlined below.
4. Contract 4-2017:
 - a. Refer to the milestones in the construction contract.
 - b. Construct connection manholes for each pump station within the time allowed to not delay work of Contract 1-2017.
 - c. Test force main in accordance with the testing plan outlined below.

D. Rose Run 8-inch and 16-inch force main:

1. See Sheet 46. CONTRACTOR 1-2017 shall install two ductile iron force mains on Rose Run PS site-the 16-inch from its connection with Contract 2-2017 to its point of connection with Contract 3-2017 and the 8-inch from the PS to its point of connection with Contract 3-2017. Use MJ plugs on discharge side of Rose Run PS site to pressure test 8-inch force main to the valve on the force main as it enters the Rose Run PS site. Install plugs at both ends and pressure test the 16-inch. After successful test, remove plugs and drain water from force mains into trench and properly dispose. Plug for upstream 16-inch force main will be reused by CONTRACTOR 2-2017 and 3-2017.
2. See Sheets 46 and 47. CONTRACTOR 3-2017 shall install 8- and 16-inch force main from Rose Run PS site through the railroad bore. CONTRACTOR 3-2017 shall install valves on each end of the bore, in accordance with the CSX permit. CONTRACTOR 3-2017 shall close downstream valves, plug upstream ends, and test 16-inch force main back to where the force main enters the Rose Run PS site and test 8-inch force main to the Rose Run PS valve vault. Force main work of Contract 1-2017 at the Rose Run site will have been previously tested and accepted. Drain water into trench and dispose properly.
3. CONTRACTOR 2-2017 shall install 8- and 16-inch force mains from the downstream end of CONTRACTOR 3-2107 installation to termination at Elizabethtown WWTP site. Install blind flange on force mains at Elizabethtown WWTP termination points and on the 16-inch force main on the upstream side of the Rose Run PS site. Test the 8-inch force main from the Rose Run PS to the Elizabethtown WWTP site and the 16-inch force main from the Rose Run PS site to the Elizabethtown WWTP site. Force main work of Contract 1-2017 at the Rose Run site and Contract 3-2017 will have been

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previously tested and accepted. Blind flange on 16-inch force main will be used for later testing. Drain water into trench or PS and properly dispose.

- E. Industrial Park PS 2 (IPPS2) Site 1: Sheet 34. CONTRACTOR 1-2017 shall install three ductile iron force mains coming into the IPPS2 site—the 6-inch around IPPS2 and the 8-inch and 10-inch connections into IPPS2 valve vault. Besides the 6-inch around IPPS2, CONTRACTOR 1-2017 shall also install a 16-inch force main from the valve vault to the connection with Contract 2-2017. Install MJ plugs at the ends of all force mains and pressure test force mains. Drain water from tested force mains back to low points or PS and properly dispose.
- F. Industrial Park PS 1 (IPPS1) Site 1: See Sheet 29. CONTRACTOR 1-2017 shall install three ductile iron force mains from IPPS1 to point of connection with Contract 2-2017. Use MJ plugs to pressure test force mains. After test drain water back to IPPS1 and properly dispose.
- G. Force Mains IPP2 PS to Rose Run PS 1: See Sheets 34, 40, 41, and 46. CONTRACTOR 2-2017 shall install two force main from IPPS2 site; the 16-inch to Rose Run PS site and 6-inch to MH M-12. Install MJ plugs at each end of and test 6-inch force main from the connection point upstream of IPPS2 site to its discharge at manhole M-12. Use valve on 16-inch force main before CSX bore by Rose Run PS site to isolate force main for testing. Test complete force main from IPPS2 to the Rose Run PS. Force main work of Contract 1-2017 at the Rose Run PS and the IPPS2 sites will have been previously tested and accepted.
- H. Force Mains IPPS1 PS to IPPS2 PS 1: See Sheets 29 and 34. CONTRACTOR 2-2017 shall install three force mains from IPPS1 site to the IPPS2 site. Install a valve at the connection point at the IPPS2 site and test 6-inch force back to IPPS1 PS. In the alternative, install a plug at MH M-12 and test the 6-inch force main from IPPS1 to manhole M-12. Force main work of Contract 1-2017 at the IPPS1 and IPPS2 sites will have been previously tested and accepted. Use valves in the IPPS2 valve vault on on the 10-inch and 12-inch force mains and test the force mains from IPPS1 PS to the IPPS2 PS. Force main work of Contract 1-2017 at the IPPS1 and IPPS2 sites will have been previously tested and accepted.
- I. Industrial Park PS 3 (IPPS3) And 4-inch Force Main:
 - 1. See Sheet 61. CONTRACTOR 1-2017 shall install ductile iron force main to point of connection with Contract 2-2017. Use MJ plugs to pressure test force main. Drain water back to IPPS3.
 - 2. CONTRACTOR 4-2017 shall connect to force main at IPPS3 site. Construct force main to MH R-08. Test force main from IPPS3 to MH R-08. Force main work of Contract 1-2017 will have been previously tested and accepted.

1.04 CONTRACTOR USE OF SITE

- A. General:
 - 1. The “area of the site” referred to in these Specifications shall be as shown on the Drawings. If the “area of the site” is not shown, OWNER's property lines, the Project right-of-way and/or any easements obtained for the Project shall be considered the “area of the site.”
 - 2. Construction activities shall be confined within the “area of the site” limits.

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3. From the start of work to completion CONTRACTOR is responsible for the care of the site and the premises which are affected by operations of Work of this Contract.
4. Except for permanent site improvements provided under the Contract, CONTRACTOR shall restore property disturbed during the Work, to the conditions which previously existed.
5. Work in occupied spaces shall be restricted to specified Work and essential activities, such as making necessary connections and extending services or constructing temporary access ways. Such work shall be scheduled in advance with OWNER.

B. Parking and Deliveries:

1. CONTRACTOR is responsible for control of traffic by vehicles and persons within the limits of its operations.
2. Parking for employees, subcontractors, and agents of CONTRACTOR shall be in areas subject to approval of OWNER.
3. Access to the site for delivery of construction material or equipment shall be subject to approval of OWNER.

1.05 EXISTING SERVICES, OVERHEAD UTILITIES, AND UNDERGROUND FACILITIES INCLUDING STRUCTURES

- A. Interruption of existing services and systems including heating, ventilating, air conditioning, water, sanitary, lighting and power, signal and security systems, and similar work shall be kept to an absolute minimum and shall be limited to times approved by OWNER.
- B. If deemed necessary by OWNER, such work shall be accomplished after OWNER's normal office hours.
- C. Work shall not commence until all labor, materials and equipment are available so Work can continue without interruption or delay.
- D. Should uncharted or incorrectly charted services or Underground Facilities be encountered during installation, notify OWNER and consult with utility owner immediately.
- E. Cooperate with OWNER and utility companies in keeping respective services and Underground Facilities in operation and repair any damage.
- F. CONTRACTOR shall not interrupt existing services and Underground Facilities occupied and used by OWNER or others, except when permitted in writing by OWNER.
- G. Any accidental interruption of services and Underground Facilities shall be repaired immediately, including provision of temporary facilities until permanent repairs can be made.
- H. Prior to any excavation, demolition, or drilling on site, CONTRACTOR shall contact owners of the Underground Facilities in and near the construction area of the intent to excavate, demolish, or drill. As part of this notification requirement, CONTRACTOR shall contact the utility notification service Kentucky 811 (811 or 1-800-752-6007) at least two but not more than 10 business days in advance of any work. CONTRACTOR shall be aware that not all owners participate in Kentucky 811. A call to this agency shall not absolve CONTRACTOR of the requirements for contacting all owners of Underground Facilities in and near the construction area. CONTRACTOR shall give reasonable advance notice to Kentucky 811 and other owners—such notification shall not be less than the minimum advance notification

COPY OF BID SET

required.

- I. Locations and elevations of services and Underground Facilities as shown on the Drawings are approximate. It shall be CONTRACTOR's responsibility to determine their exact location when in their vicinity. To this end, CONTRACTOR shall proceed with caution in the excavation and preparation of the Site so the exact location of services and Underground Facilities can be determined. CONTRACTOR shall include in the Contract Price any costs for temporary or permanent relocations of such services and Underground Facilities required to complete the Work unless specifically indicated otherwise in the Specifications.
- J. Where potential grade conflicts might occur with existing services and Underground Facilities, CONTRACTOR shall uncover such services and Underground Facilities sufficiently in advance of construction so that elevations may be determined to allow any necessary adjustments to be made.
- K. CONTRACTOR shall coordinate with overhead utility companies prior to the Work. CONTRACTOR shall provide all necessary temporary and permanent support relocation or temporary and permanent restraint to maintain overhead utilities in service.
- L. CONTRACTOR shall keep an accurate and complete record of all such services and Underground Facilities encountered and shall provide OWNER a copy of this record. The record shall include a description of the item encountered, opinion as to conditions, and adequate measurements and depths so that the item can be located in the future.
- M. CONTRACTOR shall inspect all services and Underground Facilities for condition and soundness. Unsound conditions shall be reported to OWNER immediately after exposing. CONTRACTOR shall not proceed with the Work until the service or facility owner has been notified. Service or facility owner shall then be given time to inspect and correct, if required, the service or Underground Facility. CONTRACTOR may make claim under the provisions of Articles 11 and 12 of the General Conditions should CONTRACTOR feel a price or time adjustment is justified.
- N. Any additional costs incurred because of failure of CONTRACTOR to report the condition of any and all existing services and Underground Facility encountered shall be paid for by CONTRACTOR.
- O. Whenever ENGINEER feels it is necessary to explore and excavate to determine the location of existing services and Underground Facilities, CONTRACTOR shall make explorations and excavations for such purposes. If CONTRACTOR is required to perform additional Work in making the explorations and excavations, extra compensation will be allowed as provided for in the General Conditions.

1.06 PROTECTION OF WORK AND IMPROVEMENTS

- A. CONTRACTOR shall protect the property of OWNER, existing improvements, and the Work installed by CONTRACTOR and others from abuse, damage, dust, debris, and other objectionable materials resulting from construction activities.
- B. CONTRACTOR shall provide suitable covers, partitions, or other dust and fume containment devices to suit construction operations.

COPY OF BID SET

- C. CONTRACTOR shall keep property, existing improvements and the Work, including structures, mains, fittings and accessories free from dirt and foreign matter at all times.
- D. CONTRACTOR shall provide temporary plugging of openings, holes and pipe ends that are existing or that CONTRACTOR has installed.
- E. Property, improvements and Work damaged by CONTRACTOR shall be repaired or replaced by CONTRACTOR to the satisfaction of OWNER.
- F. If more than one contractor is responsible, the cost shall be shared. ENGINEER will determine responsibility for damages. All repair and replacement methods shall be approved by OWNER.

1.07 AVAILABILITY OF LAND

- A. Easements were obtained for this Project. CONTRACTOR shall confine its operations, equipment and storage areas to the easements, lands and rights-of-way in which the Project is to be located. CONTRACTOR may enter into written agreements with property owners for use of other lands during construction. Copies of such agreements shall be provided to OWNER.
- B. Easements with special conditions are located at the end of Division 1. The easements with special conditions are also marked with an asterisk on the drawings.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

COPY OF BID SET

SECTION 01019

CONTRACT CONSIDERATIONS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Cash Allowances.
 - 2. Measurement and Payment–Unit Prices.
 - 3. Measurement and Payment–Lump Sum.

1.02 CASH ALLOWANCES

- A. See Paragraph 11.02 of the General Conditions for costs to be included in Allowances.
- B. Refer to sections of the specifications identified in the Bid Form for specific information on use of cash allowances.
- C. The Bid shall include the amount equal to the specified quantity times the unit price.

1.03 MEASUREMENT AND PAYMENT–UNIT PRICES

- A. Measurement methods are delineated in the individual Specification sections.
- B. CONTRACTOR shall take measurements and compute quantities. ENGINEER will check measurements and quantities.
- C. Incidental Items of Work: Any items of Work shown on the Drawings or called for in the Specifications, but not included in the Bid Form, shall be considered incidental items of Work. The cost of incidental items of Work shall be included in the prices bid for adjacent Work.

1.04 MEASUREMENT AND PAYMENT–LUMP SUM

- A. Payment for Lump Sum projects will be based on the accepted schedule of values for the project.
- B. An acceptable schedule of values will include the following features:
 - 1. Schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction. Schedule shall be subdivided as necessary by specification section and work area.
 - 2. Identify each line item with the number and title of the respective Specification Section.
 - 3. For each major line item list sub-values of major products or operations under the item.
 - 4. For the various portions of the work:
 - a. Each item shall include a directly proportional amount of CONTRACTOR's overhead and profit.

COPY OF BID SET

- b. For items on which progress payments will be requested for stored materials, break down the value into:
 - (1) The cost of the materials, delivered and unloaded, with taxes paid. Paid invoices are required for materials upon request by ENGINEER.
 - (2) The total installed value.
- 5. The sum of all values listed in the schedule shall equal the total Contract Sum.
- 6. Schedule shall include a separate listing of general items such as bonds, insurance, mobilization, demobilization, field supervision, and record documents.

- C. Once a schedule of values is accepted, it shall not be revised, except for changes associated with subsequently executed change orders.

- D. No separate measurement for payment will be performed for Lump Sum Work.

- E. CONTRACTOR shall estimate percentage of Work completed. ENGINEER will review CONTRACTOR's estimate of quantity of Work completed.

- F. Payment will be made based on the percentage of the Contract completed less retainage and/or liquidated damages.

- G. Unless noted otherwise, all Work described in the Specifications and/or shown on the Drawings shall be included in the Lump Sum Bid.

- H. Some technical specification sections may include payment provisions. These provisions are in addition to the provisions of this section, which apply to all of the Work.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

COPY OF BID SET

SECTION 01039

COORDINATION, FIELD ENGINEERING, AND MEETINGS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Coordination.
 - 2. Field engineering.
 - 3. Progress meetings.
 - 4. Preinstallation meetings.

1.02 COORDINATION

- A. CONTRACTOR shall coordinate scheduling, submittals, and work of the various sections of the work to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. CONTRACTOR shall verify utility requirements and characteristics of operating equipment are compatible with building utilities and coordinate Work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. CONTRACTOR shall coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on the Drawings and shall follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas, except as otherwise indicated, CONTRACTOR shall conceal pipes, ducts, and wiring within the construction and coordinate locations of fixtures and outlets with finish elements.
- E. CONTRACTOR shall coordinate completion and cleanup of Work of separate sections in preparation for substantial completion and for portions of Work designated for OWNER's occupancy.
- F. After OWNER occupancy of premises, CONTRACTOR shall coordinate access to Site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of OWNER's activities.

1.03 FIELD ENGINEERING

- A. CONTRACTOR shall locate and protect property stakes, legal survey monuments, benchmarks, and survey control and reference points. CONTRACTOR shall pay for replacement of disturbed property stakes and legal survey monuments by a Registered Land Surveyor acceptable to OWNER and for replacement of benchmarks and survey control and reference points provided by ENGINEER.

COPY OF BID SET

- B. CONTRACTOR shall provide field engineering services as required to establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- C. CONTRACTOR shall furnish all required plummets and graduated poles to check all Work.
- D. If stakes and boards have to be reset because of negligence of CONTRACTOR, CONTRACTOR shall bear the cost of such work.
- E. If laser beam is used, CONTRACTOR shall check its Work against intermediate grade stakes provided between manholes. Prior to initial use of the laser, CONTRACTOR shall set up laser on ground surface and check line and gradient controls. Lasers not functioning properly shall be immediately removed.
- F. If existing property stakes, not within the limits of the trench, are removed or damaged by CONTRACTOR, CONTRACTOR shall bear the cost of replacement. Replacement shall be made by a legal survey performed by a licensed Land Surveyor hired by OWNER. Cost for survey shall be deducted from the Contract Price.
- G. CONTRACTOR shall be responsible for all lines, elevations, and measurements of buildings, structures, piping, utilities, and other work executed by CONTRACTOR under the Contract. CONTRACTOR must exercise proper precaution to verify figures before laying out the Work, and will be held responsible for any error resulting from its failure to exercise such precaution.
- H. See Specifications for additional requirements concerning layout of the Work.

1.04 PROGRESS MEETINGS

- A. Progress meetings will be held throughout progress of the Work at intervals agreed to by OWNER, ENGINEER, and CONTRACTOR. Interval will generally be monthly.
- B. CONTRACTOR's project manager, job superintendent, major subcontractors and suppliers shall attend as appropriate to address agenda topics for each meeting. CONTRACTOR's representatives shall have authority to bind CONTRACTOR to decisions at the meetings.
- C. The project schedule shall be updated monthly and shall be reviewed at each progress meeting. CONTRACTOR shall provide the following information in written form at each meeting.
 - 1. Construction progress, including:
 - a. Activities completed this reporting period.
 - b. Activities in progress this reporting period.
 - c. Activities scheduled to commence this reporting period.
 - 2. Description of problem areas.
 - 3. Current and anticipated delays.
 - a. Cause of the delay.
 - b. Corrective action and schedule adjustments to correct the delay.
 - c. Impact of the delay on other activities, on milestones, and on completion dates.
 - 4. Changes in construction sequence.
- D. ENGINEER will prepare and distribute minutes to all attending parties.

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PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

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SECTION 01060

REGULATORY REQUIREMENTS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. OSHA requirements.
 - 2. Roadway limits.
 - 3. Permits.
 - 4. Wage rates.
 - 5. Recording and preserving historical and archaeological finds.

1.02 OSHA REQUIREMENTS

- A. All work including site safety, equipment, materials, and fabricated items provided under the Contract shall comply with the provisions of the "Occupational Safety and Health Act" (OSHA), the Kentucky Occupational Safety and Health Act (KYOSH), the Hardin County Water District No. 2, Safety Program, Latest Edition, and all other applicable federal, state, county and local laws, ordinances, codes, the requirements set forth herein, and any regulations that may be specified in other parts of these Contract Documents. Where any of these are in conflict, the more stringent requirements shall be followed.
- B. CONTRACTOR's failure to thoroughly familiarize itself with the aforementioned safety provisions shall not relieve CONTRACTOR from compliance with the obligations and penalties set forth therein.

1.03 ROADWAY LIMITS

- A. CONTRACTOR shall comply with roadway weight restrictions including seasonal weight restrictions.

1.04 PERMITS

- A. The following permits were obtained by OWNER:
 - 1. Kentucky Division of Water (KDOW) Construction Permit Application for Clean Water Collection System.
 - 2. KDOW Application to Construct on or Along a Stream and/or Water Quality Construction.
 - 3. U.S. Army Corps of Engineers Application for Department of the Army Permit.
 - 4. Kentucky Transportation Cabinet Encroachment Permit.
 - 5. CSX Railroad Permit.
 - 6. Hardin County Road Department Encroachment Permit.
- B. They are included as attachments to this division. CONTRACTOR shall comply with all provisions of these permits and shall be responsible for notifications as required by these permits. CONTRACTOR shall obtain all other permits required for the Work. Where the requirements of any permit is more restrictive than the Drawings or the Specifications, the permit requirements shall govern.

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- C. Any permits required for dewatering operations shall be obtained and paid for by CONTRACTOR.

1.05 WAGE RATES

- A. A State Wage Rate Determination is not a requirement of this project.
- B. Payment of Davis-Bacon wages (Federal Prevailing Wages) is not a requirement of this project.

1.06 RECORDING AND PRESERVING HISTORICAL AND ARCHAEOLOGICAL FINDS

- A. In the event archaeological materials (arrowheads, stone tools, stone axes, prehistoric and historic pottery, bottles, foundations, Civil War artifacts, and other types of artifacts) are uncovered during the construction of the Project, Work is to immediately cease at the location and the Kentucky Heritage Council shall be contacted. The telephone number is (502) 564-7005. Construction shall not commence at this location until a written release is received from the Kentucky Heritage Council. Failure to report a find could result in legal action.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

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SECTION 01090

REFERENCE STANDARDS AND DEFINITIONS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Reference Standards:
 - a. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
 - b. Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is CONTRACTOR's responsibility to provide materials and workmanship which meet or exceed that specifically named code or standard.
 - c. It is also CONTRACTOR's responsibility, when so required by the Contract Documents, to deliver to ENGINEER all required proof that the material or workmanship, or both, meet or exceed the requirements of the specifically named code or standard.
 - 2. Definitions:
 - a. A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including the Drawings which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon.
 - b. Certain terms used in the Contract Documents are defined generally in this section to supplement definitions of the Agreement, General Conditions, Supplementary Conditions, and other general contract documents.
 - c. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the Work.
- B. Related Work Described Elsewhere: The specific naming of codes or standards occurs on the Drawings and in other sections of these Specifications.

1.02 QUALITY ASSURANCE

- A. Familiarity with Pertinent Codes and Standards:
 - 1. It is CONTRACTOR's responsibility to verify the requirements of the specifically named codes and standards and to verify that the items procured for use in this Work meet or exceed the specified requirements.
 - 2. When required by individual sections of these specifications, CONTRACTOR shall obtain a copy of each pertinent code or standard and maintain the copies at the job site during submittals, planning, and progress of the Work until Substantial Completion of the Work is attained.
- B. Overlapping or Conflicting Requirements:
 - 1. Where compliance with two or more industry standards or sets of requirements are specified, and the overlapping of those standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement (which is

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generally recognized to be also most costly) is intended and will be enforced, unless more detailed language written directly into Contract Documents clearly indicates that a less stringent requirement is acceptable.

2. Refer all uncertainties to ENGINEER for decision before proceeding.

1.03 REFERENCE STANDARDS

- A. Applicable standards of the construction industry are made a part of the Contract Documents by reference as if copied directly into the Contract Documents, or as if published copies were bound herewith. See Article 3.02 of the General Conditions for additional provisions regarding references.
- B. Standards referenced directly in the Contract Documents or by governing regulation, have precedence over nonreferenced standards which are recognized in industry for applicability to the Work.
- C. Nonreference standards are hereby defined to have no particular applicability to the work except as a general measurement of whether the Work complies with standards recognized in the construction industry.
- D. Reference standards and codes listed in these specifications may include, but are not necessarily limited to, standards or codes published by the following agencies and organizations:

1. AA Aluminum Association
1525 Wilson Boulevard, Arlington, VA 22209
2. AAMA American Architectural Manufacturer's Association
1827 Walden Office Square Suite 550, Schaumburg, IL 60173-4268
3. AASHTO American Association of State Highway & Transportation Officials
444 North Capitol Street NW Suite 249, Washington, DC 20001
4. ACI American Concrete Institute
38800 Country Club Drive, Farmington Hills, MI 48331-3439
5. AI Asphalt Institute
2696 Research Park Drive, Lexington, KY 40511-8480
6. AISC American Institute of Steel Construction
One East Wacker Drive Suite 700, Chicago, IL 60601-1802
7. AISI American Iron and Steel Institute
25 Massachusetts Avenue NW Suite 800, Washington, DC 20001
8. ANSI American National Standards Institute
25 West 43rd Street, New York, NY 10036
9. APA American Plywood Association
7011 South 19th, Tacoma, WA 98466-5333

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10. API American Petroleum Institute
1220 L Street NW, Washington, DC 20005-4070
11. ARI Air-Conditioning & Refrigeration Institute
4100 North Fairfax Drive Suite 200, Arlington, VA 22203
12. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
1791 Tullie Circle NE, Atlanta, GA 30329
13. ASME American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990
14. ASSE American Society of Sanitary Engineering
901 Canterbury Suite A, Westlake, OH 44145
15. ASTM ASTM International
100 Barr Harbor Drive, West Conshohocken, PA 19428-2959
16. AWI Architectural Woodwork Institute
46179 Westlake Drive Suite 120, Potomac Falls, VA 20165-5874
17. AWPA American Wood Protection Association
P.O. Box 361784, Birmingham, AL 35236-1784
18. AWS American Welding Society
8669 Doral Boulevard Suite 130, Doral, FL 33166
19. AWWA American Water Works Association
6666 West Quincy Avenue, Denver, CO 80235
20. BHMA Builder's Hardware Manufacturers Association
355 Lexington Avenue 15th floor, New York, NY 10017
21. BIA Brick Industry Association
1850 Centennial Park Drive Suite 301, Reston, VA 20191
22. CRSI Concrete Reinforcing Steel Institute
9333 North Plum Grove Road, Schaumburg, IL 60173
23. EJMA Expansion Joint Manufacturers Association
25 North Broadway, Tarrytown, NY 10591
24. FM FM Global
FM Global Corporate Offices, 270 Central Avenue, Johnston, RI 02919
25. FTI Facing Tile Institute
Box 8880, Canton, OH 44711

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- 26. GA Gypsum Association
6525 Belcrest Road Suite 480, Hyattsville, MD 20782
- 27. GANA Glass Association of North America
800 SW Jackson Street Suite 1500, Topeka, KS 66612-1200
- 28. ICC International Code Council
500 New Jersey Avenue NW 6th Floor, Washington, DC 20001
- 29. IES Illuminating Engineering Society
120 Wall Street, Floor 17, New York, NY 10005-4001
- 30. MIL Military Specifications
Naval Publications and Forms Center
5801 Tabor Avenue, Philadelphia, PA 19120
- 31. NAAMM National Association of Architectural Metal Manufacturers
800 Roosevelt Road Building C Suite 312, Glen Ellyn, IL 60137
- 32. NCMA National Concrete Masonry Association
13750 Sunrise Valley Drive, Herndon, VA 20171-4662
- 33. NECA NECA
National Electrical Contractors Association
3 Bethesda Metro Center Suite 1100, Bethesda, MD 20814
- 34. NEMA National Electrical Manufacturers Association
1300 North 17th Street Suite 1752, Rosslyn, VA 22209
- 35. NFPA National Fire Protection Association
1 Batterymarch Park, Quincy, MA 02169-7471
- 36. NIST National Institute of Standards and Technology
(U.S. Department of Commerce), 100 Bureau Drive, Stop 1070
Gaithersburg, MD 20899-1070
- 37. NRCA National Roofing Contractors Association
10255 West Higgins Road Suite 600, Rosemont, IL 60018-5607
- 38. NSF National Sanitation Foundation International
P.O. Box 130140, 789 North Dixboro Road, Ann Arbor, MI 48113-0140
- 39. OSHA Occupational Safety & Health Administration
200 Constitution Avenue NW, Washington, DC 20210
- 40. PCA Portland Cement Association
5420 Old Orchard Road, Skokie, IL 60077
- 41. PCI Prestressed Concrete Institute
200 West Adams Street Suite 2100, Chicago, IL 60606

COPY OF BID SET

- 42. SAE Society of Automotive Engineers
SAE World Headquarters
400 Commonwealth Drive, Warrendale, PA 15096-0001
- 43. SDI Steel Deck Institute
P.O. Box 25, Fox River Grove, IL 60021
- 44. SDI Steel Door Institute
30200 Detroit Road, Westlake, OH 44145-1987
- 45. SIGMA Sealed Insulating Glass Manufacturers Assoc.
401 North Michigan Avenue Suite 2400, Chicago, IL 60611
- 46. SJI Steel Joist Institute
234 Cheves Street, Florence, SC 29501
- 47. SMACNA Sheet Metal and Air Conditioning
Contractor's National Association
4201 Lafayette Center Drive, Chantilly, VA 20151-1219
- 48. SSPC Society for Protective Coatings
40 24th Street 6th Floor, Pittsburgh, PA 15222-4656
- 49. TCA Tile Council of America
100 Clemson Research Boulevard, Anderson, SC 29625
- 50. UL Underwriters Laboratories
333 Pfingston Road; Northbrook, IL 60062

1.04 SUBMITTALS

- A. For OWNER's records, CONTRACTOR shall submit copies of permits, licenses, certifications, inspection reports, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

1.05 DEFINITIONS

- A. Indicated:
 - 1. The term "indicated" is a cross-reference to details, notes, or schedules on the drawings, to other paragraphs or schedules in the specifications and to similar means of recording requirements in the Contract Documents.
 - 2. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated", it is for the purpose of helping the reader locate cross-reference, and no limitation is intended except as specifically noted.
- B. Approve (or Words of Similar Nature):
 - 1. Where used in conjunction with ENGINEER's response to submittals, requests, applications, inquiries, reports, and claims by CONTRACTOR, the meaning of the term "approve" will be held to the limitation of ENGINEER's responsibilities and duties as specified in Paragraph 1.02.B.1. of the General Conditions.

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2. In no case will "approval" by ENGINEER be interpreted as a release of CONTRACTOR from responsibility to fulfill requirements of the Contract Documents.
- C. Minimum Requirements:
1. Indicated requirements are for a specific minimum acceptable level of quality or quantity, as recognized in the industry.
 2. Actual work must comply with (or within specified tolerances) or exceed minimums.
 3. CONTRACTOR shall refer uncertainties to ENGINEER before proceeding.
- D. Abbreviations: Abbreviations, where not defined in the Contract Documents, will be interpreted to mean the normal construction industry terminology.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

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SECTION 01300

SUBMITTALS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Whenever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.
 - 2. To facilitate CONTRACTOR's understanding of the design intent, procedures have been established for advance submittal of design data and for its review or rejection by ENGINEER.
 - 3. The type of submittal requirements specified in this section include progress schedule, shop drawings, product data, samples, and other miscellaneous work related submittals.
- B. Related work described elsewhere: More detailed requirements for submittals are described in other sections of these specifications for some materials and equipment. They are to be considered additional requirements to supplement the requirements specified in this section. Submittals shall conform to Article 6 of the General Conditions.
- C. Definitions: "Electronic Submittal" is defined as any submittal transmitted electronically to ENGINEER for review.

1.02 IDENTIFICATION OF SUBMITTALS

- A. CONTRACTOR shall completely identify each submittal and resubmittal by showing at least the following information:
 - 1. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
 - 2. Name and location of project and identification number.
 - 3. Drawing number and specifications section number to which the submittal applies.
 - 4. Include the date of each submittal or resubmittal.

1.03 GROUPING OF SUBMITTALS

- A. Unless otherwise specifically permitted by ENGINEER, CONTRACTOR shall make all submittals in groups containing all associated items so that information is available for checking each item when it is received.
- B. Partial submittals may be rejected as not complying with the provisions of the Contract Documents.

1.04 TIMING OF SUBMITTALS

- A. CONTRACTOR shall make all submittals far enough in advance of scheduled dates of installation to provide required time for reviews, for securing necessary approval, for possible revision and resubmittal, and for placing orders and securing delivery.

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- B. The review period for submittals that are received after 3 P.M. shall commence on the following business day.

1.05 CONSTRUCTION PROGRESS SCHEDULE

- A. Submit initial schedule in duplicate within 10 days after date of OWNER-CONTRACTOR Agreement.
- B. Revise and resubmit as required.
- C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
- D. Submit a horizontal bar chart with separate line for each major portion of Work or operation, identifying first workday of each week.
- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- F. Indicate estimated percentage of completion for each item of Work at each submission.
- G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates.

1.06 PRECONSTRUCTION AND POSTCONSTRUCTION DIGITAL RECORDING

- A. This Section provides for:
 - 1. Comprehensive documentation: Digital photographic documentation of the construction process progressively and at selected milestones.
 - 2. Documentation inclusive of electronic indexing, navigation, hosting, storage, and remote access, as applicable, throughout construction.
 - 3. CONTRACTOR support, security of information, and technological requirements related to the documentation.
 - 4. Qualifying credentials required by CONTRACTOR.
- B. Photographic Documentation:
 - 1. Documentation indexing and navigation system will utilize actual construction drawings (project plans) or equivalent as the basis for an interactive on-line interface.
 - 2. For all photographic documentation referenced herein, indexing and navigation must be organized by both time (date-stamped) and location throughout the Project.
 - 3. Access interface will include multiple active projects per user, if applicable.
 - 4. Documentation will combine indexing and navigation system with inspection-grade high-resolution digital photography performed by CONTRACTOR, designed to capture actual conditions throughout construction and at critical milestones.
 - 5. CONTRACTOR documentation will be accessible on-line within 24 hours after each shoot, through the use of an Internet connection.
 - 6. Multi-tiered access levels shall be achievable through use of individual passwords, if applicable. Users of a sufficient tier will be able to identify other authorized users on each project.
 - 7. Online interface will allow users to upload OWNER's own digital photographic images to the documentation indexing and navigation system.

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8. Online interface will allow users to comment (privately or publically) on images, shoots and projects.
 - a. Through integrated reporting functionality, users can generate custom reports per image or on a collection of images (“image reports”), including their associated comments. Image reports are exportable in PDF format or as a standalone hyperlink.
 - b. All image reports will identify the time, date, and location of each image, and will include associated comments that can be archived indefinitely.
- C. Mobile Access to Documentation: All documentation that is accessible online through an Internet connection will be accessible via mobile devices, such as tablets and smart phones, in a format optimized for mobile viewing and navigation. It is acknowledged that not all software features will be enabled on the mobile version/functionality may vary to optimize the mobile experience. Mobile access must be supported for at least the following mobile operating systems: Apple iOS, Android OS, and Blackberry OS.
- D. Demonstrable minimum experience of three (3) years in operation providing expert and independent third party digital photography construction documentation using advanced indexing/navigation systems.
- E. Proficiency in the execution of digital photography, videography and web camera systems’ configuration, including use and knowledge of associated equipment.
- F. Representative portfolio of completed construction projects of similar type, size, duration, and complexity as the Project.
- G. In-house programming division for customizable documentation solutions required.
- H. Preconstruction Photographic Documentation: Prior to mobilization, all existing conditions of streets, roadways, parkways, driveways, curbs, sidewalks, landscaping, and structures surrounding the site will be documented using overlapping photographic techniques. Indexing and navigation shall be accomplished through interactive architectural drawings. Integrated commenting and tagging will allow for indication and isolation of issues on the interactive plan and for report generation including, per report, issue image, index number, date, and depiction of issue location on the floor plan or site plan.
- I. Postconstruction Photographic Documentation: After construction, all streets, roadways, parkways, driveways, curbs, sidewalks, landscaping, and structures surrounding the site will be documented using overlapping photographic techniques. This documentation may be required at multiple intervals prior to commencing vertical construction. Indexing and navigation shall be accomplished through interactive architectural drawings. Integrated commenting and tagging will allow for indication and isolation of issues on the interactive plan and for report generation including per report issue image, index number, date, and depiction of issue location on the floor plan or site plan.

1.07 SHOP DRAWINGS

- A. Shop drawings shall include specially prepared technical data for this project including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements, and similar information not in standard printed form for general application to a range of similar projects. Shop drawings shall be submitted for all manufactured or fabricated items. See individual technical sections for special requirements.

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- B. CONTRACTOR shall make all shop drawings accurately to scale and sufficiently large to show all pertinent aspects of the item and its method of connection to the work.
- C. Shop drawings shall be checked, approved, and stamped by CONTRACTOR in accordance with the General Conditions before transmittal to ENGINEER for review and approval.
- D. Complete shop drawings and descriptive data shall be submitted on all manufactured or fabricated items prior to 25% completion of the Work. Applications for payment beyond 25% of the Contract amount will not be recommended for payment until all shop drawings are submitted, including the required hard copies, or a revised schedule for any remaining submittals is agreed to by OWNER and ENGINEER.
- E. CONTRACTOR shall submit shop drawings following the procedure described below. Except as noted, six color copies of shop drawings and descriptive data shall be submitted to ENGINEER for approval. Three copies of these will be returned to CONTRACTOR if approved. If shop drawings are not approved or if they are stamped "Approved as Noted-Resubmit," two corrected copies will be returned to CONTRACTOR for use in resubmittal. If CONTRACTOR desires more than three approved copies, submitted quantity shall be increased accordingly.
- F. Shop drawings submitted to ENGINEER will be reviewed and stamped "Approved," "Approved as Noted," "Approved as Noted-Resubmit," or "Not Approved." CONTRACTOR shall resubmit the above number of corrected shop drawings for all shop drawings stamped "Approved as Noted-Resubmit" and "Not Approved" and will continue this process until shop drawings are stamped "Approved" or "Approved as Noted." If drawings are stamped "Approved as Noted-Resubmit," fabrication may proceed in accordance with the marked-up shop drawings. Installation shall not proceed until shop drawings have been resubmitted and stamped "Approved" or "Approved as Noted."
- G. If shop drawings are stamped "Approved as Noted" or "Approved as Noted-Resubmit" and CONTRACTOR does not agree with revisions or cannot conform with revisions, fabrication shall not proceed and shop drawings shall be resubmitted with explanation of CONTRACTOR's position.
- H. All shop drawings used for construction site activities shall bear the "Approved" or "Approved as Noted" stamp of ENGINEER.
- I. Arrangements may be made between CONTRACTOR and ENGINEER to provide additional copies of "Approved" shop drawings for field activity purposes.

1.08 SAMPLES AND FIELD MOCKUPS

- A. CONTRACTOR shall provide samples and field mockups where noted or specified.
- B. Samples are physical examples which illustrate materials, equipment, or workmanship and establish standards by which the work will be judged.
- C. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product and full range of color, texture, and pattern.

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- D. Samples shall have labels firmly attached, bearing the following information:
 - 1. Name of project.
 - 2. Description of product and finish.
 - 3. Name of CONTRACTOR.
 - 4. Trade name and number of product.
 - 5. Standards met by the product.
- E. Approval of samples must be obtained prior to proceeding with any work affected by material requiring sample approval.
- F. Samples, unless otherwise noted, become the property of OWNER.
- G. In situations specifically approved by ENGINEER, the retained sample may be used in the construction as one of the installed items.
- H. Field Mockups:
 - 1. CONTRACTOR shall erect field mockups at the project site in a location acceptable to ENGINEER and OWNER.
 - 2. When accepted by ENGINEER, the mockup will become the basis for comparison of the actual work.
 - 3. Remove mockup at conclusion of the work if it was not incorporated into the work.

1.09 PRODUCT DATA

- A. CONTRACTOR shall provide product data as required to supplement shop drawings.
- B. Product data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by CONTRACTOR to illustrate a material, product, or system for some portion of the work.
- C. CONTRACTOR shall collect required product data into one submittal for each unit of work or system.
- D. CONTRACTOR shall include manufacturer's standard printed recommendations for application and use, compliance with standards, performance characteristics, wiring and piping diagrams and controls, component parts, finishes, dimensions, required clearances, and other special coordination requirements.
- E. CONTRACTOR shall mark each copy of standard printed data to identify pertinent products, models, options, and other data.
- F. CONTRACTOR shall supplement manufacturer's standard data to provide information unique to the work.

1.10 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by ENGINEER.
- B. Shop Drawings and Product Data:
 - 1. Revise initial drawings or data and resubmit as specified for initial submittal.
 - 2. Itemize in a cover letter any changes which have been made other than those requested by ENGINEER.

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C. See SC-6.17 for additional information regarding resubmittals.

1.11 MANUFACTURER'S DIRECTIONS

- A. Manufactured articles, materials, and equipment shall be stored, commissioned, operated, applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturer, unless specified to the contrary.
- B. Wherever specifications call for work to be performed or materials to be installed in accordance with the manufacturer's printed instructions or directions, CONTRACTOR shall furnish copies as required for shop drawings of those instructions or directions to ENGINEER before installing the material or performing the work.

1.12 MAINTENANCE MANUAL

- A. Prior to 50% completion of the Contract or at a minimum of 45 days prior to the scheduled start-up date of any individual item of equipment, whichever is earlier, CONTRACTOR shall furnish to ENGINEER four complete copies of a maintenance manual for all equipment furnished and an electronic format compact disk of the maintenance manual in the most recent version of Adobe (.pdf) format identical to the hard copy. Applications for payment beyond 50% of the contract amount will not be recommended for payment until all maintenance manuals are submitted or a revised schedule for remaining maintenance manuals is agreed to by OWNER and ENGINEER.
- B. CONTRACTOR is responsible for producing an electronic version of the Equipment Operations and Maintenance (O&M) Manuals Manual. The Electronic Equipment O&M Manual shall be delivered in Portable Document Format (PDF). The entire manual may be converted to PDF via scanning or other method of conversion. Drawings or other graphics must be converted to PDF format and made part of the PDF document. The CONTRACTOR shall provide all Equipment O&M Manuals in the electronic format as defined below.
- C. The filename for the Equipment O&M Manual submittal will be provided with the request for final Equipment O&M Manuals. Filenames use the "eight dot three" convention (XXXXX_YY.PDF) where XXXXX is the specification section number and YY is an ID number. No one file shall be larger than 10 MB. If technical problems require that the submittal be divided into more than one file, a letter extension shall be added to the end of each filename.
- D. (Example: 19876_01a.pdf). The number of files shall be kept to a minimum. Equipment O&M Manuals that span more than one file shall have the final Bookmark "Return to Table of Contents" which shall take the User to the first file on the Equipment O&M Manual.
- E. All text (word processed), spreadsheets, and electronic graphics shall be delivered in portable document format (*.PDF). The resolution of all scanned images shall be a minimum of 300 dpi unless otherwise requested by ENGINEER. Scanned images shall be processed with the "original image with hidden text" option (Adobe Acrobat 6 or higher). This results in a clear image and provides for optical character recognition (OCR) and word search functionality. Graphical files shall be fully searchable. All submittals must be indexed with the Adobe Catalog feature. Placement and structure of index files shall be in accordance with Adobe's recommendations to minimize problems when transferring files. Successful searches for words or strings in the PDF document shall demonstrate proof of OCR.

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- F. Rotate pages viewed in landscape to the appropriate position for easy reading on a computer monitor.
- G. Bookmarks shall be created in the navigation frame for each entry in the Table of Contents. Three levels deep is usually enough (i.e., "Chapter", "Section", "Subsection"); however, complex submittals like instrumentation and electrical may be required at the discretion of ENGINEER. When setting bookmarks for Chapter level heading, the page shall be displayed at Full Page. Section and Subsection level heading pages shall be displayed as a magnified view. Bookmarks shall be displayed as subordinate (to other bookmarks in their hierarchy set so that only the Chapter level headings are displayed).
- H. Thumbnails shall be generated and embedded in each PDF file.
- I. Files shall be delivered without Security features activated. Password protected files will be unacceptable.
- J. The opening view for PDF files shall be set as follows:
 - 1. Initial View: Bookmarks and Page
 - 2. Magnification: Fit In Window
 - 3. Page Layout: Single Page
- K. The file shall open to the cover page of the Equipment O&M Manual with bookmarks to the left. The first bookmark shall be the name of Equipment O&M Manual.
- L. The submittal shall be delivered on CD after all Equipment O&M Manuals have been received and reviewed. Each CD shall be labeled, at a minimum, as follows, including:
 - 1) CD-ROM disks, 2) jewel cases, and 3) hard copies.
- M. Manufacturer name, point of contact, telephone number, facsimile number, and e-mail address as appropriate.
- N. Equipment name and/or O&M title spelled out in complete words.
 - Example "Operations and Maintenance Manual"
 - "Horizontal Centrifugal Nonclog Pump"
- O. Specifications section number.
- P. Project name.
- Q. Date and File Name: Example "12-20-07", "19876_01.pdf"
- R. CONTRACTOR shall reprocess any portion of the document that does not view or print to OWNER's satisfaction.
- S. CONTRACTOR is fully responsible for obtaining any and all copyright permissions associated with conversion of this information to electronic format.
- T. The manuals shall include manufacturer's instructions for maintenance and operation for each item of mechanical and electrical equipment. Manuals shall be specific for the equipment as installed; provide project specific inserts as required. Manuals shall contain: operation instructions, lubrication schedules, types and quantities, preventive maintenance

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program, spare parts list, parts lists, I.D. No. and exploded views, assembly instructions, parts supplier location, trouble shooting and start-up procedures and, where applicable, test data and curves. All sheets shall have reduced dimensions as described for shop Drawings. Only one copy shall be submitted in a 3-ring binder or 3-tab report cover, and the remaining copies shall be furnished in 3-tab report covers, binder clips, or large envelopes.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

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SECTION 01400

QUALITY CONTROL

PART 1–GENERAL

1.01 SUMMARY

- A. Work Includes:
 - 1. Quality Assurance–Control of Installation.
 - 2. Tolerances.
 - 3. Manufacturers' Field Services and Reports.

1.02 QUALITY ASSURANCE–CONTROL OF INSTALLATION

- A. CONTRACTOR shall monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. CONTRACTOR shall comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, CONTRACTOR shall request clarification from ENGINEER before proceeding.
- D. CONTRACTOR shall comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Work shall be performed by persons qualified to produce workmanship of specified quality.
- F. CONTRACTOR shall secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.03 TOLERANCES

- A. CONTRACTOR shall monitor tolerance control of installed products to produce acceptable work and shall not permit tolerances to accumulate.
- B. CONTRACTOR shall comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from ENGINEER before proceeding.
- C. CONTRACTOR shall adjust products to appropriate dimensions; position before securing products in place.

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1.04 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified in individual specification sections or when requested by ENGINEER, CONTRACTOR shall require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, and quality of workmanship.
- B. CONTRACTOR shall submit qualifications of observer to ENGINEER 30 days in advance of required observations.
- C. CONTRACTOR shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. CONTRACTOR shall submit report in duplicate within 30 days of observation to ENGINEER for information.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

COPY OF BID SET

SECTION 01500

TEMPORARY FACILITIES

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Temporary utilities.
 - 2. Temporary stairs and access.
 - 3. Temporary support facilities.
 - 4. Construction sign.
 - 5. Removal of temporary facilities.
- B. CONTRACTOR shall arrange for and provide temporary facilities as required for proper and expeditious prosecution of the Work.
- C. CONTRACTOR shall pay all costs, except as otherwise specified, until final acceptance of the Work unless OWNER makes arrangements for use of completed portions of the Work after substantial completion in accordance with the provisions of the General Conditions.
- D. CONTRACTOR shall make all temporary connections to utilities and services in locations acceptable to OWNER and local authorities having appropriate jurisdiction.
 - 1. Furnish all necessary labor and materials.
 - 2. Make all installations in a manner subject to the acceptance of such authorities and OWNER.
 - 3. Maintain such connections.
 - 4. Remove temporary installation and connection when no longer required.
 - 5. Restore services and sources of supply to proper operating conditions.

1.02 TEMPORARY UTILITIES

- A. Temporary Toilets: CONTRACTOR shall provide and maintain sanitary temporary chemical toilets located where approved by OWNER and in sufficient number required for the work force employed by CONTRACTOR.
- B. Temporary Electrical Services:
 - 1. CONTRACTOR shall make all necessary arrangements, furnish, install, and maintain necessary temporary electrical services at each Site. CONTRACTOR shall remove all temporary services when Project is complete.
 - 2. All utility charges for installation of the temporary services shall be paid for by CONTRACTOR. All metering installation charges and all energy charges for electric current used for temporary lighting and power are to be paid by CONTRACTOR.
 - 3. No permanent electrical equipment or wiring shall be used without express written permission of OWNER. Such approval, if given, shall not affect guarantee period. If OWNER authorizes use of permanent service facilities, CONTRACTOR shall pay all metering costs until acceptance or occupancy (whichever occurs first) of building by OWNER.

COPY OF BID SET

- C. Weather Protection and Temporary Heat: CONTRACTOR shall provide weather protection to protect the Work from damage because of freezing, rain, snow, and other inclement weather.
- D. Temporary Water: CONTRACTOR shall supply its own water during construction. CONTRACTOR shall also provide its own piping, valves, and appurtenances for its requirements. Connection to the existing water system shall be coordinated with OWNER and shall meet all code requirements including disinfection and backflow prevention. CONTRACTOR shall pay for all water used.
- E. Temporary Fire Protection: CONTRACTOR and Subcontractor(s) who maintain or provide an enclosed shed or trailer shall provide and maintain in operating order in each shed or trailer a minimum of one fire extinguisher. More extinguishers shall be provided as necessary. Fire extinguishers shall be minimum dry chemical, nonfreezing-type, UL rating 2A-30BC, with 10-pound capacity for Class A, B, and C fires.

1.03 TEMPORARY STAIRS AND ACCESS

- A. CONTRACTOR shall provide and maintain all equipment such as temporary stairs, ladders, ramps, runways, chutes, and so on as required for proper execution of the Work. CONTRACTOR shall be responsible for providing its own scaffolds, hoists, etc.
- B. All such apparatus, equipment, and construction shall meet all requirements of OSHA, the labor laws, and other applicable State and local laws. Provide stairs with handrails. As soon as possible and where applicable, permanent stairs shall be installed.
- C. As soon as permanent stairs are created, provide temporary protective treads, handrails, and shaft protection.
- D. Provide barricades at hazardous locations, complete with signs, temporary general lighting, warning lights, and similar devices as required.

1.04 TEMPORARY SUPPORT FACILITIES

- A. CONTRACTOR shall provide whatever facilities and services which may be needed to properly support primary construction process and meet compliance requirements and governing regulations.
- B. CONTRACTOR shall not use permanent facilities except as otherwise indicated, unless authorized by OWNER.

1.05 CONSTRUCTION SIGN

- A. Furnish and erect a construction sign to be maintained and kept in place until completion of the Contract.
- B. The sign shall be minimum 4 feet high by 8 feet wide, constructed by a professional sign painter, and shall show the name of the Project, OWNER, all prime contractors and ENGINEER. OWNER will select colors of paint required. General sign layout shall be as approved by OWNER.

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1.06 REMOVAL OF TEMPORARY FACILITIES

- A. Remove temporary materials, equipment, services, and construction as soon as practicable but no later than just prior to final completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities and restore existing facilities used during construction to specified, or to original, condition.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

COPY OF BID SET

SECTION 01560

TEMPORARY CONTROLS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Dust Control.
 - 2. Water, Erosion, and Sediment Control.
 - 3. Noise Control.
 - 4. Traffic Control.
 - 5. Site Security.
 - 6. Daily Cleanup.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

3.01 DUST CONTROL

- A. CONTRACTOR shall execute the Work by methods to minimize raising dust from construction operations.
- B. CONTRACTOR shall provide positive means to prevent air-borne dust from dispersing into atmosphere.
- C. CONTRACTOR shall provide partitions, enclosures, etc., within buildings as necessary to confine dust and protect adjacent areas.

3.02 WATER, EROSION, AND SEDIMENT CONTROL

- A. CONTRACTOR shall grade site to drain and shall maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. CONTRACTOR shall protect Site from puddling or running water.
- C. CONTRACTOR shall provide erosion control measures as necessary to control discharge of sediment laden water to surface waters and wetlands.
- D. Except as provided for in the document, overland discharge of water from dewatering operations shall not be allowed. Depending on water quality, such water shall either be piped directly to the surface water or shall be directed to sedimentation basins or other such structures or features prior to discharge to surface waters so as not to cause damage to existing ground and improvements, erosion, or deposition in the discharge area.

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- E. CONTRACTOR shall use jute or synthetic netting, silt fences, straw bales, dikes, channels, and other applicable measures to prevent erosion of soils disturbed by its construction operation.
- F. Restoration of the Site shall proceed concurrently with the construction operation. See Drawings and Specifications for erosion control measures in addition to that which may be required above.
- G. Erosion control measures shall comply with the following document: Kentucky's Best Management Practices for Construction Activities.

3.03 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

3.04 TRAFFIC CONTROL

- A. CONTRACTOR shall be responsible for providing all signs, barricades, flagmen and other traffic control devices in the construction zone. All traffic control measures shall meet the requirements Manual on Uniform Traffic Control Devices for Streets and Highways, Latest Edition.
- B. Do not close or obstruct roadways without approval of OWNER.
- C. Maintain one-way traffic on streets at all times.
- D. Conduct operations with minimum interference to roadways.

3.05 SITE SECURITY

- A. CONTRACTOR shall have the sole responsibility of safeguarding the Site perimeter to prevent unauthorized entry to the Site throughout the duration of the Project. CONTRACTOR shall at all times provide such permanent and temporary fencing or barricades or other measures as may be necessary to restrict unauthorized entry to its construction area including construction in public rights-of-way or easements. Site security measures shall include safeguards against attractive nuisance hazards as a result of construction activity.
- B. CONTRACTOR shall at all times be responsible for the security of the Work including materials and equipment. OWNER will not take any responsibility for missing or damaged equipment, tools, or personal belongings. CONTRACTOR shall have the sole responsibility of safeguarding the Work and the Site throughout the duration of the Project.

3.06 DAILY CLEANUP

- A. CONTRACTOR shall clean up the Site and remove all rubbish on a daily basis.

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- B. CONTRACTOR shall clean up public streets and highways and remove any dirt, mud or other materials due to project traffic on daily basis and shall comply with all local and state ordinances and permit requirements.

END OF SECTION

COPY OF BID SET

SECTION 01590

FIELD OFFICES AND SHEDS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Materials, equipment, and furnishings.
 - 2. Construction.
 - 3. Environmental control.
 - 4. CONTRACTOR office and facilities.
 - 5. ENGINEER Office.
 - 6. Storage areas and sheds.
 - 7. Preparation.
 - 8. Installation.
 - 9. Maintenance and cleaning.
 - 10. Removal.

PART 2–PRODUCTS

2.01 MATERIALS, EQUIPMENT, AND FURNISHINGS

- A. Materials, equipment and furnishings shall be serviceable, new or used, and adequate for required purpose.

2.02 CONSTRUCTION

- A. Portable or mobile buildings, or buildings shall be constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
- B. CONTRACTOR shall provide structurally sound, secure, weathertight enclosures for office and storage spaces.
- C. Temperature transmission resistance of floors, walls, and ceilings shall be compatible with occupancy and storage requirements.
- D. Exterior materials shall be weather resistant.
- E. Interior materials in offices shall consist of sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.
- F. Lighting for offices shall be 50-foot candles minimum at desk top height, with exterior lighting at entrance doors.
- G. Provide appropriate type fire extinguisher at each office and each storage area.
- H. Interior materials in storage sheds shall be as required to provide specified conditions for storage of products.

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2.03 ENVIRONMENTAL CONTROL

- A. Heating, cooling, and ventilating for offices shall consist of automatic equipment to maintain comfort conditions; 70°F heating and 78°F cooling.
- B. Heating and ventilation for storage spaces shall be as needed to maintain products in accordance with Contract Documents and to provide adequate lighting for maintenance and observation of products.

2.04 CONTRACTOR OFFICE AND FACILITIES

- A. CONTRACTOR shall provide facilities to meet CONTRACTOR's needs and to provide space for Project meetings.
- B. Provide telephone as required for CONTRACTOR's needs.
- C. Provide furnishings in meeting area. As a minimum, provide conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.

2.05 ENGINEER OFFICE

- A. CONTRACTOR for Contract 1-2017 shall provide separate trailer located at the Rose Run pump station site for sole use of ENGINEER, with separate entrance door with new lock and two keys.
- B. Minimum area shall be 200 square feet, minimum dimension 8 feet.
- C. Minimum total area of windows shall be 10% of floor area, with operable sash and insect screens. Locate to provide views of construction area.
- D. Electrical distribution panel shall have two circuits minimum, 110 volt, 60 Hz service. Provide minimum four 110 volt duplex convenience outlets, one on each wall.
- E. Provide minimum single-line touch tone phone and answering machine.
- F. Provide the following personal computer items:
 - 1. One desktop or laptop PC, Windows compatible, with minimum, 3.0 GhZ Multi Core (latest generation) Intel i5 or i7 processor, 8 GB RAM (or larger), 250 GB Solid State Drive (or larger), GB Ethernet and WiFi NIC, Six USB 2.0 or higher ports, Windows 10, CDR/DVDR Drive.
 - 2. Video Card with 1024 MB RAM capable of displaying a minimum resolution of 1920 x 1080.
 - 3. External 500 GB (or larger) USB 3.0 hard drive with software for backing up computer
 - 4. Setup software and verify software backups and restores the computer and its data files.
 - 5. LCD Display, Minimum 24-inch capable of displaying 1920 x 1080 or higher resolution.
 - 6. Hewlett Packard LaserJet all in one (Printer, Copier, Fax, Scan) with USB and WiFi connectivity. Using Laser Technology (must use toner and not ink). Must accommodate both 8.5 x 11 and 11 x 17 paper. Replenish paper, toner cartridges, and other supplies before fully expended.

COPY OF BID SET

7. Microsoft Office software 2016 or higher, compatible with supplied operating system and hardware.
8. Current version of Antivirus software with subscription to new updates
9. A broadband high speed internet service provider with minimum download speeds of Ten Mbps; minimum upload speeds of Two Mbps.
10. K Slot or Kensington lock and cable system to deter theft
11. Web Cam compatible with Skype with a resolution of 720p or higher
12. All necessary cables for system configurations.
13. PC, monitor, and printer to be set up, configured, and fully functional for use with communications and Microsoft Office Software. Security lock system installed.

G. Provide bottled drinking water dispenser and refill as necessary.

H. Provide the following furnishings:

1. One desk, minimum 54-inch by 30-inch, with three drawers.
2. One drafting table, 36-inch by 72-inch, with one equipment drawer.
3. Plan rack to hold working drawings, shop drawings, and record documents.
4. One standard four-drawer legal size metal filing cabinet.
5. Six linear feet of metal bookshelves.
6. One swivel armchair.
7. Two straight chairs.
8. One drafting table stool.
9. One tackboard, 36-inch by 30-inch.
10. One wastebasket.

2.06 STORAGE AREAS AND SHEDS

- A. Provide storage areas and sheds of size to meet storage requirements for products of individual sections, allowing for access and orderly provision for maintenance and for observation of products to meet requirements of Section 01600–Materials and Equipment.

PART 3–EXECUTION

3.01 PREPARATION

- A. CONTRACTOR shall fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

- A. CONTRACTOR shall install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed or as agreed upon by ENGINEER.
- B. Provide two hard surfaced parking spaces for use by ENGINEER, connected to office by hard surfaced walk.

3.03 MAINTENANCE AND CLEANING

- A. CONTRACTOR shall maintain approach walks free of mud, water, and snow.

COPY OF BID SET

3.04 REMOVAL

- A. Upon final acceptance and completion of the Work, CONTRACTOR shall remove field offices, foundations, utility services, and debris, and shall restore areas.

END OF SECTION

COPY OF BID SET

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: CONTRACTOR shall be responsible for the delivery, handling, storage and protection of all material and equipment required to complete the Work as specified herein.
- B. Related Sections and Divisions: Specific requirements for the handling and storage of material and equipment are described in other sections of these Specifications.

1.02 PRODUCTS

- A. Components required to be supplied in quantity within a Specification section shall be the same, and shall be interchangeable.
- B. When any construction deviations from the Drawings and/or Specifications necessary to accommodate equipment supplied by CONTRACTOR, result in additional costs to CONTRACTOR or other contractors, such additional costs shall be borne by CONTRACTOR. CONTRACTOR shall also pay any additional costs necessary for revisions of Drawings and/or Specifications by ENGINEER.
- C. Each major component of equipment shall bear a nameplate giving the name and address of the manufacturer and the catalogue number or designation.

1.03 TRANSPORTATION AND HANDLING

- A. Materials, products and equipment shall be properly containerized, packaged, boxed, and protected to prevent damage during transportation and handling.
- B. CONTRACTOR shall not overload any portion of the structure in the transporting or storage of materials.
- C. CONTRACTOR shall not damage other construction by careless transportation, handling, spillage, staining or impact of materials.
- D. CONTRACTOR shall provide equipment and personnel to handle products, including those provided by OWNER, by methods to prevent soiling and damage.
- E. CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.
- F. CONTRACTOR shall handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

COPY OF BID SET

1.04 DELIVERY AND RECEIVING

- A. CONTRACTOR shall arrange deliveries of products in accordance with the Progress Schedule, allowing time for observation prior to installation.
- B. CONTRACTOR shall coordinate deliveries to avoid conflict with the Work and conditions at the Site; work activities of other contractors or OWNER; limitations on storage space; availability of personnel and handling equipment and OWNER's use of premises.
- C. CONTRACTOR shall deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.
- D. CONTRACTOR shall clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.
- E. Immediately on delivery, CONTRACTOR shall inspect shipment to assure:
 - 1. Product complies with requirements of Contract Documents and reviewed submittals.
 - 2. Quantities are correct.
 - 3. Accessories and installation hardware are correct.
 - 4. Containers and packages are intact and labels legible.
 - 5. Products are protected and undamaged.

1.05 STORAGE AND PROTECTION

- A. General:
 - 1. CONTRACTOR shall store products, immediately on delivery, in accordance with manufacturer's instructions, with all seals and labels intact and legible.
 - 2. Available storage space at the Site is limited. Behind the Rose Run Pump Station Site, there is some available space for storage. CONTRACTOR for Contract 1-2016 shall have priority. Any additional off-site space required shall be arranged by CONTRACTOR.
 - 3. CONTRACTOR shall allocate the available storage areas and coordinate their use by the trades on the job.
 - 4. CONTRACTOR shall arrange storage in a manner to provide access for maintenance of stored items and for observation.
- B. In enclosed storage, CONTRACTOR shall:
 - 1. Provide suitable temporary weather tight storage facilities as may be required for materials that will be damaged by storage in the open.
 - 2. Maintain temperature and humidity within ranges stated in manufacturer's instructions.
 - 3. Provide ventilation for sensitive products as required by manufacturer's instructions.
 - 4. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
 - 5. Store solid materials such as insulation, tile, mechanical and electrical equipment, fittings, and fixtures under shelter, in original packages, away from dampness and other hazards.
 - 6. Store liquid materials away from fire or intense heat and protect from freezing.

COPY OF BID SET

- C. At exterior storage, CONTRACTOR shall:
1. Store unit materials such as concrete block, brick, steel, pipe, conduit, door frames, and lumber off ground, out of reach of dirt, water, mud and splashing.
 2. Store tools or equipment that carry dirt outside.
 3. Store large equipment so as not to damage the Work or present a fire hazard.
 4. Cover products subject to discoloration or deterioration from exposure to the elements, with impervious sheet material and provide ventilation to avoid condensation.
 5. Completely cover and protect any equipment or material which is prime coated or finish painted with secured plastic or cloth tarps. Store out of reach of dirt, water, mud and splashing.
 6. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
 7. Provide surface drainage to prevent erosion and ponding of water.
 8. Prevent mixing of refuse or chemically injurious materials or liquids.
 9. Cover aggregates such as sand and gravel in cold wet weather.
 10. Remove all traces of piled bulk materials at completion of work and return site to original or indicated condition.

1.06 MAINTENANCE OF STORAGE

- A. CONTRACTOR shall periodically inspect stored products on a scheduled basis.
- B. CONTRACTOR shall verify that storage facilities comply with manufacturer's product storage requirements, and verify that manufacturer required environmental conditions are maintained continually.
- C. CONTRACTOR shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of Contract Documents.
- D. CONTRACTOR shall perform scheduled maintenance of equipment in storage as recommended by the manufacturer. A record of the maintenance shall be kept and turned over to ENGINEER when the equipment is installed.

1.07 INSTALLATION REQUIREMENTS

- A. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise specified.
- B. After installation, CONTRACTOR shall protect all materials and equipment against weather, dust, moisture, and mechanical damage.
- C. CONTRACTOR shall be responsible for all damages that occur in connection with the care and protection of all materials and equipment until completion and final acceptance of the Work by OWNER. Damaged material and equipment shall be immediately removed from the Site.

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1.08 EQUIPMENT WARRANTIES

- A. Warranties shall be nonprorated, include all parts and labor, and be in written form. Warranties shall specifically exclude buyer's indemnification language. Warranty language shall not eliminate manufacturer's responsibility for sizing of the equipment. During warranty period, manufacturer shall be responsible for any travel expenses, outside contractor fees, and rental equipment fees associated with providing warranty service. Warranties shall not exclude normal wear items. Manufacturer shall pay expenses incurred for repairs and parts replacement not made by manufacturer if manufacturer's response is not within 72 hours of notification by OWNER. Warranty language shall be provided with the shop drawings.

1.09 CONCRETE EQUIPMENT BASE

- A. Cast-in-place concrete equipment bases shall be provided for all new and relocated equipment including electrical control panels, motor control centers, switchgear, etc. Concrete equipment bases shall be provided by CONTRACTOR except where specifically noted to be provided by others. Bases shall be 3-1/2 inch minimum height and shall be a minimum of 3 inches larger than equipment being supported. Grouting of equipment bases shall be as recommended by equipment manufacturer.
- B. Concrete and grout shall meet applicable sections of the specifications.
- C. Provide all anchor bolts, metal shapes and templates to be cast in concrete or used to form concrete for support of equipment.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

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SECTION 01650

STARTING OF SYSTEMS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. General.
 - 2. Equipment and System Installation.
 - 3. Starting equipment and systems.
 - 4. Demonstration, Instructions, and Operator Training.
 - 5. Start-up and testing.
- B. CONTRACTOR shall perform the Work described in the following subsections.

1.02 GENERAL

- A. The number of days for manufacturer's services stated in the Specifications shall be considered as the minimum number of days. Should additional time be required for services because of equipment malfunction or other problem, such time shall be at the expense of CONTRACTOR, with no change in Contract Price.
- B. "Days" specified shall consist of 8-hour days on-site, excluding travel time.
- C. CONTRACTOR shall designate and provide one person to be responsible for scheduling, coordinating, and expediting the specified services. Scheduling the services shall be done in cooperation with, and with the prior approval of ENGINEER and OWNER. Such schedule shall be arranged with the appropriate subcontractors, manufacturers, and suppliers with sufficient time to allow their compliance with the service requirements.
- D. CONTRACTOR shall manage equipment checkout such that checkout has been completed and deficiencies addressed prior to demonstration and training. Scheduling training prior to checkout may result in cancellation when checkout cannot be completed prior to training.

1.03 EQUIPMENT AND SYSTEM INSTALLATION

- A. Competent and experienced technical personnel shall represent the manufacturers of all equipment and systems for as many days as may be necessary to provide proper installation and to resolve assembly or installation problems at the site that are attributable to, or associated with, the equipment furnished. This requirement applies to manufacturers for all equipment furnished, whether or not specifically set forth in the Specifications.
- B. Where a manufacturer's certificate is called for in this Specification Section, the manufacturer's representative shall provide the attached certificate stating that the equipment or system has been installed in accordance with the manufacturer's instructions and has been inspected by a manufacturer's authorized representative, that it has been serviced with the proper initial lubricants, that applicable safety equipment has been properly installed, that the proper electrical and mechanical connections have been made,

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and that any other manufacturer requirements have been met. This certification shall be provided to ENGINEER and OWNER prior to the start-up. This certificate is in addition to the manufacturer's standard startup reports, checklists, and other pertinent information.

- C. Functional (or run) testing is required for all equipment and systems. The manufacturer's representative shall supervise the functional test, which shall include checking for proper rotation, alignment, speed, excessive vibration, and noisy operation. The Manufacturer's Certificate of Proper Installation shall state that proper adjustments have been made and that the equipment or system is ready for start-up.
- D. Manufacturer shall demonstrate, using laser alignment equipment, if appropriate, that the installed equipment has been aligned properly. Final acceptance of equipment will not be granted until manufacturer has demonstrated to ENGINEER that acceptable alignment to tolerances have been achieved. For pumps with motors 7.5 hp and larger, the acceptable shaft alignment tolerances shall be as recommended in the pump manufacturer's written instructions and shall include parallel offset and angular gap measurements.

1.04 STARTING EQUIPMENT AND SYSTEMS

- A. Where field testing and start-up services are called for in the Specifications, or when technical assistance is necessary as a result of any malfunction of the equipment or system furnished, the manufacturer's representative shall provide such services.
- B. Manufacturer's representative shall also conduct and/or assist with performance testing, as required by the Specifications. These services shall continue until such times as the applicable equipment or system has been successfully tested for performance and has been accepted by OWNER for full-time operation.
- C. Coordinate schedule for start-up of various equipment and systems. Coordination includes, but is not limited to, communication with subcontractors, suppliers, OWNER, and ENGINEER. CONTRACTOR shall confirm that all necessary work is complete and that the equipment and systems can be operated in conjunction with all associated processes.
- D. Notify ENGINEER and OWNER a minimum of 7 days prior to start-up of each item.
- E. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions that may cause damage.
- F. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- G. Verify wiring and support components for equipment are complete and tested.
- H. Execute start-up under supervision of applicable manufacturer's representative and CONTRACTOR's personnel in accordance with manufacturers' instructions.
- I. Require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up and to supervise placing equipment or system in operation.
- J. Equipment manufacturer shall provide a written report covering checkout, testing, inspections, and start-up and shall identify any deficiencies noted. Report shall be

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submitted to ENGINEER. CONTRACTOR shall be responsible for correcting all deficiencies noted in report. In addition, CONTRACTOR shall submit a fully executed Certificate of Proper Installation form if required in Paragraph 3.01 of this section.

1.05 DEMONSTRATION, INSTRUCTIONS, AND OPERATOR TRAINING

- A. For all mechanical equipment and systems and where called for in the Specifications, provide a qualified technical representative to provide detailed instructions to OWNER's personnel for operation and maintenance of equipment and associated instrumentation. Training services shall include pre-start-up classroom instruction and start-up on-site instruction, as stated in the Specifications.
- B. Refer to the Specifications for additional training requirements.
- C. CONTRACTOR shall coordinate the pre-start-up training periods with OWNER's operating personnel and manufacturers' representatives.
 - 1. Schedule training dates and times with OWNER, that are acceptable to the OWNER, using equipment, startup, and O&M training form. Normal hours available for training are between 7:30 A.M. to 3 P.M., Monday through Friday, except for holidays.
 - 2. Submit outline and presentation to ENGINEER at least 7 days in advance of training.
 - 3. Provide name, contact information, and brief synopsis of qualifications of the trainer.
 - 4. If materials above are not provided at least 7 days in advance, training may be canceled.
 - 5. Failure of supplier's or manufacturer's representative to appear for scheduled training, failure to notify OWNER 24 hours in advance of need to cancel scheduled training or failure to arrive within 30 minutes of start of scheduled training shall result in reimbursement to OWNER for time lost by OWNER's personnel in waiting for arrival of manufacturer's representative. Except in case of failure to arrive on time, time will not exceed 1 hour for each employee scheduled to receive training. Failure to arrive on time will be reimbursed by actual time late, up to 1 hour, after 1 hour, training will be rescheduled. CONTRACTOR shall reimburse OWNER via a change order.
 - 6. During the training, instructor will dedicate its time solely to training and not start-up services.
 - 7. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with OWNER's personnel in detail to explain all aspects of operation and maintenance.
 - 8. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment.
 - 9. Prepare and insert additional data in operation and maintenance manuals when need for additional data becomes apparent during instruction.
 - 10. OWNER may videotape the training for future internal use. Provide to OWNER paper and electronic copies of any media used as part of training.
 - 11. Provide training handouts for each of OWNER's personnel present.
- D. CONTRACTOR shall provide attached Certificate of Operator Training cosigned by OWNER and supplier's representative verifying training was accomplished to satisfaction of all parties.

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- E. Operation and maintenance manual submitted in accordance with Section 01300–Submittals shall be provided prior to operator training.
- F. Final payment for various items of equipment will not be made by OWNER until the equipment is operating to OWNER’s satisfaction.
- G. Where items of equipment are placed into service at different times or sequence, manufacturer’s services for start-up, field testing, and supervision shall be provided for each time or sequence. Training shall be provided prior to or at the time the first similar item of equipment is placed in service.

1.06 START-UP AND TESTING

- A. Prior to acceptance of any portion of the Work, start-up and testing of all equipment and testing of all materials furnished on the Project by CONTRACTOR shall have been conducted in the presence of representatives of CONTRACTOR, OWNER, and ENGINEER and also manufacturer if requested by OWNER or ENGINEER.
- B. CONTRACTOR shall provide whatever temporary installations and conditions are necessary in order to perform start-up and testing operations on all equipment and materials furnished under the Contract. Temporary connections and equipment necessary during start-up and testing operations shall include, but not be limited to, temporary piping and electrical power and control equipment and devices, temporary connection from various parts of the systems and any other labor, materials, fuel, devices, or items that may be required for start-up and testing operations. Temporary conditions shall include filling with water, if necessary, to check equipment and materials.
- C. All temporary installations and conditions shall be removed by CONTRACTOR upon completion of start-up and testing.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

NOT APPLICABLE

END OF SECTION

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CERTIFICATE OF OPERATOR TRAINING

Project _____

Equipment _____

Specification Section _____

Contract _____

I hereby certify the equipment supplier/manufacture has instructed OWNER's personnel in the start-up operation and maintenance of this equipment as required in the Specifications.

MANUFACTURER'S REPRESENTATIVE

Signature _____ Date _____

Name (print) _____

Title _____

Representing _____

CONTRACTOR

Signature _____ Date _____

Name (print) _____

Title _____

OWNER

I hereby certify that my operating personnel received instruction for start-up, operation, and maintenance of this equipment.

Signature _____ Date _____

Name (print) _____

Title _____

END SECTION

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SECTION 01700

CONTRACT CLOSEOUT

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Closeout procedures.
 - 2. Final cleaning.
 - 3. Adjusting.
 - 4. Project record documents.
 - 5. Warranties.
 - 6. Spare parts and maintenance materials.

1.02 CLOSEOUT PROCEDURES

- A. CONTRACTOR shall provide submittals to ENGINEER that are required by governing or other authorities.
- B. CONTRACTOR shall comply with General Conditions and Supplementary Conditions and complete the following before requesting ENGINEER's observation of the Work, or designated portion thereof, for substantial completion.
 - 1. Submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates, and similar required documentation for specific units of Work, enabling OWNER's unrestricted occupancy and use.
 - 2. Submit record documentation, maintenance manuals, tools, spare parts, keys, and similar operational items.
 - 3. Submit consent of surety (if surety required in Contract).
 - 4. Complete final cleaning, touch-up work of marred surfaces, and remove temporary facilities and tools.

1.03 FINAL CLEANING

- A. It is CONTRACTOR's responsibility to completely clean up the inside and outside of all buildings and the construction site at the completion of the Work.
- B. CONTRACTOR shall clean areas of the building in which painting and finishing work is to be performed just prior to the start of this work, and maintain these areas in satisfactory condition for painting and finishing. This cleaning includes:
 - 1. Removal of trash and rubbish from these areas.
 - 2. Broom cleaning of floors.
 - 3. Removal of any plaster, mortar, dust, and other extraneous materials from finish surfaces, including but not limited to exposed structural steel, miscellaneous metal, masonry, concrete, mechanical equipment, piping, and electrical equipment.

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- C. In addition to the cleaning specified above and the more specific cleaning that may be required in various technical sections of the Specifications, CONTRACTOR shall prepare the Project for occupancy by a thorough cleaning throughout, which shall include the following:
1. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
 2. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
 3. Replace filters of operating equipment.
 4. Clean debris from roofs, gutters, downspouts, and drainage systems.
 5. Clean site; sweep paved areas, rake clean landscaped surfaces.
 6. Remove waste and surplus materials, rubbish, and construction facilities from the Site.

1.04 ADJUSTING

- A. CONTRACTOR shall adjust operating products and equipment to ensure smooth and unhindered operation.

1.05 PROJECT RECORD DOCUMENTS

- A. CONTRACTOR shall maintain on Site, one set of the following record documents to record actual revisions to the Work:
1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change orders and other modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. CONTRACTOR shall ensure entries are complete and accurate, enabling future reference by OWNER.
- C. CONTRACTOR shall store record documents separate from documents used for construction.
- D. CONTRACTOR shall record information concurrent with construction progress.
- E. Specifications: CONTRACTOR shall legibly mark and record at each Product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by addenda and modifications.
- F. Record Drawings: CONTRACTOR shall legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.

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4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

1.06 WARRANTIES

- A. CONTRACTOR shall provide warranties beyond project one year warranty as required by technical sections and as follows.
- B. Submit warranty information as follows:
 1. Provide notarized copies.
 2. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers, and provide Table of Contents and assemble in three ring binder with durable cover.
 3. Submit with request for certificate of Substantial Completion.
 4. For items of work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

- A. CONTRACTOR shall provide spare parts, maintenance, and extra materials in quantities specified in individual specification sections.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

COPY OF BID SET

PERMITS

COPY OF BID SET



MATTHEW G. BEVIN
GOVERNOR

CHARLES G. SNAVELY
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

AARON B. KEATLEY
COMMISSIONER

300 SOWER BOULEVARD
FRANKFORT, KENTUCKY 40601

August 24, 2016

Mr. James Jeffries
PO Box 970
Elizabethtown, KY 42702

Re: Nolin River Watershed Sewer Infrastructure Change Request
Hardin County, Kentucky
Project ID #: 15-0696
Elizabethtown Valley Creek WWTP
Activity ID #: 1661, APE20150008
Receiving Treatment Plant KPDES #: KY0022039

Dear Mr. Jeffries:

We have reviewed the changes proposed to the above referenced project. The changes include the installation of an additional 670 linear feet of 8-inch PVC gravity sewer main. This is to advise that the requested change is APPROVED with respect to sanitary features of design. All stipulations and requirements contained in the original approval letter dated October 20, 2015, remain in effect.

If we can be of any further assistance or should you wish to discuss this correspondence, please do not hesitate to contact Mr. Terry Humphries at 502-782-6983.

Sincerely,

A handwritten signature in black ink, appearing to read "T. Humphries".

Terry Humphries, P.E.
Supervisor, Engineering Section
Water Infrastructure Branch
Division of Water

TH / MT

Enclosures

c: Hardin County Health Department
Mark Sneve, P.E.
Division of Plumbing
City of Elizabethtown

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STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

October 20, 2015

Mr. James Jeffries
PO Box 970
Elizabethtown, KY 42702

Re: Nolin River Watershed Sewer Infrastructure
Hardin County, Kentucky
Project ID #: 15-0696
Elizabethtown Valley Creek WWTP
Activity ID #: 1661, APE20150008
Receiving Treatment Plant KPDES #: KY0022039

Dear Mr. Jeffries:

We have reviewed the plans and specifications for the above referenced project. The plans include the construction of approximately 20,513 LF of 8-inch PVC gravity sewer line, 8,747 LF of 10-inch PVC gravity sewer line, 2,327 LF of 12-inch PVC gravity sewer line, 1,530 LF of 24-inch PVC gravity sewer line, 8,620 LF of 4-inch PVC force main, 15,600 LF of 6-inch PVC force main, 16,102 LF of 8-inch PVC force main, 7,078 LF of 10-inch PVC force main, 7,078 LF of 12-inch PVC force main, 30,330 LF of 16-inch PVC force main, and 4 pump stations - pump Sta. No. 1 with approximate flow of 230 gpm @ 132 ft. TDH, Pump Sta. No. 3 with approximate flow of 80 gpm @ 51 ft. TDH, Rose Run pump station with approximate flow of 360 gpm @ 76 ft. TDH and the wet well only for Pump Sta. No. 2. This is to advise that plans and specifications for the above referenced project are APPROVED with respect to sanitary features of design, as of this date with the requirements contained in the attached construction permit and the following two paragraphs.

At this point in time, only the 6-inch discharge force main will be in operation from Pump Station No. 1. The 10-inch and 12-inch discharge force mains from Pump Station No. 1 will be installed base on a pump accommodating a future flow of 1,350 GPM. Upon determination of the future tenants of the industrial park, a resubmission of plans for Pump Station No. 1 (for an upgrade) will be necessary to verify future flow conditions in the force main.

At this point in time, pumps will not be installed in Pump Station No. 2. The 16-inch discharge force main leaving Pump Station No. 2 is approved based on a pump accommodating a flow of 1,350 GPM. Upon determination of the future tenants of the industrial park, a resubmission of plans for the pump stations will be necessary to verify future flow conditions in the force main.

For Pump Stations No. 1 and No. 2 and their force main, other wastewater infrastructure work may be necessary if the flows are unable to obtain a velocity of 2 ft/sec, or cause additional line losses in the force main. This should be considered before beginning construction.

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Additionally, changes of the pump in Pump Station No. 3 or Rose Run Pump Station will require a new submission to Division of Water.

To verify the need of a water quality certification for crossing for this project, please contact Adam Jackson with the Water Quality Certification Section at 502-564-8158 extension at 4855.

If we can be of any further assistance or should you wish to discuss this correspondence, please do not hesitate to contact Mr. Mortaza Tabayeh at 502-564-3410 extension 4826 or Mr. Terry Humphries at 502-564-3410 extension 4881.

Sincerely,



Terry Humphries, P.E.
Supervisor, Engineering Section
Water Infrastructure Branch
Division of Water

TH / MT

Enclosures

C: Hardin County Health Department
Mark Sneve, PE
Division of Plumbing
City of Elizabethtown

COPY OF BID SET

Sewer Line Construction

Elizabethtown Valley Creek WWTP

Facility Requirements

Activity ID No.: APE20150008

Page 1 of 8

Submittal/Action Requirements:

Condition No.	Item ID	Condition
S-1	GACT35 (Nolin River Watershed-Sewer Infrastructure)	When this project is completed, the applicant shall: submit written certification: Due 30 calendar days after Completion of Construction to the Division of Water that the facilities have been constructed and tested in accordance with the approved plans and specifications and the approval conditions. Such certification shall be signed by a registered professional engineer. Failure to certify may result in penalty assessment and/or future approvals being withheld. [401 KAR 5:005 Section 24(2)]
S-2	PORT96 (Force Main)	When this project is completed, the applicant shall: submit written certification: Due 30 calendar days after Completion of Construction to the Division of Water that the facilities have been constructed and tested in accordance with the approved plans and specifications and the approval conditions. Such certification shall be signed by a registered professional engineer. Failure to certify may result in penalty assessment and/or future approvals being withheld. [401 KAR 5:005 Section 24(2)]

Narrative Requirements:

Condition No.	Item ID	Condition
T-1	GACT35 (Nolin River Watershed-Sewer Infrastructure)	The plans and specifications submitted for the project are approved by the Department of Environmental Protection as to sanitary features, subject to the requirements contained within the permit. [401 KAR 5:005 Section 24(3)]
T-2	GACT35 (Nolin River Watershed-Sewer Infrastructure)	Authority to construct these sewers is hereby granted. This approval is issued under the provisions of KRS Chapter 224.10-100 (19) regulations promulgated pursuant thereto. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any permits or licenses required by this cabinet and other state, federal, and local agencies. [401 KAR 5:005 Section 24(3)(c)2]
T-3	GACT35 (Nolin River Watershed-Sewer Infrastructure)	A permit to construct a facility shall be effective and valid for twenty-four (24) months upon issuance unless otherwise conditioned. If construction has not commenced within twenty-four (24) months following a permit's issuance, a new permit shall be obtained before construction may begin. [401 KAR 5:005 Section 24(1)]

COPY OF BID SET

Sewer Line Construction

Elizabethtown Valley Creek WWTP

Facility Requirements

Activity ID No.: APE20150008

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Narrative Requirements:

Condition No.	Item ID	Condition
T-4	GACT35 (Nolin River Watershed-Sewer Infrastructure)	The permit is issued to the applicant, and the permittee shall remain the responsible party for compliance with all applicable statutes and administrative regulations until a notarized applicable change in ownership certification is submitted and the transfer of ownership is acknowledged by the cabinet. [401 KAR 5:005 Section 28(1)]
T-5	GACT35 (Nolin River Watershed-Sewer Infrastructure)	The issuance of a permit by the cabinet does not convey any property rights of any kind or any exclusive privilege. [401 KAR 5:005 Section 24(5)]
T-6	GACT35 (Nolin River Watershed-Sewer Infrastructure)	There shall be no deviations from the plans and specifications submitted with the application or the conditions specified, unless authorized in writing by the cabinet. [401 KAR 5:005 Section 24(3)(b)1]
T-7	GACT35 (Nolin River Watershed-Sewer Infrastructure)	For subfluvial pipe crossings, a floodplain construction permit will not be required pursuant to KRS 151.250, if the following requirements of 401 KAR 4:050 Section 2 are met: 1) During the construction of the crossing, no material may be placed in the stream or in the flood plain of the stream to form construction pads, coffer dams, access roads, etc., unless prior approval has been obtained from the cabinet. 2) The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside of the flood plain, unless the applicant has received prior approval from the cabinet to fill within the flood plain. 3) For subfluvial crossings of erodible channels, there shall be at least thirty (30) inches of clear cover above the top of the pipe or conduit at all points. 4) For subfluvial crossings of nonerodible channels, there shall be at least six (6) inches of clear cover above the top of the pipe or conduit at all points, and the pipe or conduit shall be encased on all sides by at least six (6) inches of concrete. 5) The weight of a pipe and its contents during normal operating conditions at all points must exceed that of an equal volume of water, or the applicant must provide the division with sufficient information to show that the pipe and joints have sufficient strength. Contact the Floodplain Management Section of the Surface Water Permits Branch at (502) 564-3410 with any question on these requirements. [KRS 151.250 & 401 KAR 4:060]
T-8	GACT35 (Nolin River Watershed-Sewer Infrastructure)	If any portion of the sewer project will be constructed in or along a stream or wetland, contact the Water Quality Certification Section, located within the Water Quality Branch, at 502-564-3410, to determine if a 401 certification will be required. [KRS 224.16-050]

COPY OF BID SET

Sewer Line Construction

Elizabethtown Valley Creek WWTP

Facility Requirements

Activity ID No.: APE20150008

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Narrative Requirements:

Condition No.	Item ID	Condition
T-9	GACT35 (Nolin River Watershed-Sewer Infrastructure)	Facilities shall be designed and constructed in accordance with the "Recommended Standards for Wastewater Facilities" of the Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, commonly referred to as "Ten States' Standards", 2004 edition. [401 KAR 5:005 Section 7(1)(a)]
T-10	GACT35 (Nolin River Watershed-Sewer Infrastructure)	Gravity sewer lines and force mains shall be designed and constructed to give mean velocities, when flowing full, of not less than two (2) feet per second. Velocity calculations shall incorporate roughness coefficients pursuant to 401 KAR 5:005 Section 8(8). [401 KAR 5:005 Section 8(8)]
T-11	GACT35 (Nolin River Watershed-Sewer Infrastructure)	Sewer line pipe material, joints, fittings, and installation shall conform to the latest ASTM specifications. [Ten States (WW) 33.7-33.9]
T-12	GACT35 (Nolin River Watershed-Sewer Infrastructure)	Gravity sewer lines and force mains shall have a minimum of thirty (30) inches of cover or provide comparable protection. [401 KAR 5:005 Section 8(9)]
T-13	GACT35 (Nolin River Watershed-Sewer Infrastructure)	Sewer lines crossing water mains shall be laid to provide a vertical distance of eighteen (18) inches between the outside of the water main and the outside of the sewer line. This shall be the case where the water main is either above or below the sewer line. The crossing shall be arranged so that the sewer line joints are equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer line to prevent damage to the water main. [Ten States (WW) 38.32]
T-14	GACT35 (Nolin River Watershed-Sewer Infrastructure)	Sewer lines shall be laid at least ten (10) feet horizontally from any existing or proposed water main. The distance shall be measured from edge to edge. [Ten States (WW) 38.31]
T-15	GACT35 (Nolin River Watershed-Sewer Infrastructure)	If gravity sewer lines and force mains are to be constructed in fill areas, the fill areas shall be compacted to ninety-five (95) percent density as determined by the Standard Proctor Density test or to a minimum of ninety (90) percent density as determined by the Modified Proctor Density test prior to the installation of the sewer lines. [401 KAR 5:005 Section 8(10)]

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Sewer Line Construction

Elizabethtown Valley Creek WWTP

Facility Requirements

Activity ID No.: APE20150008

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Narrative Requirements:

Condition No.	Item ID	Condition
T-16	GACT35 (Nolin River Watershed-Sewer Infrastructure)	An audible and visible alarm shall be provided at any proposed wastewater pump station. [Ten States (WW) 46]
T-17	GACT35 (Nolin River Watershed-Sewer Infrastructure)	All proposed pump station wetwells shall be sized such that, based on the average flow, the time to fill the wetwell from the pump-off elevation to the pump-on elevation shall not exceed thirty (30) minutes. [401 KAR 5:005 Section 8(16)]
T-18	GACT35 (Nolin River Watershed-Sewer Infrastructure)	All pump stations shall provide a minimum of two (2) hours of detention time, based on the average design flow, above the high level alarm elevation or provide an alternate source of power with wetwell storage providing sufficient time for the alternate power source to be activated. [401 KAR 5:005 Section 8(18)]
T-19	GTSP1 (Nolin River Watershed-Sewer Infrastructure)	Pumps and force mains handling raw wastewater shall be capable of passing spheres of at least three (3) inches in diameter. Pump suction and discharge openings, as well as sewer force main pipe, shall be a minimum of four (4) inches in diameter. The above requirements do not apply to grinder pump stations or force mains directly connected to grinder pump stations. [Ten States (WW) 42.33, 49.1]
T-20	PORT92 (Gravity Sewer Lines)	The integrity of a new gravity sewer line shall be verified by either the infiltration-exfiltration or low pressure air testing method, and a deflection test shall be performed, if using flexible pipe. The deflection test shall be performed after the final backfill has been in place for at least thirty (30) days with no pipe exceeding a deflection of five (5) percent. Additionally, each new manhole shall be tested for water tightness. [401 KAR 5:005 Section 8(6)(a)]
T-21	PORT92 (Gravity Sewer Lines)	The entrance of groundwater into or loss of waste from a new gravity sewer line shall be limited to two-hundred (200) gpd per inch of diameter per mile of the gravity sewer line. This limitation includes manholes, gravity sewer lines, and appurtenances. [401 KAR 5:005 Section 8(5)]
T-22	PORT92 (Gravity Sewer Lines)	Concrete anchors shall be provided, with a spacing not over thirty-six (36) feet center to center, on all gravity sewer lines having a slope greater than twenty (20) percent and up to thirty-five (35) percent. [Ten States (WW) 33.46]

COPY OF BID SET

Sewer Line Construction

Elizabethtown Valley Creek WWTP

Facility Requirements

Activity ID No.: APE20150008

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Narrative Requirements:

Condition No.	Item ID	Condition
T-23	PORT92 (Gravity Sewer Lines)	Aerial sewer line crossings shall have support for all aerial joints. Precautions against freezing, such as insulation or increased slope, shall be provided. Additionally, expansion jointing shall be provided between sewer line surface transitions. [Ten States (WW) 37]
T-24	PORT92 (Gravity Sewer Lines)	A drop pipe shall be provided where the sewer enters the manhole at two (2) feet or more above the manhole invert. [Ten States (WW) 34.2]
T-25	PORT96 (Force Main)	The plans and specifications submitted for the project are approved by the Department of Environmental Protection as to sanitary features, subject to the requirements contained within the permit. [401 KAR 5:005 Section 24(3)]
T-26	PORT96 (Force Main)	Authority to construct these sewers is hereby granted. This approval is issued under the provisions of KRS Chapter 224.10-100 (19) regulations promulgated pursuant thereto. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any permits or licenses required by this cabinet and other state, federal, and local agencies. [401 KAR 5:005 Section 24(3)(c)2]
T-27	PORT96 (Force Main)	A permit to construct a facility shall be effective and valid for twenty-four (24) months upon issuance unless otherwise conditioned. If construction has not commenced within twenty-four (24) months following a permit's issuance, a new permit shall be obtained before construction may begin. [401 KAR 5:005 Section 24(1)]
T-28	PORT96 (Force Main)	The permit is issued to the applicant, and the permittee shall remain the responsible party for compliance with all applicable statutes and administrative regulations until a notarized applicable change in ownership certification is submitted and the transfer of ownership is acknowledged by the cabinet. [401 KAR 5:005 Section 28(1)]
T-29	PORT96 (Force Main)	The issuance of a permit by the cabinet does not convey any property rights of any kind or any exclusive privilege. [401 KAR 5:005 Section 24(5)]

COPY OF BID SET

Sewer Line Construction

Elizabethtown Valley Creek WWTP

Facility Requirements

Activity ID No.: APE20150008

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Narrative Requirements:

Condition No.	Item ID	Condition
T-30	PORT96 (Force Main)	There shall be no deviations from the plans and specifications submitted with the application or the conditions specified, unless authorized in writing by the cabinet. [401 KAR 5:005 Section 24(3)(b)1]
T-31	PORT96 (Force Main)	<p>For subfluvial pipe crossings, a floodplain construction permit will not be required pursuant to KRS 151.250, if the following requirements of 401 KAR 4:050 Section 2 are met:</p> <ol style="list-style-type: none">1) During the construction of the crossing, no material may be placed in the stream or in the flood plain of the stream to form construction pads, coffer dams, access roads, etc., unless prior approval has been obtained from the cabinet.2) The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside of the flood plain, unless the applicant has received prior approval from the cabinet to fill within the flood plain.3) For subfluvial crossings of erodible channels, there shall be at least thirty (30) inches of clear cover above the top of the pipe or conduit at all points.4) For subfluvial crossings of nonerodible channels, there shall be at least six (6) inches of clear cover above the top of the pipe or conduit at all points, and the pipe or conduit shall be encased on all sides by at least six (6) inches of concrete.5) The weight of a pipe and its contents during normal operating conditions at all points must exceed that of an equal volume of water, or the applicant must provide the division with sufficient information to show that the pipe and joints have sufficient strength. <p>Contact the Floodplain Management Section of the Surface Water Permits Branch at (502) 564-3410 with any question on these requirements. [KRS 151.250 & 401 KAR 4:060]</p>
T-32	PORT96 (Force Main)	If any portion of the sewer project will be constructed in or along a stream or wetland, contact the Water Quality Certification Section, located within the Water Quality Branch, at 502-564-3410, to determine if a 401 certification will be required. [KRS 224.16-050]
T-33	PORT96 (Force Main)	Facilities shall be designed and constructed in accordance with the "Recommended Standards for Wastewater Facilities" of the Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, commonly referred to as "Ten States' Standards", 2004 edition. [401 KAR 5:005 Section 7(1)(a)]
T-34	PORT96 (Force Main)	Gravity sewer lines and force mains shall be designed and constructed to give mean velocities, when flowing full, of not less than two (2) feet per second. Velocity calculations shall incorporate roughness coefficients pursuant to 401 KAR 5:005 Section 8(8). [401 KAR 5:005 Section 8(8)]

COPY OF BID SET

Sewer Line Construction

Elizabethtown Valley Creek WWTP

Facility Requirements

Activity ID No.: APE20150008

Page 7 of 8

Narrative Requirements:

Condition No.	Item ID	Condition
T-35	PORT96 (Force Main)	Sewer line pipe material, joints, fittings, and installation shall conform to the latest ASTM specifications. [Ten States (WW) 33.7-33.9]
T-36	PORT96 (Force Main)	Gravity sewer lines and force mains shall have a minimum of thirty (30) inches of cover or provide comparable protection. [401 KAR 5:005 Section 8(9)]
T-37	PORT96 (Force Main)	Sewer lines crossing water mains shall be laid to provide a vertical distance of eighteen (18) inches between the outside of the water main and the outside of the sewer line. This shall be the case where the water main is either above or below the sewer line. The crossing shall be arranged so that the sewer line joints are equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer line to prevent damage to the water main. [Ten States (WW) 38.32]
T-38	PORT96 (Force Main)	Sewer lines shall be laid at least ten (10) feet horizontally from any existing or proposed water main. The distance shall be measured from edge to edge. [Ten States (WW) 38.31]
T-39	PORT96 (Force Main)	If gravity sewer lines and force mains are to be constructed in fill areas, the fill areas shall be compacted to ninety-five (95) percent density as determined by the Standard Proctor Density test or to a minimum of ninety (90) percent density as determined by the Modified Proctor Density test prior to the installation of the sewer lines. [401 KAR 5:005 Section 8(10)]
T-40	PORT96 (Force Main)	An audible and visible alarm shall be provided at any proposed wastewater pump station. [Ten States (WW) 46]
T-41	PORT96 (Force Main)	All proposed pump station wetwells shall be sized such that, based on the average flow, the time to fill the wetwell from the pump-off elevation to the pump-on elevation shall not exceed thirty (30) minutes. [401 KAR 5:005 Section 8(16)]

COPY OF BID SET

Sewer Line Construction

Elizabethtown Valley Creek WWTP

Facility Requirements

Activity ID No.: APE20150008

Page 8 of 8

Narrative Requirements:

Condition No.	Item ID	Condition
T-42	PORT96 (Force Main)	All pump stations shall provide a minimum of two (2) hours of detention time, based on the average design flow, above the high level alarm elevation or provide an alternate source of power with wetwell storage providing sufficient time for the alternate power source to be activated. [401 KAR 5:005 Section 8(18)]

COPY OF BID SET



MATTHEW G. BEVIN
GOVERNOR

CHARLES G. SNAVELY
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

AARON B. KEATLEY
COMMISSIONER

300 SOWER BOULEVARD
FRANKFORT, KENTUCKY 40601

August 11, 2017

Hardin County Water District No. 2
360 Ring Rd
Elizabethtown, KY 427020970

RE: Stream Construction Permit #21761-Extension Hardin Co Water Dist No 2 - Hardin Co -
**Installation of gravity sewers and force main across stream and four pump stations in the
floodplain of Nolin River, with coordinates 37.601667, -85.905556, in Hardin County. AI:
127202**

Dear Hardin County Water District No. 2:

We have received your request for an extension of Stream Construction Permit #21761-
Extension. Since there are no changes in the original plans or circumstances involved, we are extending
the expiration date to August 11, 2018. Please note that all restrictions and requirements on the previous
permit are still applicable.

If you have any questions, please call Kathy Allen at 502-782-6875.

Sincerely,

E-Signed by Kathy Allen
VERIFY authenticity with e-Sign

For: Ron Dutta, P.E.
Floodplain Section Supervisor
Division of Water

RD/KA/kla

pc: Louisville Regional Office
Vicki Meredith – Hardin County



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STEVEN L. BESHEAR
GOVERNOR

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

LEONARD K. PETERS
SECRETARY

STREAM CONSTRUCTION PERMIT For Construction In Or Along A Stream

Issued to: **Hardin County Water District No. 2**
Address: **360 Ring Rd**
Elizabethtown, KY 42702-0970

Permit expires on

November 3, 2016

Permit No. **21761**

AI: **127202**

In accordance with KRS 151.250 and KRS 151.260, the Energy and Environment Cabinet approves the application dated **September 10, 2015** for **installation of gravity sewers and force main across stream and four pump stations in the floodplain of Nolin River, with coordinates 37.601667, -85.905556, in Hardin County.**

There shall be no deviation from the plans and specifications submitted and hereby approved unless the proposed change shall first have been submitted to and approved in writing by the Cabinet. This approval is subject to the attached limitations. **Please read these limitations carefully!** If you are unable to adhere to these limitations for any reason, please contact this office prior to construction.

This permit is valid from the standpoint of stream obstruction only. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet and other state, federal and local agencies. Specifically if the project involves work in a stream, such as bank stabilization, dredging, relocation, or in designated wetlands, a 401 Water Quality Certification from the Division of Water will be required.

This permit is nontransferable and is not valid unless actual construction of this authorized work is begun prior to the expiration date noted above. Any violation of the Water Resources Act of 1966 as amended is subject to penalties as set forth in KRS 151.990.

If you have any questions regarding this permit, please call Mr. Solitha Dharman at (502) 564-3410.

Issued November 3, 2015.

A handwritten signature in black ink that reads "Ron Dutta".

Ron Dutta, P.E., Supervisor
Floodplain Management Section
Surface Water Permit Branch

RD/SD/kec

pc: Louisville Regional Office
Vicki Meredith – Hardin County Floodplain Coordinator
Mark A Sneve, PE (by email)
File

COPY OF BID SET

Stream Construction Permit
Hardin Co Water Dist No 2 - Hardin Co
Facility Requirements
Permit Number: 21761
Activity ID No.:APE20150001

Page 1 of 2

STRC0000000001 (AI: 127202 - Sewer Infrastructure) Installation of gravity sewers and force main across stream and four pump stations:

Submittal/Action Requirements:

Condition No.	Condition
S-1	Hardin Co Water District #2 must submit final construction report: Due within 90 days after completion of construction Hardin Co Water District #2 must certify in writing that the project has been completed in accordance with the approved plans and specifications. A Final Construction Report Form is enclosed. [401 KAR 4:060 Section 6]

Narrative Requirements:

Condition No.	Condition
T-1	The issuance of this permit by the cabinet does not convey any property rights of any kind or any exclusive privilege. [KRS 151.250 & 401 KAR 4:060]
T-2	This permit is issued from the standpoint of stream obstruction only and does not constitute certification of any other aspect of the proposed construction. The applicant is liable for any damage resulting from the construction, operation, or maintenance of this project. This permit has been issued under the provisions of KRS Chapter 151.250 and regulations promulgated pursuant thereto. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet and other state, federal and local agencies. [KRS 151.250]
T-3	A copy of this permit must be available at the construction site. [KRS 151.250]
T-4	Any work performed by or for Hardin Co Water District #2 that does not fully conform to the submitted application or drawings and the limitations set forth in this permit, is subject to partial or total removal and enforcement actions pursuant to KRS 151.280 as directed by the Kentucky Department for Environmental Protection. [KRS 151.280]
T-5	Any design changes or amendments to the approved plans must be submitted to the Division of Water and approved in writing prior to implementation. [KRS 151.250]
T-6	Since Hardin County participates in the National Flood Insurance Program, a local floodplain permit must be obtained prior to beginning of construction. Upon completion of construction Hardin Co Water District #2 must contact the local permitting agency for final approval of the construction for compliance with the requirements of the local floodplain ordinance. [401 KAR 4:060 Section 9(c)]

COPY OF BID SET

Stream Construction Permit
Hardin Co Water Dist No 2 - Hardin Co
Facility Requirements
Permit Number: 21761
Activity ID No.:APE20150001

Page 2 of 2

STRC0000000001 (AI: 127202 - Sewer Infrastructure) Installation of gravity sewers and force main across stream and four pump stations:

Narrative Requirements:

Condition No.	Condition
T-7	The permittee may contact Water Quality Certification (or a determination that none is required) through the Division of Water, Water Quality Branch before beginning construction. Contact the Water Quality Certification Supervisor at (502) 564-3410. [KRS 224.16-050 & Clean Water Act Section 401]
T-8	Erosion prevention measures, sediment control measures, and other site management practices shall be designed, installed, and maintained in an effective operating condition to prevent migration of sediment off site. [KRS 224.70-110]
T-9	All debris and excess material shall be removed for disposal outside of the base floodplain. [401 KAR 4:060]
T-10	Upon completion of construction all disturbed areas shall be seeded and mulched or otherwise stabilized to prevent erosion. [401 KAR 4:060]
T-11	The entry of mobile equipment into the stream channel shall be limited as much as reasonably possible to minimize degradation of the waters of the Commonwealth. [401 KAR 4:060]
T-12	Construction other than as authorized by this permit shall require written approval from the Division of Water. [401 KAR 4:060]
T-13	The existing stream flow shall be maintained at all times during construction using standard flow diversion or pump around methods. Cofferdams or other structures placed in the stream shall be removed immediately if adverse flooding conditions result or if a flooding event is imminent. [401 KAR 4:060 Section 4]
T-14	Pursuant to KRS 151.250, following criteria are applicable to subfluvial utility or pipeline crossing of streams : (1) During the construction of the crossing, no material may be placed in the stream or in the flood plain of the stream to form construction pads, coffer dams, access roads, etc., unless prior approval has been obtained from the cabinet. (2) The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside of the flood plain unless the applicant has received prior approval from the cabinet to fill within the flood plain. (3) For subfluvial crossings of erodible channels, there shall be at least thirty (30) inches clear to the top of the pipe or conduit at all points. (4) For subfluvial crossings of nonerodible channels, there shall be at least six (6) inches of clear cover above the top of the pipe or conduit at all points, and the pipe or conduit shall be encased on all sides by at least six (6) inches of concrete. (5) The weight of a pipe and its contents during normal operating conditions at all points must exceed that of an equal volume of water, or the applicant must provide the division with sufficient information to show that the pipe and joints have sufficient strength. [401 KAR 4:050 Section 2]

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STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER
200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

November 19, 2015

Hardin County Water District No. 2
Attention: James Jeffries
360 Ring Road
Elizabethtown, Kentucky 42701

Re: Water Quality Certification #2015-087-1
Nolin River Watershed Sewer Infrastructure
Project
USACE ID No.: LRL-2015-774-mck
AI No.: 127202; Activity ID: APE20150002
Unnamed Tributaries to Nolin River, Unnamed
Tributaries to Rose Run, Rose Run, East
Rhudes Creek, Unnamed Tributaries to Valley
Creek
Hardin County, Kentucky

Dear Mr. Jeffries:

Pursuant to Section 401 of the Clean Water Act (CWA), the Commonwealth of Kentucky certifies it has reasonable assurances that applicable water quality standards under Kentucky Administrative Regulations Title 401, Chapter 10, established pursuant to Sections 301, 302, 303, 304, 306, and 307 of the CWA, will not be violated by the above referenced project provided that the U.S. Army Corps of Engineers authorizes the activity under 33 CFR part 330, and the attached conditions are met.

All future correspondence on this project must reference **AI No. 127202**. **The attached document is your official Water Quality Certification; please read it carefully.** If you should have any questions concerning the conditions of this water quality certification, please contact Chloe Brantley of my staff at Chloe.Brantley@ky.gov or (502) 564-3410 Extension 4863.

Sincerely,

A handwritten signature in black ink that reads "Andrea Keatley".

Andrea Keatley, Acting Supervisor
401 Water Quality Certification Section
Kentucky Division of Water

CB

Attachments

cc: Meagan Knuckles, USACE: Louisville District (via email: Meagan.C.Knuckles@usace.army.mil)

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Lee Andrews, USFWS: Frankfort (via email: teresa_hyatt@fws.gov)

Joanna Ashford, Green River Basin Coordinator (via email: Joanna.Ashford@ky.gov)

Jordan Bailey, KDOW: Louisville RO (via email: Jordan.Bailey@ky.gov)

James Jeffries, HCWD2 (via email: jjeffries@hardincountywater2.org)

Mark Sneve, Strand Associates, Inc. (via email: mark.sneve@strand.com)

Abbe Michalski, Strand Associates, Inc. (via email: Abbe.Michalski@strand.com)

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Water Quality Certification

Hardin Co Water Dist No 2 - Hardin Co
Facility Requirements

Activity ID No.: APE20150002

Page 1 of 4

ACTV0000000001 (Nolin River, Rose Run, East Rhudes Cr, Valley Cr) Hardin County Water District No. 2- Nolin River Watershed Sewer Infrastructure Project:

Submittal/Action Requirements:

Condition No.	Condition
S-1	Hardin County Water District No. 2 shall submit notification: Due prior to any construction activity to the Kentucky Division of Water, 401 Water Quality Certification Section Project Manager or Supervisor. [Clean Water Act]
S-2	Hardin County Water District No. 2 shall submit notification: Due when construction is complete to the Kentucky Division of Water, 401 Water Quality Certification Section Project Manager or Supervisor. [Clean Water Act]

COPY OF BID SET

Water Quality Certification

Hardin Co Water Dist No 2 - Hardin Co

Facility Requirements

Activity ID No.: APE20150002

Page 2 of 4

ACTV0000000001 (continued):

Narrative Requirements:

Condition No.	Condition
T-1	<p>The work approved by this certification shall be limited to the proposed Hardin County Water District No. 2 Nolin River Watershed Sewer Infrastructure project to install a sewer infrastructure for the Nolin River watershed, including the Town of Glendale, the Glendale Industrial Tract, the Interstate 65 Glendale Interchange and the U.S. 31W corridor. The proposed infrastructure will consist of gravity sewers, force mains, and pump stations. There will be approximately 8,620 linear feet of 4-inch PVC pipe, 15,600 linear feet of 6-inch PVC pipe, 36,615 linear feet of 8-inch PVC pipe, 15,825 linear feet of 10-inch PVC pipe, 9,405 linear feet of 12-inch PVC pipe, 30,330 linear feet of 16-inch PVC pipe, and 1,530 linear feet of 24-inch PVC pipe. There will also be four pump stations. This project will consist of approximately twenty-three (23) jurisdictional stream crossings. The proposed project will result in impacts to a total of 690 linear feet of temporary impacts to the following jurisdictional waters:</p> <p>21</p> <p>Nolin River:</p> <ul style="list-style-type: none">- 90 linear feet of four (4), unnamed, ephemeral tributaries to Nolin River- 80 linear feet of two (2), unnamed, intermittent tributaries to Nolin River- 80 linear feet of three (3), unnamed, perennial tributaries to Nolin River <p>Rose Run:</p> <ul style="list-style-type: none">- 230 linear feet of seven (7), unnamed, ephemeral tributaries to Rose Run- 60 linear feet of two (2), unnamed, intermittent tributaries to Rose Run- 30 linear feet of perennial, Rose Run <p>East Rhudes Creek:</p> <ul style="list-style-type: none">- 30 linear feet of perennial, East Rhudes Creek <p>Valley Creek:</p> <ul style="list-style-type: none">- 60 linear feet of two (2), unnamed, intermittent tributaries to Valley Creek- 30 linear feet of one (1), unnamed, perennial tributary to Valley Creek. [Clean Water Act]
T-2	<p>All work performed under this certification shall adhere to the design and specifications set forth in the Application 401 Water Quality Certification, Nolin River Watershed- Sewer Infrastructure, Glendale, Hardin County, Kentucky and associated documentation and plans received September 08, 2015; copies of the USACE Application for Department of Army Permit, Preliminary Jurisdictional Determination Form, and Drawing Sets sent via electronic mail October 6, 2015. [Clean Water Act]</p>

COPY OF BID SET

Water Quality Certification

Hardin Co Water Dist No 2 - Hardin Co

Facility Requirements

Activity ID No.: APE20150002

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ACTV0000000001 (continued):

Narrative Requirements:

Condition No.	Condition
T-3	Hardin County Water District No. 2 shall mitigate on-site for temporary impacts to streams through minimization of impacts and restoration to preconstruction grade, contours and conditions or better. [Clean Water Act]
T-4	Hardin County Water District No. 2 should limit timing of construction to avoid periods of high rainfall and stream flow as schedules permit. [Clean Water Act]
T-5	Hardin County Water District No. 2 should conduct blasting, trenching, pipe installation, backfilling, capping, and temporary stabilization or final restoration activities at each individual waterbody crossing in a manner which minimizes erosion and subsequent sedimentation into the waterbody. [Clean Water Act]
T-6	Hardin County Water District No. 2 shall limit the removal of riparian vegetation within the utility line right-of-way to that necessary for equipment access and staging areas. Effective erosion and sedimentation control measures and structures and best management practices shall be employed at all times during the project to prevent degradation of waters of the Commonwealth. Revegetation of exposed soil should be conducted immediately after site grading through seeding, hay or straw application and placement of erosion control matting. [Clean Water Act]
T-7	Hardin County Water District No. 2 shall properly place and install sediment and erosion control measures and structures and enact best management practices along and within the project construction right-of-ways and at each surface water crossing location during the construction process to minimize silt entry into the waterbodies. All sediment and erosion control measures shall be removed after re-vegetation has become well-established. [Clean Water Act]
T-8	All impacted areas shall be revegetated with a groundcover mix of species recommended by the Kentucky Division of Water at a density of 25 to 30 pounds per acre in addition to annual rye at a density of 15 to 20 pounds per acres. The seed mix shall be covered with hay or straw mulch or erosion control matting. Streambanks shall be restored to preconstruction grades and contours and revegetated with native herbaceous seeding, tree and shrub plantings, live staking, and erosion control matting. [Clean Water Act]
T-9	The Division of Water reserves the right to modify or revoke this certification should it be determined that the activity is in noncompliance with any condition set forth in this certification. [Clean Water Act]
T-10	If construction does not commence within one year of the date of this letter, this certification will become void. A letter requesting a renewal should be submitted. [Clean Water Act]

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Water Quality Certification

Hardin Co Water Dist No 2 - Hardin Co

Facility Requirements

Activity ID No.: APE20150002

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ACTV0000000001 (continued):

Narrative Requirements:

Condition No.	Condition
T-11	Other permits from the Division of Water may be required for this activity. If this activity occurs within a floodplain, a Permit to Construct Across or Along a Stream may be required. Please contact the Floodplain Section Supervisor (502-564-3410) for more information. If the project will disturb one acre or more of land, or is part of a larger common plan of development or sale that will ultimately disturb one acre or more of land, a Kentucky Pollution Discharge Elimination System (KPDES) stormwater permit shall be required from the Surface Water Permits Branch. This permit requires the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP must include erosion prevention and sediment control measures. Contact: Surface Water Permits Branch (SWPB) Support (502-564-3410 or SWPBSupport@ky.gov)
T-12	Dredging work shall not be conducted during the fish spawning season, April 15th through June 15th. [Clean Water Act]
T-13	Mitigation for impacts shall begin prior to or concurrently with impacts. [Clean Water Act]
T-14	Check dams are not allowed within the stream channel. [Clean Water Act]
T-15	Remove all sediment and erosion control measures after re-vegetation has become well-established. [Clean Water Act]

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ENERGY AND ENVIRONMENT CABINET
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200 FAIR OAKS LANE, 4TH FLOOR
FRANKFORT, KENTUCKY 40601
www.kentucky.gov

ATTENTION APPLICANT

If your project involves one or more of the following activities, you may need more than one permit from the Kentucky Division of Water.

- *building in a floodplain *road culvert in a stream**
- *streambank stabilization *stream cleanout**
- *utility line crossing a stream**
- *construction sites greater than 1 acre**

- **Construction sites greater than 1 acre will require the filing of a Notice of Intent to be covered under the KPDES General Stormwater Permit. This permit requires the creation of an erosion control plan.**
Contact: Surface Water Permits Branch (SWPB) Support at (502) 564-3410 or SWPBsupport@ky.gov
- **Projects that involve filling in the floodplain will require a floodplain construction permit from the Floodplain Management Section.**
Contact: Ron Dutta
- **Projects that involve work IN a stream, such as bank stabilization, road culverts, utility line crossings, and stream alteration will require a floodplain permit and a Water Quality Certification from the Division of Water.**
Contact: Andrea Keatley

All three contacts listed above can be reached at (502) 564-3410. A complete listing of environmental programs administered by the Kentucky Department for Environmental Protection is available from Pete Goodmann by calling (502) 564-3410.

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GENERAL CONDITIONS FOR WATER QUALITY CERTIFICATION

1. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
2. All dredged material shall be removed to an upland location and/or graded on adjacent areas (so long as such areas are not regulated wetlands), to obtain original streamside elevations, i.e. overbank flooding shall not be artificially obstructed.
3. In areas not riprapped or other wise stabilized, revegetation of stream banks and riparian zones shall occur concurrently with project progression. At a minimum, revegetation will approximate pre-disturbance conditions.
4. To the maximum extent practicable, all instream work under this certification shall be performed during low flow.
5. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such instream work is unavoidable, then it shall be performed in such a manner and duration as to minimize resuspension of sediments and disturbance to substrates and bank or riparian vegetation.
6. Any fill or riprap including refuse fill, shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.
7. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when work will be done.
8. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.
9. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling 800/564-2380.



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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, LOUISVILLE
CORPS OF ENGINEERS
P.O. BOX 59
LOUISVILLE KY 40201-0059
FAX: (502) 315-6677
<http://www.lrl.usace.army.mil/>

March 30, 2016

Operations Division
Regulatory Branch (South)
ID No. LRL-2015-00774-mck

Mr. James Jeffries
Hardin County Water District No. 2
360 Ring Road, P.O. Box 970
Elizabethtown, Kentucky 42701

Dear Mr. Jeffries:

This is in response to your request for authorization to construct 23 stream crossings (see enclosed Table 1), for the Nolin River Sewer Infrastructure project, located on unnamed tributaries (UTs) to Nolin River, Rose Run, UTs to Rose Run, East Rhudes Creek, and UTs to Valley Creek near Glendale and to the north and east of Glendale, Hardin County, Kentucky (Latitude: 37.60167°N and Longitude: 85.90556°W). The proposed stream crossings would be temporary and restored to preconstruction contours once construction is complete. The utility line crossing at station 113+50 would be constructed using a bore, and would not require the discharge of dredged or fill material into "waters of the United States (U.S.)." and therefore would not require an authorization. The information supplied by you was reviewed to determine whether a Department of the Army (DA) permit will be required under the provisions of Section 404 of the Clean Water Act.

This project is considered a discharge of backfill or bedding material for utility lines. The project is authorized under the provisions of Nationwide Permit (NWP) No. 12, Utility Line Activities, as published in the Federal Register February 21, 2012. Under the provisions of this authorization, you must comply with the enclosed Terms and General Conditions for NWP No. 12 and the following Special Condition:

The permittee must conduct all removal of trees associated with the project between the dates of October 15th to March 31st.

Hardin County Water District No. 2 must also comply with the enclosed Water Quality Certification (WQC) Conditions for Nationwide Permit No. 12 dated March 19, 2012, issued by the Kentucky Division of Water (KDOW). Once Hardin County Water District No. 2 obtains their certification, or if no application was required, they may proceed with the project without further contact or verification from us.

COPY OF BID SET

This verification is valid until the NWP is modified, reissued, or revoked. All of the existing NWPs are scheduled to be modified, reissued, or revoked prior to March 18, 2017. It is incumbent upon Hardin County Water District No. 2 to remain informed of changes to the NWPs. We will issue a public notice when the NWPs are reissued. Furthermore, if Hardin County Water District No. 2 commences or are under contract to commence this activity before the date that the relevant NWP is modified or revoked, they will have 12 months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this nationwide permit. The enclosed Compliance Certification should be signed and returned when the project is completed. Please note that we also perform periodic inspections to ensure compliance with our permit conditions and applicable Federal laws. Copies of this letter are being sent to the appropriate coordinating agencies and to your agent, Strand Associates, Inc. (see enclosure for addresses).

Attached to this verification are a preliminary jurisdictional determination (JD), a Notification of Appeal Process (NAP) fact sheet, and Request for Appeal (RFA) form. However, a preliminary JD is not appealable and impacting "waters of the United States" identified in the preliminary JD will result in Hardin County Water District No. 2 waiving the right to request an approved JD at a later date. An approved JD may be requested (which may be appealed), by contacting the project manager for further instruction.

If you have any questions, please contact this office by writing to the above address, ATTN: CELRL-OPF-S, or by calling me at 502-315-6709. All correspondence pertaining to this matter should refer to our ID No. LRL-2015-00774-mck.

Sincerely,



Meagan Knuckles
Project Manager
Regulatory Branch

Enclosures

COPY OF BID SET

TABLE 1

Waters Crossing (Station Number)	Stream Name	Latitude (°N)	Longitude (°W)	Cowardin Class	Impacts (Linear Feet)	Impact Type
11+00	UT Nolin River	37.57583	-85.8775	R5-RIVERINE, UNKNOWN PERENNIAL	50	Open Cut-Temporary
113+50	UT Nolin River	37.595	-85.86556	R4-RIVERINE, INTERMIT	160	Bore
128+25	UT Nolin River	37.58972	-85.90361	R4-RIVERINE, INTERMIT	50	Open Cut-Temporary
14+00	UT Rose Run	37.60722	-85.90361	R6-RIVERINE, EPHEMERAL	70	Open Cut-Temporary
195+75	UT Rose Run	37.6025	-85.89833	R6-RIVERINE, EPHEMERAL	40	Open Cut-Temporary
200+00	UT Rose Run	37.60361	-85.89889	R6-RIVERINE, EPHEMERAL	40	Open Cut-Temporary
207+25	UT Rose Run	37.605	-85.90056	R4-RIVERINE, INTERMIT	40	Open Cut-Temporary
215+25	UT Rose Run	37.60611	-85.90278	R6-RIVERINE, EPHEMERAL	40	Open Cut-Temporary
240+00	UT Rose Run	37.60972	-85.90528	R6-RIVERINE, EPHEMERAL	180	Open Cut-Temporary
241+25	Rose Run	37.60991	-85.90532	R5-RIVERINE, UNKNOWN PERENNIAL	180	Open Cut-Temporary
26+50	Rose Run	37.61054	-85.90246	R6-RIVERINE, EPHEMERAL	60	Open Cut-Temporary
264+50	UT Rose Run	37.61611	-85.90556	R6-RIVERINE, EPHEMERAL	50	Open Cut-Temporary
300+00	East Rhudes Creek	37.62591	-85.90614	R5-RIVERINE, UNKNOWN PERENNIAL	125	Open Cut-Temporary
31+50	UT Nolin River	37.59167	-85.87111	R6-RIVERINE, EPHEMERAL	90	Open Cut-Temporary
336+50	UT Valley Creek	37.63583	-85.90472	R4-RIVERINE, INTERMIT	50	Open Cut-Temporary
347+50	UT Valley Creek	37.63833	-85.90528	R5-RIVERINE, UNKNOWN PERENNIAL	70	Open Cut-Temporary
352+00	UT Valley Creek	37.63889	-85.90444	R4-RIVERINE, INTERMIT	20	Open Cut-Temporary
44+25	UT Rose Run	37.615	-85.90056	R4-RIVERINE, INTERMIT	50	Open Cut-Temporary
67+50	UT Nolin River	37.58194	-85.87222	R6-RIVERINE, EPHEMERAL	60	Open Cut-Temporary
76+50	UT Nolin River	37.57917	-85.89861	R6-RIVERINE, EPHEMERAL	50	Open Cut-Temporary
80+00	UT Nolin River	37.57861	-85.87306	R5-RIVERINE, UNKNOWN PERENNIAL	100	Open Cut-Temporary
81+50	UT Nolin River	37.57806	-85.87306	R5-RIVERINE, UNKNOWN PERENNIAL	75	Open Cut-Temporary
83+00	UT Nolin River	37.5775	-85.87306	R6-RIVERINE, EPHEMERAL	40	Open Cut-Temporary

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Terms for Nationwide Permit No. 12 – Utility Line Activities

12. Utility Line Activities. Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project.

Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. A “utility line” is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and radio and television communication. The term “utility line” does not include activities that drain a water of the United States, such as drainage tile or french drains, but it does apply to pipes conveying drainage from another area.

Material resulting from trench excavation may be temporarily sidecast into waters of the United States for no more than three months, provided the material is not placed in such a manner that it is dispersed by currents or other forces. The district engineer may extend the period of temporary side casting for no more than a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. The trench cannot be constructed or backfilled in such a manner as to drain waters of the United States (e.g., backfilling with extensive gravel layers, creating a french drain effect). Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line crossing of each waterbody.

Utility line substations: This NWP authorizes the construction, maintenance, or expansion of substation facilities associated with a power line or utility line in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not result in the loss of greater than 1/2-acre of waters of the United States. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters of the United States to construct, maintain, or expand substation facilities.

Foundations for overhead utility line towers, poles, and anchors: This NWP authorizes the construction or maintenance of foundations for overhead utility line towers, poles, and anchors in all waters of the United States, provided the foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) are used where feasible.

Access roads: This NWP authorizes the construction of access roads for the construction and maintenance of utility lines, including overhead power lines and utility line substations, in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not cause the loss of greater than 1/2-acre of non-tidal waters of the United States. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters for access roads. Access roads must be the minimum width necessary (see Note 2, below). Access roads must be constructed so that the length of the road minimizes any adverse effects on waters of the United States and must be as near as possible to pre-construction contours and elevations (e.g., at grade corduroy roads or geotextile/gravel roads). Access roads constructed above pre-construction contours and elevations in waters of the United States must be properly bridged or culverted to maintain surface flows.

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This NWP may authorize utility lines in or affecting navigable waters of the United States even if there is no associated discharge of dredged or fill material (See 33 CFR Part 322). Overhead utility lines constructed over section 10 waters and utility lines that are routed in or under section 10 waters without a discharge of dredged or fill material require a section 10 permit.

This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if any of the following criteria are met: (1) the activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1/10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials. (See general condition 31.) (Sections 10 and 404)

Note 1: Where the proposed utility line is constructed or installed in navigable waters of the United States (i.e., section 10 waters) within the coastal United States, the Great Lakes, and United States territories, copies of the pre-construction notification and NWP verification will be sent by the Corps to the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), for charting the utility line to protect navigation.

Note 2: Access roads used for both construction and maintenance may be authorized, provided they meet the terms and conditions of this NWP. Access roads used solely for construction of the utility line must be removed upon completion of the work, in accordance with the requirements for temporary fills.

Note 3: Pipes or pipelines used to transport gaseous, liquid, liquescent, or slurry substances over navigable waters of the United States are considered to be bridges, not utility lines, and may require a permit from the U.S. Coast Guard pursuant to Section 9 of the Rivers and Harbors Act of 1899. However, any discharges of dredged or fill material into waters of the United States associated with such pipelines will require a section 404 permit (see NWP 15).

Note 4: For overhead utility lines authorized by this NWP, a copy of the PCN and NWP verification will be provided to the Department of Defense Siting Clearinghouse, which will evaluate potential effects on military activities.



US Army Corps
of Engineers

Louisville District

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Nationwide Permit Conditions

The following General Conditions must be followed in order for any authorization by NWP to be valid:

1. Navigation. (a) No activity may cause more than a minimal adverse effect on navigation.
- (b) Any safety lights and signals prescribed by the US Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the US.
- (c) The permittee understands and agrees that, if future operations by the US require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the US. No claim shall be made against the US on account of any such removal or alteration.
2. Aquatic Life Movements. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species.
3. Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.
4. Migratory Bird Breeding Areas. Activities in waters of the US that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.
5. Shellfish Beds. No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.
6. Suitable Material. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).
7. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.
8. Adverse Effects From Impoundments. If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.
9. Management of Water Flows. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).
10. Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.
11. Equipment. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.
12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high

tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the US during periods of low-flow or no-flow.

13. Removal of Temporary Fills. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. Single and Complete Project. The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. Wild and Scenic Rivers. No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, US Forest Service, US Fish and Wildlife Service).

17. Tribal Rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

18. Endangered Species. (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will review the documentation and determine whether it is sufficient to address ESA compliance for the NWP activity, or whether additional ESA consultation is necessary.

(c) Non-federal permittees must submit a pre-construction notification (PCN) to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the PCN must include the name(s) of the endangered or threatened species that might be affected by the proposed work or that utilize the designated critical habitat that might be affected by the proposed work. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete PCN. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the project, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification the proposed activities will have "no effect" on listed species or critical habitat, or until Section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from Corps.

(d) As a result of formal or informal consultation with the USFWS or NMFS the district engineer may add species-specific regional endangered species conditions to the NWPs.

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(e) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the USFWS or the NMFS, The Endangered Species Act prohibits any person subject to the jurisdiction of the US to take a listed species, where "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word "harm" in the definition of "take" means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the USFWS and NMFS at <http://www.fws.gov/> or <http://www.fws.gov/ipac> and <http://www.noaa.gov/fisheries.html> respectively.

19. Migratory Birds and Bald and Golden Eagles. The permittee is responsible for obtaining any "take" permits required under the USFWS's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The permittee should contact the appropriate local office of the USFWS to determine if such "take" permits are required for a particular activity.

20. Historic Properties. (a) In cases where the district engineer determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

(b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will review the documentation and determine whether it is sufficient to address section 106 compliance for the NWP activity, or whether additional section 106 consultation is necessary.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of Section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties on which the activity may have the potential to cause effects and notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA is complete.

(d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA Section 106 consultation is required. Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR §800.3(a)). If NHPA section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to an applicant who,

with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the activity on historic properties.

21. Discovery of Previously Unknown Remains and Artifacts. If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal and state coordination required to determine if the items or remains warrant recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters. Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.

(a) Discharges of dredged or fill material into waters of the US are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 31, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation. The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal:

(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the US to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre-construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse effects of the proposed activity are minimal, and provides a project-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment. Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in minimal adverse effects on the aquatic environment.

(2) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered.

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(3) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) – (14) must be approved by the district engineer before the permittee begins work in waters of the US, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)).

(4) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan only needs to address the baseline conditions at the impact site and the number of credits to be provided.

(5) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan.

(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation, such as stream rehabilitation, enhancement, or preservation, to ensure that the activity results in minimal adverse effects on the aquatic environment.

(e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any project resulting in the loss of greater than 1/2-acre of waters of the US, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs.

(f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the restoration or establishment, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, riparian areas may be the only compensatory mitigation required. Riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to establish a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or establishing a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

(g) Permittees may propose the use of mitigation banks, in-lieu fee programs, or separate permittee-responsible mitigation. For activities resulting in the loss of marine or estuarine resources, permittee-responsible compensatory mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.

(h) Where certain functions and services of waters of the US are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

24. Safety of Impoundment Structures. To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has

been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. Water Quality. Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

26. Coastal Zone Management. In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or USEPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. Use of Multiple Nationwide Permits. The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the US authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the US for the total project cannot exceed 1/3-acre.

29. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature: "When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

(Transferee)

(Date)

30. Compliance Certification. Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:

(a) A statement that the authorized work was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;

(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and

(c) The signature of the permittee certifying the completion of the work and mitigation.

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31. **Pre-Construction Notification (PCN).** (a) **Timing.** Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a PCN as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or in the vicinity of the project, or to notify the Corps pursuant to general condition 20 that the activity may have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) **Contents of Pre-Construction Notification:** The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed project;

(3) A description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause, including the anticipated amount of loss of water of the US expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. The description should be sufficiently detailed to allow the district engineer to determine that the adverse effects of the project will be minimal and to determine the need for compensatory mitigation. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(4) The PCN must include a delineation of wetlands, other special aquatic sites, and waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many waters of the US. The 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(5) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse effects are minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(6) Many listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work. Federal applicants must provide documentation demonstrating compliance with the Endangered Species Act; and

(7) For an activity that may affect a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, for non-Federal applicants the PCN must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property. Federal applicants must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

(c) **Form of PCN Notification:** The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is a PCN and must include all of the information required in paragraphs (b)(1) through (7) of this general condition. A letter containing the required information may also be used.

(d) **Agency Coordination:** (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.

(2) For all NWP activities that require PCN notification and result in the loss of greater than 1/2-acre of waters of the US, for NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require PCN notification and will result in the loss of greater than 300 linear feet of intermittent and ephemeral stream bed, and for all NWP 48 activities that require PCN notification, the district engineer will immediately provide (e.g., via e-mail, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (USFWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Office (THPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to telephone or fax the district engineer notice that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the PCN notification. The district engineer will fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects to the aquatic environment of the proposed activity are minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each PCN notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(3) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

(4) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of PCN notifications to expedite agency coordination.

Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project.

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STEVEN L. BESHEAR
GOVERNOR

LEONARD K. PETERS
SECRETARY

ENERGY AND ENVIRONMENTAL PROTECTION CABINET

DEPARTMENT FOR ENVIRONMENTAL PROTECTION

DIVISION OF WATER

200 FAIR OAKS LANE

FRANKFORT, KENTUCKY 40601

www.kentucky.gov

General Certification--Nationwide Permit # 12 Utility Line Backfill and Bedding

This General Certification is issued March 19, 2012, in conformity with the requirements of Section 401 of the Clean Water Act of 1977, as amended (33 U.S.C. §1341), as well as Kentucky Statute KRS 224.16-050.

For this and all nationwide permits, the definition of surface water is as per 401 KAR 10:001 Chapter 10, Section 1(80): Surface Waters means those waters having well-defined banks and beds, either constantly or intermittently flowing; lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface. Lagoons used for waste treatment and effluent ditches that are situated on property owned, leased, or under valid easement by a permitted discharger are not considered to be surface waters of the commonwealth.

Agricultural operations, as defined by KRS 224.71-100(1) conducting activities pursuant to KRS 224.71-100 (3), (4), (5), (6), or 10 are deemed to have certification if they are implementing an Agriculture Water Quality Plan pursuant to KRS 224.71-145.

For all other operations, the Commonwealth of Kentucky hereby certifies under Section 401 of the Clean Water Act (CWA) that it has reasonable assurances that applicable water quality standards under Kentucky Administrative Regulations Title 401, Chapter 10, established pursuant to Sections 301, 302, 304, 306 and 307 of the CWA, will not be violated for the activity covered under NATIONWIDE PERMIT 12, namely Utility Line Backfill and Bedding, provided that the following conditions are met:

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.
2. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.
3. This general water quality certification is limited to the crossing of surface waters by utility lines. This document does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.

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General Certification--Nationwide Permit # 12

Utility Line Backfill and Bedding

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4. For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.
5. This general certification shall not apply to nationwide permits issued for individual crossings which are part of a larger utility line project where the total cumulative impacts from a single and complete linear project exceed $\frac{1}{2}$ acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.
6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For the utility line crossing and roads, only one bank length is used in calculation of the totals.
7. Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).
8. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.
9. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.
10. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.
11. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow construction within the 50 foot buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.
12. Utility line stream crossings shall be constructed by methods that maintain flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the excavation shall not be allowed to enter the flowing portion of the stream.

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General Certification--Nationwide Permit # 12
Utility Line Backfill and Bedding
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13. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.
14. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.
15. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:
 - Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
 - Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.
 - Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
 - Removal of riparian vegetation shall be limited to that necessary for equipment access.
 - To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
 - Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.

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**General Certification--Nationwide Permit # 12
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- Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
- If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
- Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

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WATER QUALITY GENERAL CERTIFICATION OF UTILITY LINE ACTIVITIES ALONG STREAMS

IN EFFECT: NOVEMBER 15, 2012

Condition 11 of the March 19, 2012 Section 401 Water Quality Certification (WQC) of the U.S. Army Corps of Engineers' Nationwide Permit (NWP) # 12 Utility Line Backfill and Bedding states:

Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow for construction within the 50-ft buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.

From March 19, 2012 through November 15, 2012, WQC required an individual water quality certification if the utility line was proposed to be placed closer than 50 feet from the top of the stream bank of an intermittent or perennial stream. After November 15, 2012, by order of the Director, we will now issue a general certification if all of the following criteria are met:

1. The project meets all the remaining certification conditions of the 2012 NWP 12;
2. The applicant cannot avoid placing the utility line within 50 feet of the stream bank; and
3. The applicant submits an adequate sediment and erosion control plan (see page 3 for requirements).

If a utility line project qualifies for a general certification of NWP 12 and is within 50 feet of the stream bank, a WQC application and a site-specific sediment and erosion control plan must be submitted for review by WQC before construction and construction-related activities can proceed. This is in addition to the Stormwater Pollution Prevention Plans for construction sites one (1) acre or more in size. Approval of the sediment and erosion control plan by the WQC Section is required before construction activities can begin.

WHY SEDIMENT AND EROSION CONTROL PLANS AND PRACTICES?

Construction activities near streams, rivers, and lakes have the potential to cause water pollution and stream degradation if erosion and sediment controls are not properly installed and maintained. In order to effectively reduce erosion and sedimentation impacts, plans and practices must be designed, located, installed, and maintained in effective operating condition at all times during land disturbing activities to prevent the discharge of sediment and other pollutants into waters of the Commonwealth. Sediment is a major contributor to the pollution of surface waters in Kentucky and construction activities are a major source of sediment and stream siltation. Disturbed soil, if not managed properly, can be washed off-site during storms and can cause major impairment in the receiving waters. Excessive silt causes adverse impacts such as disruption of aquatic organism life cycles, reduced passage, higher drinking water treatment costs for sediment removal, and the alteration of waters' physical/chemical properties, resulting in degradation of its quality. Therefore, erosion prevention and sediment control practices are the key parameter for successful water quality protection.

Applicants should design the site construction and development by selecting erosion prevention and sediment controls and practices to accommodate the unique hydrologic and geologic conditions of the site. Some of the factors to be considered include: local development requirements and/or codes, precipitation patterns for the area when the project will be underway, soil types, slopes, layout of structures for the site, sensitivity of nearby waters and natural areas, and safety concerns. A number of structural practices (e.g., mulching, vegetated buffer strips, grassed swales, retention/detention ponds, silt

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fence and haybale barriers, stone check dams, inlet protection, infiltration practices) and non-structural practices (minimizing disturbance, good housekeeping) have shown to be efficient, cost effective, and versatile for construction site developers to implement.

EROSION PREVENTION AND SEDIMENT CONTROL STRATEGIES

Appropriate erosion prevention and sediment control measures and other stormwater management practices must be designed, installed, and maintained. Applicants are encouraged to perform work within surface waters during periods of low-flow or no-flow. To ensure that all sources of soil erosion and sediment on the construction site are adequately controlled, the following strategies should be employed:

- **Sediment and erosion control measures shall not be placed in surface waters.** The design and placement of temporary erosion control measures shall not be conducted in a manner that may result in disruption of flow in wetlands or streams.
- **Maximize the protection of existing vegetation.** Natural vegetation should be retained, protected or supplemented to the maximum extent practical, and vegetation not intended for removal should be adequately marked, fenced, or flagged as necessary.
- **Avoid disturbing critical areas.** Areas such as sinkholes, streams, wetlands, stream buffers, highly erodible soils, and steep slopes should be avoided to the greatest extent feasible. Mark, fence or flag areas in the field that should be protected from construction activities such as clearing, grubbing, grading, mowing, staging activities, material storage and/or other related activities.
- **Minimize size and duration of disturbed soil.** Limit site preparation of activities such as grading and clearing to where they are absolutely necessary and consistent with plan and daily schedules of construction activities.
- **Manage stormwater.** Prevent stormwater from entering areas and leaving areas of disturbed soil by using vegetated strips, diversion dikes and swales, filter berms, sediment traps and basins, check dams, stabilized construction entrances, and silt fences or filter tubes/wattles. Reduce the amount of sediment and water velocity produced from areas of disturbed soils by using vegetation, riprap, sod, seeding and mulching or blankets, as well as the use of structural measures including diversion, check dams, slope drains, and storm drain protection.
- **Stabilize soils.** Stabilize soil with seeding and mulch as soon as possible after disturbance. Soil disturbed by construction activities should be stabilized within 14 days of ceasing construction activities. Erosion prevention measures such as erosion control mats/blankets, mulch, hydro applications, tracking, or soil binders shall be implemented on disturbed areas within 24 hours or as soon as practical after completion of disturbance/grading or following the end of activities. Final stabilization practices shall be initiated on any site where construction activities have been suspended for more than 180 days.
- **Use low-impact/biological/recyclable materials.** To the extent possible, construction managers should utilize natural or recyclable materials as temporary measures than can remain on-site after the completion of construction. One example is using mulch berms as opposed to silt fences, which must be removed and disposed after the completion of construction activities has occurred and vegetation has become well-established. This also reduces waste and removal costs.

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SEDIMENT AND EROSION CONTROL PLAN REQUIREMENTS

Erosion prevention and sediment control plans submitted to WQC must contain detailed drawings, a site description and supporting information (narrative), including the following:

1. Narrative discussion of why the utility line must be placed within 50 feet of the top of the stream bank;
2. Construction details with dimensions, cross-sectional views and plan views to scale, showing location of utility lines and all surface waters;
3. Site development plan with the proposed construction area and construction-related activities areas clearly outlined, estimated project start and end dates, project type and description of all construction activities at the site;
4. The location of all surface waters on a 7.5 Minute topographical map, including streams, wetlands, sinkholes, and stormwater discharges from the site;
5. The types, depth, slope, locations and limitations of the soils and geology, natural landscape features, drainage patterns, flooding potential, and other pertinent information that helps identify both beneficial conditions and potential problems of a site;
6. Locations of temporary and permanent erosion, sediment, and stormwater management structures; construction details with dimensions, cross-sectional views and/or plan views with enough information for the reviewer and contractor to understand how to install the practice;
7. Approximate slopes anticipated after major grading activities;
8. Areas of soil disturbance, including an outline of areas which are not to be disturbed;
9. Location and technical specifications of any bank stabilization;
10. Location and boundaries of buffer zones, if any, existing or established to protect waters of the Commonwealth located within the boundaries of the project;
11. Locations of stockpile and/or borrow areas;
12. Separate sheets for staged plans to show detail, including the clearing and grubbing phase, initial grading plan with perimeter control and the final grading plan with final erosion prevention and sediment control plans and stormwater management controls in place.

Approved plans and specifications for projects are incorporated by reference and are enforceable parts of a certification. Any changes to the approved plans or specifications require written approval by WQC. For questions or clarifications, contact the Water Quality Certification Section at (502) 564-3410.

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REFERENCES

Kentucky Pollutant Discharge Elimination System (KPDES) General Permit for Stormwater Discharge Associated with Construction Activities (KYR10). Locate on line at:
<http://water.ky.gov/permitting/Pages/WastewaterDischarge.aspx>

Best Management Practices (BMPs) for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites. Planning and Technical Specifications Manual for Stormwater Pollution Prevention Plans. Revised October 2009. Technology Transfer Program, Kentucky Transportation Center, University of Kentucky.

General Certification of Nationwide Permit #12, Utility Line Backfill and Bedding, 2012. Locate on line at: <http://water.ky.gov/permitting/Pages/CertificationNationwidePermits.aspx>

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ADDRESSES FOR COORDINATING AGENCIES

Mr. Duncan Powell
USEPA, Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-8960

Mr. Lee Andrews
U.S. Fish & Wildlife Service
JC Watts Federal Building
330 West Broadway, Room 265
Frankfort, KY 40601

Ms. Stephanie Hayes
Kentucky Energy & Environment Cabinet
Division of Water
200 Fair Oaks, 4th Floor
Frankfort, KY 40601

Mr. Gregory Johnson, Commissioner
KY Dept. of Fish and Wildlife Resources
#1 Sportsman's Lane
Frankfort, KY 40601

Mr. Craig Potts
Executive Director
State Historic Preservation Officer
Kentucky Heritage Council
300 Washington Street
Frankfort, KY 40601

ADDRESS FOR AUTHORIZED AGENT

Mr. Mark Sneve
Strand Associates, Inc.
325 West Main Street, Suite 710
Louisville, KY 40202

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PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PRELIMINARY JURISDICTIONAL DETERMINATION (JD):
February 12, 2016

B. NAME AND ADDRESS OF PERSON REQUESTING PRELIMINARY JD:

APPLICANT: Hardin County Water District No. 2
ATTN: Mr. James Jeffries
360 Ring Road, P.O. Box 970
Elizabethtown, Kentucky 42701

AGENT: Strand Associates, Inc.
ATTN: Mr. Mark Sneve
325 West Main Street, Suite 710
Louisville, Kentucky 40202

C. DISTRICT OFFICE, FILE NAME, AND NUMBER: Louisville District, Nolin River-Sewer Infrastructure, LRL-2015-00774-mck

**D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE ATTACHED TABLE TO DOCUMENT MULTIPLE WATERBODIES AT DIFFERENT SITES)**

State: KY County/parish/borough: Hardin City: Glendale
Center coordinates of site (lat/long in degree decimal format): Lat. 37.601667° N, Long. 85.905556° W.
Universal Transverse Mercator:

Name of nearest waterbody: Nolin River, Rose Run, East Rhudes Creek, Valley Creek

Identify (estimate) amount of waters in the review area:

Non-wetland waters: 1,690 linear feet: width (ft) and/or acres.

Cowardin Class: Riverine

Stream Flow: Ephemeral, Intermittent and Perennial

Wetlands: N/A acres.

Cowardin Class:

Name of any water bodies on the site that have been identified as Section 10 waters: N/A

Tidal:

Non-Tidal:

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

- Office (Desk) Determination. Date: February 12, 2016
 Field Determination. Date(s):

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that

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activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable. This preliminary JD finds that there "may be" waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for preliminary JD (check all that apply - checked items should be included in case file and, where checked and requested, appropriately reference sources below):

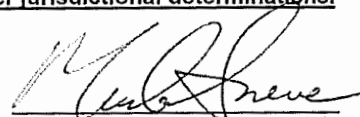
- Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: Application package dated August 28, 2015 submitted by Strand Associates, Inc., on behalf of Hardin County Water District No. 2..
- Data sheets prepared/submitted by or on behalf of the applicant/consultant.
 - Office concurs with data sheets/delineation report.
 - Office does not concur with data sheets/delineation report.
- Data sheets prepared by the Corps:
- Corps navigable waters' study:
- U.S. Geological Survey Hydrologic Atlas:
 - USGS NHD data.
 - USGS 8 and 12 digit HUC maps.
- U.S. Geological Survey map(s). Cite scale & quad name: 7.5 minute/Sonora, Cecilia and Tonieville.
- USDA Natural Resources Conservation Service Soil Survey. Citation:
- National wetlands inventory map(s). Cite name:
- State/Local wetland inventory map(s):
- FEMA/FIRM maps: 21093C0293D, 21093C0294D, 21093C0435D.
- 100-year Floodplain Elevation is: (National Geodetic Vertical Datum of 1929)
- Photographs: Aerial (Name & Date):
or Other (Name & Date):
- Previous determination(s). File no. and date of response letter:
- Other information (please specify):

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

Signature and date of
Regulatory Project Manager
(REQUIRED)


2/12/2016

Signature and date of
person requesting preliminary JD
(REQUIRED, unless obtaining the signature
is impracticable)

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Waters Name	Latitude (°N)	Longitude (°W)	Cowardin Class	Waters Size (Linear Feet)	Class of Aquatic Resources
11+00	37.57583	-85.8775	R5-RIVERINE, UNKNOWN PERENNIAL	50	non-section 10-non wetland
113+50	37.595	-85.86556	R4-RIVERINE, INTERMIT	160	non-section 10-non wetland
128+25	37.58972	-85.90361	R4-RIVERINE, INTERMIT	50	non-section 10-non wetland
14+00	37.60722	-85.90361	R6-RIVERINE, EPHEMERAL	70	non-section 10-non wetland
195+75	37.6025	-85.89833	R6-RIVERINE, EPHEMERAL	40	non-section 10-non wetland
200+00	37.60361	-85.89889	R6-RIVERINE, EPHEMERAL	40	non-section 10-non wetland
207+25	37.605	-85.90056	R4-RIVERINE, INTERMIT	40	non-section 10-non wetland
215+25	37.60611	-85.90278	R6-RIVERINE, EPHEMERAL	40	non-section 10-non wetland
240+00	37.60972	-85.90528	R6-RIVERINE, EPHEMERAL	180	non-section 10-non wetland
241+25	37.60991	-85.90532	R5-RIVERINE, UNKNOWN PERENNIAL	180	non-section 10-non wetland
26+50	37.61054	-85.90246	R6-RIVERINE, EPHEMERAL	60	non-section 10-non wetland
264+50	37.61611	-85.90556	R6-RIVERINE, EPHEMERAL	50	non-section 10-non wetland
300+00	37.62591	-85.90614	R5-RIVERINE, UNKNOWN PERENNIAL	125	non-section 10-non wetland
31+50	37.59167	-85.87111	R6-RIVERINE, EPHEMERAL	90	non-section 10-non wetland
336+50	37.63583	-85.90472	R4-RIVERINE, INTERMIT	50	non-section 10-non wetland
347+50	37.63833	-85.90528	R5-RIVERINE, UNKNOWN PERENNIAL	70	non-section 10-non wetland
352+00	37.63889	-85.90444	R4-RIVERINE, INTERMIT	20	non-section 10-non wetland
44+25	37.615	-85.90056	R4-RIVERINE, INTERMIT	50	non-section 10-non wetland
67+50	37.58194	-85.87222	R6-RIVERINE, EPHEMERAL	60	non-section 10-non wetland
76+50	37.57917	-85.89861	R-RIVERINE	50	non-section 10-non wetland
80+00	37.57861	-85.87306	R5-RIVERINE, UNKNOWN PERENNIAL	100	non-section 10-non wetland
81+50	37.57806	-85.87306	R5-RIVERINE, UNKNOWN PERENNIAL	75	non-section 10-non wetland
83+00	37.5775	-85.87306	R6-RIVERINE, EPHEMERAL	40	non-section 10-non wetland

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NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Hardin County Water District No. 2		File Number: LRL-2015-00774	Date: 30 MAR 2016
Attached is:			See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
	APPROVED JURISDICTIONAL DETERMINATION		D
X	PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/CECW/Pages/reg_materials.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **OBJECT:** If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **APPEAL:** If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- **ACCEPT:** You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- **APPEAL:** If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

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SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION

If you have questions regarding this decision and/or the appeal process you may contact:

Meagan Knuckles
US Army Corps of Engineers – Louisville District
PO Box 59, Rm 752
Attn: CELRL-OPF-S
Louisville, KY 40201-0059
(502) 315-6709

If you only have questions regarding the appeal process you may also contact:

U.S. Army Corps of Engineers
ATTN: Jacob Siegrist
Appeal Review Officer CELRD-PD-REG
550 Main Street, Room 10524
Cincinnati, OH 45202-3222
TEL (513) 684-2699; FAX (513) 684-2460

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

Signature of appellant or agent.

Date:

Telephone number:

COPY OF BID SET

**HARDIN COUNTY ROAD DEPARTMENT
501 BACON CREEK ROAD
ELIZABETHTOWN, KY 42701
TELEPHONE #: 270-737-6046
FAX #: 270-737-6037**

ENCROACHMENT PERMIT

Revised 03/16/16

FOR SEWER LINES NOLIN RIVER WATERSHED - SEWER INFRASTRUCTURE

The Hardin County Road Department grants Hardin County Water District No 2 permission to install sanitary sewer lines through or on county right-of-way for the **Nolin River Watershed - Sewer Infrastructure at Glendale** on the following county roads:

1. **SPORTSMAN LAKE RD**
2. **SHIPP LN**
3. **JAGGERS RD**
4. **HIGH ST**
5. **N. BELL AVE**
6. **S. BELL AVE**
7. **COLLEGE ST**
8. **E. RAILROAD ST**
9. **W. RAILROAD ST**
10. **S. RAILROAD ST**
11. **RAILROAD ALLEY**
12. **E. MAPLE RD**
13. **W. MAPLE RD**
14. **OXMOOR DR**

All work per construction plans as outlined below:

Line A ~

The 12-inch gravity sewer is located within easements. The first 400 linear feet of 10-inch gravity sewer is located within easements and the state right-of-way of New Glendale Road (KY 1136). The last 632 linear feet of 10-inch gravity sewer is located within the county right-of-way of West Railroad Avenue by a boring method to minimize disruption. It will start approximately 200 feet from the intersection of West Railroad Avenue and New Glendale Road (KY1136) and continue south to the end of Line A at the intersection of West Railroad Avenue and East Maple Road.

Three manholes will need to be installed by open cut on West Railroad Avenue.

- The first manhole is located near 245 West Railroad Avenue which is located approximately 215 feet from the intersection of West Railroad Avenue and New Glendale Road (KY1136)
- The second one is located near 225 West Railroad Avenue which is located approximately 510 feet from the intersection of West Railroad Avenue and New Glendale Road (KY1136)
- The third one is located at the intersection of West Railroad Avenue and East Maple Street

COPY OF BID SET

Three sewer laterals will need tie in at one of the manholes.

- The first lateral will be for 233 West Railroad Avenue which is located approximately 215 feet from the intersection of West Railroad Avenue and New Glendale Road (KY1136)
- The second lateral will be for 225 West Railroad Avenue which is located approximately 510 feet from the intersection of West Railroad Avenue and New Glendale Road (KY1136)
- The last lateral will be for 221 West Railroad Avenue which is located approximately 510 feet from the intersection of West Railroad Avenue and New Glendale Road (KY1136)

Line B ~

The 8-inch gravity sewer is located within easements; outside of the state right-of-way of New Glendale Road (KY1136).

Line D ~

The first 230 feet of 8-inch gravity sewer is located within easements; outside the county right-of-way of East Maple Street. The next 25 feet will be within county right-of-way. The 8-inch gravity sewer will cross North Bell Avenue approximately 20 feet from the intersection of North Bell Avenue and East Maple Street. The last 665 feet will be located within easements and also within the state right-of-way of New Glendale Road (KY 1136).

Five sewer laterals will need to cross East Maple Street in order to tie into the 8-inch gravity sewer.

- The first lateral will be for 140 East Maple Street which is located approximately 80 feet from the intersection of East Maple Street and West Railroad Avenue
- The second lateral will be for 130 East Maple Street which is located approximately 130 feet from the intersection of East Maple Street and West Railroad Avenue
- The third one will be for 122 East Maple Street which is located approximately 240 feet from the intersection of East Maple Street and West Railroad Avenue
- The fourth one will be for 114 East Maple Street which is located approximately 330 feet from the intersection of East Maple Street and West Railroad Avenue
- The last one will be for 6628 New Glendale Road (KY1136) which is located approximately 410 feet from the intersection of East Maple Street and West Railroad Avenue

Line H ~

Line H will be installed as listed below:

- The 8-inch gravity sewer is located within the county right-of-way of North Bell Avenue by open cut and a boring method to minimize disruption. The bore will start approximately 90 feet from the intersection of North Bell Avenue and Railroad Alley and end approximately 40 feet from the intersection of South Bell Avenue and South Railroad Avenue.
- It will then be located within the county right-of-way of South Bell Avenue for approximately 130 feet by open cut.
- The 8-inch gravity sewer will be located within easements; outside the county right-of-way of South Railroad Avenue by open cut from the intersection of South Railroad Avenue and South Bell Avenue to where South Railroad Avenue turns north.
- It will then be located within easements along the backside of the houses located on South Bell Avenue.
- The 8-inch gravity sewer will then be located within the county right-of-way of South Bell Avenue from approximately 70 feet from the intersection of College Street and South Bell Avenue to the intersection of High Street and South Bell Avenue.
- It will then cross High Street approximately 25 feet from the intersection of South Bell Street and High Street.
- It will then continue within easements; outside the county right-of-way of High Street.

Four sewer laterals will need to cross North Bell Avenue in order to tie into the 8-inch gravity sewer.

COPY OF BID SET

- The first lateral will be for 129 North Bell Avenue which is located approximately 100 feet from the intersection of East Maple Street and North Bell Avenue
- The second one will be for 121 North Bell Avenue which is located approximately 110 feet from the intersection of East Maple Street and North Bell Avenue
- The third one will be for 129B North Bell Avenue which is located approximately 60 feet from the intersection of Railroad Alley and North Bell Avenue
- The fourth one will be for 150 KY 222 which is located approximately 150 feet from the intersection of KY 222 and North Bell Avenue

Four sewer laterals will need to cross South Bell Avenue in order to tie into the 8-inch gravity sewer.

- The first lateral will be for 203 KY 222 which is located approximately 130 feet from the intersection of KY 222 and South Bell Avenue
- The second one will be for 211 KY 222 which is located approximately 130 feet from the intersection of KY 222 and South Bell Avenue
- The third one will be for 151 KY 222 which is located approximately 150 feet from the intersection of KY 222 and South Bell Avenue
- The fourth one will be for 226 South Bell Avenue which is located approximately 20 feet from the intersection of High Street and South Bell Avenue

One sewer lateral will need to cross South Railroad Avenue in order to tie into the 8-inch gravity sewer.

- The lateral will be for 215 KY 222 which is located approximately 175 feet from the intersection of South Railroad Avenue and South Bell Avenue

Line I ~

The 8-inch gravity sewer is located within Railroad Alley by open cut.

Seven sewer laterals will need to cross Railroad Alley in order to tie into the 8-inch gravity sewer.

- The first lateral will be for 144 KY 222 which is located approximately 150 feet from the intersection of North Bell Avenue and Railroad Alley
- The second lateral will be for 138 KY 222 which is located approximately 215 feet from the intersection of North Bell Avenue and Railroad Alley
- The third lateral will be for 134 KY 222 which is located approximately 275 feet from the intersection of North Bell Avenue and Railroad Alley
- The fourth lateral will be for 128 KY 1136 which is located approximately 345 feet from the intersection of West Railroad Avenue and Railroad Alley
- The fifth lateral will be for 128 KY 222 which is located approximately 360 feet from the intersection of North Bell Avenue and Railroad Alley
- The sixth lateral will be for 120 KY 222 which is located approximately 420 feet from the intersection of North Bell Avenue and Railroad Alley
- The last lateral will be for 100 KY 222 which is located approximately 425 feet from the intersection of North Bell Avenue and Railroad Alley

Line J ~

The 8-inch gravity sewer is located within easements.

Line K ~

The first 20 linear feet of 8-inch gravity sewer is located within the county right-of-way of South Bell Avenue by open cut. The last 1,410 linear feet of 8-inch gravity sewer is located within easements and the state right-of-way of New Glendale Road (KY 1136).

Two sewer laterals will need to cross College Street in order to tie into the 8-inch gravity sewer.

COPY OF BID SET

- The first lateral will be for 136B KY 1136 which is located approximately 300 feet from the intersection of KY 222 and College Street
- The last lateral will be for 136A KY 1136 which is located approximately 210 feet from the intersection of KY 222 and College Street

Line L ~

The first 185 linear feet of 8-inch gravity sewer is located within easements; outside the county right-of-way of High Street. The next 25 feet will be within county right-of-way. The 8-inch gravity sewer will cross High Street approximately 555 feet from the intersection of South Bell Avenue and High Street. The last 180 feet will be located within easements; outside the county right-of-way of High Street.

One sewer lateral will need to cross High Street in order to tie into the 8-inch gravity sewer.

- The first lateral will be for 129 College Street which is located approximately 555 feet from the intersection of South Bell Avenue and High Street

Line M ~

The 10-inch gravity sewer is located within easements and the state right-of-way of Glendale/Hodgenville Road (KY222) for the first 2620 feet. The next 30 feet will be within county right-of-way. The 10-inch gravity sewer will cross Jagers Road approximately 595 feet from the intersection of Shipp Lane and Jagers Road. The last 560 feet will be located within easements; outside the county right-of-way of Jagers Road.

One sewer lateral will need to cross Jagers Road in order to tie into the 8-inch gravity sewer.

- The lateral will be for 244 Jagers Road which is located approximately 380 feet from the intersection of Shipp Lane and Jagers Road

Line N ~

The 8-inch gravity sewer is located within easements.

Line O ~

The 8-inch gravity sewer is located outside the state right-of-way of Glendale/Hodgenville Road (KY222).

Line P ~

The 8-inch gravity sewer is located within easements; outside the county right-of-way of Jagers Road. The next 40 feet will be within county right-of-way. The 8-inch gravity sewer will cross Shipp Lane approximately 25 feet from the intersection of Jagers Road and Shipp Lane. The last 10 feet will be located within easements; outside the county right-of-ways of Jagers Road and Shipp Lane.

One sewer lateral will need to cross Jagers Road in order to tie into the 8-inch gravity sewer.

- The lateral will be for 162 Jagers Road which is located approximately 90 feet from the intersection of Shipp Lane and Jagers Road

Line R ~

The 24-inch gravity sewer is located within easements. The 10-inch gravity sewer is located within easements the state right-of-way of 31 W and the federal right-of-way of I-65. The first 4,740 feet of 8-inch gravity sewer is located within easements. The next 60 feet will be within county right-of-way. The 8-inch gravity sewer will cross Sportsman Lake Road approximately 1,300 feet from the intersection of KY 222 and Sportsman Lake Road. The last 2,325 feet will be located within easements and the state right-of-ways for 31 W and Glendale/Hodgenville Road (KY 222).

COPY OF BID SET

Line R1 ~

The 8-inch gravity sewer is located within easements and the state right-of-ways of 31 W and Glendale/Hodgenville Road (KY 222).

Line T ~

The 8-inch gravity sewer is located within easements and the state right-of-way of Glendale/Hodgenville Road (KY222).

Line T1 ~

The 8-inch gravity sewer is located within easements.

Line U ~

The first 895 feet of 12-inch gravity sewer is located within easements; outside the state right-of-way of KY 1136. The next 30 feet will be within county right-of-way. The 12-inch gravity sewer will cross Oxmoor Drive approximately 60 feet from the intersection of KY 1136 and Oxmoor Drive. The last 3,475 feet will be located within easements and the state right-of-way of KY 1136.

6-inch Force Main ~

The 6-inch force main is located within easements and state right-of-way of KY 1136. The 6-inch force main will be located within easements; outside the county right-of-way of Shipp Lane.

16-inch Force Main ~

The 16-inch force main is located within easements and the state right-of-ways of New Glendale Road (KY 1136) and Glendale/Hodgenville Road (KY222). The 16-inch force main will cross Jagers Road approximately 2,150 feet from the intersection of Shipp Lane and Jagers Road.

COPY OF BID SET

As part of this permit, Hardin County Water District No. 2 agrees to the following conditions:

1. All County roads and ditch lines impacted during construction will be restored to the preconstruction condition per the specifications including but not limited to line and grade, pavement section and stabilization.
2. Hardin County Water District No 2 or its designated representative will respond to all complaints in a timely manner.
3. Efforts will be made to minimize the impact to the businesses and traveling public in Glendale by limiting the area disturbed by construction at any one time to 1000 LF. Roadways in these areas shall be backfilled and paved per the project specifications prior to excavating a new section(s).
4. The contractor shall notify with the Road Supervisor prior to backfilling any trench within the County ROW.

The Road Supervisor, County Engineer or their agent will inspect all the roads and after the repairs have been made.



Hardin County Road Supervisor

3/21/2016

Date



Hardin County Water District No. 2

3/22/16

Date

COPY OF BID SET



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Kentucky Ecological Services Field Office
330 West Broadway, Suite 265
Frankfort, Kentucky 40601
(502) 695-0468

February 8, 2016

Mr. Michael Bell
Hardin County Water District No. 2
360 Ring Road
Elizabethtown, Kentucky 42701

Re: FWS 2011-B-0478; Hardin County Water District No. 2; Glendale sewer project; located in Hardin County, Kentucky

Dear Mr. Bell:

We have received a February 1, 2016 copy of a receipt from Kentucky Natural Lands Trust acknowledging the contribution Hardin County Water District No. 2 made to Kentucky Natural Lands Trust for the Imperiled Bat Conservation Fund. The U.S. Fish and Wildlife Service (Service) has reviewed this contribution in relation to the proposed project and offers the following comments in accordance with the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

Indiana bat (*Myotis sodalis*)

Northern long-eared bat (*Myotis septentrionalis*)

Your project adheres to the conservation measures associated with the Kentucky Field Office's 2015 *Conservation Strategy for Forest-Dwelling Bats* (Conservation Strategy) and the 2015 Biological Opinion: *Kentucky Field Office's Participation in Conservation Memoranda of Agreement for the Indiana Bat and/or Northern Long-eared Bat* (BO). The contribution made is the appropriate amount, following the process in the Conservation Strategy, to mitigate for the removal of the "potential" Indiana bat and northern long-eared bat habitat for this project as described in the January 18, 2016 correspondence and attachments from Strand Associates, Inc. Specifically, 10.58 acres of forested habitat removal will occur between the dates on October 15 and March 31. Through the adherence to the Conservation Strategy, the Service has already analyzed the effects of your action under the BO and has concluded that the project is not likely to jeopardize the continued existence of the Indiana bat or northern long-eared bat or result in the destruction or adverse modification of designated critical habitat for either species. Any incidental take of Indiana and/or northern long-eared bats that will or could result from the forest habitat removal associated with your project are authorized under the BO. If tree clearing must occur during the occupied timeframe (April 1 – August 14), then Hardin County Water District

COPY OF BID SET

Mr. Michael Bell

2

No. 2 should notify the Service in advance of tree clearing to account for the adverse effects to Indiana bats and northern long-eared bats that would occur as a result of tree clearing during the occupied timeframe. In addition, if additional forested areas not previously considered are to be removed, then Hardin County Water District No. 2 should coordinate with the Service to determine if additional compensation is necessary to be in ESA compliance.

In view of these findings we believe that the requirements of section 7 of the Endangered Species Act have been fulfilled for this project. Your obligations under section 7 must be reconsidered, however, if: (1) new information reveals that the proposed action may affect listed species in a manner or to an extent not previously considered, (2) the proposed action is subsequently modified to include activities which were not considered during this consultation, or (3) new species are listed or critical habitat designated.

Thank you again for your request. Your concern for the protection of endangered and threatened species is greatly appreciated. If you have any questions regarding the information that we have provided, please contact Jessica Blackwood Miller at (502) 695-0468 extension 104 or jessica_miller@fws.gov.

Sincerely,

A handwritten signature in blue ink that reads "Virgil Lee Andrews, Jr." with a stylized flourish at the end.

Virgil Lee Andrews, Jr.
Field Supervisor

COPY OF BID SET



Matthew G. Bevin
Governor

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
Department of Highways, District 4 Office
634 East Dixie Highway
Elizabethtown, Kentucky 42701
(270) 766-5066
www.transportation.ky.gov/

Greg Thomas
Secretary

May 17, 2017

Hardin County Water District #2
James Jeffries
360 Ring Road
Elizabethtown, Kentucky 42701

Subject: Permit #: 04-2017-00058
Permit Type: Utilities - Sewer
Approval

Dear Applicant:

Attached is your permit approval and documentation for the subject permit.

Be advised that all work must be done in conformity with permit and application conditions. If you have any questions, please contact the Permits Section at this office.

Sincerely,

A handwritten signature in blue ink, appearing to read "K. Blain".

Kevin Blain
D4 Permits - Supervisor

Attachments



An Equal Opportunity Employer M/F/D



COPY OF BID SET

Kentucky Transportation Cabinet
Department of Highways
Division of Maintenance
Permits Branch

TC 99-1 (B)
03/2016
Page 1 of 1

ENCROACHMENT PERMIT

KEPT No.: 04-2017-00058

Permittee: Hardin County Water District #2

Permit Type / Subtype: Utilities / Sewer

Work Completion Date: 2/23/2018

INDEMNITIES		
Type	Amount Required	Tracking Number
Performance Bond	\$0.00	
Cash / Check	\$0.00	
Self-Insured	\$0.00	
Payment Bond	\$0.00	
Liability Insurance	\$0.00	

This permit has been: **APPROVED** **DENIED**

Kevin Blain	D4 Permits - Supervisor	2/24/2017
SIGNATURE	TITLE	DATE

The TC 99-1(B), including the application TC-99 1(A) and all related and accompanying documents and drawings make up the permit. It is not a permit unless both the TC 99-1(A) and TC 99-1(B) are both present.

LOCATION(S)			
Description	County - Route	Latitude	Longitude
	Hardin - KY 1136	37.601283	-85.908218

COPY OF BID SET

NOTICE OF COMPLETION OF ENCROACHMENT PERMIT WORK

PERMITEE

Name: Hardin County Water District #2
Contact Person: James Jeffries
Address: 360 Ring Road
City: Elizabethtown
State: Kentucky
Zip: 42701
Telephone: (270) 737-1056

PROJECT IDENTIFICATION

Permit Number: 04-2017-00058

I wish to notify the Department of Highways that the above mentioned permit work and any necessary right-of-way restoration have been completed and are ready for final inspection.

Applicant

Please return this form to the address below when work is completed and ready for final inspection.

Please Return to: Permit Engineer
Department of Highways, District 4 Office
634 East Dixie Highway
Elizabethtown, Kentucky 42701
(270) 766-5066
www.transportation.ky.gov/

LOCATION(S)			
Description	County - Route	Latitude	Longitude
	Hardin - KY 1136	37.601283	-85.908218

COPY OF BID SET



Kentucky Transportation Cabinet
 Department of Highways
 Permits Branch

TC 99-1 (A)
 8/2012
 Page 1 of 4

APPLICATION FOR ENCROACHMENT PERMIT

Permittee Information		KYTC No. 04-2017-00058	
Name	Hardin County Water District No. 2	Permit Information	
Address	360 Ring Road	Address	Various Locations
City	Elizabethtown	City	Glendale
State	KY	State	KY
Zip	42701	Zip	42740
Phone#	270-737-1056	County	Hardin
Contact	James Jeffries	Route No.	See Attached
Phone	270-737-1056	Mile-Point	See Attached
Email	jjeffries@hardincountywater2.org	Longitude (X)	85d54'20" W -85.908218
Contact		Latitude (Y)	37d36'06" N 37.601283
Phone	Cell	Information below to be filled out by KYTC	
Email		<input type="checkbox"/> Air Right	<input type="checkbox"/> Entrance
		<input checked="" type="checkbox"/> Utilities	<input type="checkbox"/> Other: _____
			Sewer _____
		<input type="checkbox"/> Left	<input type="checkbox"/> Right
			<input checked="" type="checkbox"/> X-ing
		Access:	<input type="checkbox"/> Full
			<input type="checkbox"/> Partial
			<input checked="" type="checkbox"/> by Permit

General Description of Work:

See Attached

THE UNDERSIGNED PERMITTEE(s) (being duly authorized representative(s) or owner(s)) DO AGREE TO ALL TERMS AND CONDITIONS ON THE TC 99-1 (A).

James L. Jeffries

2/22/17

Signature

Date

This is not a permit unless and until the permittee(s) receives an approved TC 99-1(B) from KYTC. This application will become void if not approved by the cancellation date. The cancellation date will be one year from the date the permittee submits their application.

COPY OF BID SET

NOLIN RIVER WATERSHED - SEWER INFRASTRUCTURE KYTC ROAD CROSSINGS FEBRUARY 15, 2017

Project Description: The objective of this project is to install a sewer infrastructure for the Nolin River watershed, including the Town of Glendale, the Glendale Industrial Tract, the Interstate 65 Glendale Interchange and the US 31W corridor.

The infrastructure will consist of gravity sewers, force mains, and pump stations. There will be approximately 8,620 linear feet of 4-inch PVC pipe, 15,600 linear feet of 6-inch PVC pipe, 36,615 linear feet of 8-inch PVC pipe, 15,825 linear feet of 10-inch PVC pipe, 9,405 linear feet of 12-inch PVC pipe, 30,330 linear feet of 16-inch PVC pipe, and 1,530 linear feet of 24-inch PVC pipe. There will also be four pump stations. This project will consist of approximately sixteen blue line stream crossings, two railroad crossings, and thirty road crossings, eighteen of which are State road crossings.

Gravity Sewers ~

KY 1136 Crossings:

Line A (MP 4.26):

165 LF of 12-inch PVC sewer main crossing with 165 LF of 20-inch minimum bore with steel casing pipe starting at Station 15+34 to Station 16+99. See Sheet 67.

Line A (MP 4.24):

125 LF of 10-inch PVC sewer main crossing with 125 LF of 18-inch minimum bore with steel casing pipe starting at Station 17+13 to Station 18+38. See Sheet 67.

Line C (MP 4.18):

145 LF of 8-inch PVC sewer main crossing with 145 LF of 16-inch minimum bore with steel casing pipe starting at Station 10+07 to Station 11+52. See Sheet 70.

Line D (MP 4.06):

40 LF of 8-inch PVC sewer main crossing with 40 LF of 16-inch minimum bore with steel casing pipe starting at Station 15+50 to Station 15+90. See Sheet 71.

Line K (MP 3.82):

60 LF of 8-inch PVC sewer main crossing with 60 LF of 16-inch minimum bore with steel casing pipe starting at Station 21+29 to Station 21+89. See Sheet 76.

KY 1136 Parallel:

Line U (MP 5.03 to 5.17):

700 LF of 10-inch PVC sewer main running parallel with KY 1136 starting at Station 47+00 (50-foot offset from centerline of road) to Station 54+00 (50-foot offset from centerline of road). See Sheets 99 and 100.

Line U (MP 4.75 to 4.81):

390 LF of 10-inch PVC sewer main running parallel with KY 1136 starting at Station 31+60 (55-foot offset from centerline of road) to Station 35+50 (55-foot offset from centerline of road). See Sheet 98.

COPY OF BID SET

Line U (MP 4.51 to 4.65):

731 LF of 12-inch PVC sewer main running parallel with KY 1136 starting at Station 19+31 (55-foot offset from centerline of road) to Station 26+62 (55-foot offset from centerline of road). See Sheets 97.and 98

Line A (MP 4.27 to 4.29):

115 LF of 12-inch PVC sewer main running parallel with KY 1136 starting at Station 14+48 (73-foot offset from centerline of road) to Station 15+41 (71-foot offset from centerline of road). See Sheet 67.

Line B (MP 4.17 to 4.25):

240 LF of 8-inch PVC sewer main running parallel with KY 1136 starting at Station 10+00 (37-foot offset from centerline of road) to Station 11+81 (35-foot offset from centerline of road). See Sheet 69.

KY 222 Crossings:**Line H (MP 4.37):**

275 LF of 8-inch PVC sewer main crossing with 275 LF of 16-inch minimum bore with steel casing pipe starting at Station 13+60 to Station 16+35. See Sheet 72.

Line M (MP 4.60):

65 LF of 10-inch PVC sewer main crossing with 65 LF of 18-inch minimum bore with steel casing pipe starting at Station 28+89 to Station 29+54. See Sheet 79.

Line T (MP 6.10):

140 LF of 8-inch PVC sewer main crossing with 140 LF of 16-inch minimum bore with steel casing pipe starting at Station 22+01 to Station 23+41. See Sheet 94.

Line R (MP 6.66):

80 LF of 8-inch PVC sewer main crossing with 80 LF of 16-inch minimum bore with steel casing pipe starting at Station 113+80 to Station 114+60. See Sheet 92.

Line R1 (MP 6.76):

465 LF of 8-inch PVC sewer main crossing with 456 LF of 16-inch minimum bore with steel casing pipe starting at Station 10+05 to Station 14+70. See Sheet 93.

31 W Crossings:**Line R1 (MP 9.53):**

150 LF of 8-inch PVC sewer main crossing with 150 LF of 16-inch minimum bore with steel casing pipe starting at Station 21+96 to Station 23+46. See Sheet 93.

Line R (MP 9.43):

205 LF of 8-inch PVC sewer main crossing with 205 LF of 16-inch minimum bore with steel casing pipe starting at Station 104+09 to Station 106+14. See Sheet 92.

Line R (MP 8.28):

330 LF of 10-inch PVC sewer main crossing with 330 LF of 18-inch minimum bore with steel casing pipe starting at Station 40+02 to Station 43+32. See Sheet 87.

COPY OF BID SET

I-65 Crossing:

Line R (MP 84.35):

315 LF of 10-inch PVC sewer main crossing with 315 LF of 18-inch minimum bore with steel casing pipe starting at Station 27+25 to Station 30+40. See Sheet 86.

Force Main ~

KY1136 Crossings:

(MP 4.27) 120 LF of 16-inch and 8-inch PVC force main crossing with 120 LF of 42-inch minimum bore with steel casing pipe starting at Station 223+50 to Station 224+70. See Sheets 46 and 47.

(MP 1.78) 60 LF of 6-inch, 10-inch, and 12-inch PVC force main crossing with 60 LF of 54-inch minimum bore with steel casing pipe starting at Station 77+56 to Station 78+16. See Sheet 34.

(MP 1.32) 80 LF of 6-inch, 10-inch, and 12-inch PVC force main crossing with 80 LF of 54-inch minimum bore with steel casing pipe starting at Station 51+50 to Station 52+30. See Sheet 32.

KY 1136 Parallel:

(MP 4.27 to 4.29) 145 LF of 16-inch and 8-inch PVC force main running parallel with KY 1136 starting at Station 222+71 (45-feet offset from centerline of road) to Station 223+50 (40-feet offset from centerline of road). See Sheet 46.

Access Roads:

(MP 0.58) Industrial Park PS No. 1. See Sheet 5.

(MP 1.77) Industrial Park PS No. 2. See Sheet 11.

(MP 4.37) Rose Run PS. See Sheet 17.

KY222 Crossing:

(MP 4.85) 65 LF of 16-inch PVC force main crossing with 65 LF of 26-inch minimum bore with steel casing pipe starting at Station 190+72 to Station 191+37. See Sheet 44.

Laterals ~

KY 1136 Crossings:

Line B (MP 4.23):

70 LF of 4-inch PVC sewer main crossing with 70 LF of 12-inch minimum bore with steel casing pipe near Station 10+65. See Sheet 69.

KY 222 Crossings:

Line O (MP 4.55):

60 LF of 6-inch PVC sewer main crossing with 60 LF of 14-inch minimum bore with steel casing pipe near Station 17+25. See Sheet 82.

COPY OF BID SET

Line O (MP 4.55):

60 LF of 6-inch PVC sewer main crossing with 60 LF of 14-inch minimum bore with steel casing pipe near Station 17+30. See Sheet 82.

31 W Crossings:

Line R (MP 8.75):

60 LF of 4-inch PVC sewer main crossing with 60 LF of 12-inch minimum bore with steel casing pipe near Station 68+06. See Sheet 89.

Line R (MP 8.81):

60 LF of 4-inch PVC sewer main crossing with 60 LF of 12-inch minimum bore with steel casing pipe near Station 71+21. See Sheet 89.

Line R (MP 8.86):

60 LF of 4-inch PVC sewer main crossing with 60 LF of 12-inch minimum bore with steel casing pipe near Station 73+69. See Sheet 89.

Line R (MP 8.95):

85 LF of 4-inch PVC sewer main crossing with 85 LF of 12-inch minimum bore with steel casing pipe near Station 78+17. See Sheet 90.

Line R (MP 8.98):

95 LF of 4-inch PVC sewer main crossing with 95 LF of 12-inch minimum bore with steel casing pipe near Station 80+29. See Sheet 90.

Line R (MP 9.12):

175 LF of 4-inch PVC sewer main crossing with 175 LF of 12-inch minimum bore with steel casing pipe near Station 86+67. See Sheet 90.

Line R (MP 9.16):

190 LF of 4-inch PVC sewer main crossing with 190 LF of 12-inch minimum bore with steel casing pipe near Station 88+63. See Sheet 90.

Line R (MP 9.38):

50 LF of 6-inch PVC sewer main crossing with 50 LF of 14-inch minimum bore with steel casing pipe near Station 101+84. See Sheet 91.

COPY OF BID SET



Matthew G. Bevin
Governor

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
Department of Highways, District 4 Office
634 East Dixie Highway
Elizabethtown, Kentucky 42701
(270) 766-5066
www.transportation.ky.gov/

Greg Thomas
Secretary

February 27, 2017

Hardin County Water District #2
James Jeffries
360 Ring Road
Elizabethtown, Kentucky 42701

Subject: Permit #: 04-2017-00058
Permit Type: Utilities - Sewer
Approval

Dear Applicant:

Attached is your permit approval and documentation for the subject permit.

Be advised that all work must be done in conformity with permit and application conditions. If you have any questions, please contact the Permits Section at this office.

Sincerely,

Kevin Blain
D4 Permits - Supervisor

Attachments



An Equal Opportunity Employer M/F/D



COPY OF BID SET

Kentucky Transportation Cabinet
Department of Highways
Division of Maintenance
Permits Branch

TC 99-1 (B)
03/2016
Page 1 of 1

ENCROACHMENT PERMIT

KEPT No.: 04-2017-00058

Permittee: Hardin County Water District #2

Permit Type / Subtype: Utilities / Sewer

Work Completion Date: 2/23/2018

INDEMNITIES		
Type	Amount Required	Tracking Number
Performance Bond	\$0.00	
Cash / Check	\$0.00	
Self-Insured	\$0.00	
Payment Bond	\$0.00	
Liability Insurance	\$0.00	

This permit has been: **APPROVED** **DENIED**

Kevin Blain	D4 Permits - Supervisor	2/24/2017
SIGNATURE	TITLE	DATE

The TC 99-1(B), including the application TC-99 1(A) and all related and accompanying documents and drawings make up the permit. It is not a permit unless both the TC 99-1(A) and TC 99-1(B) are both present.

LOCATION(S)			
Description	County - Route	Latitude	Longitude
	Hardin - KY 1136	37.601283	-85.908218

COPY OF BID SET

NOTICE OF COMPLETION OF ENCROACHMENT PERMIT WORK

PERMITEE

Name: Hardin County Water District #2
Contact Person: James Jeffries
Address: 360 Ring Road
City: Elizabethtown
State: Kentucky
Zip: 42701
Telephone: (270) 737-1056

PROJECT IDENTIFICATION

Permit Number: 04-2017-00058

I wish to notify the Department of Highways that the above mentioned permit work and any necessary right-of-way restoration have been completed and are ready for final inspection.

Applicant

Please return this form to the address below when work is completed and ready for final inspection.

Please Return to: Permit Engineer
Department of Highways, District 4 Office
634 East Dixie Highway
Elizabethtown, Kentucky 42701
(270) 766-5066
www.transportation.ky.gov/

LOCATION(S)			
Description	County - Route	Latitude	Longitude
	Hardin - KY 1136	37.601283	-85.908218

COPY OF BID SET



Kentucky Transportation Cabinet
 Department of Highways
 Permits Branch

TC 99-1 (A)
 8/2012
 Page 1 of 4


APPLICATION FOR ENCROACHMENT PERMIT

Permittee Information		KYTC No. 04-2017-00058	
Name	Hardin County Water District No. 2	Permit Information	
Address	360 Ring Road	Address	Various Locations
City	Elizabethtown	City	Glendale
State	KY	State	KY
Zip	42701	Zip	42740
Phone#	270-737-1056	County	Hardin
Contact	James Jeffries	Route No.	See Attached
Phone	270-737-1056	Mile-Point	See Attached
Email	jjeffries@hardincountywater2.org	Longitude (X)	85d54'20" W -85.908218
Contact		Latitude (Y)	37d36'06" N 37.601283
Phone	Cell	Information below to be filled out by KYTC	
Email		<input type="checkbox"/> Air Right	<input type="checkbox"/> Entrance
		<input checked="" type="checkbox"/> Utilities	<input type="checkbox"/> Other: _____
			Sewer _____
		<input type="checkbox"/> Left	<input type="checkbox"/> Right
			<input checked="" type="checkbox"/> X-ing
		Access:	<input type="checkbox"/> Full
			<input type="checkbox"/> Partial
			<input checked="" type="checkbox"/> by Permit

General Description of Work:

See Attached

THE UNDERSIGNED PERMITTEE(s) (being duly authorized representative(s) or owner(s)) DO AGREE TO ALL TERMS AND CONDITIONS ON THE TC 99-1 (A).

Signature 

Date 2/22/17

This is not a permit unless and until the permittee(s) receives an approved TC 99-1(B) from KYTC. This application will become void if not approved by the cancellation date. The cancellation date will be one year from the date the permittee submits their application.

COPY OF BID SET

NOLIN RIVER WATERSHED - SEWER INFRASTRUCTURE KYTC ROAD CROSSINGS FEBRUARY 15, 2017

Project Description: The objective of this project is to install a sewer infrastructure for the Nolin River watershed, including the Town of Glendale, the Glendale Industrial Tract, the Interstate 65 Glendale Interchange and the US 31W corridor.

The infrastructure will consist of gravity sewers, force mains, and pump stations. There will be approximately 8,620 linear feet of 4-inch PVC pipe, 15,600 linear feet of 6-inch PVC pipe, 36,615 linear feet of 8-inch PVC pipe, 15,825 linear feet of 10-inch PVC pipe, 9,405 linear feet of 12-inch PVC pipe, 30,330 linear feet of 16-inch PVC pipe, and 1,530 linear feet of 24-inch PVC pipe. There will also be four pump stations. This project will consist of approximately sixteen blue line stream crossings, two railroad crossings, and thirty road crossings, eighteen of which are State road crossings.

Gravity Sewers ~

KY 1136 Crossings:

Line A (MP 4.26):

165 LF of 12-inch PVC sewer main crossing with 165 LF of 20-inch minimum bore with steel casing pipe starting at Station 15+34 to Station 16+99. See Sheet 67.

Line A (MP 4.24):

125 LF of 10-inch PVC sewer main crossing with 125 LF of 18-inch minimum bore with steel casing pipe starting at Station 17+13 to Station 18+38. See Sheet 67.

Line C (MP 4.18):

145 LF of 8-inch PVC sewer main crossing with 145 LF of 16-inch minimum bore with steel casing pipe starting at Station 10+07 to Station 11+52. See Sheet 70.

Line D (MP 4.06):

40 LF of 8-inch PVC sewer main crossing with 40 LF of 16-inch minimum bore with steel casing pipe starting at Station 15+50 to Station 15+90. See Sheet 71.

Line K (MP 3.82):

60 LF of 8-inch PVC sewer main crossing with 60 LF of 16-inch minimum bore with steel casing pipe starting at Station 21+29 to Station 21+89. See Sheet 76.

KY 1136 Parallel:

Line U (MP 5.03 to 5.17):

700 LF of 10-inch PVC sewer main running parallel with KY 1136 starting at Station 47+00 (50-foot offset from centerline of road) to Station 54+00 (50-foot offset from centerline of road). See Sheets 99 and 100.

Line U (MP 4.75 to 4.81):

390 LF of 10-inch PVC sewer main running parallel with KY 1136 starting at Station 31+60 (55-foot offset from centerline of road) to Station 35+50 (55-foot offset from centerline of road). See Sheet 98.

COPY OF BID SET

Line U (MP 4.51 to 4.65):

731 LF of 12-inch PVC sewer main running parallel with KY 1136 starting at Station 19+31 (55-foot offset from centerline of road) to Station 26+62 (55-foot offset from centerline of road). See Sheets 97.and 98

Line A (MP 4.27 to 4.29):

115 LF of 12-inch PVC sewer main running parallel with KY 1136 starting at Station 14+48 (73-foot offset from centerline of road) to Station 15+41 (71-foot offset from centerline of road). See Sheet 67.

Line B (MP 4.17 to 4.25):

240 LF of 8-inch PVC sewer main running parallel with KY 1136 starting at Station 10+00 (37-foot offset from centerline of road) to Station 11+81 (35-foot offset from centerline of road). See Sheet 69.

KY 222 Crossings:**Line H (MP 4.37):**

275 LF of 8-inch PVC sewer main crossing with 275 LF of 16-inch minimum bore with steel casing pipe starting at Station 13+60 to Station 16+35. See Sheet 72.

Line M (MP 4.60):

65 LF of 10-inch PVC sewer main crossing with 65 LF of 18-inch minimum bore with steel casing pipe starting at Station 28+89 to Station 29+54. See Sheet 79.

Line T (MP 6.10):

140 LF of 8-inch PVC sewer main crossing with 140 LF of 16-inch minimum bore with steel casing pipe starting at Station 22+01 to Station 23+41. See Sheet 94.

Line R (MP 6.66):

80 LF of 8-inch PVC sewer main crossing with 80 LF of 16-inch minimum bore with steel casing pipe starting at Station 113+80 to Station 114+60. See Sheet 92.

Line R1 (MP 6.76):

465 LF of 8-inch PVC sewer main crossing with 456 LF of 16-inch minimum bore with steel casing pipe starting at Station 10+05 to Station 14+70. See Sheet 93.

31 W Crossings:**Line R1 (MP 9.53):**

150 LF of 8-inch PVC sewer main crossing with 150 LF of 16-inch minimum bore with steel casing pipe starting at Station 21+96 to Station 23+46. See Sheet 93.

Line R (MP 9.43):

205 LF of 8-inch PVC sewer main crossing with 205 LF of 16-inch minimum bore with steel casing pipe starting at Station 104+09 to Station 106+14. See Sheet 92.

Line R (MP 8.28):

330 LF of 10-inch PVC sewer main crossing with 330 LF of 18-inch minimum bore with steel casing pipe starting at Station 40+02 to Station 43+32. See Sheet 87.

COPY OF BID SET

I-65 Crossing:

Line R (MP 84.35):

315 LF of 10-inch PVC sewer main crossing with 315 LF of 18-inch minimum bore with steel casing pipe starting at Station 27+25 to Station 30+40. See Sheet 86.

Force Main ~

KY1136 Crossings:

(MP 4.27) 120 LF of 16-inch and 8-inch PVC force main crossing with 120 LF of 42-inch minimum bore with steel casing pipe starting at Station 223+50 to Station 224+70. See Sheets 46 and 47.

(MP 1.78) 60 LF of 6-inch, 10-inch, and 12-inch PVC force main crossing with 60 LF of 54-inch minimum bore with steel casing pipe starting at Station 77+56 to Station 78+16. See Sheet 34.

(MP 1.32) 80 LF of 6-inch, 10-inch, and 12-inch PVC force main crossing with 80 LF of 54-inch minimum bore with steel casing pipe starting at Station 51+50 to Station 52+30. See Sheet 32.

KY 1136 Parallel:

(MP 4.27 to 4.29) 145 LF of 16-inch and 8-inch PVC force main running parallel with KY 1136 starting at Station 222+71 (45-feet offset from centerline of road) to Station 223+50 (40-feet offset from centerline of road). See Sheet 46.

Access Roads:

(MP 0.58) Industrial Park PS No. 1. See Sheet 5.

(MP 1.77) Industrial Park PS No. 2. See Sheet 11.

(MP 4.37) Rose Run PS. See Sheet 17.

KY222 Crossing:

(MP 4.85) 65 LF of 16-inch PVC force main crossing with 65 LF of 26-inch minimum bore with steel casing pipe starting at Station 190+72 to Station 191+37. See Sheet 44.

Laterals ~

KY 1136 Crossings:

Line B (MP 4.23):

70 LF of 4-inch PVC sewer main crossing with 70 LF of 12-inch minimum bore with steel casing pipe near Station 10+65. See Sheet 69.

KY 222 Crossings:

Line O (MP 4.55):

60 LF of 6-inch PVC sewer main crossing with 60 LF of 14-inch minimum bore with steel casing pipe near Station 17+25. See Sheet 82.

COPY OF BID SET

Line O (MP 4.55):

60 LF of 6-inch PVC sewer main crossing with 60 LF of 14-inch minimum bore with steel casing pipe near Station 17+30. See Sheet 82.

31 W Crossings:

Line R (MP 8.75):

60 LF of 4-inch PVC sewer main crossing with 60 LF of 12-inch minimum bore with steel casing pipe near Station 68+06. See Sheet 89.

Line R (MP 8.81):

60 LF of 4-inch PVC sewer main crossing with 60 LF of 12-inch minimum bore with steel casing pipe near Station 71+21. See Sheet 89.

Line R (MP 8.86):

60 LF of 4-inch PVC sewer main crossing with 60 LF of 12-inch minimum bore with steel casing pipe near Station 73+69. See Sheet 89.

Line R (MP 8.95):

85 LF of 4-inch PVC sewer main crossing with 85 LF of 12-inch minimum bore with steel casing pipe near Station 78+17. See Sheet 90.

Line R (MP 8.98):

95 LF of 4-inch PVC sewer main crossing with 95 LF of 12-inch minimum bore with steel casing pipe near Station 80+29. See Sheet 90.

Line R (MP 9.12):

175 LF of 4-inch PVC sewer main crossing with 175 LF of 12-inch minimum bore with steel casing pipe near Station 86+67. See Sheet 90.

Line R (MP 9.16):

190 LF of 4-inch PVC sewer main crossing with 190 LF of 12-inch minimum bore with steel casing pipe near Station 88+63. See Sheet 90.

Line R (MP 9.38):

50 LF of 6-inch PVC sewer main crossing with 50 LF of 14-inch minimum bore with steel casing pipe near Station 101+84. See Sheet 91.

COPY OF BID SET



TRANSPORTATION CABINET

Department of Highways District 4 Office
634 East Dixie
Elizabethtown, KY 42702
(270) 766-5066

Steven L. Beshear
Governor

Michael W. Hancock, P.E.
Secretary

September 18, 2013

Mr. James Jeffries
Hardin County Water District No. 2
360 Ring Road
Elizabethtown, KY 42701

SUBJECT: Hardin County
I-65 Louisville-Nashville Road
Encroachment Permit No. 04-2013-00277

Dear Mr. Jeffries:

Your request to construct telecommunications facilities on KYTC ROW in Hardin County has been reviewed and accepted.

Please see that the work is completed in conformity with the permit and applicable conditions. This office must be notified prior to beginning work and after completion. We also request to be informed on the progress of work at all times. Please feel free to contact this office for any questions or concerns.

Sincerely,

A handwritten signature in black ink, appearing to read "C. Mason Sr.", written over a horizontal line.

Charles E. Mason Sr.
District Utilities Agent
District 4

cc: Permits



An Equal Opportunity Employer M/F/D

COPY OF BID SET



Kentucky Transportation Cabinet
Department of Highways
Permits Branch

TC 99-1 (B)
1/2012
Page 1 of 1

ENCROACHMENT PERMIT

KEPTS No.: A04-2013-00277

Permittee: Hardin County Water District #2

Latitude: 37.577036

Longitude: -85.872626

Completion Date: 7/1/2014

Coordinates provided on the TC 99-1(B) are the approved location for this permit

Indemnities		
Type	Amount Required	Tracking Number
Performance Bond	0	
Payment Bond	0	
Liability Insurance	0	

This permit has been:

APPROVED

DENIED

Kevin Blain

Permit Section Supervisor

NAME

TITLE

Kevin Blain

9/19/2013

SIGNATURE

DATE

The TC 99-1(B), including the application TC-99 1(A) and all related and accompanying documents and drawings make up the permit. It is not a permit unless both the TC 99-1(A) and TC 99-1(B) are both present.

COPY OF BID SET



Kentucky Transportation Cabinet
Department of Highways
Permits Branch

TC 99-1 (A)
8/2012
Page 1 of 4

APPLICATION FOR ENCROACHMENT PERMIT

Permittee Information		KYTC No. <u>04-2013-00277</u>	
Name	Hardin County Water District No. 2	Permit Information	
Address	360 Ring Road	Address	I-65, 0.23 miles N of Gilead Church Rd
City	Elizabethtown	City	Southeast of Glendale
State	KY	State	KY
Zip	42701	Zip	42740
Phone#	270-737-1056	County	Hardin
Contact	James Jeffries	Route No.	I-65
Phone	270-737-1056	Mile-Point	84.34, 35
Cell		Longitude (X)	37d34'36"N - 85.8726
Email	jjeffries@hardincountywater2.org	Latitude (Y)	85d52'22"W 37.5770
Contact		Information below to be filled out by KYTC	
Phone		<input type="checkbox"/> Air Right	<input type="checkbox"/> Entrance
Cell		<input checked="" type="checkbox"/> Utilities	<input type="checkbox"/> Other: _____
Email		<input type="checkbox"/> Left	<input type="checkbox"/> Right
		<input checked="" type="checkbox"/> X-ing	
		Access: <input checked="" type="checkbox"/> Full	<input type="checkbox"/> Partial
			<input type="checkbox"/> by Permit

General Description of Work:

The objective of this project is to install a sewer infrastructure for the Nolin River watershed, including the Town of Glendale, the Glendale Industrial Tract, the I-65 Glendale Interchange & the US 31W corridor. The infrastructure will consist of gravity sewers, force mains, & pump stations. There will be approximately 7,615 LF of 4-inch PVC pipe, 14,830 LF of 6-inch PVC pipe, 40,800 LF of 8-inch PVC pipe, 12,650 LF of 10-inch PVC pipe, 7,790 LF of 12-inch PVC pipe, 30,390 LF of 16-inch PVC pipe, & 530 LF of 24-inch PVC pipe. There will also be four pump stations. This project will consist of approximately thirteen stream crossings, two railroad crossings & thirty road crossings, twenty-one of which are State road crossings. The I-65 crossing will consist of 315 LF of 10-inch PVC sewer main crossing with 315 LF of 18-inch minimum bore with steel casing pipe starting at Station 27+25 to Station 30+40. See Sheet 89.

THE UNDERSIGNED PERMITTEE(s) (being duly authorized representative(s) or owner(s)) DO AGREE TO ALL TERMS AND CONDITIONS ON THE TC 99-1 (A).

James R. Jeffries, General Manager 8/5/13
Signature Date

This is not a permit unless and until the permittee(s) receives an approved TC 99-1(B) from KYTC. This application will become void if not approved by the cancellation date. The cancellation date will be one year from the date the permittee submits their application.

COPY OF BID SET



Jessica Braig
Contract Specialist

6737 Southpoint Drive South, Bldg 1
Jacksonville, FL 32216
904.279.3881
Jessica_Braig@csx.com

December 21, 2015

Mr. James Jeffries
Hardin County Water District No. 2
360 Ring Road
Elizabethtown, KY 42701

Agreement No.: CSX770614

Dated: August 28, 2014

Dear Mr. James Jeffries,

Attached is the fully-executed Agreement of the above reference file.

In accordance with this Agreement, Agreement Holder is responsible for paying the actual cost of CSXT flagging and/or support services, including all applicable surcharges (collectively "Fees").

No work is to be performed on CSXT property without Roadmaster's authorization.

It is your responsibility to schedule any work on CSXT property with CSXT Outside Services. To schedule the work, complete and follow the instructions on the attached Outside Party Number Request Form.

It was a pleasure assisting you with this project and we look forward to working with you in the future.

Should there be any questions, please feel free to give us a call at the above referenced number.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Jessica Braig'. The signature is written in a cursive, flowing style.

Jessica Braig

Attachement

COPY OF BID SET



Outside Party Request Form (OP Form) Revised 06/11/13

New Facility Installation / Rights of Entry

Date: _____

Instructions:

Please fill out sections 2-4 then submit to the Flagging Coordinator via email or fax.

Flagging Coordinator

E-Mail: op_request@csx.com

Fax: 904.245.3692

Telephone: 904.279.3805

Flagging/Inspection (Responsibility of Agreement Holder)

Estimated Average Cost

Flagging: \$1,000 per day (minimum 8 hours)

Inspection: \$1,500 per day

1. Important Information

The estimated flagging and inspection cost is based on average cost for 8 hours regular time on CSX work days. Overtime rates will apply for hours beyond 8 hours per day or beyond 40 hours per week for railroad personnel. Inspection costs will include inspector's project time, travel time, expenses, per diem, project management cost for scheduling, means and methods review, coordinating, and general account administration. Other railroad costs may include signal locates, material, rental equipment, burden and tax. The above references flagging and inspection costs are estimates only and will be billed after the project commencement.

In the event local flagging services are not available at the time of your request, flagging resources from outside the geographical area of your project may be assigned at extra cost to the Agreement Holder/Project Owner. The cost of flagging services vary based on factors including but not limited to, type of project, duration of project, utilization of local or out-of-town flagging personnel, etc.

2. Project Contact Information

Contact Name: _____

Company Name: _____

Address: _____

City_State_Zip: _____

Phone: _____

Email: _____

3. Billing Contact Information (Agreement Holder/Facility Owner)

Contact Name: _____

Company Name: HARDIN COUNTY WATER DISTRICT NO 2

Billing Address: _____

City_State_Zip: _____

Phone: _____

Email: _____

4. Project Information

Agreement Number: CSX770614 Agreement Date: 8/28/2014

City/County/ST/Mile: Glendale, Hardin, KY 000-49.47

Request Start Date: _____

Duration in Days: _____

Project Description: JACK AND BORE 20" STEEL CASING FOR 12" GRAVITY SEWER LINE AND JACK AND BORE 42" STEEL

CASING FOR 8" AND 16" FORCE SEWER MAINS. LOCATED ALONG NEW GLENDALE RD, DOT 343576B, MP

000-49.47 VAL STA 2614+27.

5. CSX Use Only:

Road Master (RM): _____ Signal Manager: _____

RM Email: _____ Signal Mgr. Email: _____

RM Phone: _____ Signal Mgr Phone: _____

Division: _____ Subdivision: _____

Additional Documents Needed _____

Special Billing Instructions _____

Contractor Must Provide CGL: YES CGL Expiration Date: TBD

RPL Insurance: PD Contractor Must Provide RPL NO

Inspector Required? yes Proj. Cord. Fee Paid? No OP# _____ Valid Thru _____

COPY OF BID SET

PS - FORM 1001-G
REVISED APRIL 29, 2008
AGREEMENT NO. CSX770614

FACILITY ENCROACHMENT AGREEMENT

THIS AGREEMENT, made and effective as of August 28, 2014, by and between CSX TRANSPORTATION, INC., a Virginia corporation, whose mailing address is 500 Water Street, Jacksonville, Florida 32202, hereinafter called "Licensor," and HARDIN COUNTY WATER DISTRICT NO. 2, a municipal corporation, political subdivision or state agency, under the laws of the Commonwealth of Kentucky, whose mailing address is P.O. Box 970, 360 Ring Road, Elizabethtown, Kentucky 42701, hereinafter called "Licensee," WITNESSETH:

WHEREAS, Licensee desires to construct (unless previously constructed and designated as existing herein), use and maintain the below described facility(ies), hereinafter called "Facilities," over, under or across property owned or controlled by Licensor, at the below described location(s):

1. One (1) twelve inch (12") diameter sub-grade pipeline crossing, solely for the conveyance of raw/treated sewage, located at or near Glendale, Hardin County, Kentucky, Louisville Division, Main Line Subdivision, Valuation Station ~~2614+27~~, Milepost 000-49.47, Latitude N37:36:18.74, Longitude W85:54:18.54; ~~2613+77~~

2. One (1) sixteen inch (16") diameter sub-grade pipeline crossing, solely for the conveyance of raw/treated sewage, located at or near Glendale, Hardin County, Kentucky, Louisville Division, Main Line Subdivision, Valuation Station 2614+27, Milepost 000-49.47, Latitude ~~N37:36:18.74~~, Longitude ~~W85:54:18.54~~; ~~N37:36:19.25~~ ~~W85:54:18.56~~

3. One (1) eight inch (8") diameter sub-grade pipeline crossing, solely for the conveyance of raw/treated sewage, located at or near Glendale, Hardin County, Kentucky, Louisville Division, Main Line Subdivision, Valuation Station 2614+27, Milepost 000-49.47, Latitude ~~N37:36:18.74~~, Longitude ~~W85:54:18.54~~; ~~N37:36:19.25~~ ~~W85:54:18.56~~

hereinafter, collectively, called the "Encroachment," as shown on print(s) labeled Exhibit "A," attached hereto and made a part hereof;

NOW, THEREFORE, in consideration of the mutual covenants, conditions, terms and agreements herein contained, the parties hereto agree and covenant as follows:

1. LICENSE:

1.1 Subject to Article 17, Licensor, insofar as it has the legal right, power and authority to do so, and its present title permits, and subject to:

(A) Licensor's present and future right to occupy, possess and use its property within the area of the Encroachment for any and all purposes;

(B) All encumbrances, conditions, covenants, easements, and limitations applicable to Licensor's title to or rights in the subject property; and

COPY OF BID SET

PS - FORM 1001-G
REVISED APRIL 29, 2008
AGREEMENT NO. CSX770614

(C) Compliance by Licensee with the terms and conditions herein contained;

does hereby license and permit Licensee to construct, maintain, repair, renew, operate, use, alter or change the Facilities at the Encroachment above for the term herein stated, and to remove same upon termination.

1.2 The term Facilities, as used herein, shall include only those structures and ancillary facilities devoted exclusively to the transmission usage above within the Encroachment, and as shown on attached plan(s).

1.3 No additional structures or other facilities shall be placed, allowed, or maintained by Licensee in, upon or on the Encroachment except upon prior separate written consent of Licensor.

2. ENCROACHMENT FEE; TERM:

2.1 Licensee shall pay Licensor a one-time nonrefundable Encroachment Fee of ONE THOUSAND FIVE HUNDRED AND 00/100 U.S. DOLLARS (\$1,500.00) upon execution of this Agreement. Licensee agrees that the Encroachment Fee applies only to the original Licensee under this Agreement. In the event of a successor (by merger, consolidation, reorganization and/or assignment) or if the original Licensee changes its name, then Licensee shall be subject to payment of Licensor's current administrative and document preparation fees for the cost incurred by Licensor in preparing and maintaining this Agreement on a current basis.

2.2 However, Licensee assumes sole responsibility for, and shall pay directly (or reimburse Licensor), any additional annual taxes and/or periodic assessments levied against Licensor or Licensor's property solely on account of said Facilities or Encroachment.

2.3 This Agreement shall terminate as herein provided, but shall also terminate upon: (a) Licensee's cessation of use of the Facilities or Encroachment for the purpose(s) above; (b) removal of the Facilities; (c) subsequent mutual consent; and/or (d) failure of Licensee to complete installation within five (5) years from the effective date of this Agreement.

2.4 In further consideration for the license or right hereby granted, Licensee hereby agrees that Licensor shall not be charged or assessed, directly or indirectly, with any part of the cost of the installation of said Facilities and appurtenances, and/or maintenance thereof, or for any public works project of which said Facilities is a part.

3. CONSTRUCTION, MAINTENANCE AND REPAIRS:

3.1 Licensee shall construct, maintain, relocate, repair, renew, alter, and/or remove the Facilities, in a prudent, workmanlike manner, using quality materials and complying with any applicable standard(s) or regulation(s) of Licensor (CSXT Specifications), or Licensee's particular industry, National Electrical Safety Code, or any governmental or regulatory body having jurisdiction over the Encroachment.

COPY OF BID SET

PS - FORM 1001-G
REVISED APRIL 29, 2008
AGREEMENT NO. CSX770614

3.2 Location and construction of Facilities shall be made strictly in accordance with design(s) and specifications furnished to and approved by Licensor and of material(s) and size(s) appropriate for the purpose(s) above recited.

3.3 All of Licensee's work, and exercise of rights hereunder, shall be undertaken at time(s) satisfactory to Licensor, and so as to eliminate or minimize any impact on or interference with the safe use and operation of Licensor's property and appurtenances thereto.

3.4 In the installation, maintenance, repair and/or removal of said Facilities, Licensee shall not use explosives of any type or perform or cause any blasting without the separate express written consent of Licensor. As a condition to such consent, a representative will be assigned by Licensor to monitor blasting, and Licensee shall reimburse Licensor for the entire cost and/or expense of furnishing said monitor.

3.5 Any repairs or maintenance to the Facilities, whether resulting from acts of Licensee, or natural or weather events, which are necessary to protect or facilitate Licensor's use of its property, shall be made by Licensee promptly, but in no event later than thirty (30) days after Licensee has notice as to the need for such repairs or maintenance.

3.6 Licensor, in order to protect or safeguard its property, rail operations, equipment and/or employees from damage or injury, may request immediate repair or renewal of the Facilities, and if the same is not performed, may make or contract to make such repairs or renewals, at the sole risk, cost and expense of Licensee.

3.7 Neither the failure of Licensor to object to any work done, material used, or method of construction or maintenance of said Encroachment, nor any approval given or supervision exercised by Licensor, shall be construed as an admission of liability or responsibility by Licensor, or as a waiver by Licensor of any of the obligations, liability and/or responsibility of Licensee under this Agreement.

3.8 All work on the Encroachment shall be conducted in accordance with Licensor's safety rules and regulations.

3.9 Licensee hereby agrees to reimburse Licensor any loss, cost or expense (including losses resulting from train delays and/or inability to meet train schedules) arising from any failure of Licensee to make repairs or conduct maintenance as required by Section 3.5 above or from improper or incomplete repairs or maintenance to the Facilities or Encroachment.

4. PERMITS, LICENSES:

4.1 Before any work hereunder is performed, or before use of the Encroachment for the contracted purpose, Licensee, at its sole cost and expense, shall obtain all necessary permit(s) (including but not limited to zoning, building, construction, health, safety or environmental matters), letter(s) or certificate(s) of approval. Licensee expressly agrees and warrants that it shall conform and limit its activities to the terms of such permit(s), approval(s)

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and authorization(s), and shall comply with all applicable ordinances, rules, regulations, requirements and laws of any governmental authority (State, Federal or Local) having jurisdiction over Licensee's activities, including the location, contact, excavation and protection regulations of the Occupational Safety and Health Act (OSHA) (29 CFR 1926.651(b)), et al., and State "One Call" - "Call Before You Dig" requirements.

4.2 Licensee assumes sole responsibility for failure to obtain such permit(s) or approval(s), for any violations thereof, or for costs or expenses of compliance or remedy.

5. MARKING AND SUPPORT:

5.1 With respect to any subsurface installation or maintenance upon Licensor's property, Licensee, at its sole cost and expense, shall:

- (A) support track(s) and roadbed in a manner satisfactory to Licensor;
- (B) backfill with satisfactory material and thoroughly tamp all trenches to prevent settling of surface of land and roadbed of Licensor; and
- (C) either remove any surplus earth or material from Licensor's property or cause said surplus earth or material to be placed and distributed at location(s) and in such manner Licensor may approve.

5.2 After construction or maintenance of the Facilities, Licensee shall:

- (A) Restore any track(s), roadbed and other disturbed property; and
- (B) Erect, maintain and periodically verify the accuracy of aboveground markers, in a form approved by Licensor, indicating the location, depth and ownership of any underground Facilities or related facilities.

5.3 Licensee shall be solely responsible for any subsidence or failure of lateral or subjacent support in the Encroachment area for a period of three (3) years after completion of installation.

6. TRACK CHANGES:

6.1 In the event that rail operations and/or track maintenance result in changes in grade or alignment of, additions to, or relocation of track(s) or other facilities, or in the event future use of Licensor's rail corridor or property necessitate any change of location, height or depth in the Facilities or Encroachment, Licensee, at its sole cost and expense and within thirty (30) days after notice in writing from Licensor, shall make changes in the Facilities or Encroachment to accommodate such track(s) or operations.

6.2 If Licensee fails to do so, Licensor may make or contract to make such changes at Licensee's cost.

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7. FACILITY CHANGES:

7.1 Licensee shall periodically monitor and verify the depth or height of the Facilities or Encroachment in relation to the existing tracks and facilities, and shall relocate the Facilities or change the Encroachment, at Licensee's expense, should such relocation or change be necessary to comply with the minimum clearance requirements of Licensor.

7.2 If Licensee undertakes to revise, renew, relocate or change in any manner whatsoever all or any part of the Facilities (including any change in voltage or gauge of wire or any change in circumference, diameter or radius of pipe or change in materials transmitted in and through said pipe), or is required by any public agency or court order to do so, plans therefor shall be submitted to Licensor for approval before such change. After approval, the terms and conditions of this Agreement shall apply thereto.

8. INTERFERENCE WITH RAIL FACILITIES:

8.1 Although the Facilities/Encroachment herein permitted may not presently interfere with Licensor's railroad or facilities, in the event that the operation, existence or maintenance of said Facilities, in the sole judgment of Licensor, causes: (a) interference (including, but not limited to, physical or interference from an electromagnetic induction, or interference from stray or other currents) with Licensor's power lines, communication, signal or other wires, train control system, or electrical or electronic apparatus; or (b) interference in any manner, with the operation, maintenance or use of the rail corridor, track(s), structures, pole line(s), devices, other property, or any appurtenances thereto; then and in either event, Licensee, upon receipt of written notice from Licensor of any such interference, and at Licensee's sole risk, cost and expense, shall promptly make such changes in its Facilities or installation, as may be required in the reasonable judgment of the Licensor to eliminate all such interference. Upon Licensee's failure to remedy or change, Licensor may do so or contract to do so at Licensee's sole cost.

8.2 Without assuming any duty hereunder to inspect the Facilities, Licensor hereby reserves the right to inspect same and to require Licensee to undertake repairs, maintenance or adjustments to the Facilities, which Licensee hereby agrees to make promptly, at Licensee's sole cost and expense.

9. RISK, LIABILITY, INDEMNITY:

With respect to the relative risk and liabilities of the parties, it is hereby agreed that:

9.1 To the fullest extent permitted by State law (constitutional or statutory, as amended), Licensee hereby agrees to, defend, indemnify, and hold Licensor harmless from and against any and all liability, loss, claim, suit, damage, charge or expense which Licensor may suffer, sustain, incur or in any way be subjected to, on account of death of or injury to any person whomsoever (including officers, agents, employees or invitees of Licensor), and for damage to or loss of or destruction of any property whatsoever, arising out of, resulting from, or in any way

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connected with the construction, repair, maintenance, replacement, presence, existence, operations, use or removal of the Facilities or any structure in connection therewith, or restoration of premises of Licensor to good order or condition after removal, EXCEPT when proven to have been caused solely by the willful misconduct or gross negligence of Licensor. HOWEVER, to the fullest extent permitted by State law, during any period of actual construction, repair, maintenance, replacement or removal of the Facilities, wherein agents, equipment or personnel of Licensee are on the railroad rail corridor, Licensee's liability hereunder shall be absolute, irrespective of any joint, sole or contributory fault or negligence of Licensor.

9.2 Use of Licensor's rail corridor involves certain risks of loss or damage as a result of the rail operations. Notwithstanding Section 9.1, Licensee expressly assumes all risk of loss and damage to Licensee's Property or the Facilities in, on, over or under the Encroachment, including loss of or any interference with use or service thereof, regardless of cause, including electrical field creation, fire or derailment resulting from rail operations. For this Section, the term "Licensee's Property" shall include property of third parties situated or placed upon Licensor's rail corridor by Licensee or by such third parties at request of or for benefit of Licensee.

9.3 To the fullest extent permitted by State law, as above, Licensee assumes all responsibility for, and agrees to defend, indemnify and hold Licensor harmless from: (a) all claims, costs and expenses, including reasonable attorneys' fees, as a consequence of any sudden or nonsudden pollution of air, water, land and/or ground water on or off the Encroachment area, arising from or in connection with the use of this Encroachment or resulting from leaking, bursting, spilling, or any escape of the material transmitted in or through the Facilities; (b) any claim or liability arising under federal or state law dealing with either such sudden or nonsudden pollution of air, water, land and/or ground water arising therefrom or the remedy thereof; and (c) any subsidence or failure of lateral or subjacent support of the tracks arising from such Facilities leakage.

9.4 Notwithstanding Section 9.1, Licensee also expressly assumes all risk of loss which in any way may result from Licensee's failure to maintain either required clearances for any overhead Facilities or the required depth and encasement for any underground Facilities, whether or not such loss(es) result(s) in whole or part from Licensor's contributory negligence or joint fault.

9.5 Obligations of Licensee hereunder to release, indemnify and hold Licensor harmless shall also extend to companies and other legal entities that control, are controlled by, subsidiaries of, or are affiliated with Licensor, as well as any railroad that operates over the rail corridor on which the Encroachment is located, and the officers, employees and agents of each.

9.6 If a claim is made or action is brought against Licensor, and/or its operating lessee, for which Licensee may be responsible hereunder, in whole or in part, Licensee shall be notified to assume the handling or defense of such claim or action; but Licensor may participate in such handling or defense.

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9.7 Notwithstanding anything contained in this Agreement, the limitation of liability contained in the state statutes, as amended from time to time, shall not limit Licensor's ability to collect under the insurance policies required to be maintained under this Agreement.

10. INSURANCE:

10.1 Prior to commencement of surveys, installation or occupation of premises pursuant to this Agreement, Licensee shall procure and shall maintain during the continuance of this Agreement, at its sole cost and expense, a policy of

- (i) Statutory Worker's Compensation and Employers Liability Insurance with available limits of not less than ONE MILLION AND 00/100 U.S. DOLLARS (\$1,000,000.00), which must contain a waiver of subrogation against CSXT and its Affiliates;
- (ii) Commercial General Liability coverage (inclusive of contractual liability) with available limits of not less than FIVE MILLION AND 00/100 U.S. DOLLARS (\$5,000,000.00), naming Licensor, and/or its designee, as additional insured and in combined single limits for bodily injury and property damage and covering the contractual liabilities assumed under this Agreement. The evidence of insurance coverage shall be endorsed to provide for thirty (30) days' notice to Licensor, or its designee, prior to cancellation or modification of any policy. Mail CGL certificate, along with agreement, to CSX Transportation, Inc., Speed Code J180, 500 Water Street, Jacksonville, FL 32202. On each successive year, send certificate to RenewalCOI@csx.com.
- (iii) Business automobile liability insurance with available limits of not less than ONE MILLION AND 00/100 U.S. DOLLARS (\$1,000,000.00) combined single limit for bodily injury and/or property damage per occurrence;
- (iv) Such other insurance as Licensor may reasonably require.

10.2 If Licensee's existing CGL policy(ies) do(es) not automatically cover Licensee's contractual liability during periods of survey, installation, maintenance and continued occupation, a specific endorsement adding such coverage shall be purchased by Licensee. If said CGL policy is written on a "claims made" basis instead of a "per occurrence" basis, Licensee shall arrange for adequate time for reporting losses. Failure to do so shall be at Licensee's sole risk.

10.3 Licensor, or its designee, may at any time request evidence of insurance purchased by Licensee to comply with this Agreement. Failure of Licensee to comply with Licensor's request shall be considered a default by Licensee.

10.4 Securing such insurance shall not limit Licensee's liability under this Agreement, but shall be security therefor.

10.5 (A) In the event Licensee finds it necessary to perform construction or demolition operations within fifty feet (50') of any operated railroad track(s) or affecting any

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railroad bridge, trestle, tunnel, track(s), roadbed, overpass or underpass, Licensee shall: (a) notify Licensor; and (b) require its contractor(s) performing such operations to procure and maintain during the period of construction or demolition operations, at no cost to Licensor, Railroad Protective Liability (RPL) Insurance, naming Licensor, and/or its designee, as Named Insured, written on the current ISO/RIMA Form (ISO Form No. CG 00 35 01 96) with limits of FIVE MILLION AND 00/100 U.S. DOLLARS (\$5,000,000.00) per occurrence for bodily injury and property damage, with at least TEN MILLION AND 00/100 U.S. DOLLARS (\$10,000,000.00) aggregate limit per annual policy period, with Pollution Exclusion Amendment (ISO CG 28 31 11 85) if an older ISO Form CG 00 35 is used. The original of such RPL policy shall be sent to and approved by Licensor prior to commencement of such construction or demolition. Licensor reserves the right to demand higher limits.

(B) At Licensor's option, in lieu of purchasing RPL insurance from an insurance company (but not CGL insurance), Licensee may pay Licensor, at Licensor's current rate at time of request, the cost of adding this Encroachment, or additional construction and/or demolition activities, to Licensor's Railroad Protective Liability (RPL) Policy for the period of actual construction. This coverage is offered at Licensor's discretion and may not be available under all circumstances.

10.6 Notwithstanding the provisions of Sections 10.1 and 10.2, Licensee, pursuant to State Statute(s), may self-insure or self-assume, in any amount(s), any contracted liability arising under this Agreement, under a funded program of self-insurance, which fund will respond to liability of Licensee imposed by and in accordance with the procedures established by law.

11. GRADE CROSSINGS; FLAGGING:

11.1 Nothing herein contained shall be construed to permit Licensee or Licensee's contractor to move any vehicles or equipment over the track(s), except at public road crossing(s), without separate prior written approval of Licensor (CSXT Form 7422).

11.2 If Licensor deems it advisable, during any construction, maintenance, repair, renewal, alteration, change or removal of said Facilities, to place watchmen, flagmen, inspectors or supervisors for protection of operations of Licensor or others on Licensor's rail corridor at the Encroachment, and to keep persons, equipment or materials away from the track(s), Licensor shall have the right to do so at the expense of Licensee, but Licensor shall not be liable for failure to do so.

11.3 Subject to Licensor's consent and to Licensor's Railroad Operating Rules and labor agreements, Licensee may provide flagmen, watchmen, inspectors or supervisors during all times of construction, repair, maintenance, replacement or removal, at Licensee's sole risk and expense; and in such event, Licensor shall not be liable for the failure or neglect of such watchmen, flagmen, inspectors or supervisors.

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12. LICENSOR'S COSTS:

12.1 Any additional or alternative costs or expenses incurred by Licensor to accommodate Licensee's continued use of Licensor's property as a result of track changes or wire changes shall also be paid by Licensee.

12.2 Licensor's expense for wages ("force account" charges) and materials for any work performed at the expense of Licensee pursuant hereto shall be paid by Licensee within thirty (30) days after receipt of Licensor's bill therefor. Licensor may, at its discretion, request an advance deposit for estimated Licensor costs and expenses.

12.3 Such expense shall include, but not be limited to, cost of railroad labor and supervision under "force account" rules, plus current applicable overhead percentages, the actual cost of materials, and insurance, freight and handling charges on all material used. Equipment rentals shall be in accordance with Licensor's applicable fixed rate. Licensor may, at its discretion, require advance deposits for estimated costs of such expenses and costs.

13. DEFAULT, BREACH, WAIVER:

13.1 The proper and complete performance of each covenant of this Agreement shall be deemed of the essence thereof, and in the event Licensee fails or refuses to fully and completely perform any of said covenants or remedy any breach within thirty (30) days after receiving written notice from Licensor to do so (or within forty-eight (48) hours in the event of notice of a railroad emergency), Licensor shall have the option of immediately revoking this Agreement and the privileges and powers hereby conferred, regardless of encroachment fee(s) having been paid in advance for any annual or other period. Upon such revocation, Licensee shall make removal in accordance with Article 14.

13.2 No waiver by Licensor of its rights as to any breach of covenant or condition herein contained shall be construed as a permanent waiver of such covenant or condition, or any subsequent breach thereof, unless such covenant or condition is permanently waived in writing by Licensor.

13.3 Neither the failure of Licensor to object to any work done, material used, or method of construction or maintenance of said Encroachment, nor any approval given or supervision exercised by Licensor, shall be construed as an admission of liability or responsibility by Licensor, or as a waiver by Licensor of any of the obligations, liability and/or responsibility of Licensee under this Agreement.

14. TERMINATION, REMOVAL:

14.1 All rights which Licensee may have hereunder shall cease upon the date of (a) termination, (b) revocation, or (c) subsequent agreement, or (d) Licensee's removal of the Facility from the Encroachment. However, neither termination nor revocation of this Agreement shall affect any claims and liabilities which have arisen or accrued hereunder, and which at the

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time of termination or revocation have not been satisfied; neither party, however, waiving any third party defenses or actions.

14.2 Within thirty (30) days after revocation or termination, Licensee, at its sole risk and expense, shall (a) remove the Facilities from the rail corridor of Licensor, unless the parties hereto agree otherwise, (b) restore the rail corridor of Licensor in a manner satisfactory to Licensor, and (c) reimburse Licensor any loss, cost or expense of Licensor resulting from such removal.

15. NOTICE:

15.1 Licensee shall give Licensor at least thirty (30) days written notice before doing any work on Licensor's rail corridor, except that in cases of emergency shorter notice may be given. Licensee shall provide proper notification as follows:

a. For non-emergencies, Licensee shall complete and submit Licensor's Outside Party Number Request Form (Form # OP) by facsimile, to facsimile numbers: (904) 245-3692. Licensee may also scan and email a completed form to email address: OP_Request@csx.com. A blank form, as well as additional instructions and information, can be obtained from Licensor's web site, via web link:
http://www.csx.com/share/wwwcsx_mura/assets/File/Customers/Non-freight_Services/Property_Real_Estate/Outside_Party_Number_Request_Form.pdf.

b. For emergencies, Licensee shall complete all of the steps outlined in Section 15.1 a. above, and shall also include detailed information of the emergency. Licensee shall also call and report details of the emergency to Licensor's Rail Operations Emergency Telephone Number: 1-800-232-0144. In the event Licensor needs to contact Licensee concerning an emergency involving Licensee's Facility(ies), the emergency phone number for Licensee is: 270-737-1056.

15.2 All other notices and communications concerning this Agreement shall be addressed to Licensee at the address above, and to Licensor at the address shown on Page 1, c/o CSXT Contract Management, J180; or at such other address as either party may designate in writing to the other.

15.3 Unless otherwise expressly stated herein, all such notices shall be in writing and sent via Certified or Registered Mail, Return Receipt Requested, or by courier, and shall be considered delivered upon: (a) actual receipt, or (b) date of refusal of such delivery.

16. ASSIGNMENT:

16.1 The rights herein conferred are the privileges of Licensee only, and Licensee shall obtain Licensor's prior written consent to any assignment of Licensee's interest herein; said consent shall not be unreasonably withheld.

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16.2 Subject to Sections 2 and 16.1, this Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors or assigns.

16.3 Licensee shall give Licensor written notice of any legal succession (by merger, consolidation, reorganization, etc.) or other change of legal existence or status of Licensee, with a copy of all documents attesting to such change or legal succession, within thirty (30) days thereof.

16.4 Licensor expressly reserves the right to assign this Agreement, in whole or in part, to any grantee, lessee, or vendee of Licensor's underlying property interests in the Encroachment, upon written notice thereof to Licensee.

16.5 In the event of any unauthorized sale, transfer, assignment, sublicense or encumbrance of this Agreement, or any of the rights and privileges hereunder, Licensor, at its option, may revoke this Agreement by giving Licensee or any such assignee written notice of such revocation; and Licensee shall reimburse Licensor for any loss, cost or expense Licensor may incur as a result of Licensee's failure to obtain said consent.

17. TITLE:

17.1 Licensee understands that Licensor occupies, uses and possesses lands, rights-of-way and rail corridors under all forms and qualities of ownership rights or facts, from full fee simple absolute to bare occupation. Accordingly, nothing in this Agreement shall act as or be deemed to act as any warranty, guaranty or representation of the quality of Licensor's title for any particular Encroachment or segment of Rail Corridor occupied, used or enjoyed in any manner by Licensee under any rights created in this Agreement. It is expressly understood that Licensor does not warrant title to any Rail Corridor and Licensee will accept the grants and privileges contained herein, subject to all lawful outstanding existing liens, mortgages and superior rights in and to the Rail Corridor, and all leases, licenses and easements or other interests previously granted to others therein.

17.2 The term "license," as used herein, shall mean with regard to any portion of the Rail Corridor which is owned by Licensor in fee simple absolute, or where the applicable law of the State where the Encroachment is located otherwise permits Licensor to make such grants to Licensee, a "permission to use" the Rail Corridor, with dominion and control over such portion of the Rail Corridor remaining with Licensor, and no interest in or exclusive right to possess being otherwise granted to Licensee. With regard to any other portion of Rail Corridor occupied, used or controlled by Licensor under any other facts or rights, Licensor merely waives its exclusive right to occupy the Rail Corridor and grants no other rights whatsoever under this Agreement, such waiver continuing only so long as Licensor continues its own occupation, use or control. Licensor does not warrant or guarantee that the license granted hereunder provides Licensee with all of the rights necessary to occupy any portion of the Rail Corridor. Licensee further acknowledges that it does not have the right to occupy any portion of the Rail Corridor held by Licensor in less than fee simple absolute without also receiving the consent of the owner(s) of the fee simple absolute estate. Further, Licensee shall not obtain, exercise or claim any interest in the Rail Corridor that would impair Licensor's existing rights therein.

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17.3 Licensee agrees it shall not have nor shall it make, and hereby completely and absolutely waives its right to, any claim against Licensor for damages on account of any deficiencies in title to the Rail Corridor in the event of failure or insufficiency of Licensor's title to any portion thereof arising from Licensee's use or occupancy thereof.

17.4 Licensee agrees to fully and completely indemnify and defend all claims or litigation for slander of title, overburden of easement, or similar claims arising out of or based upon the Facilities placement, or the presence of the Facilities in, on or along any Encroachment(s), including claims for punitive or special damages.

17.5 Licensee shall not at any time own or claim any right, title or interest in or to Licensor's property occupied by the Encroachments, nor shall the exercise of this Agreement for any length of time give rise to any right, title or interest in Licensee to said property other than the license herein created.

17.6 Nothing in this Agreement shall be deemed to give, and Licensor hereby expressly waives, any claim of ownership in and to any part of the Facilities.

17.7 Licensee shall not create or permit any mortgage, pledge, security, interest, lien or encumbrances, including without limitation, tax liens and liens or encumbrances with respect to work performed or equipment furnished in connection with the construction, installation, repair, maintenance or operation of the Facilities in or on any portion of the Encroachment (collectively, "Liens or Encumbrances"), to be established or remain against the Encroachment or any portion thereof or any other Licensor property.

17.8 In the event that any property of Licensor becomes subject to such Liens or Encumbrances, Licensee agrees to pay, discharge or remove the same promptly upon Licensee's receipt of notice that such Liens or Encumbrances have been filed or docketed against the Encroachment or any other property of Licensor; however, Licensee reserves the right to challenge, at its sole expense, the validity and/or enforceability of any such Liens or Encumbrances.

18. GENERAL PROVISIONS:

18.1 This Agreement, and the attached specifications, contains the entire understanding between the parties hereto.

18.2 Neither this Agreement, any provision hereof, nor any agreement or provision included herein by reference, shall operate or be construed as being for the benefit of any third person.

18.3 Except as otherwise provided herein, or in any Rider attached hereto, neither the form of this Agreement, nor any language herein, shall be interpreted or construed in favor of or against either party hereto as the sole drafter thereof.

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18.4 This Agreement is executed under current interpretation of applicable Federal, State, County, Municipal or other local statute, ordinance or law(s). However, each separate division (paragraph, clause, item, term, condition, covenant or agreement) herein shall have independent and severable status for the determination of legality, so that if any separate division is determined to be void or unenforceable for any reason, such determination shall have no effect upon the validity or enforceability of each other separate division, or any combination thereof.

18.5 This Agreement shall be construed and governed by the laws of the state in which the Facilities and Encroachment are located.

18.6 If any amount due pursuant to the terms of this Agreement is not paid by the due date, it will be subject to Licensor's standard late charge and will also accrue interest at eighteen percent (18%) per annum, unless limited by local law, and then at the highest rate so permitted.

18.7 Licensee agrees to reimburse Licensor for all reasonable costs (including attorney's fees) incurred by Licensor for collecting any amount due under the Agreement.

18.8 The provisions of this License are considered confidential and may not be disclosed to a third party without the consent of the other party(s), except: (a) as required by statute, regulation or court order, (b) to a parent, affiliate or subsidiary company, (c) to an auditing firm or legal counsel that are agreeable to the confidentiality provisions, or (d) to Lessees of Licensor's land and/or track who are affected by the terms and conditions of this Agreement and will maintain the confidentiality of this Agreement.

18.9 Licensor shall refund to Licensee any overpayments collected, plus any taxes paid in advance; PROVIDED, however, such refund shall not be made when the cumulative total involved is less than One Hundred Dollars (\$100.00).

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IN WITNESS WHEREOF, the parties hereto have executed this Agreement in duplicate (each of which shall constitute an original) as of the effective date of this Agreement.

Witness for Licensor:



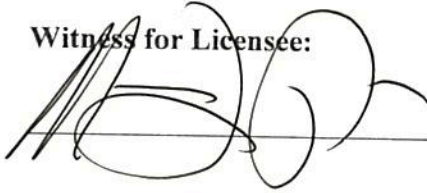
CSX TRANSPORTATION, INC

By: 

Print/Type Name: David E. Elder
Director

Print/Type Title: _____

Witness for Licensee:



HARDIN COUNTY WATER DISTRICT NO. 2

By: 

Who, by the execution hereof, affirms that he/she has the authority to do so and to bind the Licensee to the terms and conditions of this Agreement.

Print/Type Name: Michael L. Bell

Print/Type Title: Chairman

Tax ID No.: 61-0675437

Authority under Ordinance or

Resolution No. N/A

Dated 10-20-15

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NOTES:

NOTES:

The front of the casing pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe.

Casing pipe ends will be sealed in accordance with CSXT specs.

For any excavated soil that requires off-site disposal, the licensee is required to use only CSX approved laboratories, transporters and disposal facilities. All disposal-related documents (manifest, profile, etc.) must go through the CSX disposal approval process, managed by CCR Environmental Solutions, LLC.

CSX PROPERTY SERVICES REVIEW

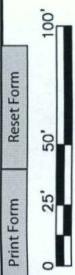
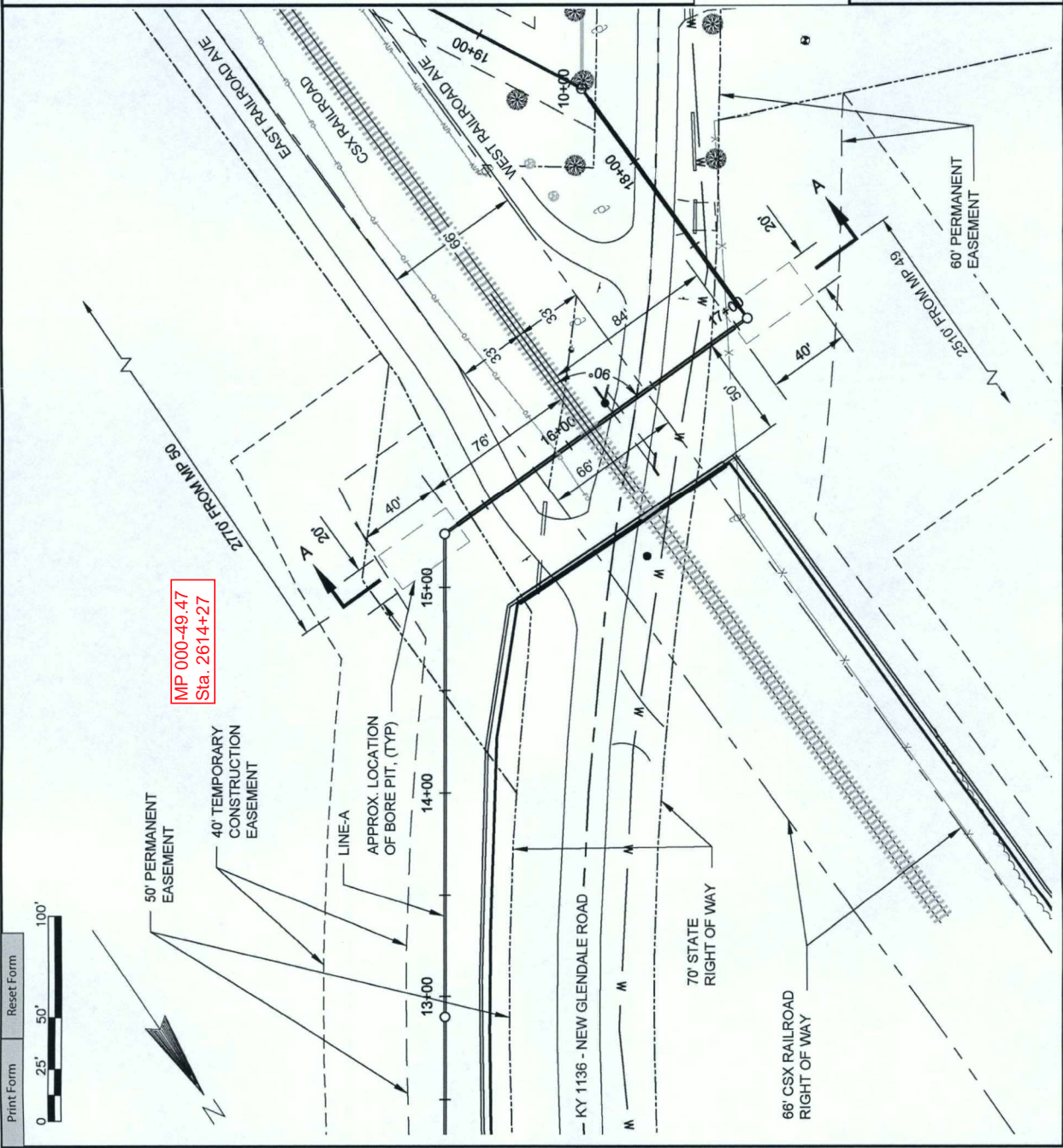
No Exceptions Exceptions Noted

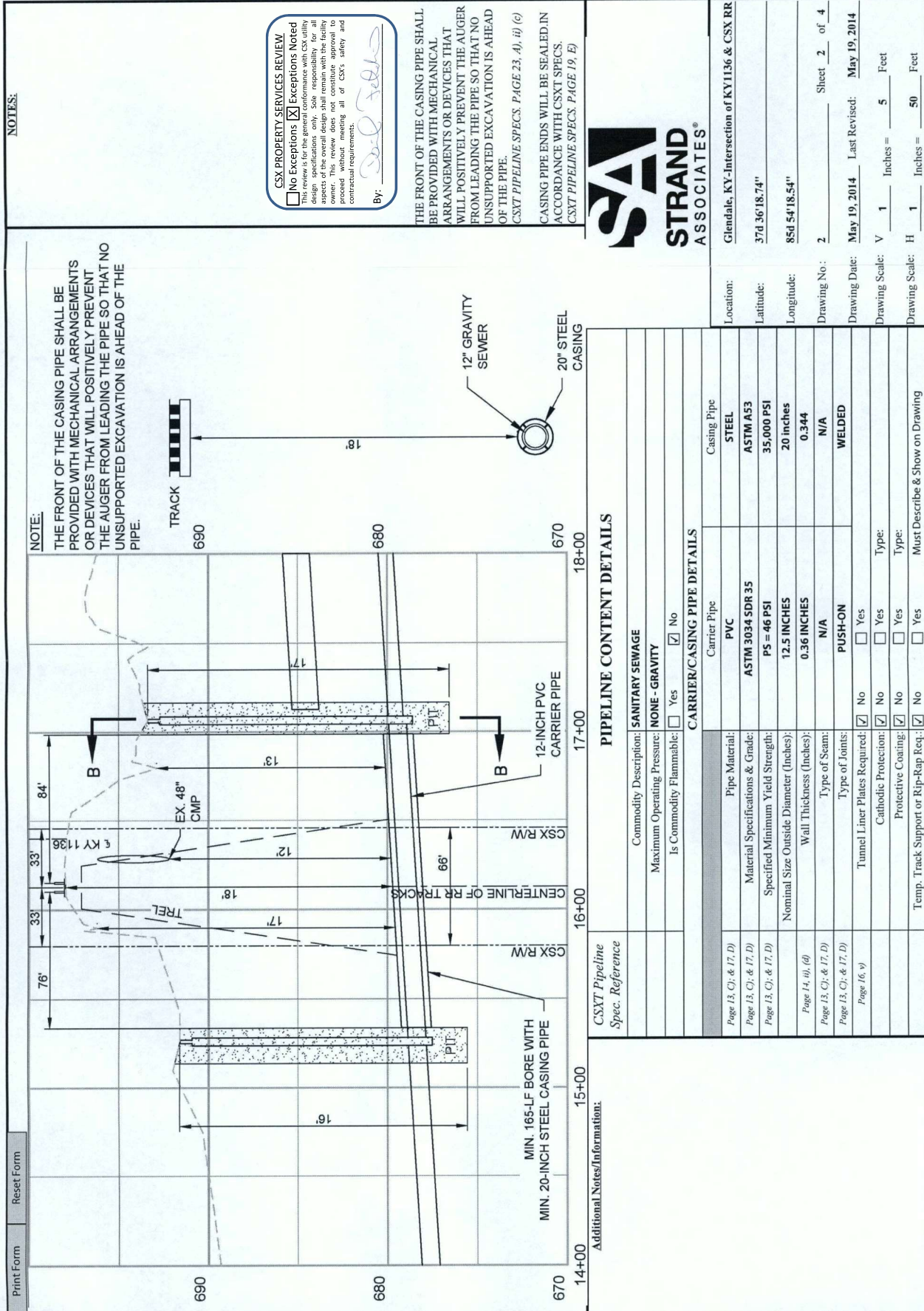
This review is for informational purposes only. The design engineer retains full responsibility for all design aspects of the overall design shall remain with the facility owner. This review does not constitute approval to proceed without meeting all of CSX's safety and contractual requirements.

By: *[Signature]*



Location:	Glendale, KY-Intersection of KY1136 & CSX RR		
Latitude:	37d 36' 18.74"		
Longitude:	85d 54' 18.54"		
Drawing No.:	1	Sheet	1 of 4
Drawing Date:	May 19, 2014	Last Revised:	May 19, 2014
Drawing Scale:	1	Inches =	50 Feet





NOTES:

CSX PROPERTY SERVICES REVIEW
 This review is for the general performance with CSX utility design specifications only. Sole responsibility for all aspects of the overall design shall remain with the facility owner. This review does not constitute approval to proceed with construction without meeting all of CSX's safety and contractual requirements.

By: *[Signature]*

THE FRONT OF THE CASING PIPE SHALL BE PROVIDED WITH MECHANICAL ARRANGEMENTS OR DEVICES THAT WILL POSITIVELY PREVENT THE AUGER FROM LEADING THE PIPE SO THAT NO UNSUPPORTED EXCAVATION IS AHEAD OF THE PIPE.
 CSXT PIPELINE SPECS. PAGE 23, 4), ii) (c)
 CASING PIPE ENDS WILL BE SEALED IN ACCORDANCE WITH CSXT SPECS.
 CSXT PIPELINE SPECS. PAGE 19, E)



Location:	Glendale, KY-Intersection of KY1136 & CSX RR		
Latitude:	37d 36' 18.74"		
Longitude:	85d 54' 18.54"		
Drawing No.:	2	Sheet	2 of 4
Drawing Date:	May 19, 2014		
Last Revised:	May 19, 2014		
Drawing Scale:	V	1	Inches = 5 Feet
Drawing Scale:	H	1	Inches = 50 Feet

PIPELINE CONTENT DETAILS

Commodity Description:	SANITARY SEWAGE		
Maximum Operating Pressure:	NONE - GRAVITY		
Is Commodity Flammable:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	
CARRIER/CASING PIPE DETAILS			
Carrier Pipe	PVC	Casing Pipe	STEEL
Pipe Material:	ASTM 3034 SDR 35	Material Specifications & Grade:	ASTM A53
Material Specifications & Grade:	PS = 46 PSI	Specified Minimum Yield Strength:	35,000 PSI
Specified Minimum Yield Strength:	12.5 INCHES	Nominal Size Outside Diameter (Inches):	20 inches
Nominal Size Outside Diameter (Inches):	0.36 INCHES	Wall Thickness (Inches):	0.344
Wall Thickness (Inches):	N/A	Type of Seam:	N/A
Type of Seams:	PUSH-ON	Type of Joints:	WELDED
Type of Joints:	<input checked="" type="checkbox"/> No	Tunnel Liner Plates Required:	<input type="checkbox"/> Yes
Tunnel Liner Plates Required:	<input checked="" type="checkbox"/> No	Cathodic Protection:	<input checked="" type="checkbox"/> Yes
Cathodic Protection:	<input checked="" type="checkbox"/> No	Protective Coating:	<input checked="" type="checkbox"/> Yes
Protective Coating:	<input checked="" type="checkbox"/> No	Temp. Track Support or Rip-Rap Req.:	<input checked="" type="checkbox"/> Yes
Temp. Track Support or Rip-Rap Req.:	<input checked="" type="checkbox"/> No	Must Describe & Show on Drawing	

CSXT Pipeline Spec. Reference

Additional Notes/Information:

Print Form Reset Form

NOTES:

The front of the casing pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe.

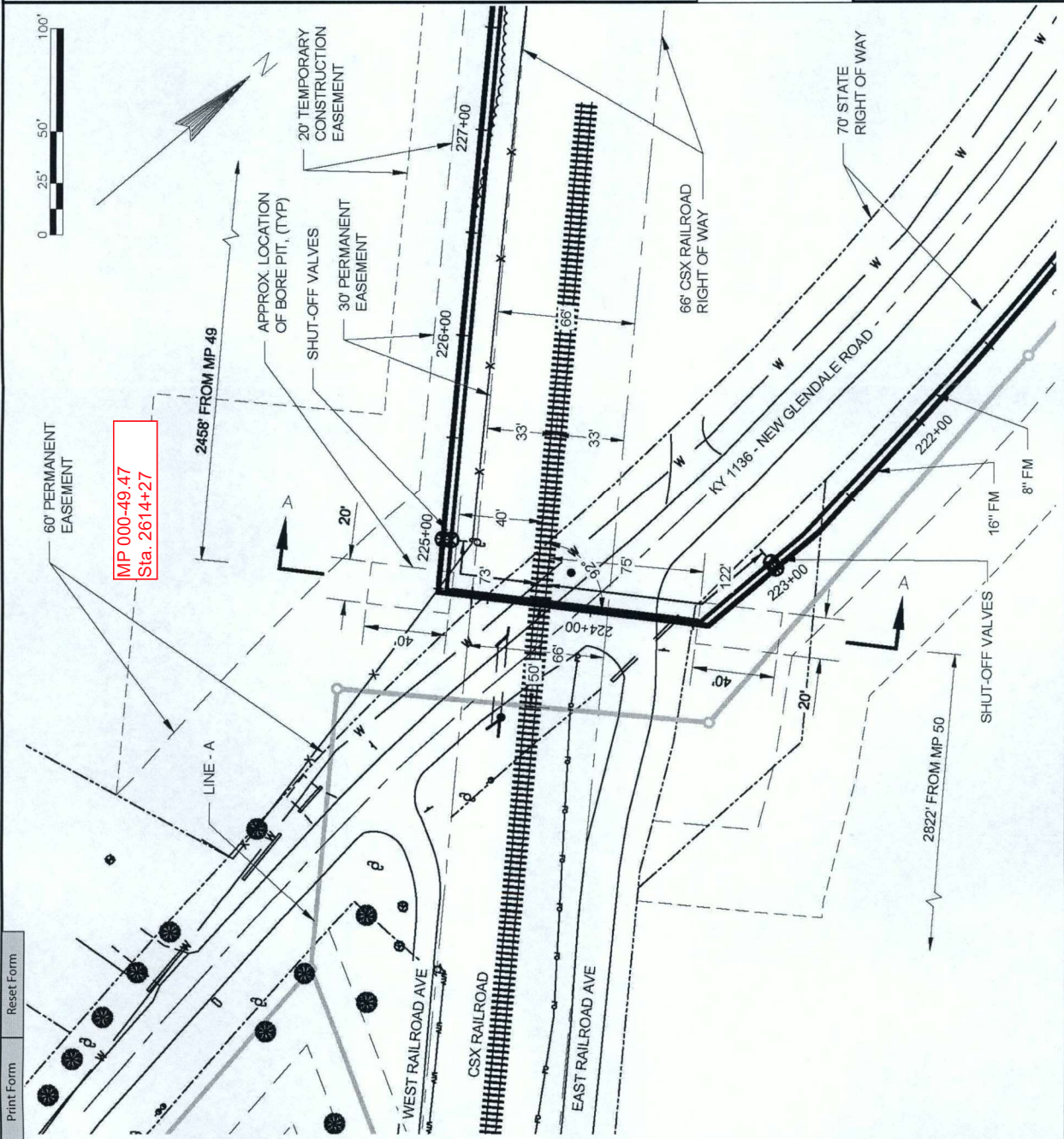
Casing pipe ends will be sealed in accordance with CSXT specs.

For any excavated soil that requires off-site disposal, the licensee is required to use only CSX approved laboratories, transporters and disposal facilities. All disposal-related documents (manifest, profile, etc.) must go through the CSX disposal approval process, managed by CCR Environmental Solutions, LLC.

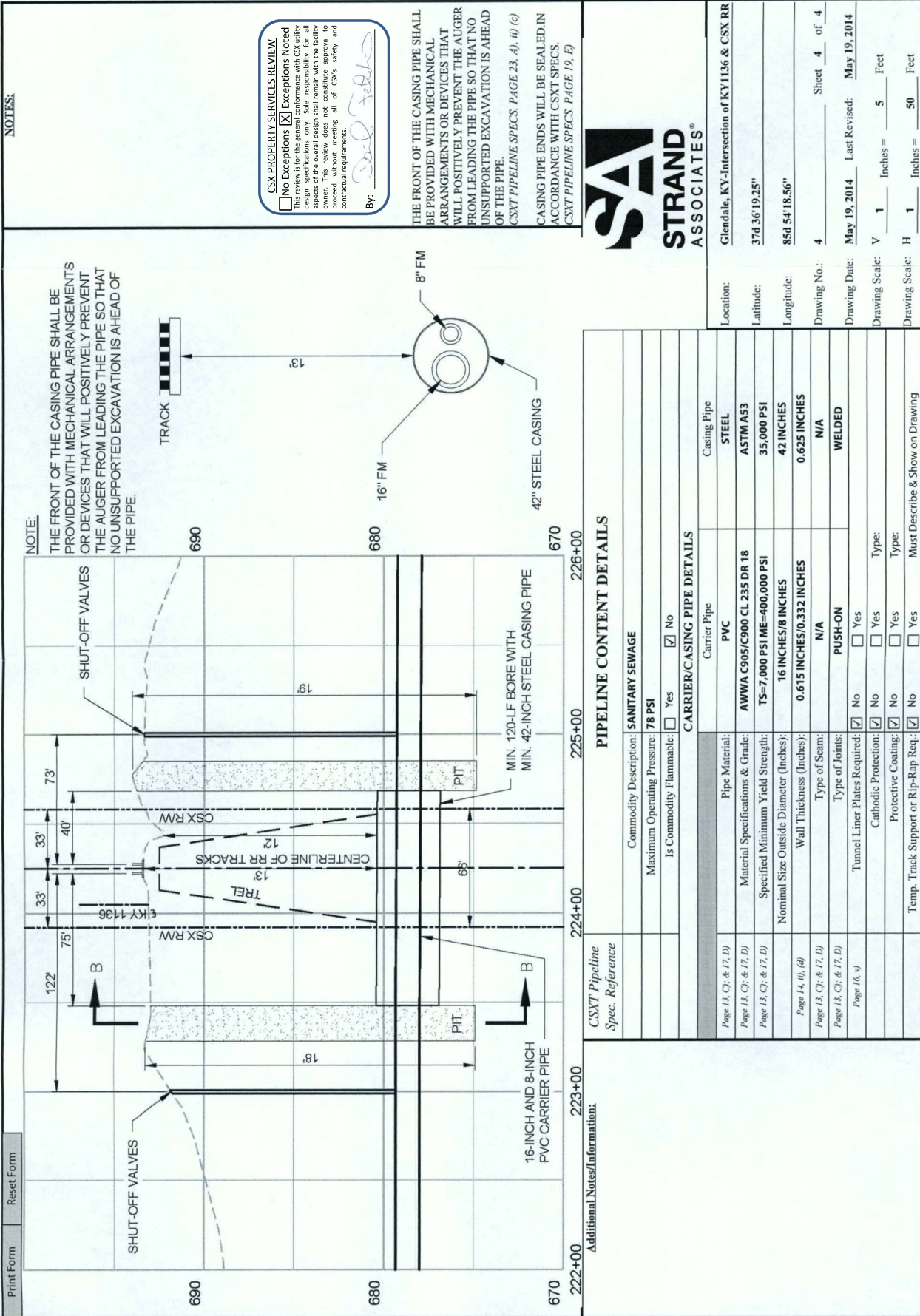
CSX PROPERTY SERVICES REVIEW
 No Exceptions Exceptions Noted
 This review is for the general conformance with CSX utility design specifications only. Sole responsibility for all work shown on this drawing shall remain with the owner. This review does not constitute approval to proceed without meeting all of CSX's safety and contractual requirements.
 By: *[Signature]*



Location:	Glendale, KY-Intersection of KY1136 & CSX RR		
Latitude:	37° 36' 19.25"		
Longitude:	85° 54' 18.56"		
Drawing No.:	3	Sheet	3 of 4
Drawing Date:	May 19, 2014	Last Revised:	May 19, 2014
Drawing Scale:	1	Inches =	50 Feet



Print Form
 Reset Form



NOTES:

CSX PROPERTY SERVICES REVIEW
 No Exceptions Exceptions Noted
 This review is for the general conformance with CSX utility design specifications only. Sole responsibility for all aspects of the overall design shall remain with the facility owner. Any deviations from the design shall be approved in writing by CSX Property Services without meeting all of CSX's safety and contractual requirements.
 BY: *[Signature]*

THE FRONT OF THE CASING PIPE SHALL BE PROVIDED WITH MECHANICAL ARRANGEMENTS OR DEVICES THAT WILL POSITIVELY PREVENT THE AUGER FROM LEADING THE PIPE SO THAT NO UNSUPPORTED EXCAVATION IS AHEAD OF THE PIPE.
 CSXT PIPELINE SPECS. PAGE 23, A), ii) (c)
 CASING PIPE ENDS WILL BE SEALED IN ACCORDANCE WITH CSXT SPECS.
 CSXT PIPELINE SPECS. PAGE 19, E)



Location:	Glendale, KY-Intersection of KY1136 & CSX RR
Latitude:	37d 36'19.25"
Longitude:	85d 54'18.56"
Drawing No.:	4 Sheet 4 of 4
Drawing Date:	May 19, 2014 Last Revised: May 19, 2014
Drawing Scale:	V 1 Inches = 5 Feet
Drawing Scale:	H 1 Inches = 50 Feet

NOTE:

THE FRONT OF THE CASING PIPE SHALL BE PROVIDED WITH MECHANICAL ARRANGEMENTS OR DEVICES THAT WILL POSITIVELY PREVENT THE AUGER FROM LEADING THE PIPE SO THAT NO UNSUPPORTED EXCAVATION IS AHEAD OF THE PIPE.

PIPELINE CONTENT DETAILS

Commodity Description:	SANITARY SEWAGE	
Maximum Operating Pressure:	78 PSI	
Is Commodity Flammable:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
CARRIER/CASING PIPE DETAILS		
Carrier Pipe	PVC	Casing Pipe
Pipe Material:	AWWA C905/C900 CL 235 DR 18	STEEL
Material Specifications & Grade:	TS=7,000 PSI ME=400,000 PSI	ASTM A53
Specified Minimum Yield Strength:	16 INCHES/8 INCHES	35,000 PSI
Nominal Size Outside Diameter (Inches):	0.615 INCHES/0.332 INCHES	42 INCHES
Wall Thickness (Inches):	N/A	0.625 INCHES
Type of Seam:	PUSH-ON	N/A
Type of Joints:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes	WELDED
Tunnel Liner Plates Required:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes	
Cathodic Protection:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes	Type:
Protective Coating:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes	Type:
Temp. Track Support or Rip-Rap Req.:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes	Must Describe & Show on Drawing

Print Form Reset Form

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**DESIGN & CONSTRUCTION
STANDARD SPECIFICATIONS**

Pipelines Occupancies

OFFICE OF:
CHIEF ENGINEER – DESIGN AND CONSTRUCTION
JACKSONVILLE, FLORIDA
September 15, 2003
Last Revised February 24, 2010

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DESIGN & CONSTRUCTION STANDARD SPECIFICATIONS

Pipelines

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Scope

- A) This specification shall apply to the design and construction of pipelines carrying flammable or non-flammable substances and casings containing wires, cables, and carrier pipes across and along CSXT property and facilities. This specification shall also apply to tracks owned by others (sidings, industry tracks, etc.) over which CSXT operates its equipment.
- B) It is to be clearly understood that CSXT owns its right-of-way for the primary purpose of operating a railroad. All occupancies shall therefore be designed and constructed so that rail operations and facilities are not interfered with, interrupted, or endangered. In addition, the proposed facility shall be located to minimize encumbrance to the right-of-way so that the railroad will have unrestricted use of its property for current and future operations.

Definitions

CSXT	CSX Transportation, Inc.
Contract Administration	CSXT's Contract Administration Department
Owner (Applicant)	Individual, Corporation, or Municipality desiring occupancy of CSXT property
Professional Engineer	Engineer licensed in the state where the facilities are to be constructed.
Carrier Pipe	Pipe used to transport the product
Casing Pipe	Pipe through which the carrier pipe is installed under main tracks
Sidings or Industry Tracks	Tracks located off of CSXT's right-of-way, serving an industry

Application for Occupancy

- A) Owner (Applicant) desiring occupancy of CSXT property by pipeline occupations must agree upon the following: Approval by CSXT of all engineering and construction details, execution of an appropriate CSXT occupational agreement, and payment of any required fees and/or rentals specified therein.
- B) Occupancy applications shall be completed in full with all of the required information requested in order for the application to be processed. Review the entire application package, as well as the engineering specifications, before completing the application.
- C) Applications may be secured in writing from: **Contract Administration Department, CSXT Transportation, 500 Water Street – J-180, Jacksonville, Florida 32202.**

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Right of Entry

- A) Entry upon CSXT property for the purpose of conducting surveys, field inspections, obtaining soils information, or any other purposes associated with the design and construction for the proposed occupancy, will not be permitted without a proper entry permit prepared by CSXT. The applicant must pay the associated fees and execute the entry permit.
- B) The issuance of an entry permit does not constitute authority to proceed with any construction. Construction cannot begin until a formal agreement is executed by CSXT and the Owner receives permission, from the designated inspection agency of CSXT, to proceed with the work.

Site Inspections

- A) For longitudinal occupancy of CSXT property, a site inspection along the proposed pipeline route may be required before final design plans are prepared. When a site inspection is required, the applicant and/or the engineer must meet with a CSXT Field Representative to view the entire length of the proposed occupancy; the applicant will be informed of the need for a meeting during application processing.
- B) Prior to the site inspection the applicant must submit the following information:
 - i) A plan view of the proposed route showing all tracks, both CSXT right-of-way lines, and all other facilities located on the right-of-way. The distance from the proposed pipeline to the adjacent track and to the right-of-way lines must be shown.
 - ii) A complete application form.
 - iii) Typical cross sections along the proposed route. (See Plate I)
- C) Site inspections for pipe crossings are not required unless, in the opinion of CSXT, the size and location of the facility warrant an inspection.

Information Required for Submission

- A) All plans and documents required in the application package shall be submitted as per the instructions in the applications package
- B) Failure to following these instructions may result in the return of the information provided without further action taken.

Notification to Proceed with Construction

- A) After approval of the engineering plans and specifications and execution of the occupational agreement, the Owner will be notified of the appropriate CSXT Regional Engineering office representative who must be contacted prior to start of construction. The appropriate CSXT Regional Engineering office at its sole discretion, may provide inspection of the project and coordinate all other construction aspects of the project that relate to CSXT (flagging, track work, protection of signal cables, etc.).

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- B) Note that on large and/or extensive projects, the following may be required: (1) A deposit equal the amount of CSXT's estimate will be required prior to the commence of any work. Any unused portion of the advance will be reimbursed to the applicant. (2) The use of an outside Service Provider for constructing engineering and inspection may be required by CSXT at the sole cost of the applicant
- C) The appropriate Regional Engineering office must be notified a minimum of fourteen (14) working days prior to desired start of construction.

General Requirements

- A) Use of Casing Pipe
 - i) A casing pipe will be required for all pipeline crossings carrying liquid or gaseous substances.
 - ii) For non-pressure sewer or drainage crossings, where the installation can be made by open cut (see Construction Requirements Section) or reinforced concrete pipe can be jacked under the railroad (see Construction Requirements Section), the casing pipe may be omitted.
 - iii) Pressure pipelines that are located within 25 feet of the centerline of any track shall be encased.
 - iv) At proposed pipe crossing the casing pipe shall be laid across the entire width of the right-of-way, except where a greater length is required to comply with the Design Requirements-Casing Pipe Section of this specification, even though such extension is beyond the right-of-way.
 - v) At the discretion of CSXT a casing pipe may be required for any application regardless of the commodity carried.
- B) Location of Pipeline on the Right-of-Way
 - i) Pipelines laid longitudinally on CSXT's right-of-way shall be located as far as practicable from any tracks or other important structures and as close to the railroad property line as possible. Longitudinal pipelines must not be located in earth embankments or within ditches located on the right-of-way.
 - ii) Pipelines shall be located, where practicable, to cross tracks at approximate right angles to the track, but preferably at not less than 45 degrees.
 - iii) Pipelines shall not be placed within a culvert, under railroad bridges, nor closer than 45 feet to any portion of any railroad bridge, building, or other important structure, except in special cases, and then by special design, as approved by CSXT's Chief Engineer, Design and Construction.
 - iv) Pipelines shall not be located within the limits of a turnout (switch) when crossing the track. The limits of the turnout extend from the point of the switch to 15 feet beyond the last long timber.

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- v) Pipeline installations shall not be designed as an open cut installation where the pipeline is to be located within the limits of a grade crossing. If it is shown that no other method of installation is possible, the owner will be responsible for reimbursing CSXT for all costs associated with the removal and reconstruction of the grade crossing. (This cost will require advance funding by the pipeline owner).
 - vi) Pipelines carrying liquefied petroleum gas shall, where practicable, cross the railroad where tracks are carried on embankment.
- C) Depth of Installation
- i) Pipelines conveying non-flammable substances
 - (a) Casing/carrier pipes placed under CSXT track(s) shall be not less than 5.5 feet from base of rail to top of pipe at its shallowest point.
 - (b) Pipelines laid longitudinally on CSXT's right-of-way, 50 feet or less from centerline track shall be buried not less than 4 feet from ground surface to top of pipe. Where the pipeline is laid more than 50 feet from centerline of track, the minimum cover shall be at least 3 feet.
 - ii) Pipelines conveying flammable substances
 - (a) Casing pipes under CSXT track(s) shall be not less than 5.5 feet from base of rail to top of pipe at its closest point. On other portions of the right-of-way, where the pipe is not directly beneath any track, the depth from ground surface or from bottom of ditch to top of pipe shall not be less than 3 feet. Where 3 feet of cover cannot be provided from bottom of ditch, a 6-inch thick reinforced concrete slab shall be provided over the pipeline for protection.
 - (b) Pipelines laid longitudinally on CSXT's right-of-way, 50 feet or less from centerline track shall be buried not less than 6 feet from ground surface to top of pipe. Where the pipeline is laid more than 50 feet from centerline of track, the minimum cover shall be at least 5 feet
- D) Pipelines within Limits of a Dedicated Highway
- i) Pipelines within the limits of a dedicated highway are subject to all the requirements of this specification and must be designed and installed in accordance with this specification.
 - ii) The limits of the dedicated highway (right-of-way) must be clearly shown on the plans.
 - iii) Construction cannot begin until an agreement has been executed between CSXT and the Owner and proper notification has been given to CSXT's Regional Engineering Officer. (See Notification to Proceed with Construction)

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- E) Modification of Existing Facilities
- i) Any replacement or modification of an existing carrier pipe and/or casing shall be considered as a new installation, subject to the requirements of this specification.
- F) Abandoned Facilities
- i) The owner of all pipe crossings proposed for abandonment shall notify CSXT, in writing, of the intention to abandon.
 - ii) Abandoned pipelines shall be removed or completely filled with cement grout, compacted sand, or other methods, as approved by CSXT.
 - iii) Abandoned manholes and other structures shall be removed to a minimum depth of 2 feet below finished grade and completely filled with cement grout, compacted sand, or other methods as approved by CSXT.
- G) Conflict of Specifications
- i) Where laws or orders of public authority prescribe a higher degree of protection than specified herein, then the higher degree so prescribed shall be deemed a part of this specification.
- H) Insulation
- i) Pipelines and casings shall be suitably insulated from underground conduits carrying electric wires on CSXT property.
- I) Corrosion Protection and Petroleum Leak Prevention
- i) Pipelines on CSXT property that carry petroleum products or hazardous liquids shall be designed in accordance with current federal, state, and/or local regulations that mandate leak detection automatic shutoff, leak monitoring, sacrificial anodes, and/or exterior coatings to minimize corrosion and prevent petroleum releases.
- J) Plastic Carrier Pipe Materials
- i) Plastic carrier pipe materials include, but are not limited to thermoplastic and thermoset plastic pipes, Thermoplastic types include Polyvinyl Chloride (PVC), Acrylonitrile Butadiene Styrene (ABS), High Density Polyethylene (HDPE), Polyethylene (PE), Polybutylene (PB), Cellulose Acetate Butyrate (CAB), and Styrene Rubber (SR), Thermoset types include Reinforced Plastic Mortar (RPM), Reinforced Thermosetting Resin (FRP) and Fiberglass Reinforce Plastic (FRP).
 - ii) Plastic carrier pipelines shall be encased according to AREMA Chapter 1 Section 5.1.5.
 - iii) Plastic pipe material shall not be used to convey liquid flammable substances.

COPY OF BID SET

- iv) Plastic pipe material shall be resistant to the chemicals with which contact can be anticipated. Plastic carrier pipe shall not be utilized where there is potential for contact with petroleum contaminated soils or other non-polar organic compounds that may be present in surrounding soils.
- v) Plastic carrier pipe can be utilized to convey flammable gas products provided the pipe material is compatible with the type of product conveyed and the maximum allowable operating pressure is less than 100 PSI. Carrier pipe materials, design, and installation shall conform to Code of Federal Regulation 49CFR§178 to §199, specifically §192 and American National Standards Institute ASME B31.8 and ASTM D2513. Codes, specifications, and regulations current at time of construction of the pipeline shall govern the installation of the facility within the railway right-of-way. The proof testing of the strength of carrier pipe shall be in accordance with ANSI requirements. Plastic carrier pipes will be encased according to AREMA Chapter 1 Section 5.1.5.
- vi) Plastic carrier pipe conveying flammable substances shall be encased the entire limits of the right-of-way. If special conditions exist which prevent encasement within the entire limits of the right-of-way, the Chief Engineer must approve the minimum encased length.
- vi) Plastic carrier pipe must be encased under all tracks, including sidings and industrial tracks within the limits of the right-of-way.
- vii) Longitudinal carrier pipeline shall be steel or ductile iron. Plastic carrier pipe may be utilized for longitudinal installation with approval by the Chief Engineer, but shall be fully encased within the limits of the right-of-way.
- viii) Codes, specifications, and regulations current at the time of construction the pipeline shall govern the installation of the facility within the railway rights-of-way. The proof testing of the strength of carrier pipe shall be in accordance with ANSI requirements.

<u>Specification Number</u>	<u>Carrier Pipe Properties</u>
ANSI/AWWA C900	PVC pressure pipe 4" through 12"
ANSI/AWWA C901	PE pressure pipe and tubing ½" through 3" for water
ANSI/AWWA C902	PE pressure pipe and tubing ½" through 3" for water
ANSI/AWWA C905	PVC water pipe, 14" through 36"
ANSI/AWWA C906	PE pressure pipe and fittings 4" –63" for water
ANSI/AWWA C907	PVC pressure fittings 4" - 8"
ANSI/AWWA C950	Fiberglass pressure pipe

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Soil Investigation

A) General

- i) Test borings or other soil investigations, approved by CSXT's Chief Engineer, shall be made to determine the nature of the underlying material for all pipe crossings with casing pipe sizes greater or equal to 48 inches in diameter and larger under track(s).
- ii) Test borings or other soil investigations, approved by CSXT's Chief Engineer, may be required when, in the judgment of CSXT, they are necessary to determine the adequacy of the design and construction of pipe crossings with casings less than 48 inches in diameter and for other facilities located on the right-of-way. Note: the applicant shall be responsible for the notification of all underground utilities including CSX signal cables.

B) Location

- i) Borings shall be made on each side of the track(s), on the centerline of the pipe crossing, and as close to the track(s) as practicable.
- ii) Test boring logs shall be accompanied with a plan, drawn to scale, showing the location of the borings in relation to the track(s) and the proposed pipe.

C) Sampling

- i) Test borings shall be made in accordance with current ASTM Designation D1586 except that sampling must be continuous from the ground surface to 5 feet below the proposed invert unless rock is encountered before this depth. Where rock is encountered, it is to be cored using a Series "M" Double Tube Core Barrel, with a diamond bit, capable of retrieving a rock core at least 1 5/8" in diameter. Individual core runs are not to exceed 5 feet in length.
- ii) All borings shall be sealed, for their full depth, with a 4-3-1 bentonite-cement-sand grout after accurate ground water readings have been taken and recorded.
- iii) Soil samples taken from auger vanes or return washwater are not acceptable.

D) Boring Logs

- i) Test boring logs shall clearly indicate all of the following:
 - (a) Boring number as shown on the required boring location plan.
 - (b) Ground elevation at each boring using same datum as the pipeline construction plans.
 - (c) Engineering description of soils or rock encountered.
 - (d) Depth and percent recovery of all soil samples.
 - (e) Depth from surface for each change in strata.

COPY OF BID SET

- (f) Blows for each 6 inches of penetration for the standard penetration test described in ASTM D 1586. Blows for lesser penetrations should be recorded.
 - (g) Percent recovery and Rock Quality Designation (RQD) for all rock cores.
 - (h) Depth to ground water while sampling and when it has stabilized in the bore hole.
- ii) The location of the carrier pipe and/or casing pipe shall be superimposed on the boring logs before submission to CSXT.
- E) Additional Information
- i) When directed by CSXT, additional borings may be required for the purpose of taking undisturbed thin-wall piston samples or Dennison type samples for laboratory testing to determine the index and engineering properties of certain soil strata.

Design Requirements

- A) Design Loads
- i) General Requirements
 - (a) All pipes, manholes, and other facilities shall be designed for the external and internal loads to which they will be subjected.
 - (b) To allow for placement of additional track(s) or shifting of the existing track(s), all proposed pipelines or structures shall be designed as if a railroad loading is directly above the facility.
 - ii) Earth Load
 - (a) The dead load of the earth shall be considered as 120 pounds per cubic foot unless soil conditions warrant the use of a higher value.
 - iii) Railroad Load (live load and impact)
 - (a) The railroad live load used shall be a Cooper E-80 loading. This loading consists of 80 kip axle loads spaced 5 feet on centers.
 - (b) An impact factor of 1.75 (multiply live load by the impact factor) shall be used for depth of cover up to 5 feet. Between 5 and 30 feet, the impact factor is reduced by 0.03 per foot of depth. Below a depth of 30 feet, the impact factor is one.

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- (c) The values shown in Table 1 shall be used for the vertical pressure on a buried structure for the various heights of cover.

Table 1

Live loads, including impact, for various heights of cover for a Cooper E-80 loading.

Height of Cover Feet	Load	
	Pound per square feet	(kPa)
2	3800	(162.8)
3	3150	(150.8)
4	2850	(136.5)
5	2550	(122.1)
6	2250	(107.7)
7	1950	(93.4)
8	1700	(81.4)
9	1500	(71.8)
10	1300	(62.2)
12	1000	(47.9)
14	800	(38.3)
16	625	(29.9)
18	500	(23.9)
20	400	(19.2)
25	250	(12.0)
30	150	(7.2)

- (d) To determine the horizontal pressure caused by the railroad loading on a sheet pile wall or other structure adjacent to the track, the Boussinesq analysis shall be used. The load on the track shall be taken as a strip load with a width equal to the length of the ties which is typically, 8.5 feet. The vertical surcharge, q (psf), caused by each axle, shall be uniform and equal to the axle load divided by the tie length and the axle spacing, 5 feet. For the E-80 loading this results in;

$$q = 80,000 / (8.5 \times 5) = 1882 \text{ psf}$$

The horizontal pressure due to the live load surcharge at any point on the wall or other structure is p_h and can be calculated by the following:

$$p_h = (2q/\pi)(\beta - \sin \beta(\cos 2\alpha))$$

- (e) The vertical and horizontal pressures given above shall be used unless an alternate design method is approved by CSXT. Proposals to use an alternate design method must include acceptable references and a statement explaining the justification for choosing the alternate method.

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B) Design Assumptions

To design a casing pipe or an uncased carrier pipe for the external loads on CSXT's right-of-way, the following design assumptions shall be used, unless site conditions indicate more conservative values are required:

i) Flexible Pipe (Steel, DIP, CMP, Tunnel Liner Plate)

(a) Steel Pipe (Bored and jacked in place)

- Spangler's Iowa formula shall be used for design with:

Deflection lag factor	-	$D_f = 1.5$
Modulus of soil reaction	-	$E' = 1080 \text{ psi}$
Bedding constant	-	$K_b = 0.096$
Soil loading constant	-	$K_u' = 0.13$
Allowable deflection of pipe	-	3% of pipe diameter

(b) Ductile Iron Pipe (Open Cut)

- AWWA Specification C150 shall be used for design with:

Pipe laying condition = Type 3
Earth load - ANSI A 51.50 prism method

(c) Corrugated Steel Pipe & Corrugated Structural Steel Plate Pipe (Open Cut)

- AREMA Chapter 1, Sections 4.9 & 4.10 shall be used for design with:

Soil stiffness factor - $K = 0.33$
Railroad impact as per Design Requirements-Casing Pipe Section of this specification.

(d) Tunnel Liner Plate (Tunneled)

- AREMA Chapter 1, Part 4, Section 4.16 shall be used for design with:

Soil stiffness factor - $K = 0.33$
Railroad impact as per Design Requirements-Casing Pipe Section of this specification.

ii) Rigid Pipe (RCP, Vitrified Clay Pipe and PCCP)

(a) Reinforced Concrete Pipe, Vitrified Clay Pipe and Prestressed Concrete Cylinder Pipe (Open Cut)

- American Concrete Pipe Association design manual shall be used for design with:

Marston load theory used for earth load
Bedding (Load Factor) - $L_f = 1.9$
Factor of safety - $FS = 1.25$ for RCP
 $FS = 1.50$ for VCP

Railroad impact as per Design Requirements-Casing Pipe Section of this specification.

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- (b) Reinforced Concrete Pipe (Jacked)
 - American Concrete Pipe Association design manual shall be used for design with:
 - Marston load theory used for earth load
 - Bedding (Load Factor) - $L_f = 3.0$
 - Factor of safety = 1.25
 - Railroad impact as per Design Requirements-Design Loads Section of this specification.
 - Others – As approved by CSXT

C) Casing Pipe

i) General Requirements

- (a) Casing pipe shall be so constructed as to prevent leakage of any substance from the casing throughout its length, except at ends of casing where ends are left open, or through vent pipes when ends of casing are sealed. Casing shall be installed so as to prevent the formation of a waterway under the railroad, and with an even bearing throughout its length, and shall slope to one end (except for longitudinal occupancy).
- (b) The casing pipe and joints shall be of steel and of leakproof construction when the pipeline is carrying liquid flammable products or highly volatile substances under pressure.
- (c) The inside diameter of the casing pipe shall be such as to allow the carrier pipe to be removed subsequently without disturbing the casing or the roadbed. For steel pipe casings, the inside diameter of the casing pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe joints or couplings, for carrier pipe less than 6 inches in diameter; and at least 4 inches greater for carrier pipe 6 inches and over in diameter.
- (d) For flexible casing pipe, a maximum vertical deflection of the casing pipe of 3 percent of its diameter, plus $\frac{1}{2}$ inch (13 mm) clearance shall be provided so that no loads from the roadbed, track, traffic, or casing pipe itself are transmitted to the carrier pipe. When insulators are used on the carrier pipe, the inside diameter of the flexible casing pipe shall be at least 2 inches greater than the outside diameter of the carrier pipe for pipe less than 8 inches in diameter; at least $3\frac{1}{4}$ inches greater for pipe 8 inches to 16 inches, inclusive, in diameter and at least $4\frac{1}{2}$ inches greater for pipe 18 inches and over in diameter.
- (e) In no event shall the casing pipe diameter be larger than is necessary to permit the insertion of the carrier pipe.

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- (f) Casing pipe under railroad tracks and across CSXT's right-of-way shall extend the **greater** of the following distances, measured at right angle to centerline of track:
- Across the entire width of the CSXT right-of-way.
 - 3 feet beyond ditch line.
 - 2 feet beyond toe of slope.
 - A minimum distance of 25 feet from each side of centerline of outside track when casing is sealed at both ends.
 - A minimum distance of 45 feet from centerline of outside track when casing is open at both ends.
 - Beyond the theoretical railroad embankment line. This line begins at a point 12 feet horizontally from centerline track, 18 inches below top-of-rail, and extends downward on a 1½ (H) to 1 (V) slope.
- (g) If additional tracks are constructed in the future, the casing shall be extended correspondingly at the Owner's expense.

ii) Steel Pipe

- (a) Steel pipe may be installed by open cut, boring or jacking depending on situation.
- (b) Steel pipe shall have a specified minimum yield strength, SMYS, of at least 35,000 psi. The ASTM or API specification and grade for the pipe are to be shown on the Application Form.
- (c) Joints between the sections of pipe shall be fully welded around the complete circumference of the pipe.
- (d) Steel casing pipe, with a minimum cover of 5.5 ft., shall have a **minimum** wall thickness as shown in Table 2, unless computations indicate that a thicker wall is required.

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Table 2

Pipe Diameter Nominal Pipe Size (in.)	Coated or Cathodically Protected Nominal Wall Thickness (in.)	Uncoated and Unprotected Nominal Wall Thickness (in.)
10 and under	0.188	0.188
12 & 14	0.188	0.250
16	0.219	0.281
18	0.250	0.312
20 & 22	0.281	0.344
24	0.312	0.375
26	0.344	0.406
28	0.375	0.438
30	0.406	0.469
32	0.438	0.500
34 & 36	0.469	0.532
38	0.500	0.562
40	0.531	0.594
42	0.562	0.625
44 & 46	0.594	0.657
48	0.625	0.688
50	0.656	0.719
52	0.688	0.750
54	0.719	0.781
56 & 58	0.750	0.812
60	0.781	0.844
62	0.812	0.875
64	0.844	0.906
66 & 68	0.875	0.938
70	0.906	0.969
72	0.938	1.000

(e) Coated steel pipe that is bored or jacked into place shall conform to the wall thickness requirements for uncoated steel pipe since the coating may be damaged during installation.

(f) Smooth wall steel pipes with a nominal diameter over 72 inches will not be permitted.

iii) Ductile Iron Pipe

(a) Ductile iron pipe may be used only at the sole discretion of the Chief Engineer when placed by the open cut method. Jacking or boring through the railroad embankment is not permitted due to the bell and spigot joints.

(b) Ductile iron pipe shall conform to the requirements of ANSI A21.51/AWWA C-151. Class 56 pipe shall be used unless computations, in accordance with the Design Requirements-Design Loads and Design Assumptions sections, are provided.

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- (c) Table 3 is based on the design assumptions given in the Design Requirements-Design Loads Section with a minimum cover of 5.5 ft. This table is provided for information only.

Table 3

Pipe diameter (in.)	Thickness Class		Pressure Class		
	Wall thickness (in.)	Class	Wall thickness (in.)	Class	
3	0.25	51	0.25		350
4	0.26	51	0.25		350
6	0.25	50	0.25		350
8	0.27	50	----	----	----
10	0.32	51	----	----	----
12	0.34	51	----	----	----
14	0.39	52	----	----	----
16	0.40	52	----	----	----
18	0.44	53	----	----	----
20	0.45	53	----	----	----
24	0.53	55	----	----	----
30	0.63	56	----	----	----
36	0.73	56	----	----	----
42	0.83	56	----	----	----
48	0.93	56	----	----	----
54	1.05	56	----	----	----

- (d) The pipe shall have mechanical or push on type joints.

iv) Corrugated Steel Pipe and Corrugated Structural Steel Plate Pipe

- (a) Corrugated steel pipe and corrugated structural steel plate pipe may be used for a casing only when placed by the open cut method. Jacking or boring through the railroad embankment is not permitted.
- (b) Corrugated steel pipe and corrugated structural steel plate pipe may be used for a casing provided the pressure in the carrier pipe is less than 100 psi.
- (c) Pipe shall be bituminous coated and shall conform to the current AREMA Specifications Chapter 1, Part 4.
- (d) Corrugated steel pipe shall have a minimum sheet thickness as shown in Table 4. Corrugated structural steel plate pipe shall have a minimum plate thickness of 8 gage, 0.168 in. If computations indicate that a greater thickness is required, the thicker sheet or plate shall be used.

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Table 4

Pipe Diameter (Inches)	Sheet Thickness	
	(Gage)	(Inches)
12 to 30	14	0.079
36	12	0.109
42 to 54	10	0.138
60 to 120	8	0.168

- v) Steel Tunnel Liner Plate
- (a) Liner plates shall be installed by the tunneling method as detailed in the Construction Requirements-Method of Installation section of this specification.
 - (b) Tunnel liner plates shall be galvanized and bituminous coated and shall conform to current AREMA guidelines. If the tunnel liner plates are used only to maintain a tunneled opening until the carrier pipe is installed, and the annular space between the carrier pipe and the tunnel liner is completely filled with cement grout within a reasonably short time after completion of the tunnel, then the tunnel liner plates need not be galvanized and coated.
 - (c) Tunnel liner plates are to be a minimum of 12 gage and shall be fabricated from structural quality, hot-rolled, carbon-steel sheets or plates conforming to ASTM Specification A 1011.
 - (d) The following liner plate information must be shown on the Application Form
 - Number of flanges (2 or 4)
 - Width of plate
 - Type of plate (smooth or corrugated)
- vi) Reinforced Concrete Pipe
- (a) Reinforced concrete pipe shall be installed by the open cut (at the sole discretion of the Chief Engineer) or jacking method.
 - (b) Reinforced concrete pipe shall conform to ASTM Specification C 76. Class V pipe, Wall B or C shall be used unless computations, in accordance with the Design Requirements-Design Assumptions, are provided.
 - (c) Reinforced concrete pipe may be used for a casing provided the pressure in the carrier pipe is less than 100 psi.

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- (d) Pipe placed by open cut shall be installed in accordance with AREMA Guidelines except that backfill and compaction shall be in accordance with the Construction Requirements-Method of Installation section of this specification.
 - (e) Pipe jacked into place shall have tongue and groove joints and shall be installed in accordance with the Construction Requirements-Method of Installation section of this specification.
 - (f) Joints between sections of the RCP shall be sealed with a gasket conforming to ASTM C 443 or approved equal.
- vii) Concrete Encasement
- (a) At locations where the installation is by open cut and a casing pipe is required, but cannot be installed due to elbows or other obstructions, concrete encasement may be used when approved by CSXT.
 - (b) The concrete encasement must provide a minimum cover of 6 inches of concrete around the pipe. A 6 x 6 - W 2.9 x W 2.9 welded wire fabric shall be placed in the concrete on all sides.

D) Carrier Pipe

- i) General Requirements
 - (a) The pipe shall be laid with sufficient slack so that it is not in tension.
 - (b) Steel pipe shall not be used to convey sewage, storm water, or other liquids that could cause corrosion.
 - (c) Carrier pipes located on CSXT's right-of-way or under tracks which CSXT operates, shall be manufactured in accordance with the following specifications:
 - Steel Pipe - The ASTM or API specification and grade for the pipe is to be shown on the Application Form. The specified minimum yield strength is to be at least 35,000 psi. For flammable substances, see the Design Requirements-Carrier Pipe Section of this document for additional requirements.
 - Ductile Iron Pipe - ANSI A21.51/AWWA C151
 - Corrugated Metal Pipe - AREMA Chapter 1, Part 4
 - Reinforced Concrete Pipe - ASTM C 76
 - Vitrified Clay Pipe - ASTM C 700
 - Prestressed Concrete Cylinder Pipe - AWWA C301
 - Reinforced Concrete Cylinder Pipe - AWWA C300

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- Others - As approved by CSXT.
- (d) Carrier pipes installed within a casing pipe shall be designed for the internal pressure to which it will be subjected.
- (e) Gravity flow carrier pipes, installed without a casing pipe, shall meet the requirements, of the particular pipe material, as given in Design Requirements-Casing Pipe Section of this specification.
- (f) Design computations, stamped by a Professional Engineer, must be submitted for all uncased pressure pipelines installed on CSXT's right-of-way. The pipe must be designed for the internal and external loads (see the Design Requirements Section of this document) to which it may be subjected. The design assumptions given in Design Requirements Section shall apply.
- ii) Pipelines Carrying Flammable Substances
- (a) Pipelines carrying oil, liquefied petroleum gas, and other flammable products shall be of steel and conform to the requirements of the current ASME B 31.4 Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols, and other applicable ASME codes, except that the maximum allowable stresses for design of steel pipe shall not exceed the following percentages of the specified minimum yield strength (multiplied by the longitudinal joint factor) of the pipe as defined in the above codes:
- The following percentages apply to hoop stress in steel pipe within a casing under railroad tracks, across railroad right-of-way and longitudinally on railroad right-of-way:

Seventy-two percent on oil pipelines.

Fifty percent for pipelines carrying condensate, natural gasoline, natural gas liquids, liquefied petroleum gas, and other liquid petroleum products.

Sixty percent for installations on gas pipelines.
The following percentages apply to hoop stress in steel pipe laid longitudinally on railroad right-of-way without a casing:

Sixty percent for oil pipelines.

Forty percent for pipelines carrying condensate, natural gasoline, natural gas liquids, liquefied petroleum gas, and other liquid petroleum products.
- (b) Computations, based on the above requirements and stamped by a Professional Engineer shall be submitted with the application for occupancy.

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- iii) Uncased Pipelines Carrying Gas
 - (a) Pipelines carrying flammable and nonflammable gas products shall be steel (Nonflammable – plastic) and shall conform to the requirements of the current ASME B 31.8 Gas Transmission and Distribution Piping Systems, and other applicable ANSI codes.
 - (b) The minimum wall thickness for uncased carrier pipe shall be in accordance with the values provided in AREMA, Chapter 1, Part 5.
 - (c) A durable coating, which will resist abrasion (fusion bonded epoxy or other suitable material), shall be used to protect the uncased pipeline when the boring method of installation is used.
 - (d) If CSXT determines there is the potential for damage to the uncased pipeline (foreign material in the subgrade, third party damage, etc.), special protection of the pipeline will be required. Special protection may include the use of concrete jacketed carrier pipe, a protection slab over the pipeline, increased depth of bury or other means.

E) Casing Pipe End Seals

- i) Casings for carrier pipes of flammable and hazardous substances shall be suitably sealed to the outside of the carrier pipe. Details of the end seals shall be shown on the plans.
- ii) Casings for carrier pipes of non-flammable substances shall have both ends of the casing blocked up in such a way as to prevent the entrance of foreign material, but allowing leakage to pass in the event of a carrier break.
- iii) The ends of a casing pipe may be left open when the ends are at or above ground surface and above high water level, provided drainage is afforded in such a manner that leakage will be conducted away from railroad tracks and structures.

F) Vents

- i) Sealed casings for flammable substances shall be properly vented. Vent pipes shall be of sufficient diameter, but in no case less than two inches in diameter, and shall be attached near each end of the casing and project through the ground surface at right-of-way lines or not less than 45 feet, measured at right angles from centerline of nearest track.
- ii) Vent pipes shall extend not less than 4 feet above the ground surface. Top of vent pipe shall have a down-turned elbow, properly screened, or a relief valve. Vents in locations subject to high water shall be extended above the maximum elevation of high water and shall be supported and protected in a manner approved by CSXT.
- iii) Vent pipes shall be at least 4 feet, vertically, from aerial electric wires or greater if required by National Electrical Safety Code (ANSI C2).
- iv) When the pipeline is in a public highway, street-type vents shall be installed.

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G) Signs

- i) All pipelines (except those in streets where it would not be practical to do so) shall be prominently marked at right-of-way lines (on both sides of track for crossings) by durable, weatherproof signs located over the centerline of the pipe. Signs shall show the following:

Name and address of owner
Contents of pipe
Pressure in pipe
Pipe depth below grade at point of a sign
Emergency telephone number in event of pipe rupture

- ii) For pipelines running longitudinally on CSXT property, signs shall be placed over the pipe (or offset and appropriately marked) at all changes in direction of the pipeline. Such signs should also be located so that when standing at one sign the next adjacent marker in either direction is visible. In no event shall they be placed more than 500 feet apart unless otherwise specified by CSXT.
- iii) The Owner must maintain all signs on CSXT's right-of-way as long as the occupational agreement is in effect.

H) Warning Tape

- i) All pressure pipelines installed by the trench method, without a casing, shall have a warning tape placed directly above the pipeline, 2 feet below the ground surface.

I) Shut-off Valves

- i) Accessible emergency shut-off valves shall be installed within 2,000 on both sides of the pipeline crossing or longitudinal occupancy.
- ii) Location of valves shall be in compliance with United States Department of Transportation, minimum Federal Safety Standards as set forth in 49 CFR 192, or at the discretion of the Chief Engineer.

J) Cathodic Protection

- i) Cathodic protection shall be applied to all pipelines carrying flammable substances on CSXT's right-of-way.
- ii) For crossings and at other locations where the pipeline must be placed within a casing, the casing is to have cathodic protection or the wall thickness is to be increased to the requirements of the Design Requirements Section Table 2.
- iii) Uncased gas carrier pipes must be coated and cathodically protected to industry standards and test sites, for monitoring the pipeline, provided within 50 feet of the crossing.

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- iv) Where casing and/or carrier pipes are cathodically protected by other than anodes, CSXT shall be notified and a suitable test made to ensure that other railroad structures and facilities are adequately protected from the cathodic current in accordance with the recommendation of current Reports of Correlating Committee on Cathodic Protection, published by the National Association of Corrosion Engineers.
- v) Where sacrificial anodes are used, the locations shall be marked with durable signs.

K) Manholes

- i) Manholes shall not be located on CSXT property where possible. At locations where this is not practical, including longitudinal occupancies, manholes shall be precast concrete sections conforming to ASTM Designation C 478, "Specification for Precast Concrete Manhole Sections."
- ii) The top of manholes located on CSXT property shall be flush with top of ground.
- iii) The distance from centerline of adjacent track to centerline of proposed manhole shall be shown on the plans.

L) Box Culverts

- i) Reinforced concrete box culverts shall be designed in conformance with CSX Standards and AREMA Guidelines.

M) Drainage

- i) Occupancies shall be designed, and their construction shall be accomplished, so that adequate and uninterrupted drainage of CSXT's right-of-way is maintained.
- ii) All pipes, ditches, and other structures carrying surface drainage on CSXT property and/or under CSXT track(s) shall be designed to carry the run-off from a one hundred (100) year storm. Plans submitted to CSXT for approval shall be prepared by a Professional Engineer and should indicate design, suitable topographic plan, and outline of total drainage area.
- iii) If the drainage is to discharge into an existing drainage channel on CSXT's right-of-way and/or through a drainage structure under CSXT's track(s), the computations must include the hydraulic analysis of any existing ditch and/or structure.
- iv) When calculating the capacity of existing or proposed drainage structures, under CSXT's track(s), the headwater calculation at the structure shall not be greater than one (1).
- v) Pipe(s) used to carry surface drainage on CSXT's right-of-way shall have a minimum diameter of 24 inches.
- vi) Detention ponds must not be placed on any part of CSXT's right-of-way. Also, the railroad embankment must not be used as any part of a detention pond structure.

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- vii) Formal approval of the proposed design, by the appropriate governmental agency having jurisdiction, shall be submitted with the drainage computations.

N) Pipelines on Bridges

- i) Pipelines **cannot** be installed on any bridge carrying CSXT tracks.
- ii) Overhead pipe bridges will only be considered over CSXT right-of-way when underground installation of the pipeline is not possible. The Applicant must show that no practicable alternative is available and overhead pipe bridges will be permitted provided the following conditions are met:
 - (a) The vertical clearance, distance from top of rail to closest component of structure, is shown and is a minimum of 23 feet, measured at a point 6 feet horizontally from centerline track.
 - (b) The support bents for the overhead structure are located off CSXT's right-of-way or a minimum clear distance of 20 feet from centerline track, whichever distance is greater.
 - (c) Support bents within 25 feet of centerline track have pier protection in accordance with AREMA, Chapter 8 Section 2.1.5.
 - (d) Complete structural plans and design computations for the structure and foundations, sealed by a licensed Professional Engineer, are submitted with the application.
 - (e) A fence (topped with barbed wire) or other measures are provided which will prevent access to the bridge by unauthorized personnel or vandals.
- iii) Pipelines carrying flammable substances or non-flammable substances, which by their nature might cause damage if escaping on or near railroad facilities or personnel, shall not be installed on bridges over CSXT tracks. In special cases when it can be demonstrated to CSXT's satisfaction that such an installation is necessary and that no practicable alternative is available, CSXT may permit the installation and only by special design approved by the Chief Engineer, Design and Construction.
- iv) When permitted, pipelines on bridges over CSXT tracks shall be so located as to minimize the possibility of damage from vehicles, railroad equipment, vandalism, and other external causes. They shall be encased in a casing pipe as directed by CSXT.

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Construction Requirements

A) Method of Installation

i) General Requirements

- (a) Bored, jacked, or tunneled installations shall have a bore hole essentially the same as the outside diameter of the pipe plus the thickness of the protective coating.
- (b) The use of water or other liquids to facilitate casing emplacement and spoil removal is prohibited.
- (c) If, during installation, an obstruction is encountered which prevents installation of the pipe in accordance with this specification, notify CSXT immediately, abandon the pipe in place, and immediately fill with grout. A new installation procedure and revised plans must be submitted to, and approved by, CSXT before work can resume.

ii) Bore and Jack (Steel Pipe)

- (a) This method consists of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.
- (b) The boring operation shall be progressed on a 24-hour basis without stoppage (except for adding lengths of pipe) until the leading edge of the pipe has reached the receiving pit.
- (c) The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe.
- (d) The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered.
- (e) The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than ½ inch. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe (plus coating) by more than approximately 1 inch grouting (see the Construction Requirements-Grouting Section) or other methods approved by CSXT, shall be employed to fill such voids.
- (f) The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.
- (g) Plans and description of the arrangement to be used shall be submitted to CSXT for approval and no work shall proceed until such approval is obtained.

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- (h) Any method that employs simultaneous boring and jacking for pipes over 8 inches in diameter that does not have the above approved arrangement **will not be permitted**. For pipe 8 inches and less in diameter, auguring or boring without this arrangement may be considered for use only as approved by CSXT.

- iii) Jacking (RCP and Steel Pipe)
 - (a) This method consists of pushing sections of pipe into position with jacks placed against a backstop and excavation performed by hand from within the jacking shield at the head of the pipe. Ordinarily 36-inch pipe is the least size that should be used, since it is not practical to work within smaller diameter pipes.
 - (b) Jacking shall be in accordance with the current AREMA Guidelines, Chapter 1, Section 4.13, "Earth Boring and Jacking Culvert Pipe Through Fills." This operation shall be conducted without hand mining ahead of the pipe and without the use of any type of boring, auguring, or drilling equipment.
 - (c) Bracing and backstops shall be so designed and jacks of sufficient rating used so that the jacking can be progressed on a 24-hour basis without stoppage (except for adding lengths of pipe) until the leading edge of the pipe has reached the receiving pit.
 - (d) When jacking reinforced concrete pipe, a jacking shield shall be fabricated as a special section of reinforced concrete pipe with a steel cutting edge, hood, breasting attachments, etc., cast into the pipe. The wall thickness and reinforcing shall be designed for the jacking stresses.
 - (e) When jacking reinforced concrete pipe tapped for no smaller than 1½-inch pipe, grout holes shall be cast into the pipe at manufacture. Three grout holes equally spaced around the circumference and 4 feet longitudinally shall be provided for greater than 54 inches and smaller. Four grout holes equally spaced around the circumference and 4 feet longitudinally shall be provided for RCP 60 inches and larger.
 - (f) Immediately upon completion of jacking operations, the installation shall be pressure grouted as per Construction Requirements-Grouting Section of this specification.

- iv) Tunneling (Tunnel liner plate)
 - (a) This method consists of placing rings of liner plate within the tail section of a tunneling shield or tunneling machine. A tunneling shield shall be used for all liner plate installations unless otherwise approved by CSXT.

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- (b) The shield shall be of steel construction, designed to support a railroad track loading as specified in the Design Requirements-Casing Pipe of this specification, in addition to the other loadings imposed. The advancing face shall be provided with a hood, extending no less than 20 inches beyond the face and extending around no less than the upper 240 degrees of the total circumference. It shall be of sufficient length to permit the installation of at least one complete ring of liner plates within the shield before it is advanced for the installation of the next ring of liner plates. The shield shall conform to and not exceed the outside dimensions of the liner plate tunnel being placed by more than 1 inch at any point on the periphery unless otherwise approved by CSXT.
 - (c) The shield shall be adequately braced and provided with necessary appurtenances for completely bulkheading the face with horizontal breastboards, and arranged so that the excavation can be benched as may be necessary. Excavation shall not be advanced beyond the edge of the hood, except in rock.
 - (d) Manufacturer's shop detail plans and manufacturer's computations showing the ability of the tunnel liner plates to resist the jacking stresses shall be submitted to CSXT for approval.
 - (e) Unless otherwise approved by CSXT, the tunneling shall be conducted continuously, on a 24-hour basis, until the tunnel liner extends at least beyond the theoretical railroad embankment line
 - (f) At any interruption of the tunneling operation, the heading shall be completely bulkheaded.
 - (g) The liner plates shall have tapped grout holes for no smaller than 1½-inch pipe, spaced at approximately 3 feet around the circumference of the tunnel liner and 4 feet longitudinally.
 - (h) Grouting behind the liner plates shall be in accordance with the Construction Requirements-Grouting Section of this specification.
- v) Directional Boring / Horizontal Directional Drilling (Steel Pipe)

Method "A"—Directional Boring

- (a) **Installations by this method are generally not acceptable.** Consideration will be given where the depth of cover is substantial, greater than 15 feet, or the bore is in rock. Factors considered will be track usage, pipe size, contents of pipeline, soil conditions, etc.

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- (b) This method consists of setting up specialized drilling equipment on existing grade (launching and receiving pits are not required) and boring a small diameter pilot hole on the desired vertical and horizontal alignment, using a mechanical cutting head with a high pressure fluid (bentonite slurry) to remove the cuttings. The drill string is advanced with the bentonite slurry pumped through the drill string to the cutting head and then forced back along the outside of the drill string, carrying the cuttings back to the surface for removal. When the cutting head reaches the far side of the crossing, it is removed and a reamer is attached to the lead end of the drill string. The pipeline is attached to the reamer and the pilot hole is then back reamed while the pipeline is pulled into place.
- (c) This method is used to place pipelines under rivers, wetlands, and other obstructions that would be difficult to cross by conventional methods. The length of the bore is generally several hundred feet in length, with installations over a thousand feet possible.
- (d) The following preliminary information must be submitted with the request for consideration of this type of installation:
 - (a) A site plan of the area.
 - (b) A plan view and profile of the crossing.
 - (c) An Application Form.
 - (d) Several soil borings along the proposed pipeline route.
 - (e) A construction procedure, including a general description of equipment to be used.

If CSXT Chief Engineer Design and Construction determines this method of installation is acceptable, final design plans and specifications are to be prepared and submitted for approval.

- (e) The project specifications must require the contractor to submit, to CSXT for approval, a complete construction procedure of the proposed boring operation. Included with the submission shall be the manufacture's catalog information describing the type of equipment to be used.

Method "B"—Jack Conduit

- (a) This method is used to place small diameter conduit for electric lines and other utilities. This method consists of using hydraulic jacking equipment to push a solid steel rod under the railroad from a launching pit to a receiving pit. At the receiving pit, a cone shaped "expander" is attached to the end of the rod and the conduit (casing pipe) is attached to the expander. The rod, expander, and conduit are then pulled back from the launching pit until the full length of the conduit is in place.
- (b) This method may be used to place steel conduit (casing pipe), up to and including 6 inches in diameter, under the railroad.

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- (c) The project specifications must require the contractor to submit, to CSXT for approval, a complete construction procedure of the proposed boring operation. Included with the submission shall be the manufacturer's catalog information describing the type of equipment to be used.
- vi) Open Cut – Not a readily accepted practice
 - (a) The Owner must request open cut approval when making application for occupancy. All procedures will be in compliance with AREMA Chapter 1 Section 5.1.5.1(b).
 - (b) Installations beneath the track by open trench methods will be permitted only with the approval of the Chief Engineer, Design and Construction.
 - (c) Installations by open cut will not be permitted under mainline tracks, tracks carrying heavy tonnage or tracks carrying passenger trains. Also, open cut shall not be used within the limits of a highway/railroad grade crossing or its approaches, 25 feet either side of traveled way, where possible.
 - (d) Rigid pipe (RCP, VCP, and PCCP) must be placed in a Class B bedding or better.
 - (e) At locations where open cut is permitted, the trench is to be backfilled with crushed stone with a top size of the aggregate to be a maximum of 2 inches and to have no more than 5% passing the number 200 sieve. The gradation of the material is to be such that a dense stable mass is produced.
 - (f) The backfill material shall be placed in loose 6 inch lifts and compacted to at least 95% of its maximum density with a moisture content that is no more than 1% greater than or 2% less than the optimum moisture as determined in accordance with current ASTM Designation D - 1557 (Modified Proctor). When the backfill material is within 3 feet of the subgrade elevation (the interface of the ballast and the subsoil) a compaction of at least 98% will be required. Compaction test results confirming compliance must be provided to CSXT's Regional Engineering Office by the Owner.
 - (g) All backfilled pipes laid either perpendicular or parallel to the tracks must be designed so that the backfill material will be positively drained. This may require the placement of lateral drains on pipes laid longitudinally to the track and the installation of stub perforated pipes at the edge of the slopes.
 - (h) Unless otherwise agreed upon, all work involving rail, ties, and other track material will be performed by railroad employees at the sole expense of the Owner, subject to advance payments by the owner.

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B) Grouting

- (a) For jacked and tunneled installations a uniform mixture of 1:6 (cement:sand) cement grout shall be placed under pressure through the grout holes to fill any voids, which exist between the pipe or liner plate and the undisturbed earth.
- (b) Grouting shall start at the lowest hole in each grout panel and proceed upwards simultaneously on both sides of the pipe.
- (c) A threaded plug shall be installed in each grout hole as the grouting is completed at that hole.
- (d) When grouting tunnel liner plates, grouting shall be kept as close to the heading as possible, using grout stops behind the liner plates if necessary. Grouting shall proceed as directed by CSXT, but in no event shall more than 6 lineal feet of tunnel be progressed beyond the grouting.

C) Soil Stabilization

- (a) Pressure grouting of the soils or freezing of the soils before jacking, boring, or tunneling may be required at the direction of CSXT Chief Engineer to stabilize the soils, control water, prevent loss of material, and prevent settlement or displacement of embankment. Grout shall be cement, chemical, or other special injection material selected to accomplish the necessary stabilization.
- (b) The materials to be used and the method of injection shall be prepared by a Licensed Professional Soils Engineer, or by an experienced and qualified company specializing in this work and submitted for approval to CSXT before the start of work. Proof of experience and competency shall accompany the submission.

D) Dewatering

- i) When water is known or expected to be encountered all plans and specification must be submitted to the Chief Engineer for approval before the process begins. Pumps of sufficient capacity to handle the flow shall be maintained at the site, provided the contractor has received approval from CSXT to operate them. Pumps in operation shall be constantly attended on a 24-hour basis until, in the sole judgment of CSXT, the operation can be safely halted. When dewatering, a process for monitoring for any settlement of track or structures must be in place.

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E) Safety Requirements

- i) All operations shall be conducted so as not to interfere with, interrupt, or endanger the operation of trains nor damage, destroy, or endanger the integrity of railroad facilities. All work on or near CSXT property shall be conducted in accordance with CSXT safety rules and regulations. Specifically all licensee's employees and agents, while on CSXT property, shall be required to wear an orange hard hat, safety glasses with side shields, 6" lace up boots with a distinct heel, shirts with sleeves, and long pants; additional personal protective equipment may be required for certain operations including abrasive cutting, use of torches, use of chainsaws, etc. The contractor and its employees shall comply with the CSXT safety rules at all times while occupying CSXT's property. Operations will be subject to CSXT inspection at any and all times.
- ii) All cranes, lifts, or other equipment that will be operated in the vicinity of the railroad's electrification and power transmission facilities shall be electrically grounded as directed by CSXT.
- iii) Whenever equipment or personnel are working closer than 25 feet from the centerline of an adjacent track, that track shall be considered as being obstructed. Insofar as possible, all operations shall be conducted no less than this distance. All operations shall be conducted only with the permission of, and as directed by, a duly qualified railroad employee present at the site of the work. All costs related to Railroad protection will be passed on to the applicant.
- iv) Crossing of tracks at grade by equipment and personnel is prohibited except by prior arrangement with and as directed by, CSXT.

F) Blasting

Blasting will not be permitted under or on CSXT's right-of-way.

G) Temporary Track Supports

- i) When the jacking, boring or tunneling method of installation is used, and depending upon the size and location of the crossing, temporary track supports shall be installed at the direction of CSXT.
- ii) The Owner's contractor shall supply the track supports with installation and removal performed by CSXT employees.
- iii) The Owner shall reimburse CSXT for all costs associated with the installation and removal of the track supports.

H) Protection of Drainage Facilities

- i) If, in the course of construction, it may be necessary to block a ditch, pipe, or other drainage facility, temporary pipes, ditches, or other drainage facilities shall be installed to maintain adequate drainage, as approved by CSXT. Upon completion of the work, the temporary facilities shall be removed and the permanent facilities restored.

COPY OF BID SET

- ii) Soil erosion methods shall be used to protect railroad ditches and other drainage facilities during construction on and adjacent to CSXT's right-of-way.
- I) Support of Excavation Adjacent to Track
 - i) Launching and Receiving Pits
 - (a) The location and dimensions of all pits or excavations shall be shown on the plans. The distance from centerline of adjacent track to face of pit or excavation shall be clearly labeled. Also, the elevation of the bottom of the pit or excavation must be shown on the profile.
 - (b) The face of all pits shall be located a minimum of 25 feet from centerline of adjacent track, measured at right angles to track, unless otherwise approved by CSXT.
 - (c) If the bottom of the pit excavation intersects the theoretical railroad embankment line, interlocking steel sheet piling, driven prior to excavation, must be used to protect the track stability. The use of trench boxes or similar devices is not acceptable in this area.
 - (d) Design plans and computations for the pits, sealed by a Licensed Professional Engineer, must be submitted by the Owner at time of application or by the contractor prior to start of construction. If the pit design is to be submitted by the contractor, the project specifications must require the contractor to obtain approval from CSXT's Chief Engineer, Design & Construction prior to beginning any work on or which may affect CSXT property.
 - (e) The sheeting shall be designed to support all lateral forces caused by the earth, railroad and other surcharge loads. See Design Requirements-Design Loads for railroad loading.
 - (f) After construction and backfilling, all sheet piling within 10 feet of centerline track must be cut off 20 inches below final grade and left in place.
 - (g) All excavated areas are to be illuminated (flashing warning lights not permitted), fenced, and otherwise protected as directed by CSXT.
 - iii) Parallel Trenching and Other Excavation
 - (a) When excavation for a pipeline or other structure will be within the theoretical railroad embankment line of an adjacent track, interlocking steel sheet piling will be required to protect the track.
 - (b) The design and construction requirements for this construction shall be in accordance with the requirements of the Construction Requirements-Support of Excavation Adjacent to Track section of this document.

COPY OF BID SET

- iv) Inspections and Testing
 - (a) For pipelines carrying flammable or hazardous materials, ANSI Codes, current at time of constructing the pipeline, shall govern the inspection and testing of the facility on CSXT property, except as follows:
 - (b) One hundred percent of all field welds shall be inspected by radiographic examinations, and such field welds shall be inspected for 100 percent of the circumference.
 - (c) The proof testing of the strength of carrier pipe shall be in accordance with ANSI requirements.

- v) Reimbursement of CSXT Costs
 - (a) All CSXT costs associated with the pipe installation (inspection, flagging, track work, protection of signal cables, etc.) shall be reimbursed to CSXT by the Owner of the facility. Estimates for Railroad costs will be provide to the Owner prior to the commencement of any work on Railroad right-of-way. **These funds will be collected in advance of any work being done.**

COPY OF BID SET

PUBLICATION STANDARDS SOURCES

ANSI	American National standards Institute, Inc. 0018 (212) 642-4900
AREMA	American Railway Engineering and Maintenance of Way Association 8201 Corporate Drive, Suite 1125 Landover, MD 20785-2230 (301) 459-3200
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103-1187 (215) 299-5585
AWWA	American Water Works Association, Inc. 6666 West Quincy Avenue Denver, CO 80235
	The National Association of Corrosion Engineers Houston, TX 77026

NOTE: If other than AREMA, ASTM, or AWWA specifications are referred to for design, materials, or workmanship on the plans and specifications for the work, then copies of the applicable sections of such other specifications referred to shall accompany the plans and specification for the work.

COPY OF BID SET

DOCUMENT REVISIONS

February 24, 2010: Page 14 - Design Requirements, Section C, Sub-Section (i), Sub-Sub-Section (f),
6th Bullet Point -- Location of the Theoretical Railroad Embankment Line
(Railroad Influence Zone) was amended.

COPY OF BID SET



To view Design and Construction documents relative to Horizontal Directional Drilling (HDD), please click on the following links:

[CSXT Interim Guidelines for HDD Projects](#)

[Sample Fraction Mitigation Plan](#)

COPY OF BID SET

SELECT EASEMENTS

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009508440003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 07/22/2014 at 09:12:08 AM
Receipt#: 2014-00009119
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1397** PG **1354-1356**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Ronnie Beavers, New Glendale Road Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 189-00-00-018.05

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 940, Page 326, in the Hardin County Clerk's Office.

Additional Information: bury man holes 25" in crop field

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 1st day of July, 2014.

Ronnie Beavers
Grantor

Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 1st day of July, 2014 by Ronnie Beavers, Grantor.

Jeff Haddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Haddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET

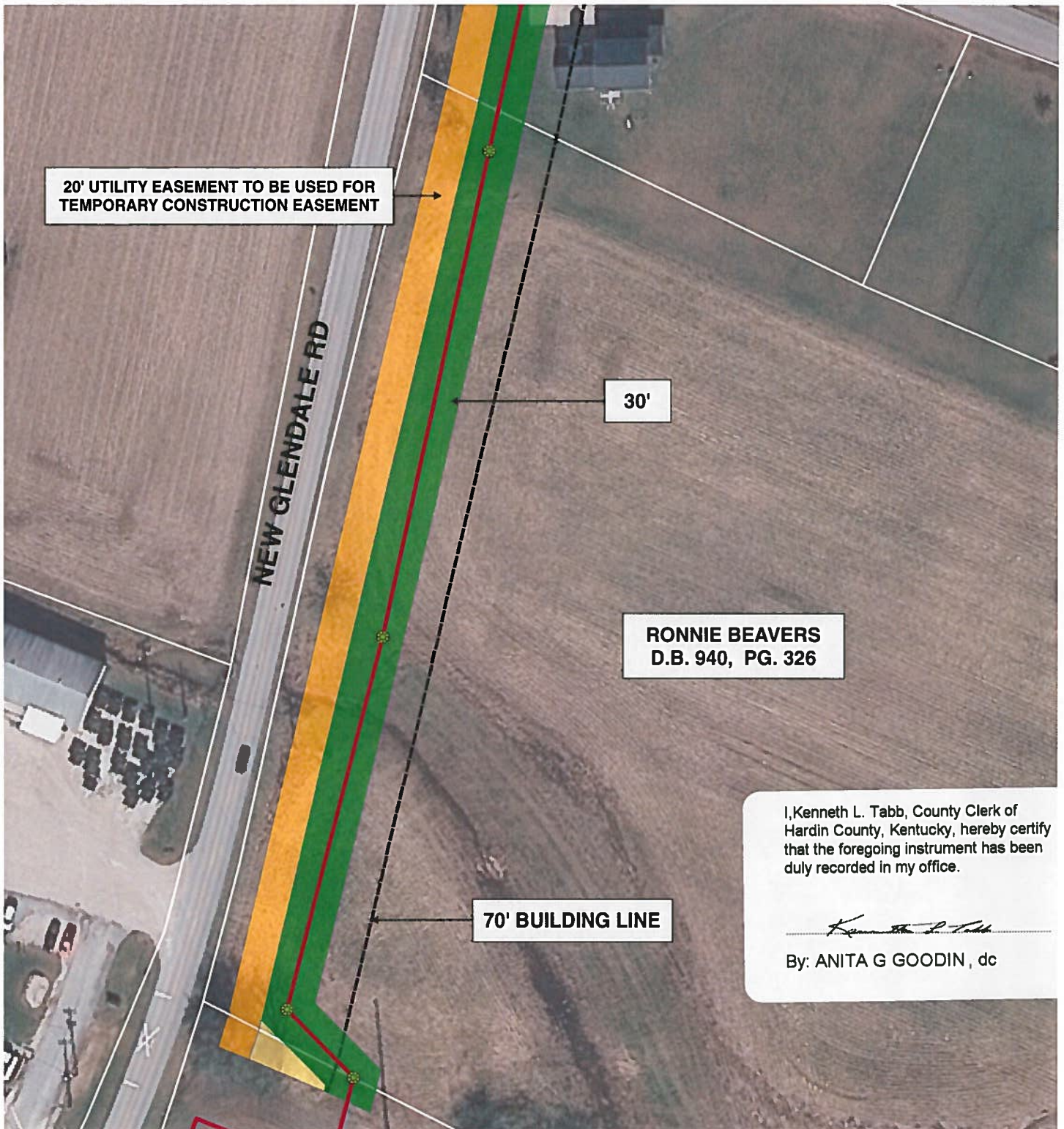







Exhibit "A" Easement | Beavers, Ronnie | Parcel # 189-00-00-018.05

**Property information was acquired from the Hardin County PVA.
Drawn for illustration purposes only; has not been surveyed.**

6-2-2014

-  Sewer Line
-  Existing Utility Easement
-  Temporary Construction Easement
-  Manhole
-  Permanent Easement

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009305780003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 01/22/2014 at 10:13:33 AM
Receipt#: 2014-00000860
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1390** PG **705-707**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Bennies Barn, LLC 434 E Main St Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-30-00-020.01

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1176, Page 705, in the Hardin County Clerk's Office.

Additional Information: all man holes to be buried on m. Lush property at least 2'

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 9th day of January, 2013.

Bennie's Barn LLC

Grantor

Gerald R Lush owner
Bennie K Lush owner

Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 9th day of Jan., 2013 by Bennies Barn, LLC, Grantor.

* Gerald R. Lush + Bennie K. Lush owners

J. H.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:

Jeff Gaddie

Hardin County Water District No. 2

PO Box 970

Elizabethtown, KY 42702

COPY OF BID SET

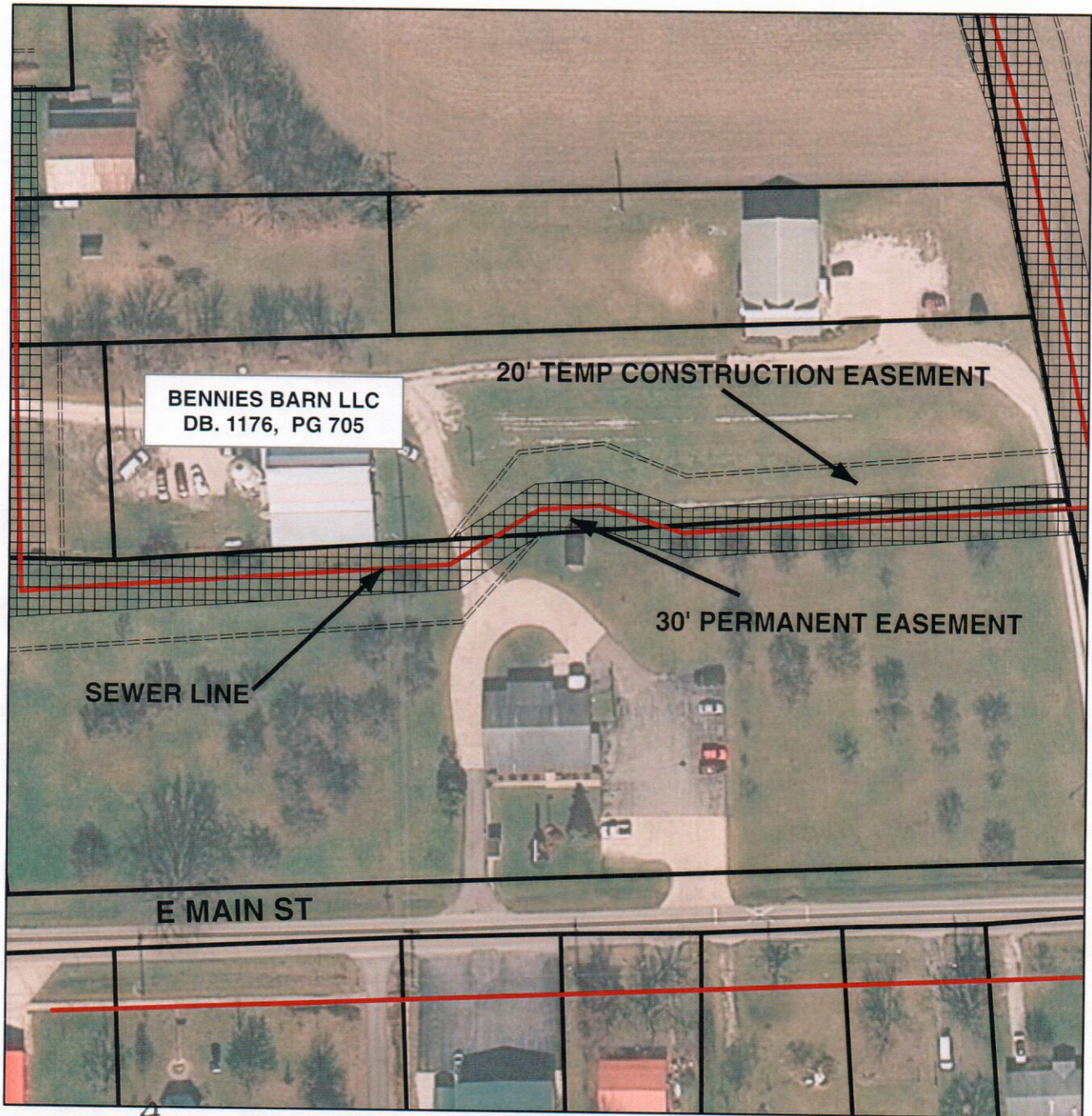


Exhibit ^A B Easement
Bennies Barn LLC
Parcel # 190-30-00-020.01
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
12-03-2013

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb

By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009234800003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 10/04/2013 at 09:08:45 AM
Receipt#: 2013-00014963
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1385** PG **1334-1336**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration John A Brown, and Cathy Brown, husband and wife 933 Gilead Ch Rd Glendale, Kentucky, 42740 (the "Grantors"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "District"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

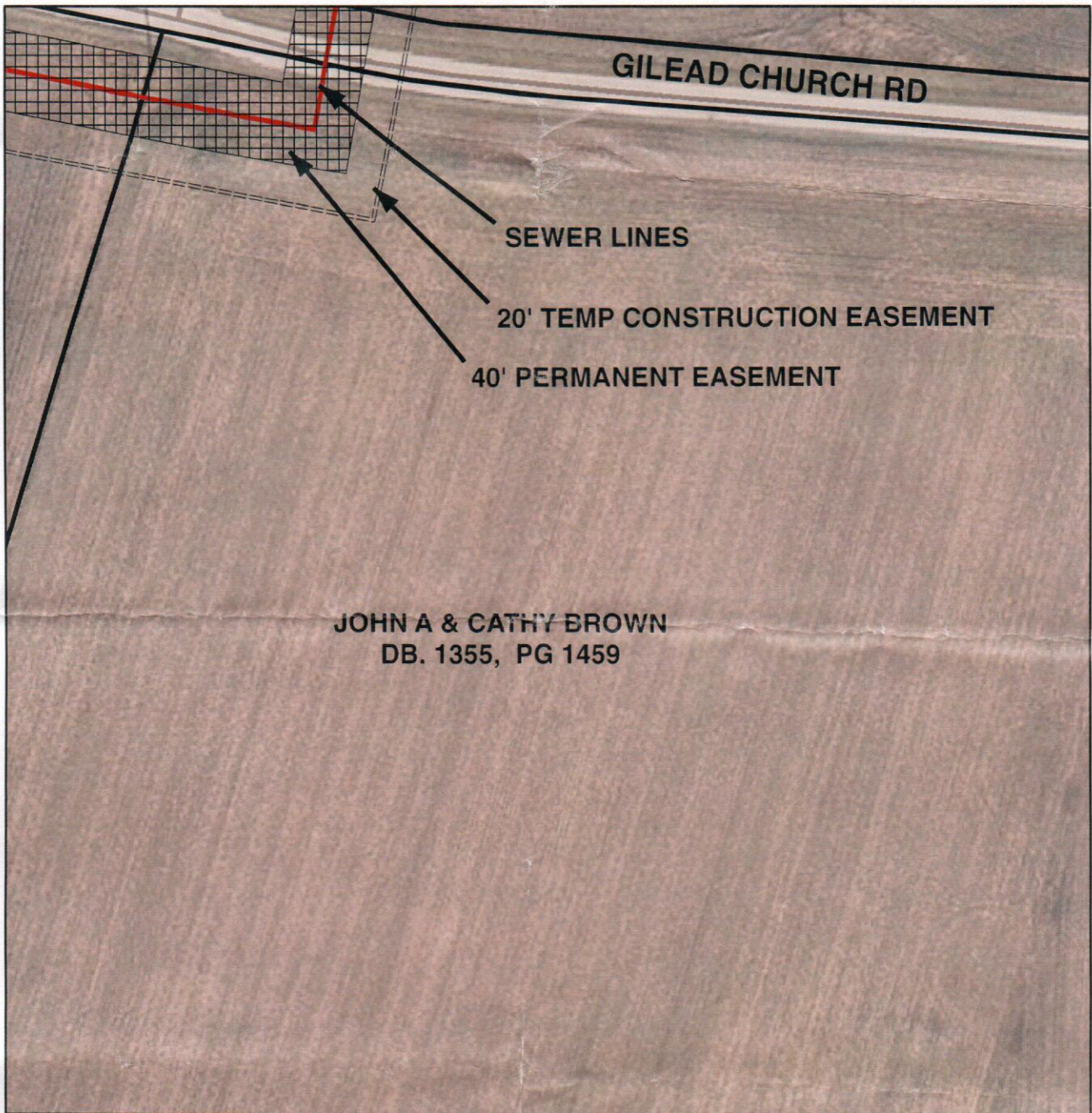
PVA Parcel No. 208-00-00-004

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1357, Page 1459, in the Hardin County Clerk's Office.

Additional Information: Mr. Brown to be paid Crop
Damage for all Crops involved & fertilizer
pd. 9-27-13

COPY OF BID SET



**Exhibit A Easement
Brown, John A & Cathy
Parcel # 208-00-00-004.01
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
8-9-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb

By: DIANE J NALL, dc

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 25 day of Sept., 2013.

John A. Brown
Grantor

Cathy A. Brown
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 25 day of Sept., 2013 by John A Brown and Cathy Brown husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009234850003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 10/04/2013 at 09:13:16 AM
Receipt#: 2013-00014963
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1385** PG **1349-1351**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Frank D Brown, and Martha V Brown, husband and wife, S Dixie Hwy Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 208-00-00-021

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 985 Page 437, in the Hardin County Clerk's Office.

Additional Information: Top soil to be laid aside
& put back on sub soil after construction. Also
would like bore to be done on West side of I-65
if practicable. all man holes to be buried 2.5 ft.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 9th day of Sept., 2013.

Frank D. Brown
Grantor

Martha V. Brown
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

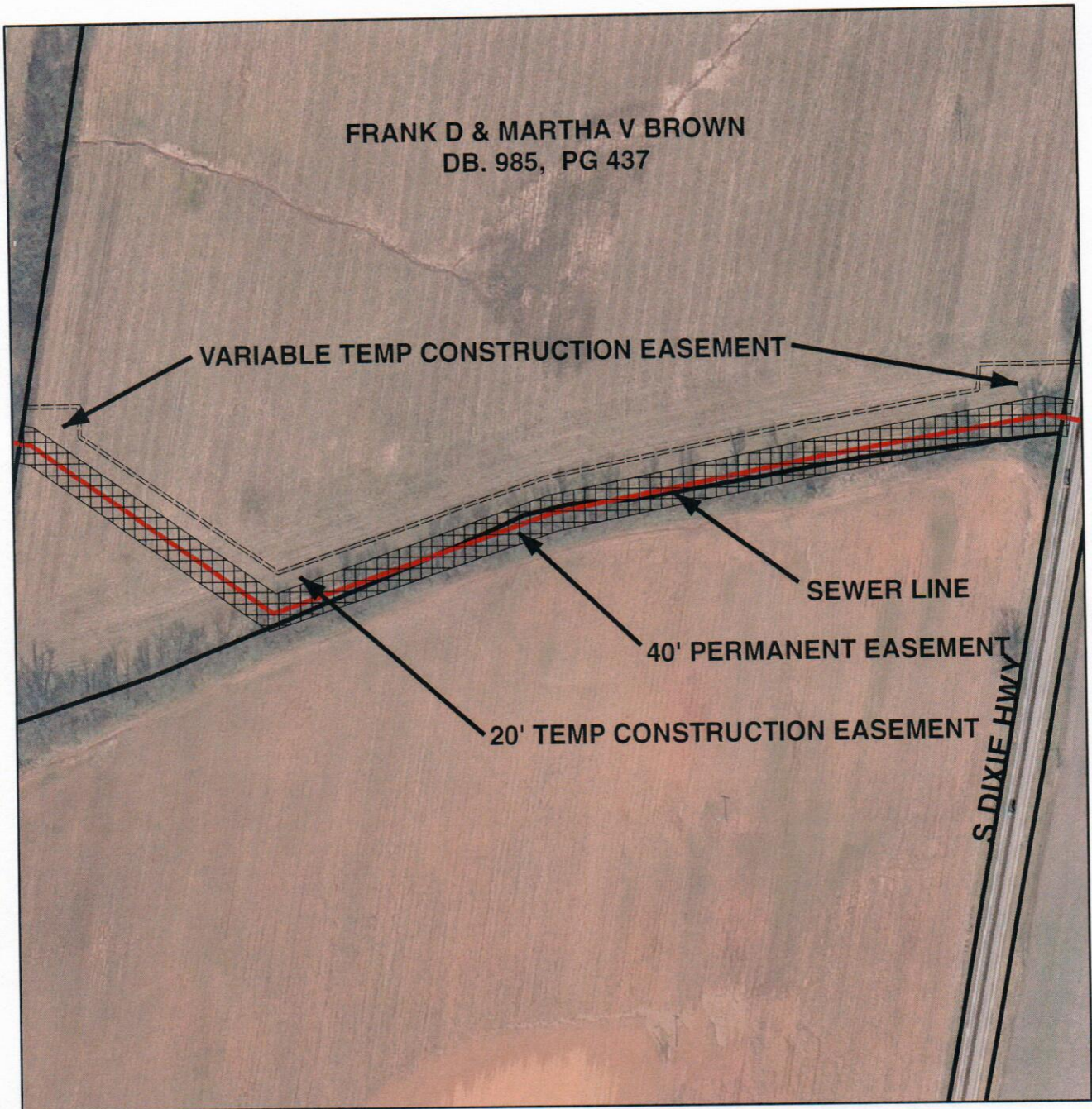
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 9th day of Sept., 2013 by Frank D Brown and Martha V Brown, husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Brown, Frank D & Martha V
Parcel # 208-00-00-021
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
8-9-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702

Doc ID: 009234840003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 10/04/2013 at 09:12:44 AM
Receipt#: 2013-00014963
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1385** PG **1346-1348**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Frank D Brown, and Martha V Brown, husband and wife, Glendale Hodgenville Rd Glendale, Kentucky, 42740 (the "Grantors"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "District"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-30-00-010

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 985 Page 437, in the Hardin County Clerk's Office.

Additional Information:

*Top soil to be laid aside
during construction + put back on subsoil after
construction*

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 9th day of Sept., 2013.

Frank D. Brown
Grantor

Martha V. Brown
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

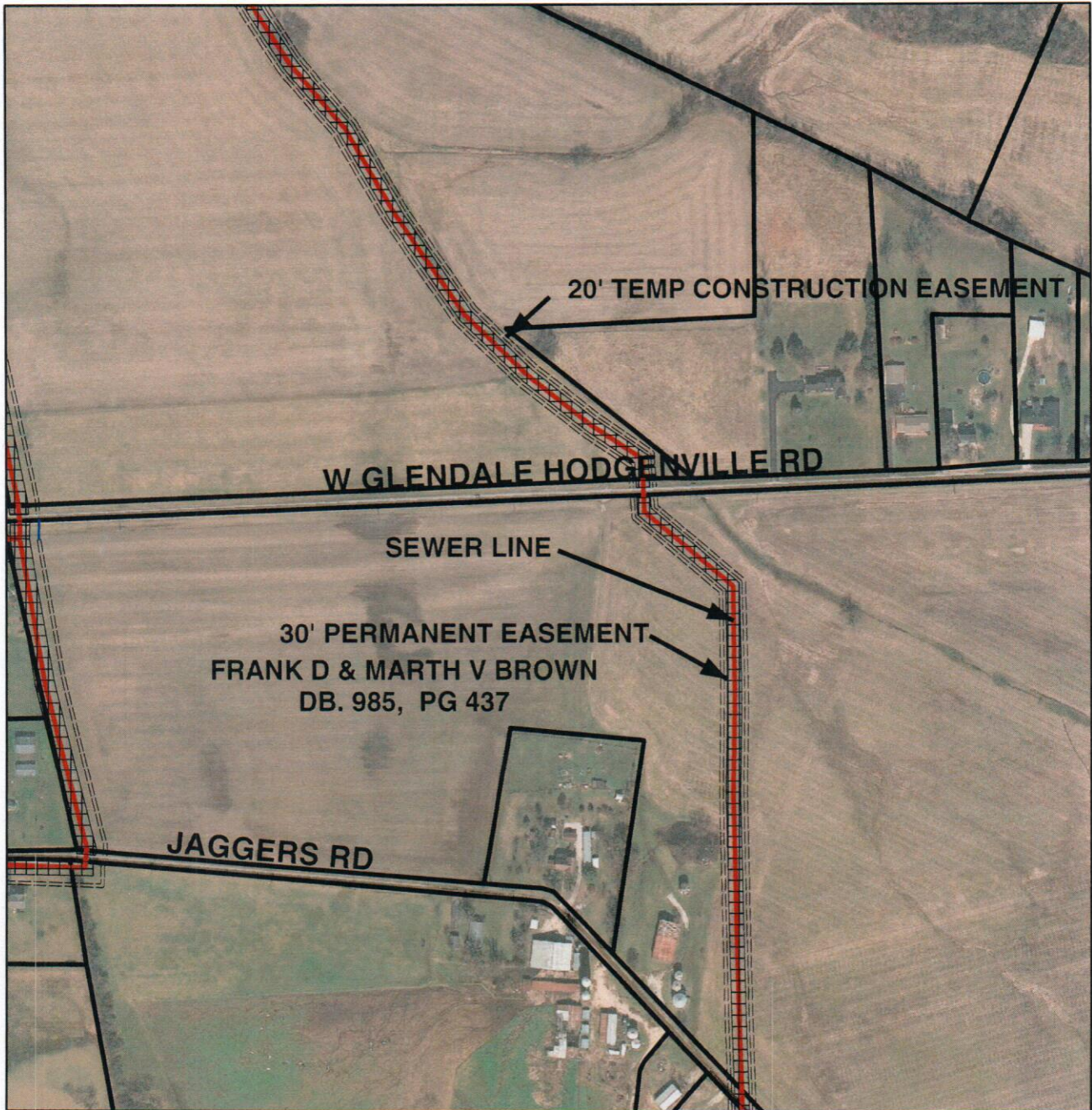
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 9th day of Sept., 2013 by Frank D Brown and Martha V Brown, husband and wife, Grantors.

Jeff Haddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Haddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Brown, Frank D & Martha V
Parcel # 190-30-00-010
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
7-16-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009234830003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 10/04/2013 at 09:12:03 AM
Receipt#: 2013-00014963
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1385** PG **1343-1345**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Frank D Brown, and Martha V Brown, husband and wife, Glendale Hodgenville Rd Glendale, Kentucky, 42740 (the "Grantors"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "District"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-30-00-020

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 985, Page 437, in the Hardin County Clerk's Office.

Additional Information: Top soil to be laid aside
at time of construction then put back on subsoil.
after construction

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 9th day of Sept., 2013.

Frank D. Brown
Grantor

Martha V. Brown
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

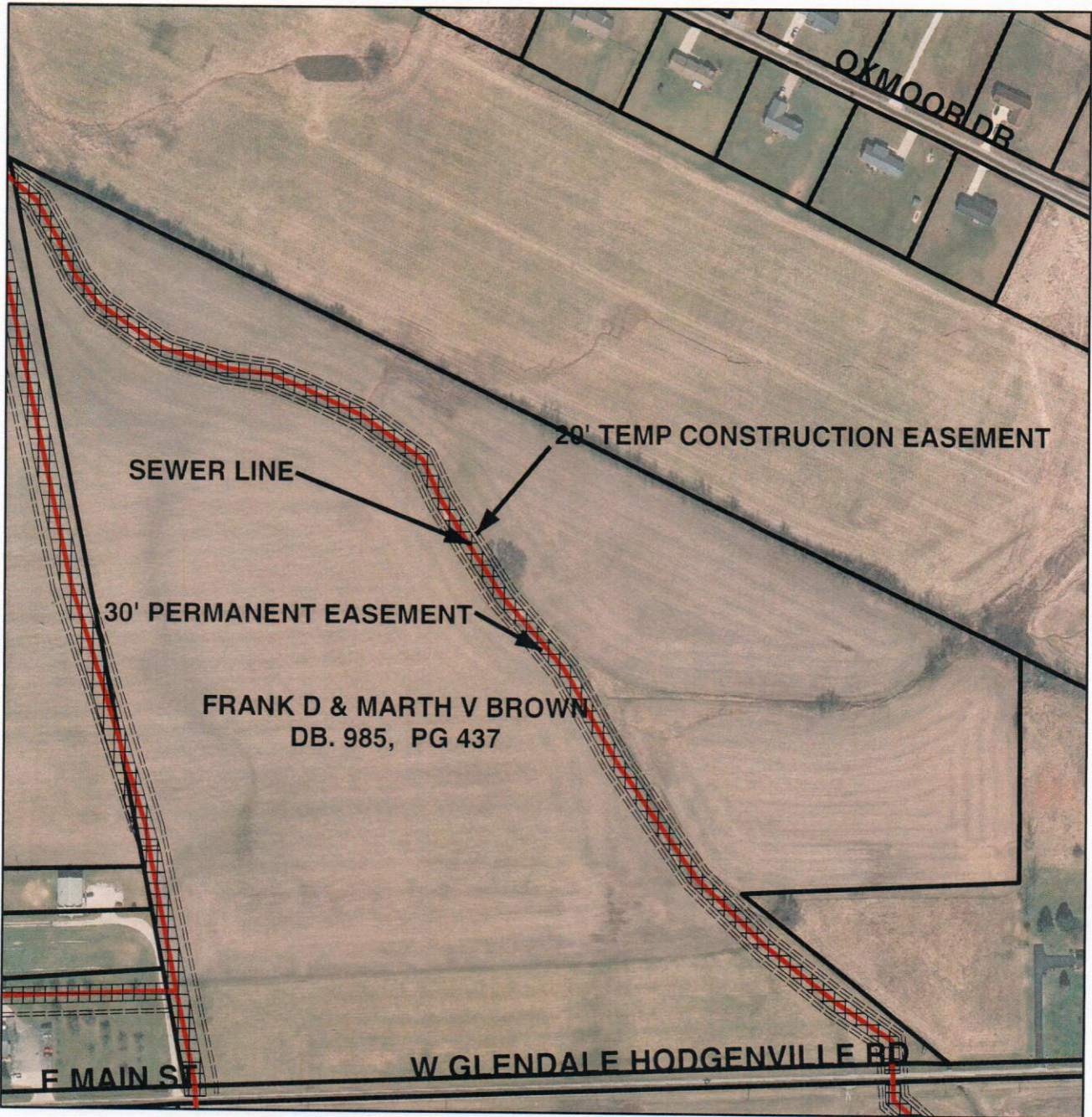
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 9th day of Sept., 2013 by Frank D Brown and Martha V Brown, husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016


PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET




**Exhibit A Easement
Brown, Frank D & Martha V
Parcel # 190-30-00-020
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
7-16-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009508430003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 07/22/2014 at 09:11:48 AM
Receipt#: 2014-00009119
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1397** PG **1351-1353**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Frank D Brown, and Martha V Brown, husband and wife, New Glendale Rd Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 189-00-00-017

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 985, Page 437, in the Hardin County Clerk's Office.

Additional Information: Mgnholes to be buried 2'5"
on Mr. Brown's property

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 1st day of July, 2014.

Frank D. Brown
Grantor

Martha Brown
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 1st day of July, 2014 by Frank D Brown and Martha V Brown, husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

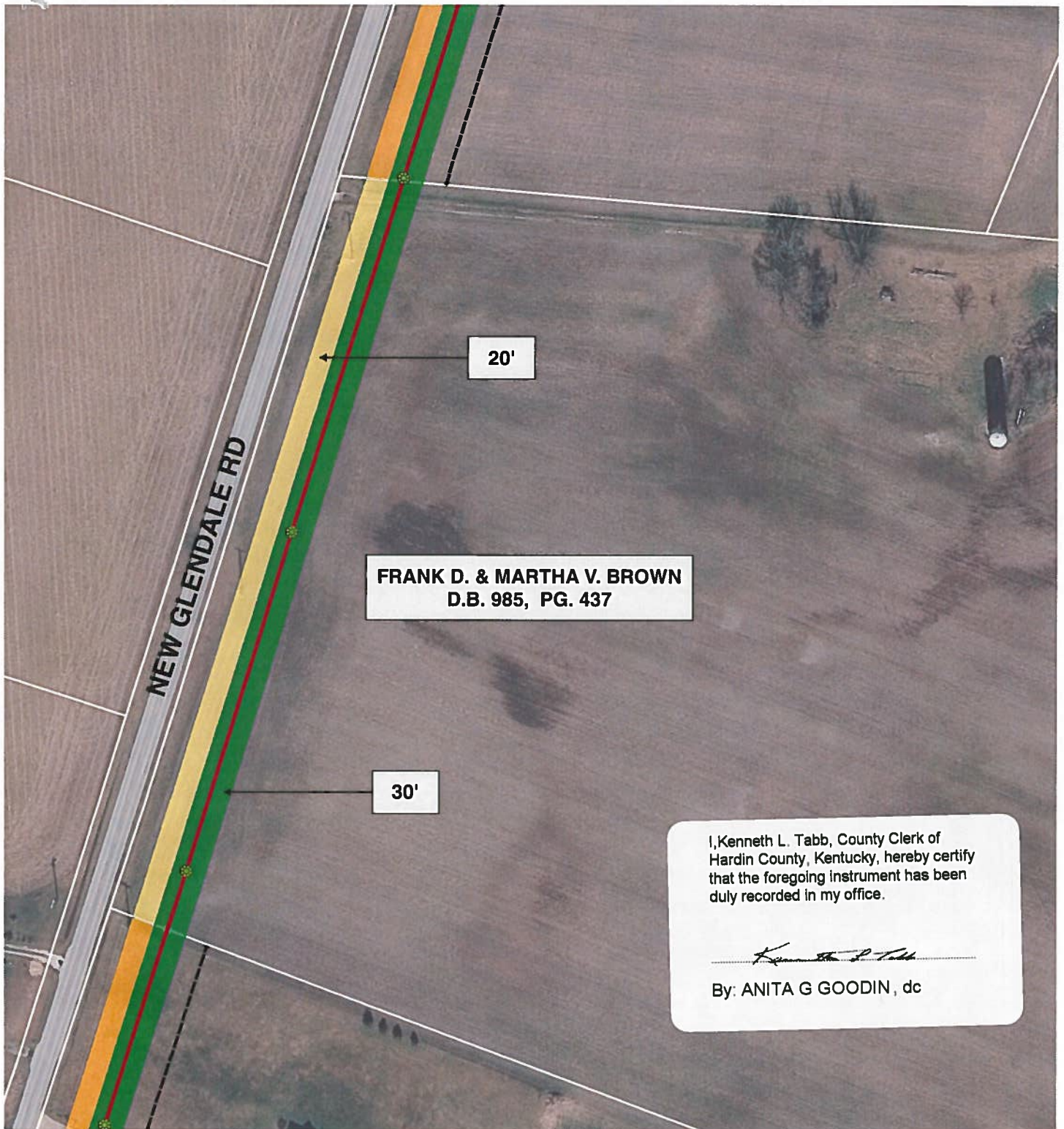


Exhibit "A" Easement | Brown, Frank D. & Martha V. | Parcel # 189-00-00-017

**Property information was acquired from the Hardin County PVA.
Drawn for illustration purposes only; has not been surveyed.**

6-2-2014

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009508420003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 07/22/2014 at 09:11:20 AM
Receipt#: 2014-00009119
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1397** PG **1348-1350**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Frank D Brown, and Martha V Brown, husband and wife, New Glendale Rd Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 189-00-00-016.01

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 985, Page 437, in the Hardin County Clerk's Office.

Additional Information: manholes to be buried 2'5"
on Mr. Brown property

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 1st day of July, 2014.

Frank D. Brown
Grantor

Martha Brown
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 1st day of July, 2014 by Frank D Brown and Martha V Brown, husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

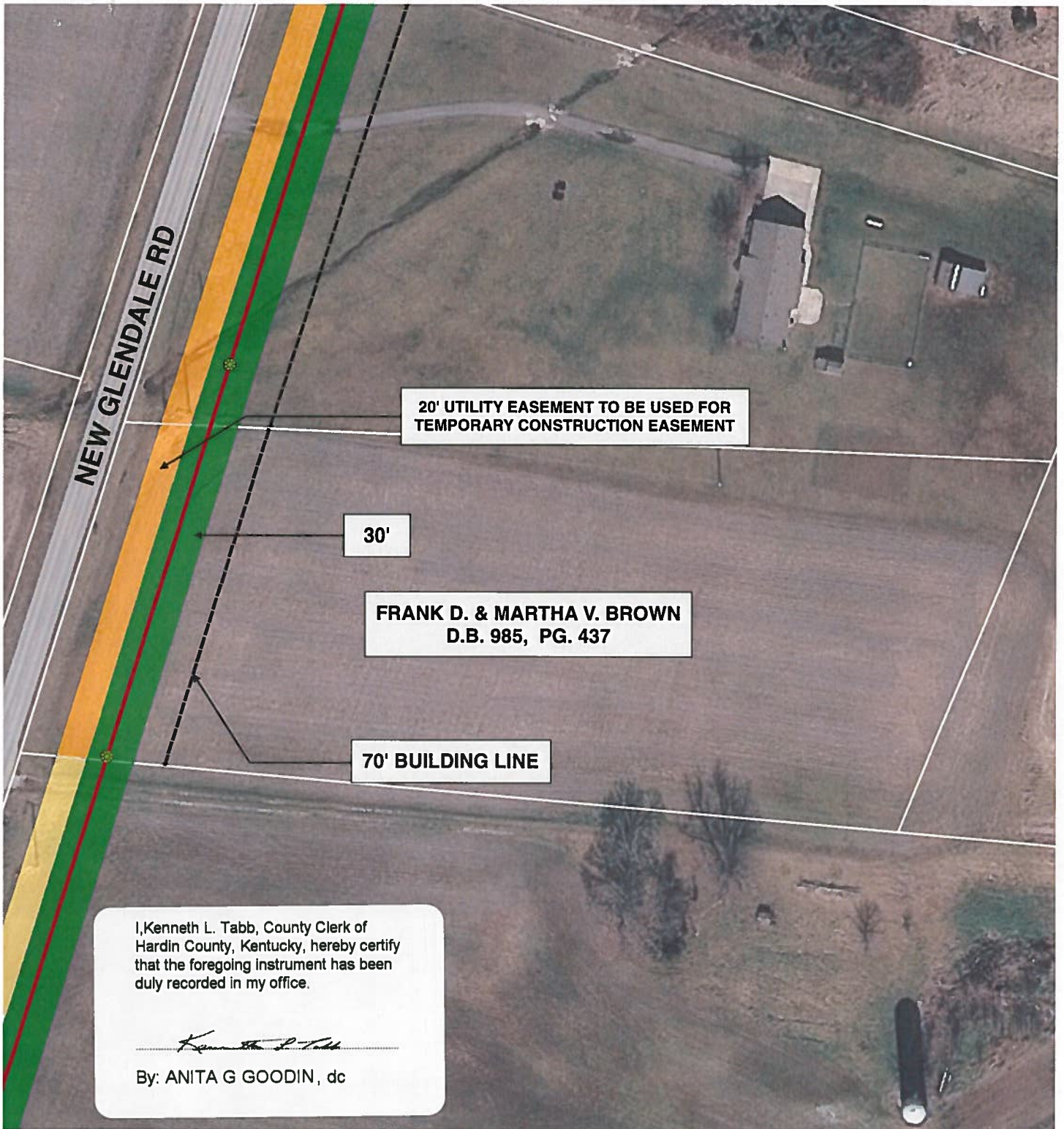


Exhibit "A" Easement | Brown, Frank D. & Martha V. | Parcel # 189-00-00-016.01

**Property information was acquired from the Hardin County PVA.
Drawn for illustration purposes only; has not been surveyed.**

6-2-2014

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009203800003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 08/29/2013 at 01:46:22 PM
Receipt#: 2013-00013248
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1384** PG **162-164**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Anna J Cave,
213 Jagers Rd Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant
unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown,
Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct,
install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and
remove a wastewater collection, conveyance (force main), lateral, and service line
or lines over, across, and through the land of the Grantors situated in Hardin
County, Kentucky and a temporary construction easement, said easements being
described as follows:

PVA Parcel No. 190-00-02-008

The perpetual easement shall be 30 feet in width across the property of
Grantors as depicted on **Exhibit A**, which is attached hereto and
incorporated herein by reference. The temporary construction easement
shall have the width and location as depicted on **Exhibit A**. The
temporary construction easement shall terminate upon completion of the
construction.

Being a part of the property conveyed to the Grantors by Deed recorded in
Deed Book 1337, 213, in the Hardin County Clerk's Office.

Additional Information:

If any tree in front of and the Hardin Co. Water #2
or Contractor will pay to remove the tree within a
period of 2 years if it dies.

J. G. Q

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 28 day of August, 2013.

Anna J Cave
Grantor

Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 28 day of August, 2013 by Anna J Cave, Grantor.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET

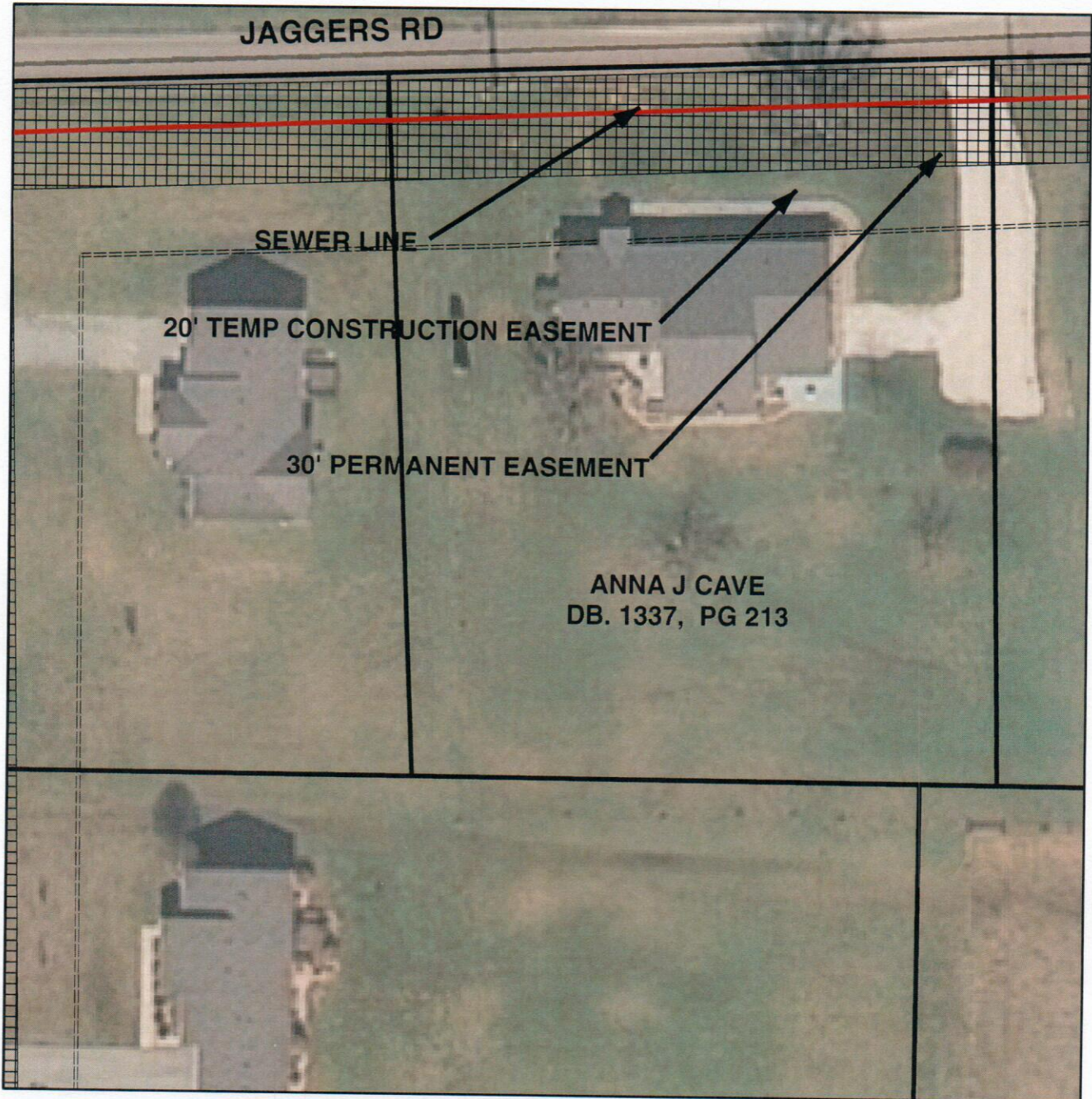


Exhibit A Easement

Cave, Anna J

Parcel # 190-00-02-008

The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.

7-23-2013

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009113450003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 06/07/2013 at 08:35:35 AM
Receipt#: 2013-00008642
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1379** PG **1537-1539**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Edwin Claycamp,
and Judy Claycamp, husband and wife, 245 W Railroad Ave
Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin**
County Water District No. 2, P.O. Box 970, Elizabethtown, Kentucky, 42702,
(the "**District**"), a perpetual easement with the right to construct, install and lay,
and thereafter use, operate, inspect, repair, maintain, and replace and remove a
wastewater collection, conveyance (force main), lateral, and service line or lines
over, across, and through the land of the Grantors situated in Hardin County,
Kentucky and a temporary construction easement, said easements being described
as follows:

PVA Parcel No. 190-30-01-030

The perpetual easement shall be 30 feet in width across the property of
Grantors as depicted on **Exhibit A**, which is attached hereto and
incorporated herein by reference. The temporary construction easement
shall have the width and location as depicted on **Exhibit A**. The
temporary construction easement shall terminate upon completion of the
construction.

Being a part of the property conveyed to the Grantors by Deed recorded in
Deed Book 978, Page 201, in the Hardin County Clerk's Office.

Additional Information: any trees that are destroyed
from construction or bore will be replaced

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 4th day of June, 2013.

X Judy B. Claycamp X Judy B. Claycamp
Grantor Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

Edwin (Ed) Claycamp
deceased 1 Aug 2004

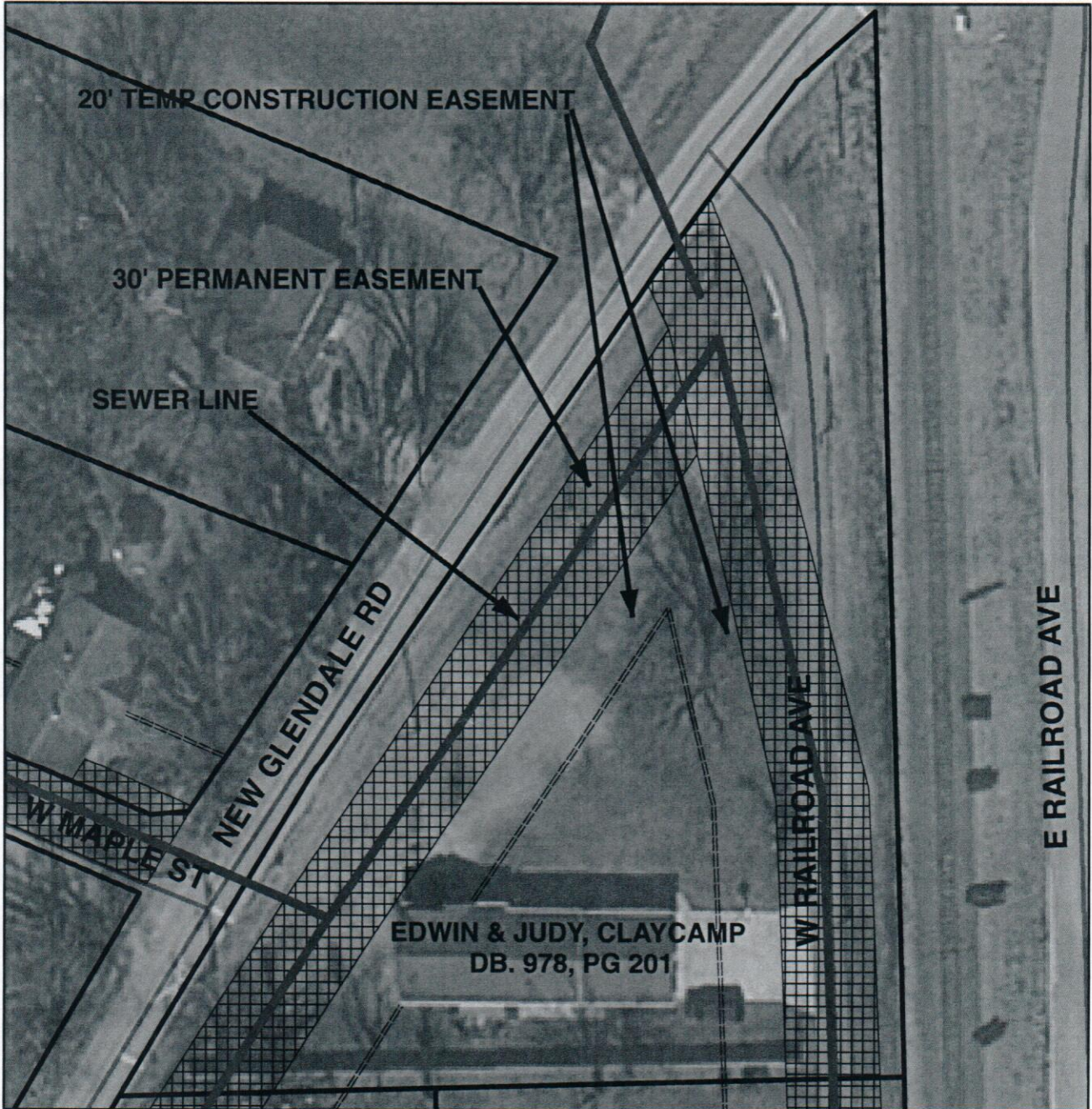
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 4th day of June, 2013 by _____ and Judy B. Claycamp husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan. 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Claycamp, Edwin & Judy
Parcel # 190-30-01-030
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
5-6-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: ANITA G GOODIN, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702

*Been
increased since
ABC Aug 2004*

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration ~~Edwin Claycamp~~,
and Judy Claycamp, ^{widow} ~~husband and~~ wife, 433 E Main St
Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin
County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702,
(the "**District**"), a perpetual easement with the right to construct, install and lay,
and thereafter use, operate, inspect, repair, maintain, and replace and remove a
wastewater collection, conveyance (force main), lateral, and service line or lines
over, across, and through the land of the Grantors situated in Hardin County,
Kentucky and a temporary construction easement, said easements being described
as follows:

PVA Parcel No. 190-30-00-031

The perpetual easement shall be 30 feet in width across the property of
Grantors as depicted on **Exhibit A**, which is attached hereto and
incorporated herein by reference. The temporary construction easement
shall have the width and location as depicted on **Exhibit A**. The
temporary construction easement shall terminate upon completion of the
construction.

Being a part of the property conveyed to the Grantors by Deed recorded in
Deed Book 894, Page 445, in the Hardin County Clerk's Office.

Additional Information:

*When black top parking lot
is repaired repair around the meter box to
be repaired & brought to grade or to ms.
Claycamp's satisfaction*



Doc ID: 009183850003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 08/09/2013 at 09:22:09 AM
Receipt#: 2013-00012064
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1383** PG **54-56**

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 18 day of July, 2013.

Judy B. Claycamp
Grantor

Deceased since
Grantor Aug 2004

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 18 day of July, 2013, ~~_____~~ and Judy B Claycamp, husband and wife, Grantors.

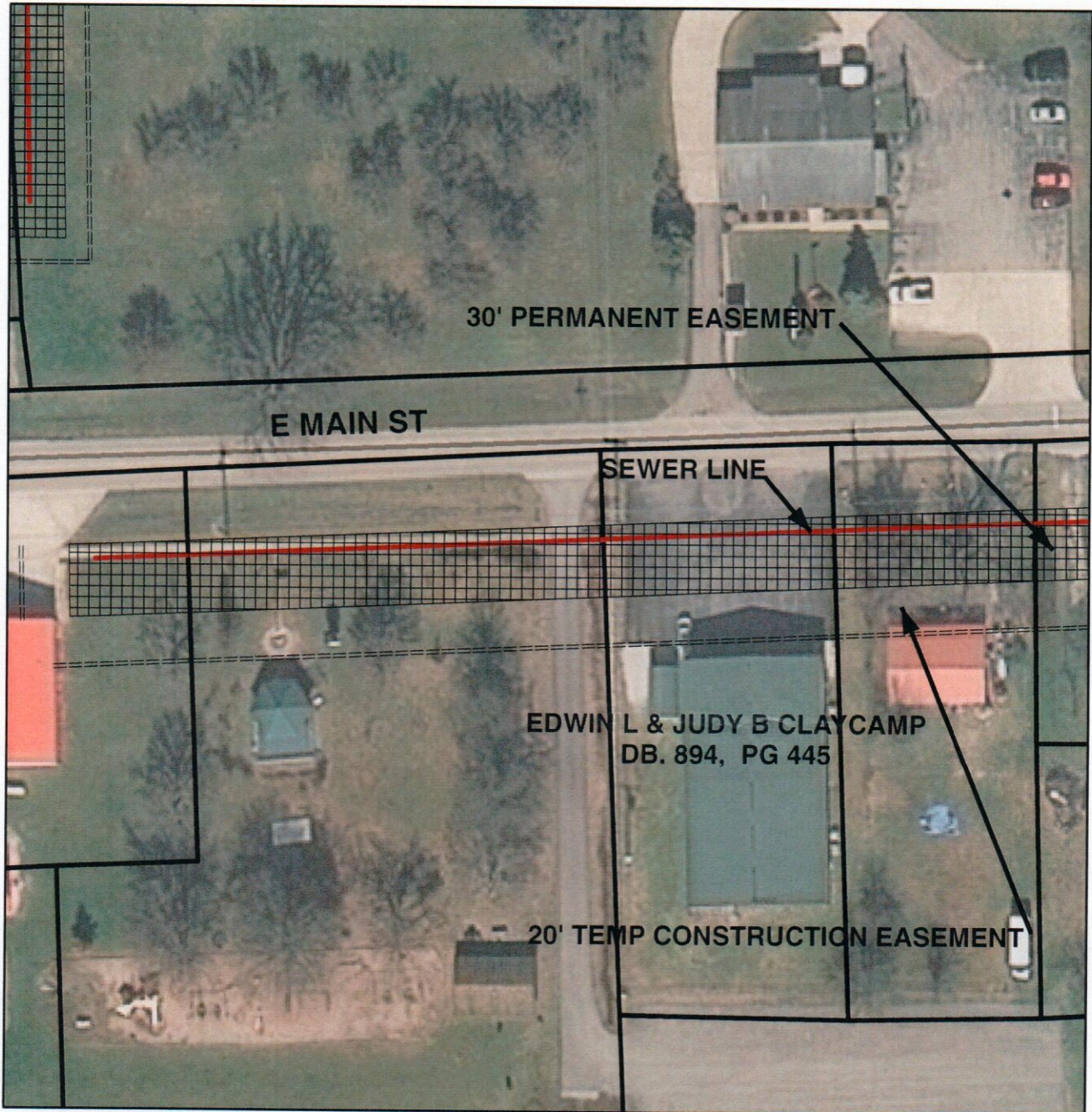
Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:

Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Claycamp, Edwin L & Judy B
Parcel # 190-30-00-031**

**The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
7-18-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009234810003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 10/04/2013 at 09:09:54 AM
Receipt#: 2013-00014963
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1385** PG **1337-1339**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Mark A Cooke, and Janyce Cooke, husband and wife, 151 E Main St Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-30-02-025

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 663, Page 275, in the Hardin County Clerk's Office.

Additional Information: Contractor is to work with the homeowner on a 'TAP' placement for ease of connection during the construction process. There is a NEW SIDEWALK installed by the Hardin County Road Department that appears to be in the way - it was installed in 2013 - IF REMOVED THE WORK Repair would not Restore to ITS ORIGINAL CONDITION - Replacement would be required with proper dowels to bring back to original condition. THIS IS IN AN AREA WHERE AUTOS WOULD DRIVE ACROSS.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 25th day of Sept., 2013.

Mark A Cooke
Grantor

Janyce Cooke
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

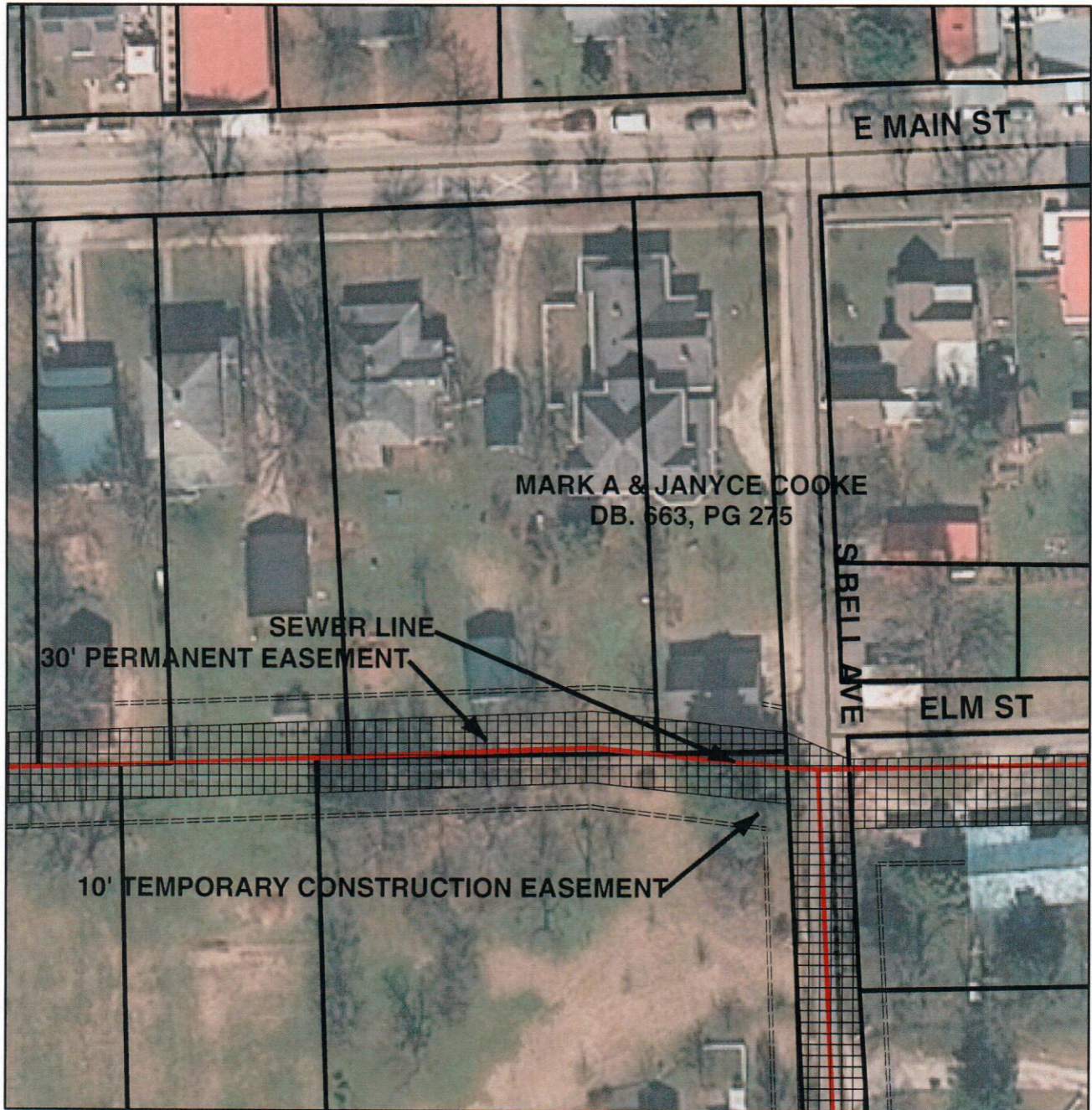
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 25 day of Sept, 2013 by Mark A Cooke and Janyce Cooke, husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Cooke, Mark A & Janyce
Parcel # 190-30-02-025
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
6-6-2013**

I, Kenneth L. Tabb, County Clerk of Hardin County, Kentucky, hereby certify that the foregoing instrument has been duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009116270003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 06/10/2013 at 09:12:07 AM
Receipt#: 2013-00008742
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1380** PG **53-55**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Melvin Druen,
233 W Railroad Ave Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby
grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown,
Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct,
install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and
remove a wastewater collection, conveyance (force main), lateral, and service line
or lines over, across, and through the land of the Grantors situated in Hardin
County, Kentucky and a temporary construction easement, said easements being
described as follows:

PVA Parcel No. 190-30-01-029

The perpetual easement shall be 30 feet in width across the property of
Grantors as depicted on **Exhibit A**, which is attached hereto and
incorporated herein by reference. The temporary construction easement
shall have the width and location as depicted on **Exhibit A**. The
temporary construction easement shall terminate upon completion of the
construction.

Being a part of the property conveyed to the Grantors by Deed recorded in
Deed Book 227, Page 305, in the Hardin County Clerk's Office.

Additional Information: Being on a fixed income would like to have
sewer hook up at no charge. Would like to have driveway and yard
restored to original condition or better.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 7th day of June, 2013.

Melvin Druen
Grantor

Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 7th day of June, 2013 by Melvin Druen and _____, husband and wife, Grantors.

Jeff Gaddis
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 20

PREPARED BY:
Jeff Gaddis
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET

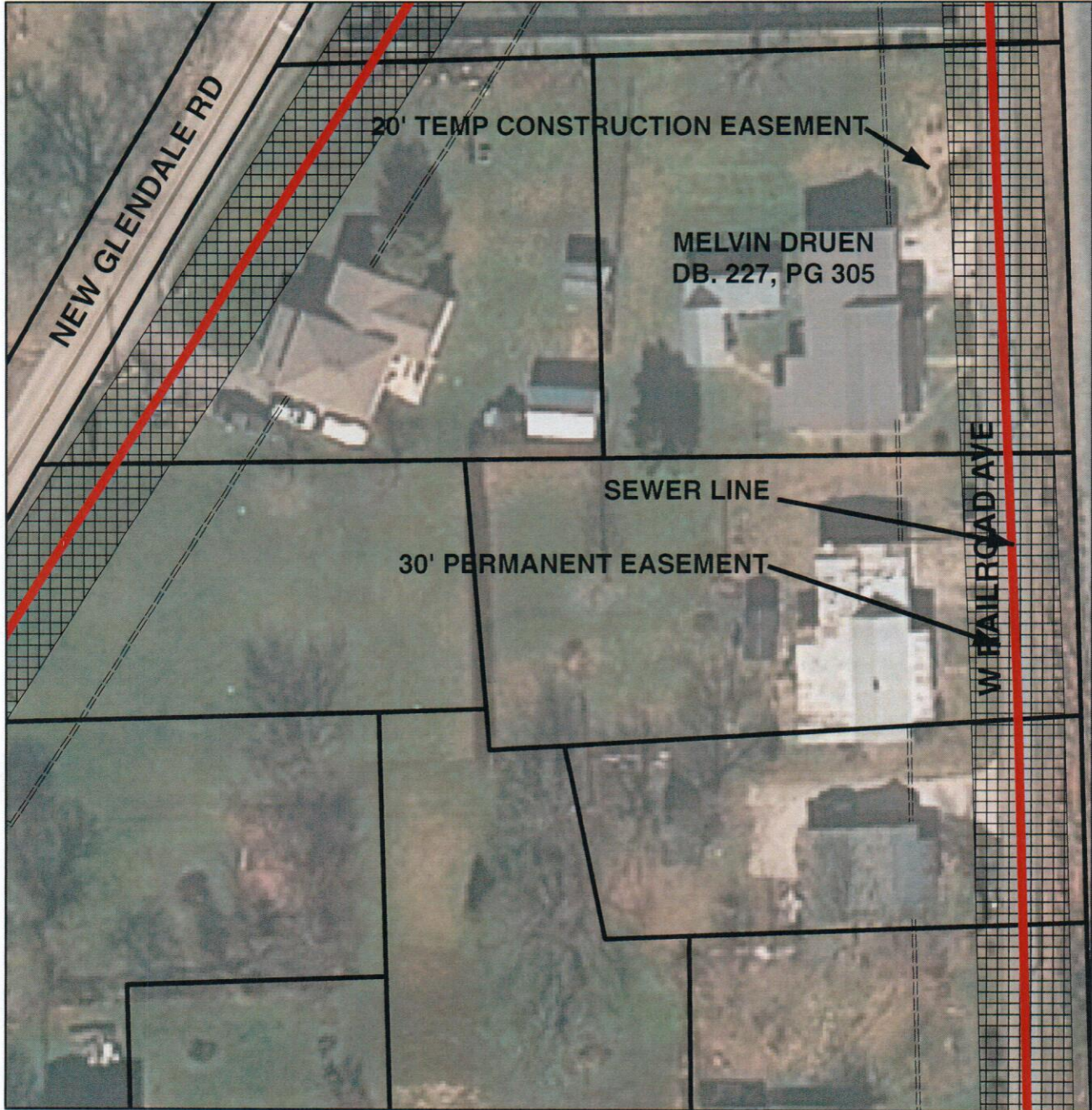


Exhibit A Easement

Druen, Melvin

Parcel # 190-30-01-029

The Source of Information is from the Hardin County PVA, and is drawn for Illustration Purposes Only, and has not been Surveyed.

5-16-2013

I, Kenneth L. Tabb, County Clerk of Hardin County, Kentucky, hereby certify that the foregoing instrument has been duly recorded in my office.



By: JANET M FIGHTS, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009234860003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 10/04/2013 at 09:13:56 AM
Receipt#: 2013-00014963
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1385** PG **1352-1354**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Matthew Duckworth, and Emily Duckworth, husband and wife, 241 High Street Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-30-00-040

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1343, Page 266, in the Hardin County Clerk's Office.

Additional Information: *man hole to be at grade level
in yard if possible*

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 26th day of SEPTEMBER 2013.

Matthew Duckworth
Grantor

Emily M. Duckworth
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

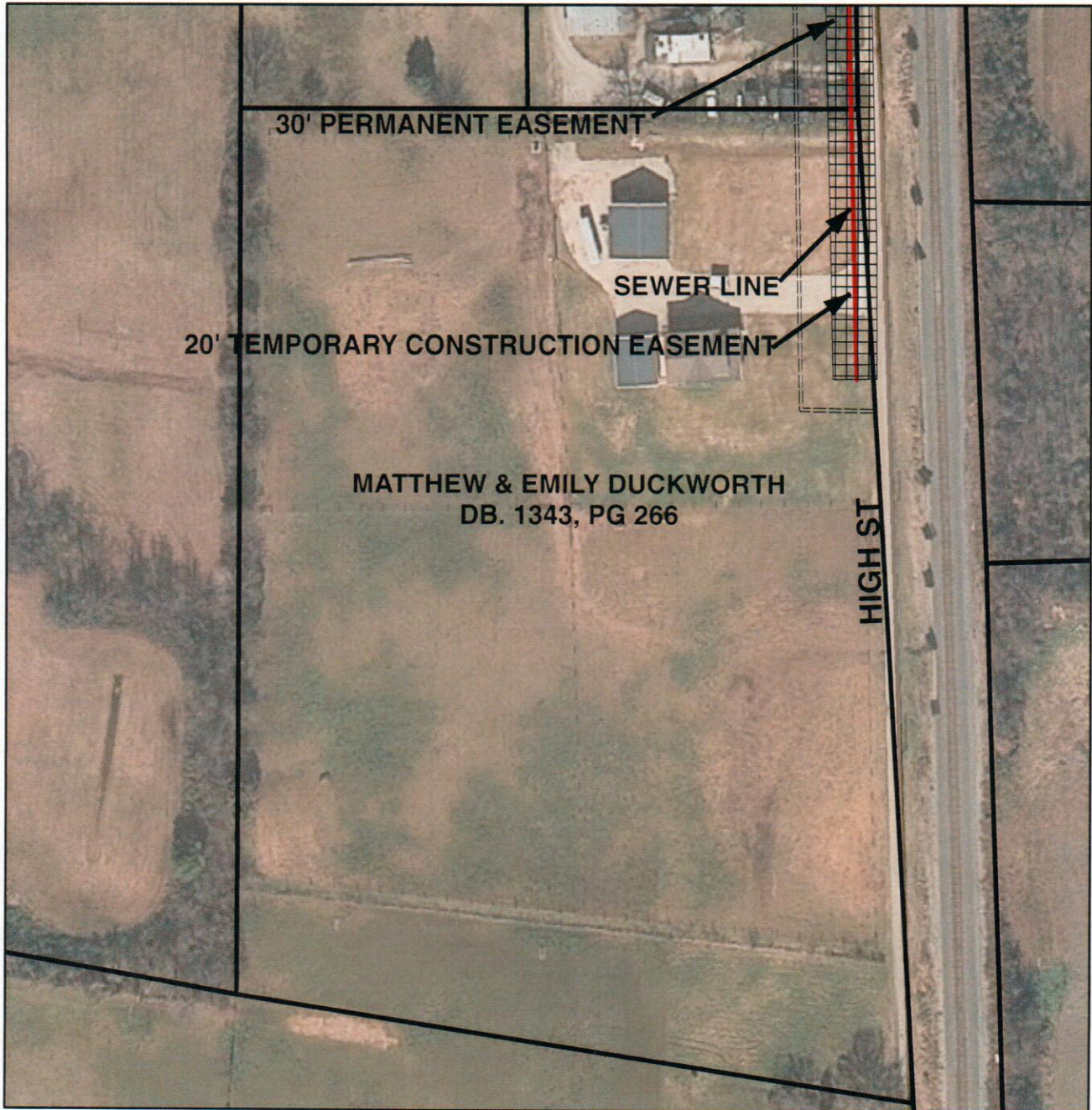
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 26th day of Sept., 2013 by Matthew Duckworth and Emily Duckworth, husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Duckworth, Matthew & Emily
Parcel # 190-30-00-040
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
6-25-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


Kenneth L. Tabb

By: DIANE J NALL, dc

COPY OF BID SET

5em A Co

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009508460003 Type: DEE
 Kind: EASEMENT - DEED
 Recorded: 07/22/2014 at 09:12:45 AM
 Receipt#: 2014-00009119
 Page 1 of 3
 Fees: \$13.00
 Hardin County Clerk
 Kenneth L. Tabb Clerk
 BK **1397** PG **1360-1362**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Albert Dunnings, 5950 New Glendale Road Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 189-00-00-018.02

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1261, Page 052, in the Hardin County Clerk's Office.

Additional Information: man holes buried 2'5 on property

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 26 day of June, 2014.

Grantor

Albert W. Dunning
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 26 day of June, 2014 by Albert Dunning, Grantor.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:

Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



I, Kenneth L. Tabb, County Clerk of Hardin County, Kentucky, hereby certify that the foregoing instrument has been duly recorded in my office.

Kenneth L. Tabb

By: ANITA G GOODIN, dc

Exhibit "A" Easement | Dunning, Albert | Parcel # 189-00-00-018.02

**Property information was acquired from the Hardin County PVA.
Drawn for illustration purposes only; has not been surveyed.**

6-2-2014

 Sewer Line  Manhole  Existing Utility Easement  Permanent Easement

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009203830003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 08/29/2013 at 01:51:57 PM
Receipt#: 2013-00013248
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1384** PG **171-173**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Charles D Freed, and Julia Ann Freed, husband and wife, 67 Shipp Lane Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-00-00-030

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1012, Page 412, in the Hardin County Clerk's Office.

Additional Information:

after construction of sewer line if Contractor doesn't do the clean up the water district (H.C.W.D.#2) will be responsible for making the clean up as good or better.

J. D.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 16 day of August, 2013.

[Signature]
Grantor

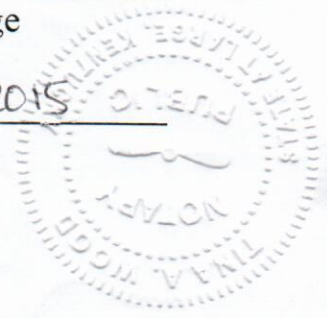
[Signature]
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 16 day of August, 2013 by Charles D Freed and Julia Ann Freed, husband and wife, Grantors.

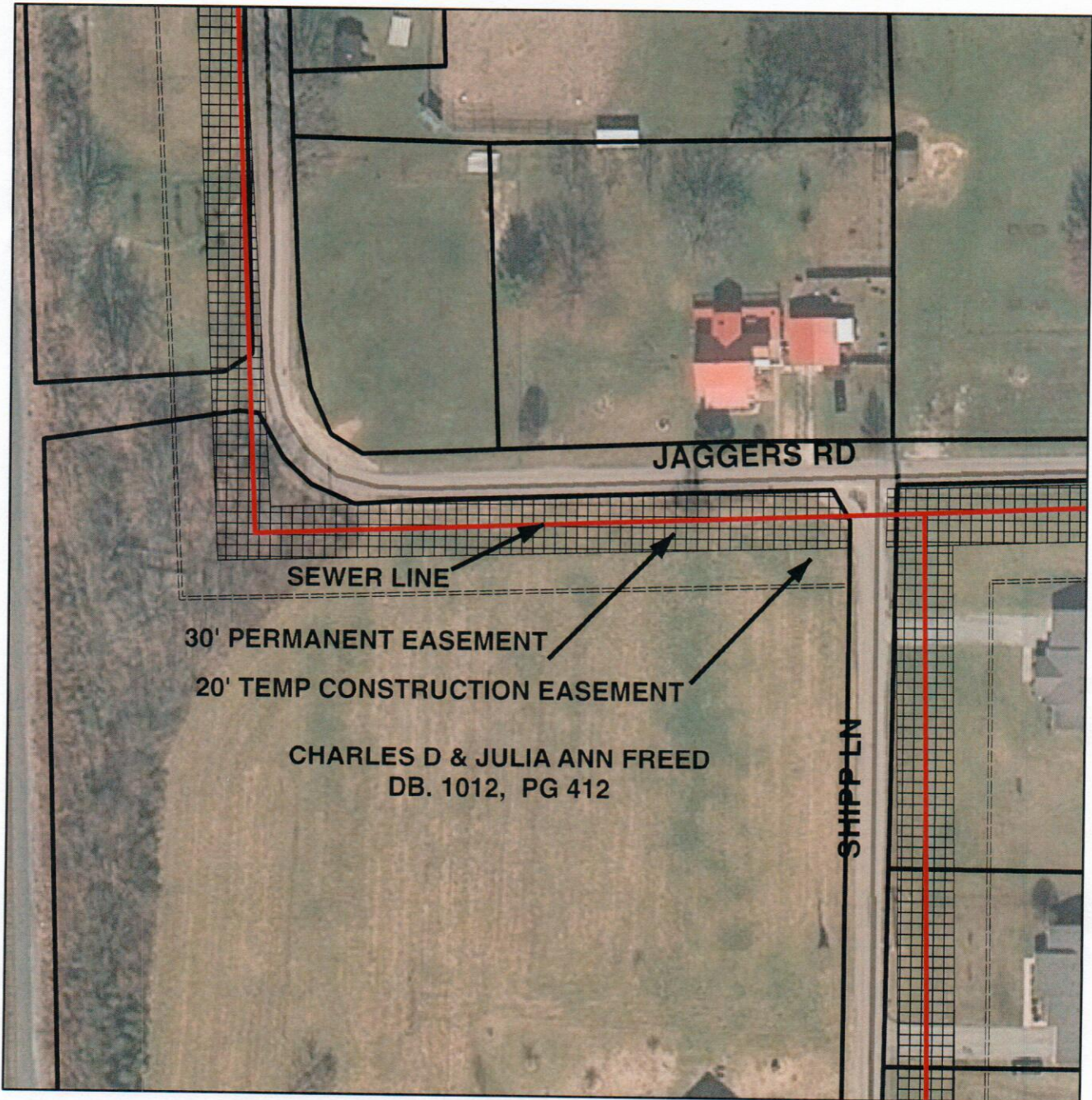
[Signature] #4400760
NOTARY PUBLIC, State at Large

My Commission Expires: 9-4-2015



PREPARED BY:
[Signature]
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Freed, Charles D & Julia Ann
Parcel # 190-00-00-030
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
7-23-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009142940003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 07/09/2013 at 08:41:57 AM
Receipt#: 2013-00010321
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1381** PG **675-677**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Larry J Hall,
and Kilcha M Hall, ~~husband and wife,~~ ^{joint owners} Glendale,
Kentucky, 42740 (the "Grantors"), do hereby grant unto the **Hardin County
Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the
"District"), a perpetual easement with the right to construct, install and lay, and
thereafter use, operate, inspect, repair, maintain, and replace and remove a
wastewater collection, conveyance (force main), lateral, and service line or lines
over, across, and through the land of the Grantors situated in Hardin County,
Kentucky and a temporary construction easement, said easements being described
as follows:

PVA Parcel No. 188-00-00-034

The perpetual easement shall be 30 feet in width across the property of
Grantors as depicted on **Exhibit A**, which is attached hereto and
incorporated herein by reference. The temporary construction easement
shall have the width and location as depicted on **Exhibit A**. The
temporary construction easement shall terminate upon completion of the
construction.

Being a part of the property conveyed to the Grantors by Deed recorded in
Deed Book 1352, Page 118, in the Hardin County Clerk's Office.

Additional Information:

Property owners request that Hardin County Water District set to
the side opposite the railroad any 14" chest-high trees or marketable
timber that may be on the easement.
to take down marketable before construction

Property owners request that the Hardin County Water District set to
the side opposite the railroad any 14" chest-high trees or marketable
timber that may be on the easement.

J. S.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 26th day of June, 2013.

Kilcha Hall
Grantor

Larry J. Hall
Grantor

Virginia K.H.
STATE OF ~~KENTUCKY~~ NEW YORK
COUNTY OF ~~HARDIN~~ Newport News K.H.



The foregoing Easement was subscribed, sworn to, and acknowledged before me this 26th day of June, 2013 by Kilcha Hall and alone, husband and wife, Grantors. K.H.

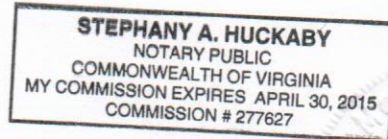
K.H.

joint owners individual

Stephany A Huckaby
NOTARY PUBLIC, State at Large

My Commission Expires: April 30, 2015

PREPARED BY:
Jeff Caddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

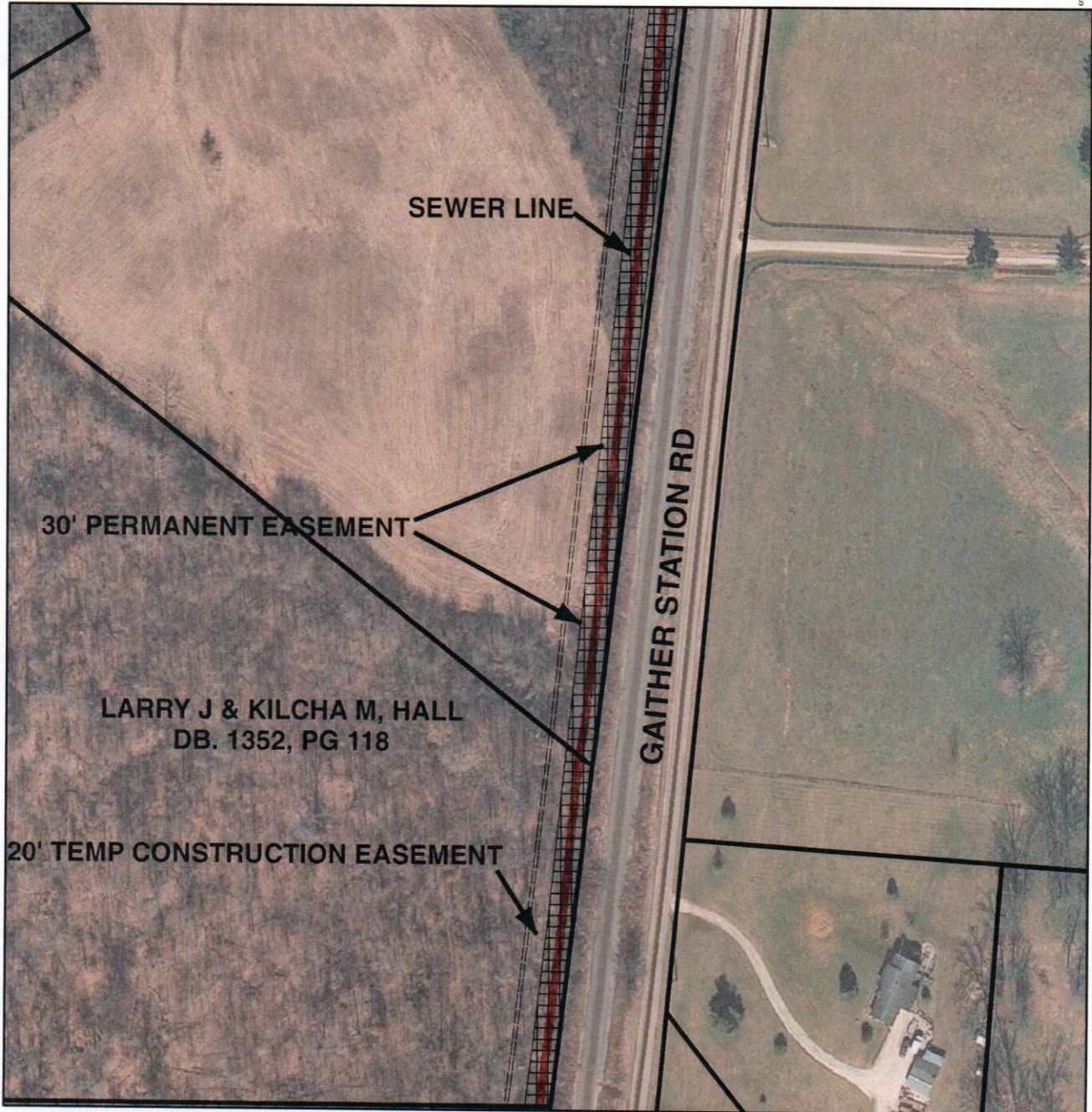


STATE OF KENTUCKY COUNTY OF HARDIN
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 28 day of June 2013, by Larry J. Hall, individual.

Quanita McCoy
NOTARY PUBLIC

My Commission Expires: 12-9-2013

COPY OF BID SET



**Exhibit A Easement
Hall, Larry J & Kilcha M
Parcel # 188-00-00-034
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
5-15-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: JANET M FIGHTS, dc

COPY OF BID SET

we easement

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702

Doc ID: 009371360003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 03/21/2014 at 08:39:36 AM
Receipt#: 2014-00003263
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1392** PG **1009-1011**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Steve M Hall, and Robin R Hall, husband and wife, 229 S Beech St Glendale, Kentucky, 42740 (the "Grantors"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "District"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-10-00-001.01

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1080, Page 323, in the Hardin County Clerk's Office.


Additional Information: sewer line stops at end of Steve property.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 25th day of February, 2013.



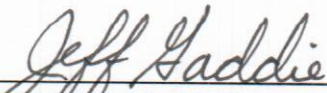
Grantor



Grantor

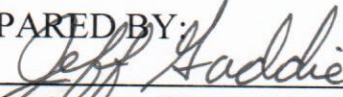
STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 25th day of February, 2013 by Steve M Hall and Robin R Hall, husband and wife, Grantors.



NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:


Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET

I, Kenneth L. Tabb, County Clerk of Hardin County, Kentucky, do hereby certify that the foregoing instrument has been duly recorded in my office.

Kenneth L. Tabb

By: JANET M FIGHTS, dc

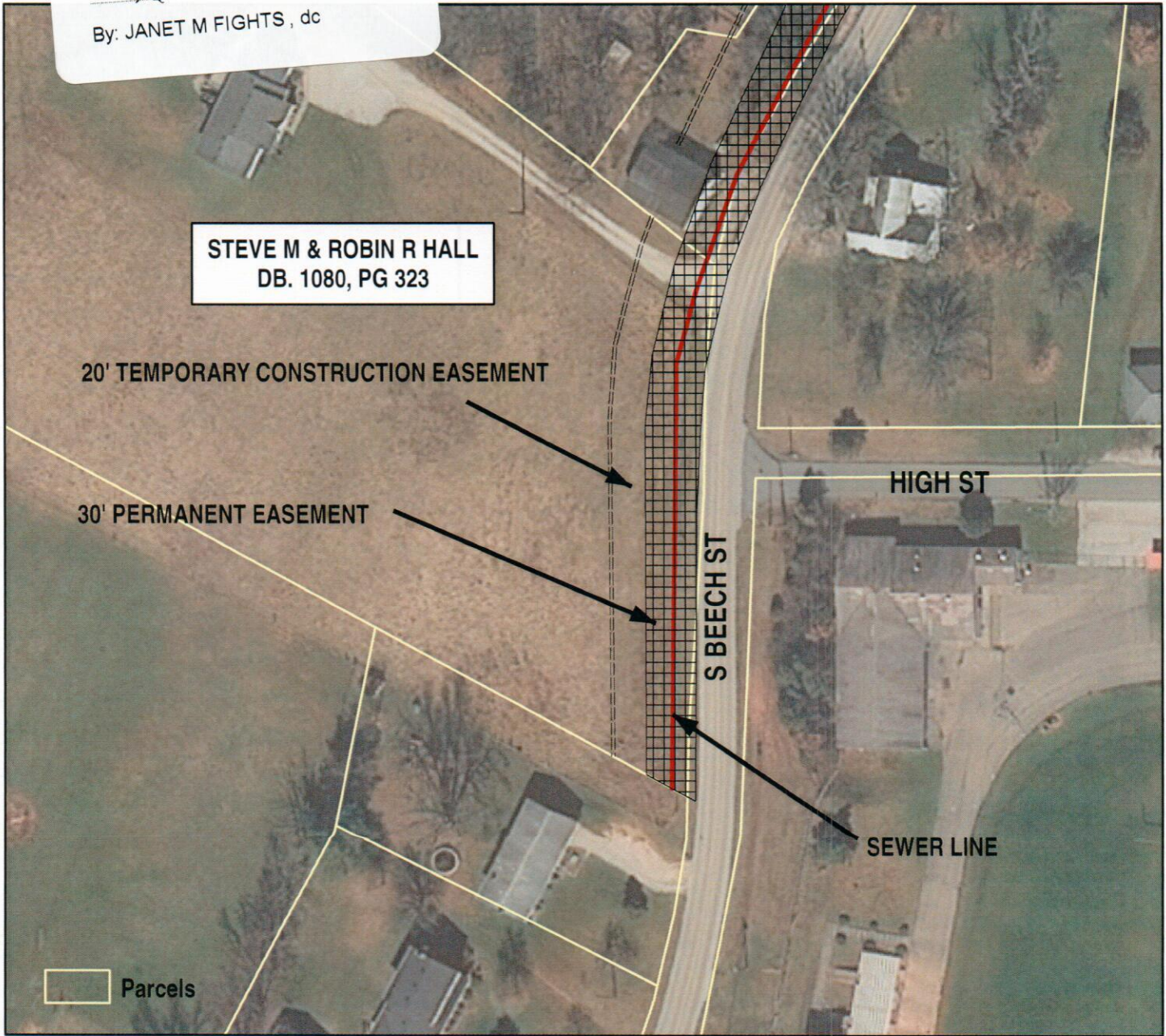


Exhibit "A" Easement | Hall, Steve M & Robin R | Parcel # 190-10-00-011.01


The source of information is from the Hardin County PVA.

Drawn for illustration purposes only and has not been surveyed.

3-20-2014

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009203910003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 08/29/2013 at 02:02:19 PM
Receipt#: 2013-00013248
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1384** PG **195-197**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Norma Howlett, 1408 Gilead Church Rd Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 191-00-00-008.01

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 287, Page 121, in the Hardin County Clerk's Office.

Additional Information:

Top soil to be laid aside during construction + put back on sub-soil after construction complete.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 12 day of August, 2013.

Norma Howlett
Grantor

Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

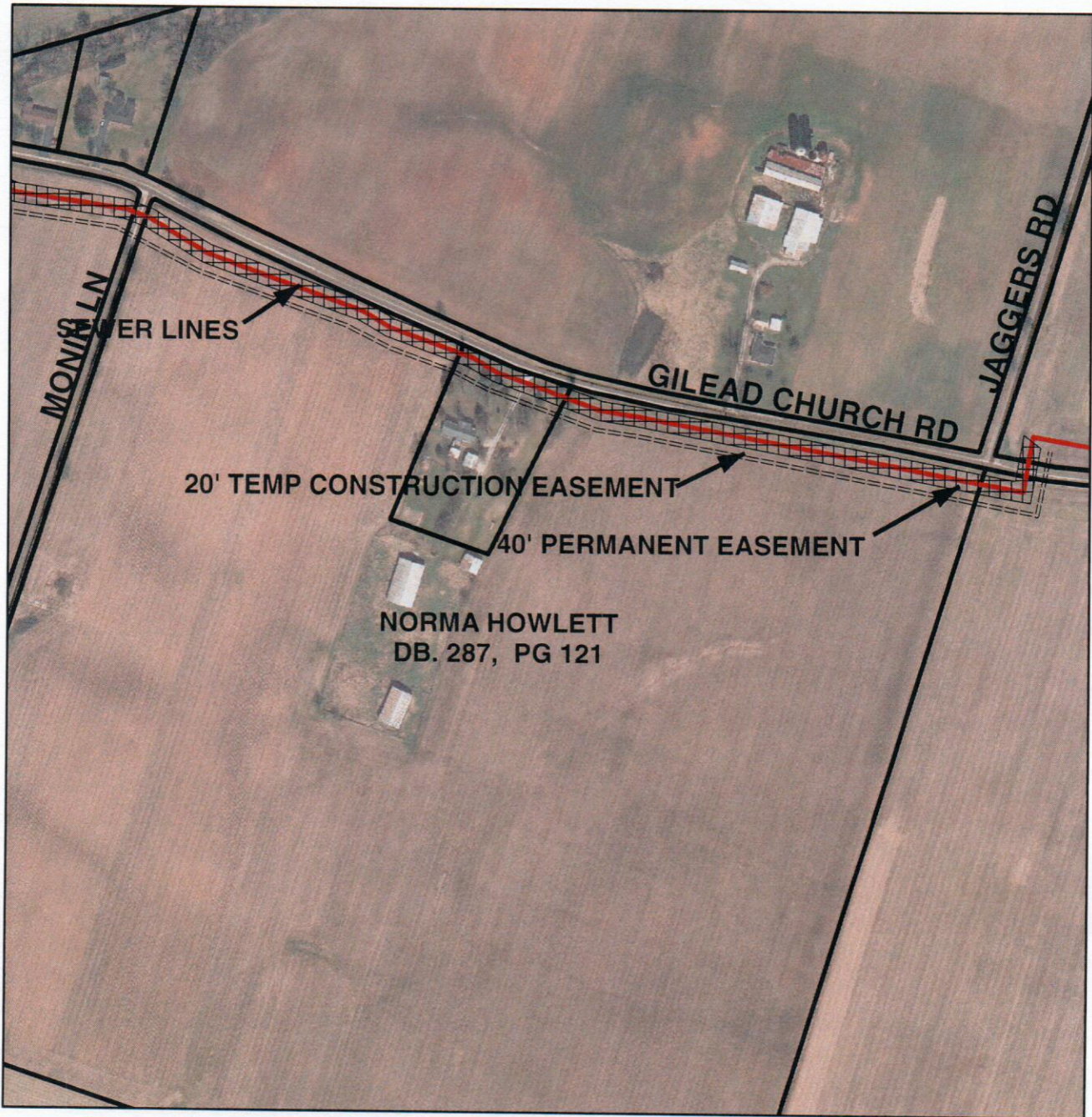
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 12 day of August, 2013 by Norma Howlett, Grantor.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Howlett, Norma
Parcel # 191-00-00-008.01
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
8-9-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

#19 5

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009560360005 Type: DEE
Kind: EASEMENT - DEED
Recorded: 09/11/2014 at 08:27:52 AM
Receipt#: 2014-00011502
Page 1 of 5
Fees: \$19.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1400** PG **136-140**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration HPT PSC Properties Trust, A Maryland Real estate investment trust, having a place of business at 400 Centre Street, Newton, MA 02458 (the "**Grantor**"), does hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual non-exclusive easement ("**Perpetual Easement**") for the purpose of constructing, installing and laying, and thereafter using, operating, inspecting, repairing, maintaining, and replacing and removing a wastewater collection, conveyance (force main), lateral, and service line or lines(collectively, the "**Facilities**") over, across, and through the land of the Grantors located at 460 Glendale Hodgenville Rd W Glendale, Hardin County, Kentucky 42740 Hardin County ("**Grantor's Property**") and (ii) a temporary construction easement, ("**Temporary Easement**" and together with the Perpetual Easement, the "**Easements**" said easements being described as follows:

PVA Parcel No. 207-00-00-043

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary easement shall have the width and location as depicted on **Exhibit A**. The temporary easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1229, Page 785, in the Hardin County Clerk's Office.

COPY OF BID SET

The Easements are granted on the following terms and conditions;

1. All construction, installation, repair, maintenance, relocation and removal of the Facilities shall be at the sole cost and expense of District. All shall be performed by District, or its agents, as promptly and efficiently as possible, once, begun, so as to minimize any inconvenience or interruption of use of Grantor's Property and shall continue to completion with diligence. In no event shall District obstruct, block or materially interfere with Grantor's, its tenant's, agent's or assign's ingress or egress to Grantor's Property. Absent emergency, District shall provide Grantor with reasonable notice prior entering Grantor's Property for the purpose of exercising its rights hereunder.
2. In performing any work within the Easements, District shall keep Grantor's property free from all claims, mechanic's liens or other encumbrances in connection with or arising out of such work and shall bind over or take such other action to release any claims, mechanics' liens or encumbrances placed on Grantor's Property in connection with or arising out of said work.
3. The Easements granted herein are subject to all matters of record, including but not limited to any and all recorded easements, licenses or rights of way insofar as they lawfully affect Grantor's Property. District acknowledges and agrees that there may be other utilities located with the Easements and District hereby agrees that its rights are subject thereto.
4. Grantor may use the Easements for any purpose that does not interfere with the rights granted to District hereunder, including but not limited to ingress, egress and parking.
5. District shall indemnify and hold Grantor harmless from and against any and all damage, claim, loss, damage or harm arising out of District's use of the Easement of Facilities or the exercise of any right granted herein, and against damage, cost, loss, claim or fees incurred in or resulting from any of the foregoing or action or proceeding brought in connection therewith. District's indemnification shall include the obligation to defend claims brought by or through Grantor as the result of District's use of the Easements or Facilities or the exercise by District of any right herein.

COPY OF BID SET

6. District shall maintain, or cause to be maintained, commercial general liability insurance (on an occurrence basis, including without limitation, broad form contractual liability, bodily injury, property damage, fire, legal liability and products and completed operation coverage) in an amount which shall be at least \$2,000,000 and which, from time to time, shall be for such higher limits, if any, as Grantor shall reasonably determine to be customarily carried in the area for similar properties which are used for similar purposes. All such coverage shall be primary with respect to any insurance policies carried by District and shall be obtained from responsible companies, which companies shall have a general policy holder's rating by A.M. Best of at least A-Viii or otherwise be acceptable to Grantor. Upon Grantor's request, Grantor shall be added as an additional insured to District's policy and a certificate of insurance shall be delivered to Grantor. The policy shall be non-cancelable without at least thirty (30) days prior written notice thereof to Grantor.
7. The declaration of trust establishing Grantor, a copy of which together with all amendments thereto (the "Declaration"), is duly filed with the Department of Assessments and taxation of the State of Maryland, provides that the name "HPT PSC Properties Trust" refers to the Trustees under the Declaration collectively as Trustees, but not individually or personally, and no trustee, officer, shareholder, employee or agent of Grantor shall be held to any personal liability, jointly or severally, for any obligation of, or claim against Grantor. All persons dealing with Grantor, in any way, shall look only to the assets of Grantor for the payment of any sum or the performance of any obligation. The provisions of this section shall survive the termination of the Easements.
8. The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

REMAINDER OF PAGE INTENTIONALLY LEFT BLANK

COPY OF BID SET

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 28th day of July, 2014.

HPT PSC PROPERTIES TRUST

~~HPT PSC PROPERTIES TRUST~~

By: John G. Murray
Its: John G. Murray
President

COMMONWEALTH OF MASSACHUSETTS
COUNTY OF MIDDLESEX

On this 28th day of July, 2014, before me, the undersigned notary public, personally appeared John G. Murray (name of document signer*), proved to me through satisfactory evidence of identification, which was personally known (state form of identification), to be the person whose name is signed on the preceding or attached document, and acknowledged to me that (he) (she) signed it voluntarily for its stated purpose. HPT PSC Properties
J. G.

(affix official signature and seal of notary)

Judith A. Crowley

PREPARED BY:
Jeff Haddie

Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

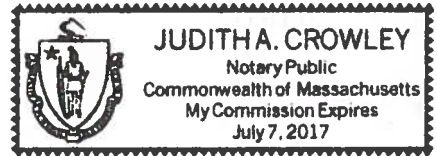





Exhibit "A" Easement | HPT PSC Properties Trust & C/O Travel Centers of America Parcel # 207-00-00-043

Property information was acquired from the Hardin County PVA.
Drawn for illustration purposes only; has not been surveyed.

9/10/2014

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: JANET M FIGHTS, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009203880003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 08/29/2013 at 01:58:06 PM
Receipt#: 2013-00013248
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1384** PG **186-188**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Larry B Jagers, and Carol L Jagers, husband and wife, 437 Jagers Rd Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-00-00-032

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 898, Page 251, in the Hardin County Clerk's Office.

Additional Information: Walnut tree in fence row not to be cut down during or after construction

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 7 day of August, 2013.

Larry B Jagers
Grantor

Carol L Jagers
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

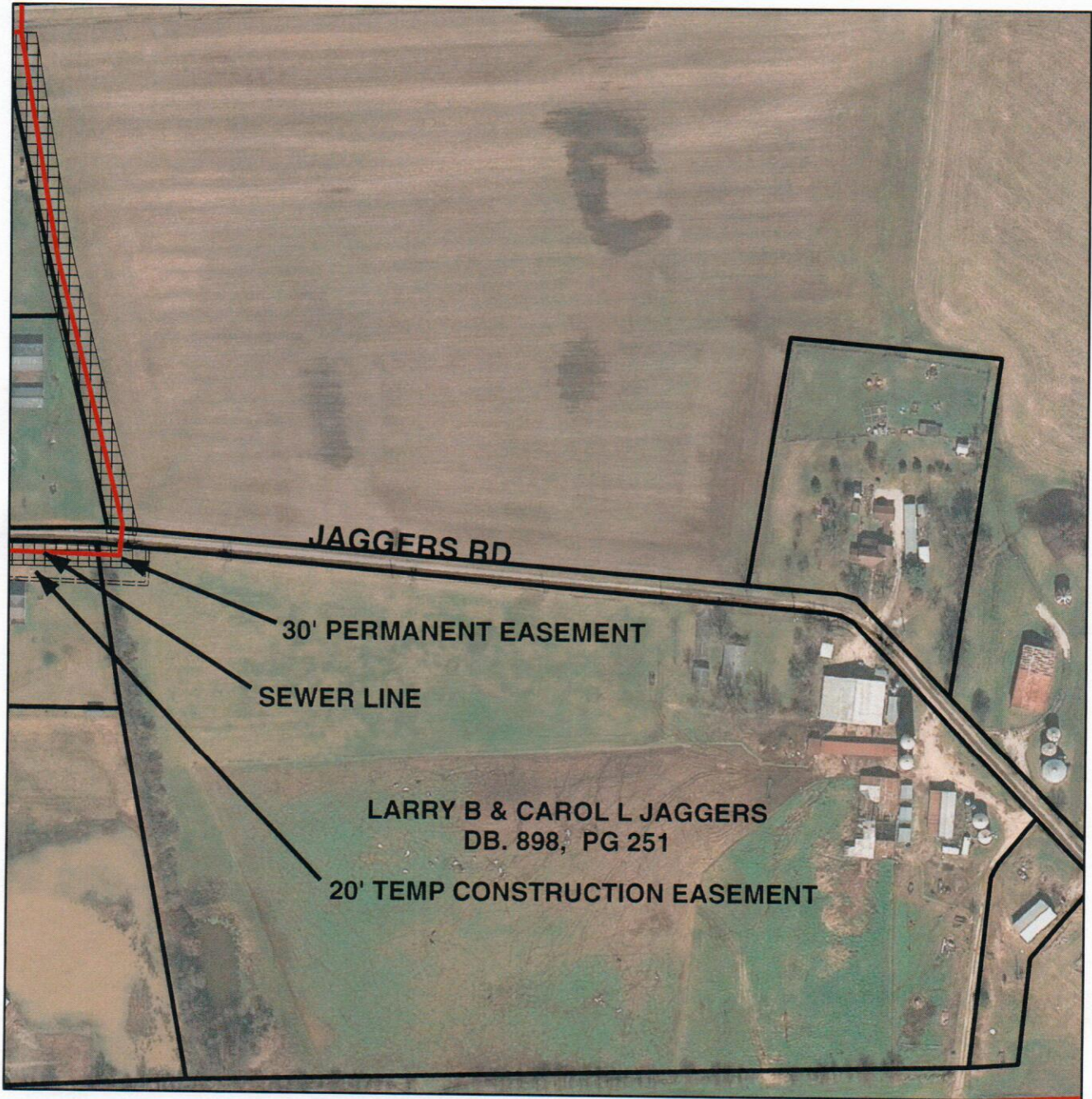
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 7 day of August, 2013 by Larry B Jagers and Carol L Jagers, husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: *Jan 19th 2016*

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Jaggers, Larry B & Carol L
Parcel # 190-00-00-032
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
7-23-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009342400003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 02/27/2014 at 01:16:25 PM
Receipt#: 2014-00002350
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1391** PG **1348-1350**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration James Jenkins, and Melissa Jenkins, husband and wife, 7662 S Dixe Hwy Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 226-00-00-001

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1356, Page 1310, in the Hardin County Clerk's Office.*

Additional Information: all man holes to be buried 2'5'
and top soil laid aside during construction &
laid back on top of subsoil after construction.


*Further conveyed to Ray Allan Mackey & David Mackey
by unrecorded Contract for Deed. *J.H.*

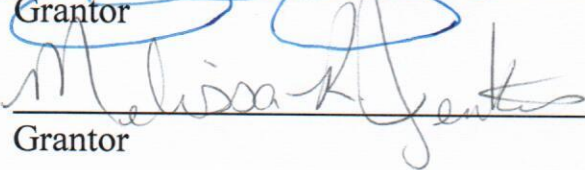
COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.


This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

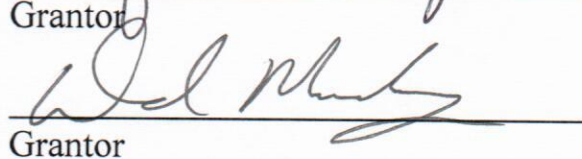
IN WITNESS WHEREOF, the Grantors have executed this Easement on the 20th day of February, 2014.



Grantor


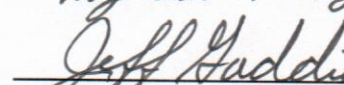
Grantor



Grantor



Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 20th day of Feb., 2014 by James Jenkins and Melissa Jenkins, husband and wife, Grantors. + Ray allan mackey + David mackey


NOTARY PUBLIC, State at Large *Contract for deed*

My Commission Expires: Jan 19th 2016

PREPARED BY:


Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Jenkins, James & Melissa
Parcel # 226-00-00-001
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
8-13-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: ANITA G GOODIN, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009342390003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 02/27/2014 at 01:16:05 PM
Receipt#: 2014-00002350
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1391** PG **1345-1347**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Mackey Brothers Farm, 7888 S Dixie Hwy Glendale Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 226-00-00-003

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1298, Page 632, in the Hardin County Clerk's Office.

Additional Information: all man holes to be buried 2'5
and top soil laid aside during construction + laid
back on subsoil after construction.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 22 day of Jan, 2013.

Ray Allan Mackey
Grantor

David Mackey
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 22 day of Jan, 2013 by Mackey Brothers Farm, Grantors.

*by Ray Allan Mackey and
David Mackey, as J.A.
owners of
Mackey Brothers Farm

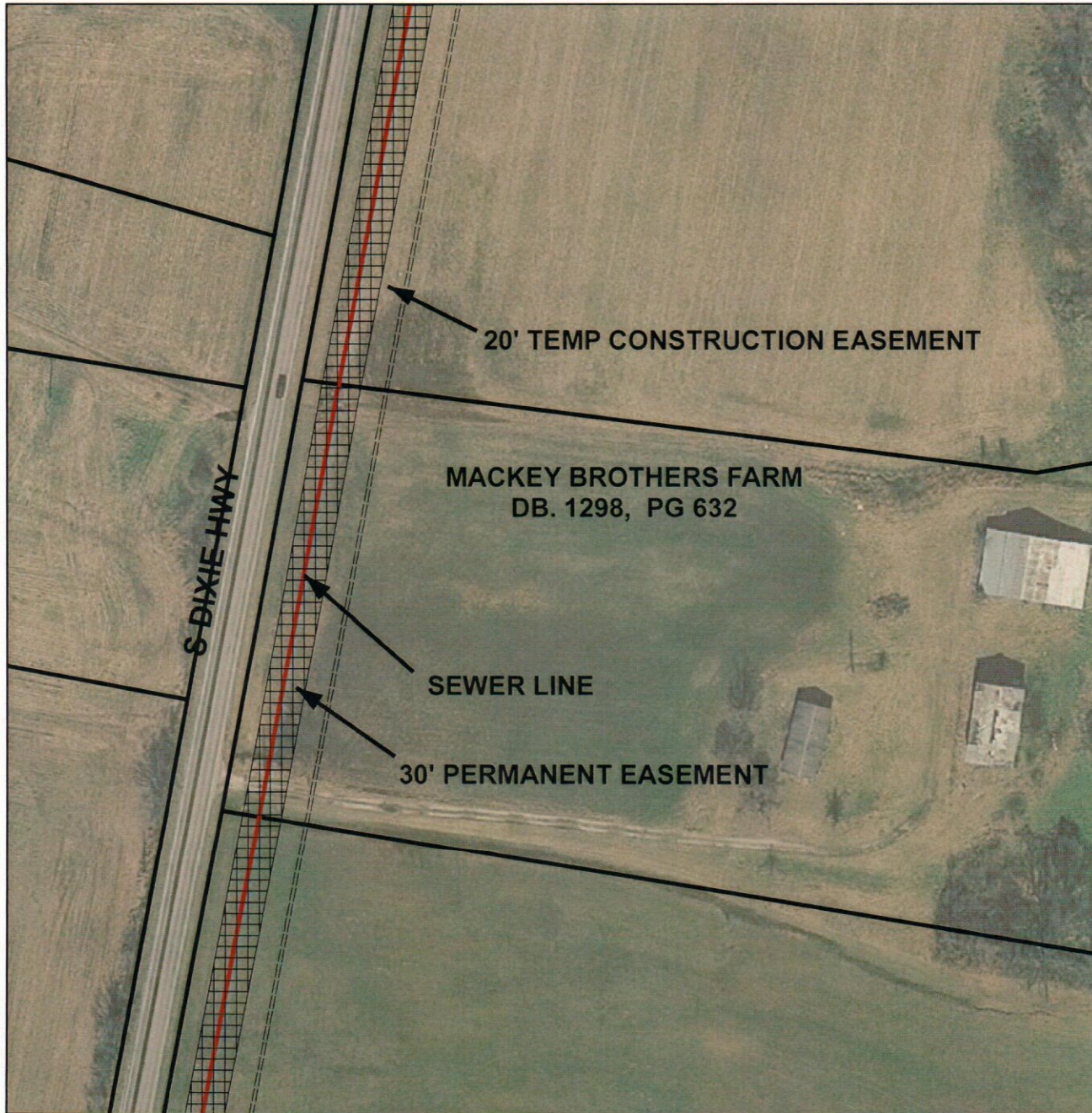
Jeff Gaddie ID# 455529
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:

Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Mackey Brothers Farm
Parcel # 226-00-00-003
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
8-13-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: ANITA G GOODIN, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration *Pamela S. Miles James E. Miles Jr*
Jennifer L. Miles
James E Miles Jr ETAL,
Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant unto the **Hardin**
County Water District No. 2, P.O. Box 970, Elizabethtown, Kentucky, 42702,
(the "**District**"), a perpetual easement with the right to construct, install and lay,
and thereafter use, operate, inspect, repair, maintain, and replace and remove a
wastewater collection, conveyance (force main), lateral, and service line or lines
over, across, and through the land of the Grantors situated in Hardin County,
Kentucky and a temporary construction easement, said easements being described
as follows:

PVA Parcel No. 188-00-00-033

The perpetual easement shall be 30 feet in width across the property of
Grantors as depicted on **Exhibit A**, which is attached hereto and
incorporated herein by reference. The temporary construction easement
shall have the width and location as depicted on **Exhibit A**. The
temporary construction easement shall terminate upon completion of the
construction.

Being a part of the property conveyed to the Grantors by Deed recorded in
Deed Book 1338, Page 1523, in the Hardin County Clerk's Office.

Additional Information:

*Mr. Miles to be paid for
tree damage + Contractor or H.C.W.D #2 will haul
off all debris from trees*


Doc ID: 009258400003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 11/01/2013 at 09:30:56 AM
Receipt#: 2013-00016129
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1387** PG **96-98**

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 13 day of Sept., 2013.

X James E. Miles III
Grantor
X Jennifer L. Miles
STATE OF KENTUCKY
COUNTY OF HARDIN

James E. Miles III
Grantor
Pamela D. Miles

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 13 day of Sept., 2013 by James E. Miles III
Pamela D. Miles

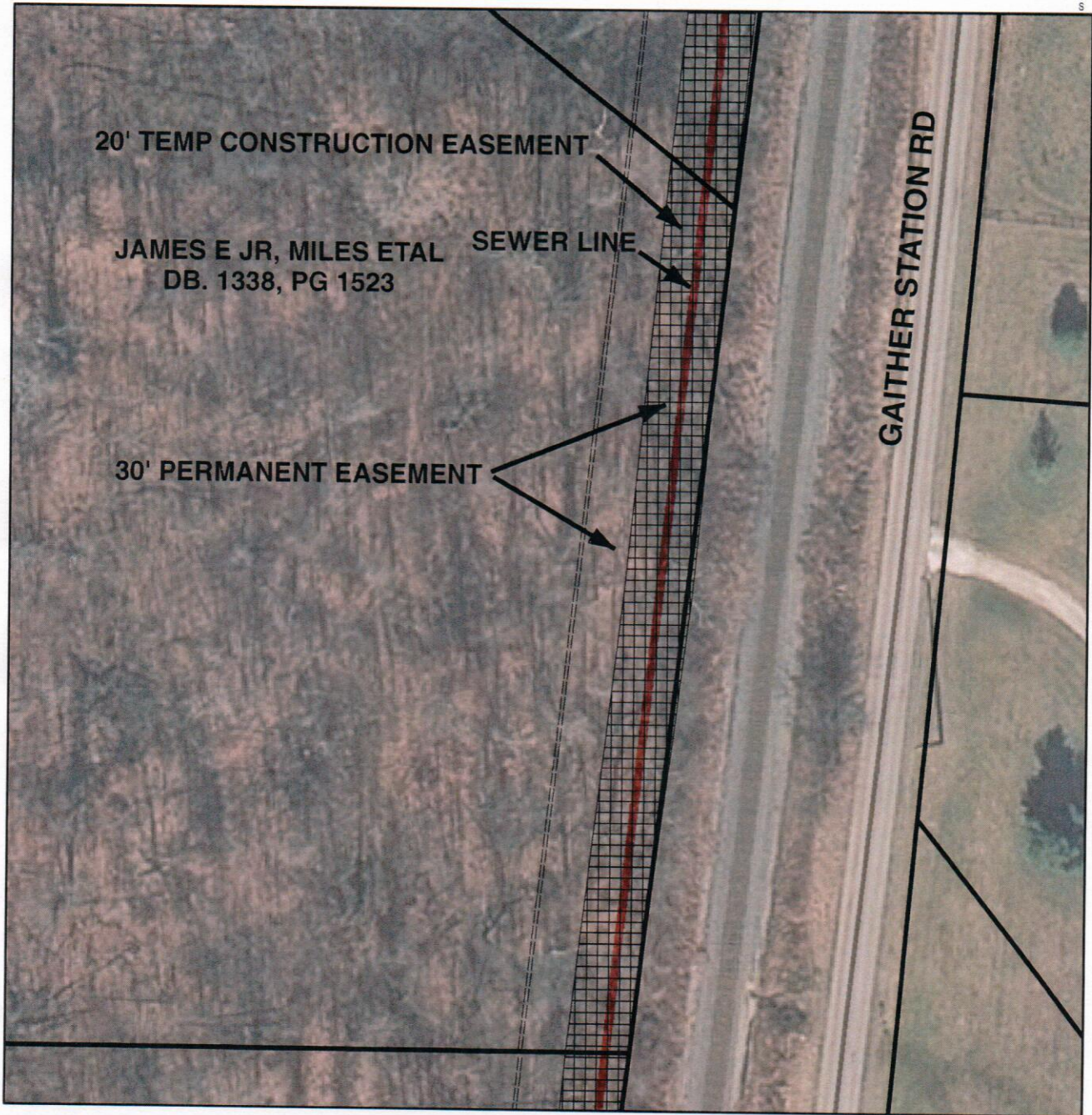
James E. Miles III
Jennifer L. Miles

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Miles, James E Jr ETAL
Parcel # 188-00-00-033
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
5-15-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009135840003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 06/28/2013 at 09:20:23 AM
Receipt#: 2013-00009862
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1380** PG **1545-1547**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Edward, and Sherry Philpott, husband and wife, 225 W Railroad Ave Glendale, Kentucky, 42740 (the "Grantors"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "District"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-30-01-026

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1364, Page 1414, in the Hardin County Clerk's Office.

Additional Information: Being on a fixed income. We would like sewer hook up at no cost to us. We would like to have yard and driveway restored after construction to original condition or better.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.)

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 7th day of June, 2013.

Edmund E. Blissett
Grantor

Sherry Blissett
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

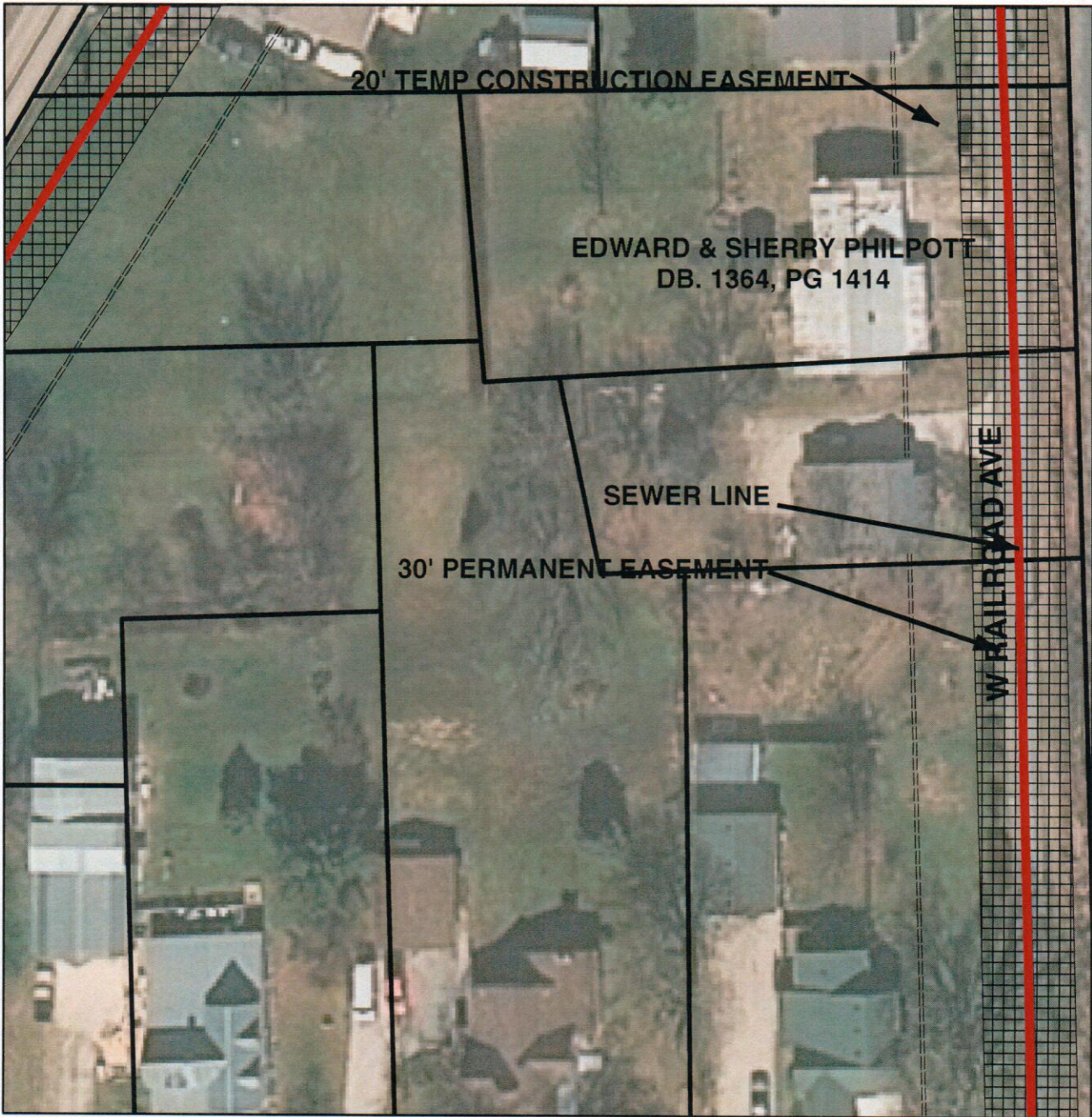
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 7th day of June, 2013 by Edmund E. Blissett and Sherry Blissett, husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Philpott, Edward & Sherry
Parcel # 190-30-01-026
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
5-16-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.



By: ANITA G GOODIN, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009234790003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 10/04/2013 at 09:07:51 AM
Receipt#: 2013-00014963
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1385** PG **1331-1333**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration _____ James David Sego , 200 S Bell Ave Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-30-02-007

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 590, Page 426, in the Hardin County Clerk's Office.

Additional Information:

stay away from old maple tree as much as possible can get closer to white fence if need be

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 1st day of October, 2013.

James D Sego
Grantor

X _____
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

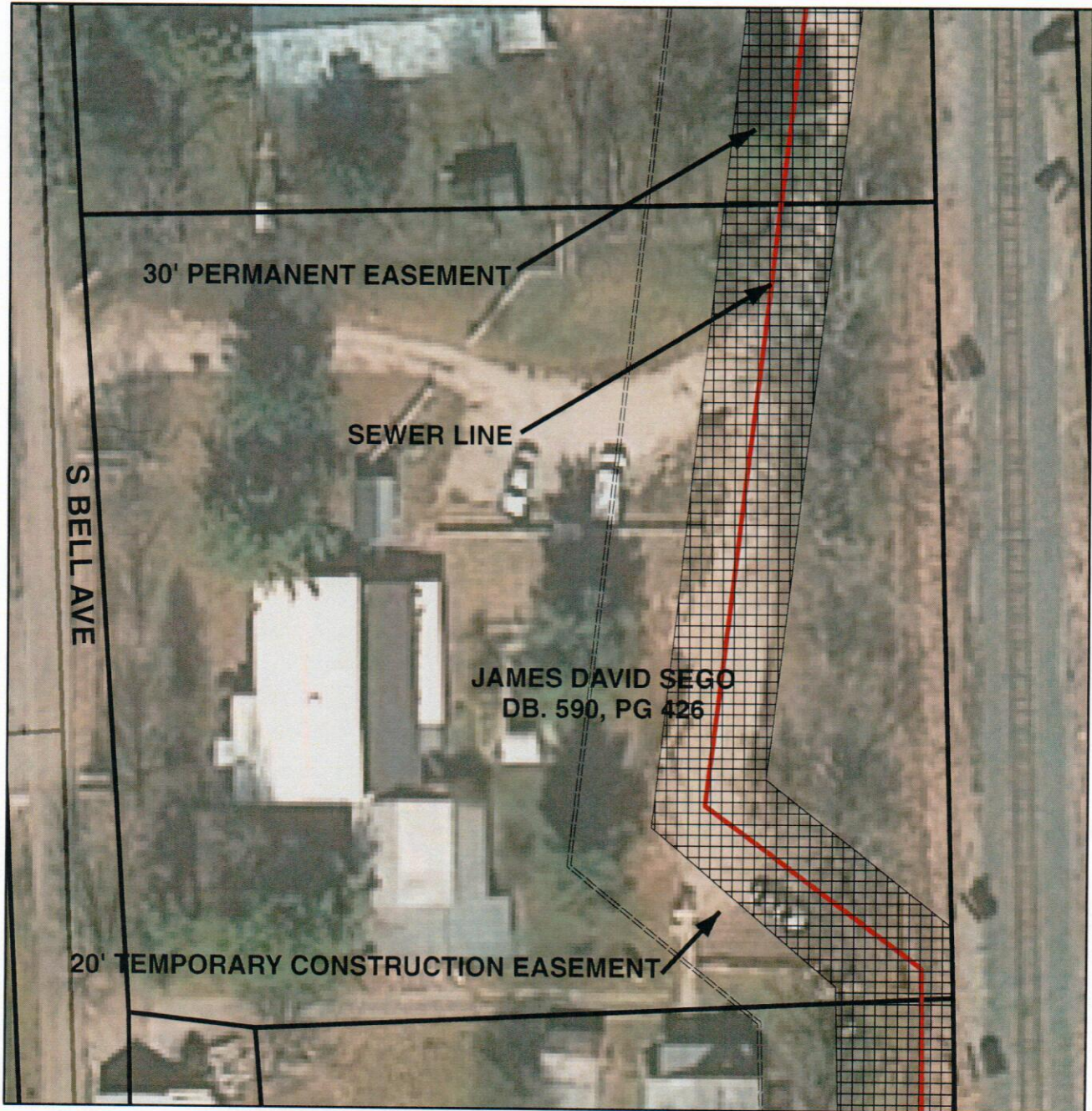
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 1st day of October, 2013 by James David Sego, Grantor.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016


PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Sego, James David
Parcel # 190-30-02-007
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
6-25-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009253970003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 10/25/2013 at 09:52:05 AM
Receipt#: 2013-00015838
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1386** PG **1196-1198**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Mary Donna Skees, 430 Mackey Rd Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No 226-00-00-009

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1026, Page 056, in the Hardin County Clerk's Office.

Additional Information:

*Man hole to be buried 2'5"
and all top soil to be laid aside & put back
on sub-soil when construction complete. If tree
has to be taken out Contractor will remove or H.C.W.D. #2 will remove*

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 17th day of October, 2013.

Grantor

Mary Donna Skees
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 17th day of October, 2013 by Mary Donna Skees, Grantor.

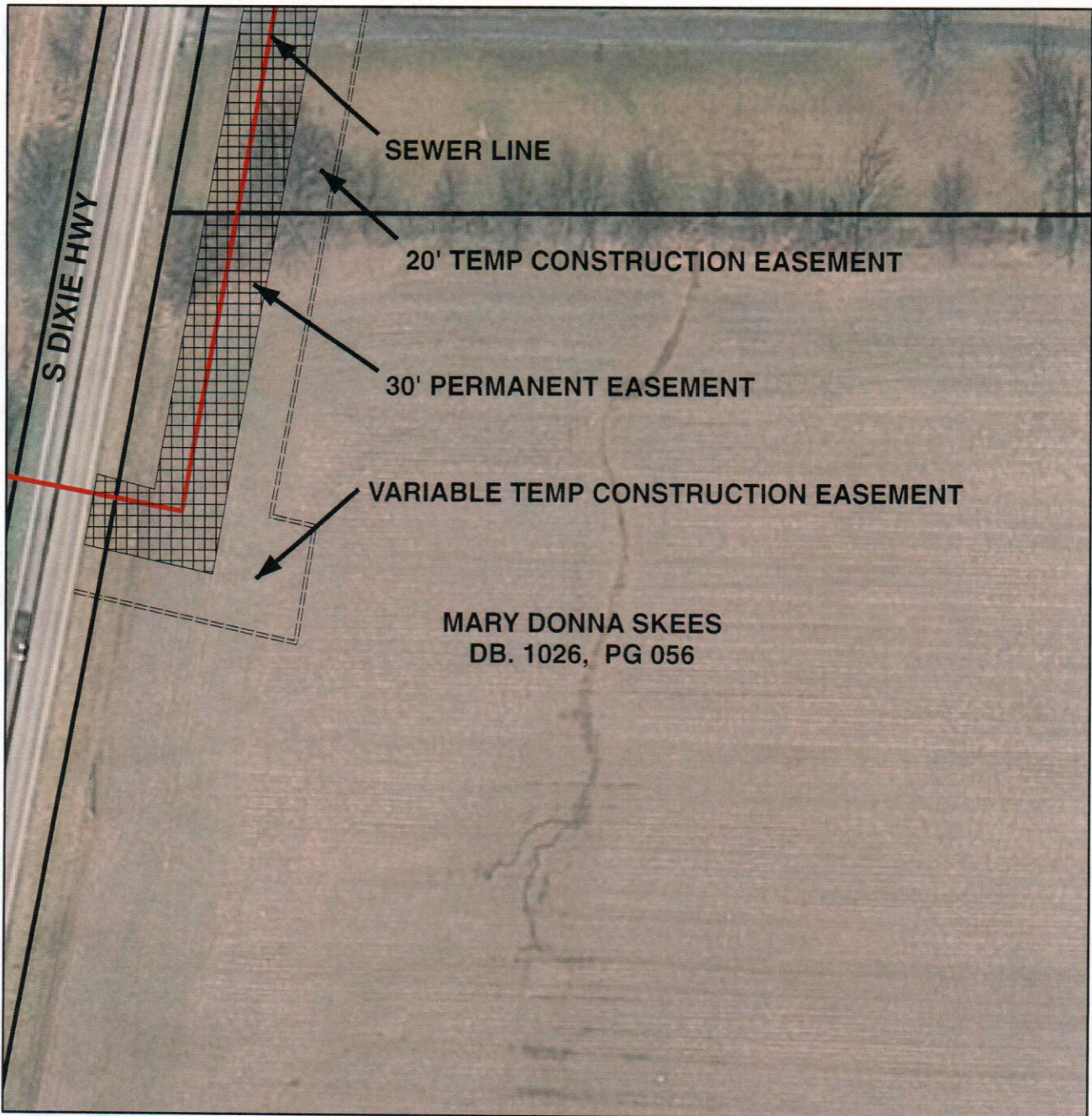
Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:

Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702


COPY OF BID SET



**Exhibit A Easement
Skees, Mary Donna
Parcel # 226-00-00-009**

**The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
8-13-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: DIANE J NALL, dc

send to

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009508480003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 07/22/2014 at 09:13:15 AM
Receipt#: 2014-00009119
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1397** PG **1366-1368**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Jeremy Sparks, and Rosemarie Sparks, husband and wife, 5676 New Glendale Rd Glendale, Kentucky, 42740 (the "Grantors"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "District"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 189-00-00-016.02

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1356, Page 1060, in the Hardin County Clerk's Office.

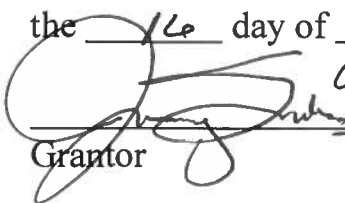
Additional Information: bury man hole on property 2'5'
deep

COPY OF BID SET

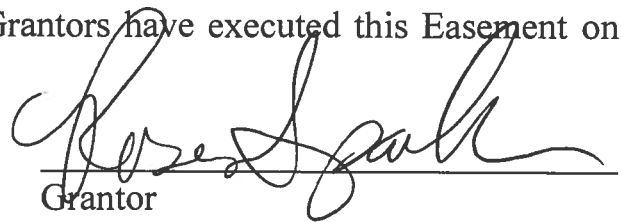
The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 16 day of June, 2014.



Grantor



Grantor


STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 16 day of June, 2014 by Jeremy Sparks and Rosemarie Sparks, husband and wife, Grantors.



NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:


Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

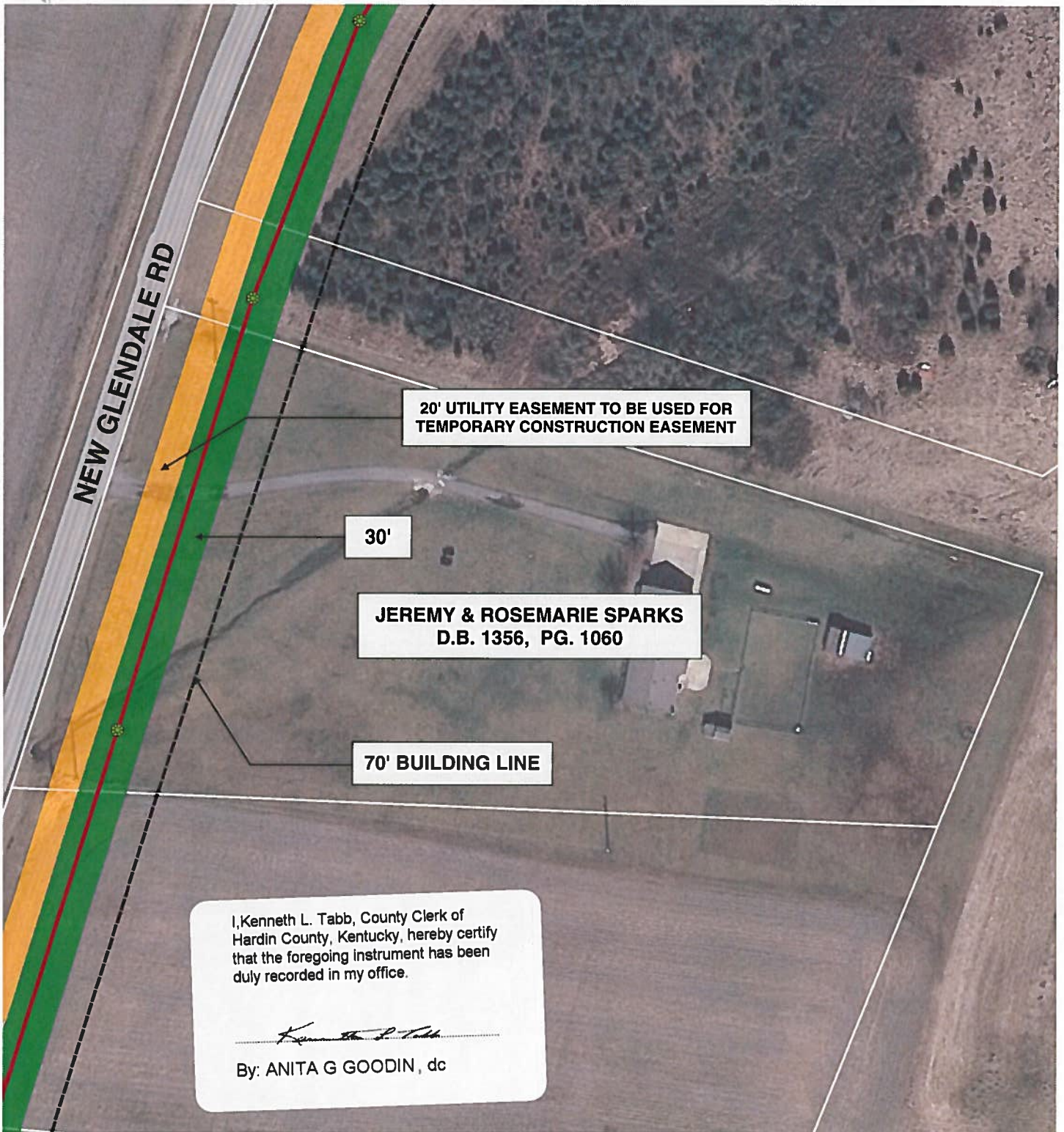


Exhibit "A" Easement | Sparks, Jeremy & Rosemarie | Parcel # 189-00-00-016.02

**Property information was acquired from the Hardin County PVA.
Drawn for illustration purposes only; has not been surveyed.**

6-2-2014

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009234820003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 10/04/2013 at 09:10:28 AM
Receipt#: 2013-00014963
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk

BK **1385** PG **1340-1342**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Patricia Ann Thurman,
8026 S Dixie Hwy Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant
unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown,
Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct,
install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and
remove a wastewater collection, conveyance (force main), lateral, and service line
or lines over, across, and through the land of the Grantors situated in Hardin
County, Kentucky and a temporary construction easement, said easements being
described as follows:

PVA Parcel No. 226-00-00-005

The perpetual easement shall be 30 feet in width across the property of
Grantors as depicted on **Exhibit A**, which is attached hereto and
incorporated herein by reference. The temporary construction easement
shall have the width and location as depicted on **Exhibit A**. The
temporary construction easement shall terminate upon completion of the
construction.

Being a part of the property conveyed to the Grantors by Deed recorded in
Deed Book 855, Page 198, in the Hardin County Clerk's Office.

Additional Information: any man holes on property
will be buried 2.5 ft.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 24th day of Sept., 2013.

Patricia Ann Thurman _____
Grantor Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

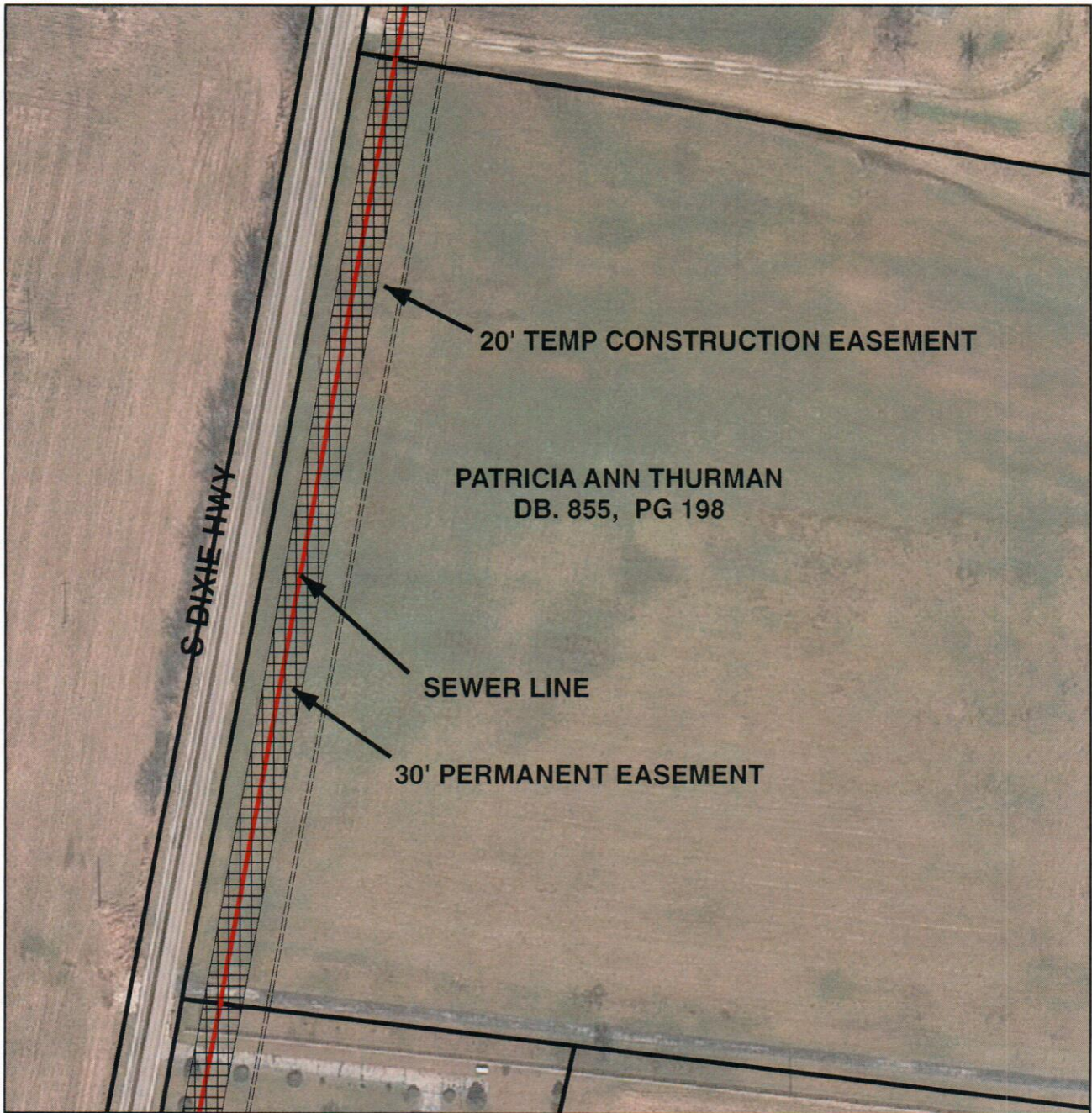
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 24 day of Sept., 2013 by Patricia Ann Thurman, Grantor.

Jeff Gaddie _____
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie _____
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Thurman, Patricia Ann
Parcel # 226-00-00-005
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
8-13-2013**


I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb

By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009156160006 Type: DEE
Kind: EASEMENT - DEED
Recorded: 07/19/2013 at 08:43:16 AM
Receipt#: 2013-00010901
Page 1 of 6
Fees: \$22.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1381** PG **1503-1508**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration The Wade Family Farm Magagment, LLC, Glendale, Kentucky, 42740 (the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 189-00-00-005.01

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 1248, Page 199, in the Hardin County Clerk's Office.

Additional Information: Top soil to be laid aside & put back on subsoil during construction. Any marketable timber 14" at chest high to be laid aside for property owner. Remove all rock after construction

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 15 day of July, 2013.

WADE FAMILY FARM MANAGEMENT LLC
BY Robert C Wade Ella Mae Wade
Grantor Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 15 day of July, 2013 by Wade Family Farm Management LLC and Robert C. & Ella Mae Wade, husband and wife, Grantors.

J. S.

wade

Jeff Saddy
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Saddy
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET

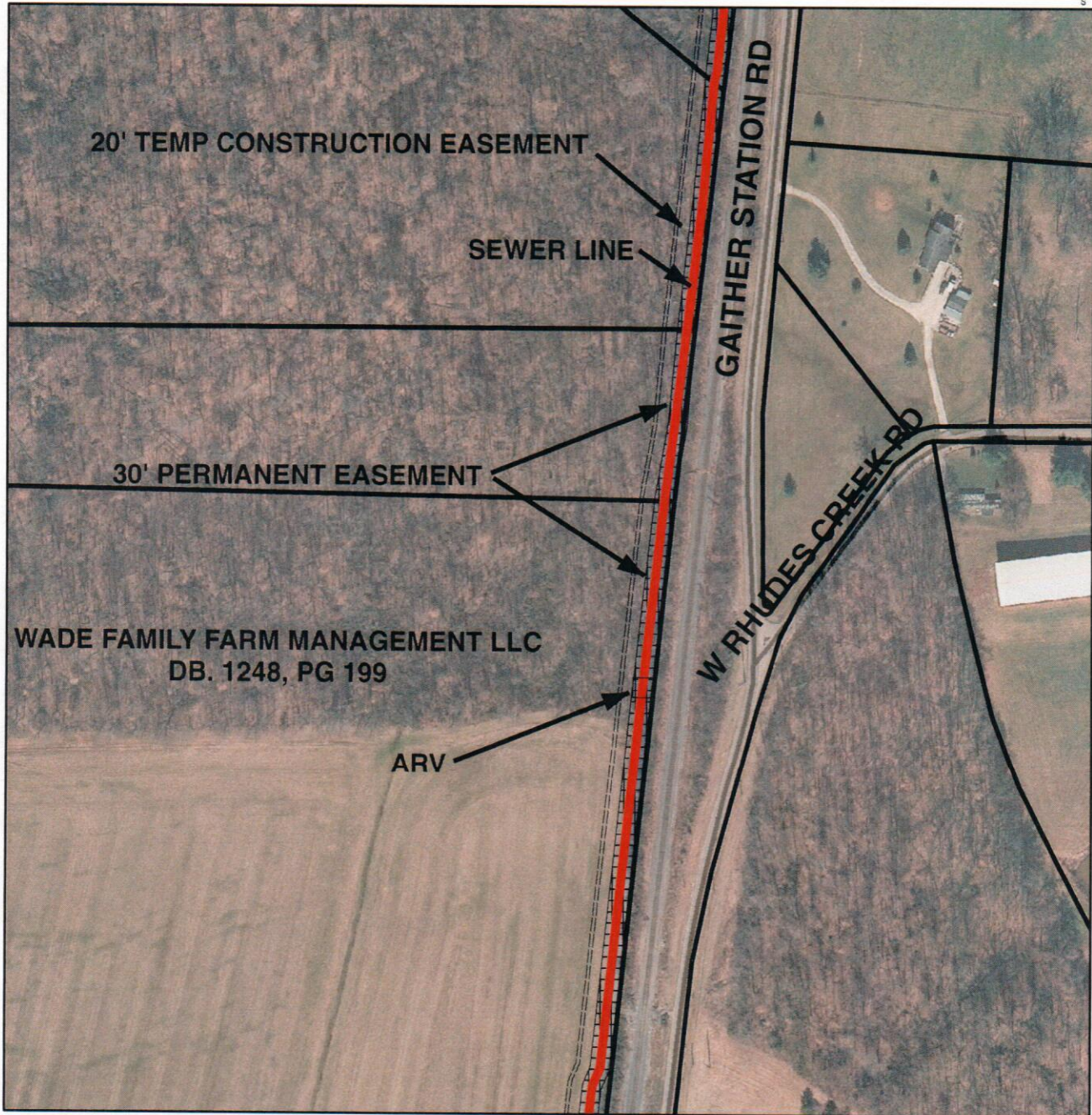


Exhibit A Easement

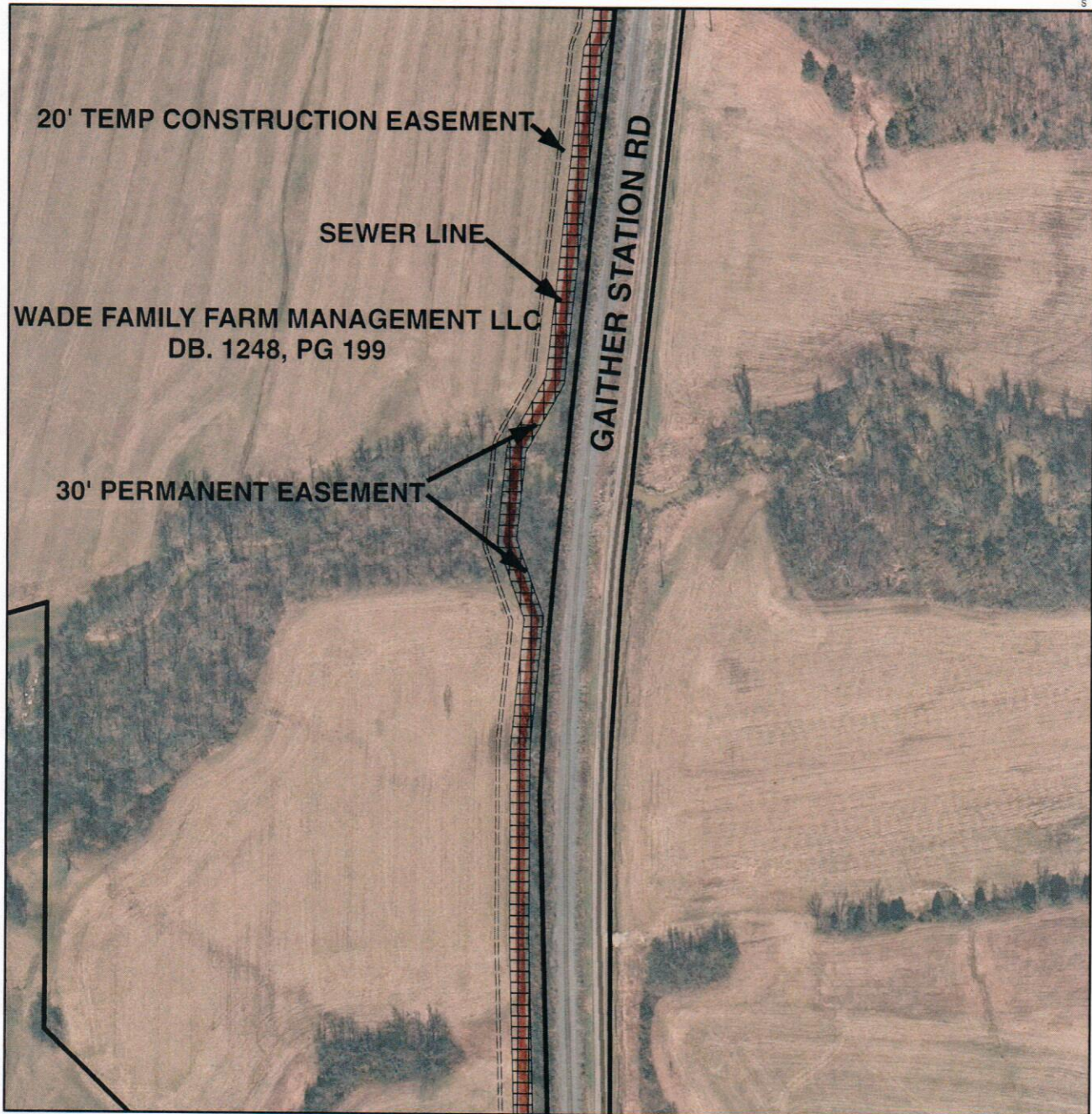
Wade Family Farm Management LLC

Parcel # 189-00-00-005.01

The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.

5-15-2013

COPY OF BID SET



**Exhibit A Easement
Wade Family Farm Management LLC
Parcel # 189-00-00-005.01
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
5-15-2013**

COPY OF BID SET

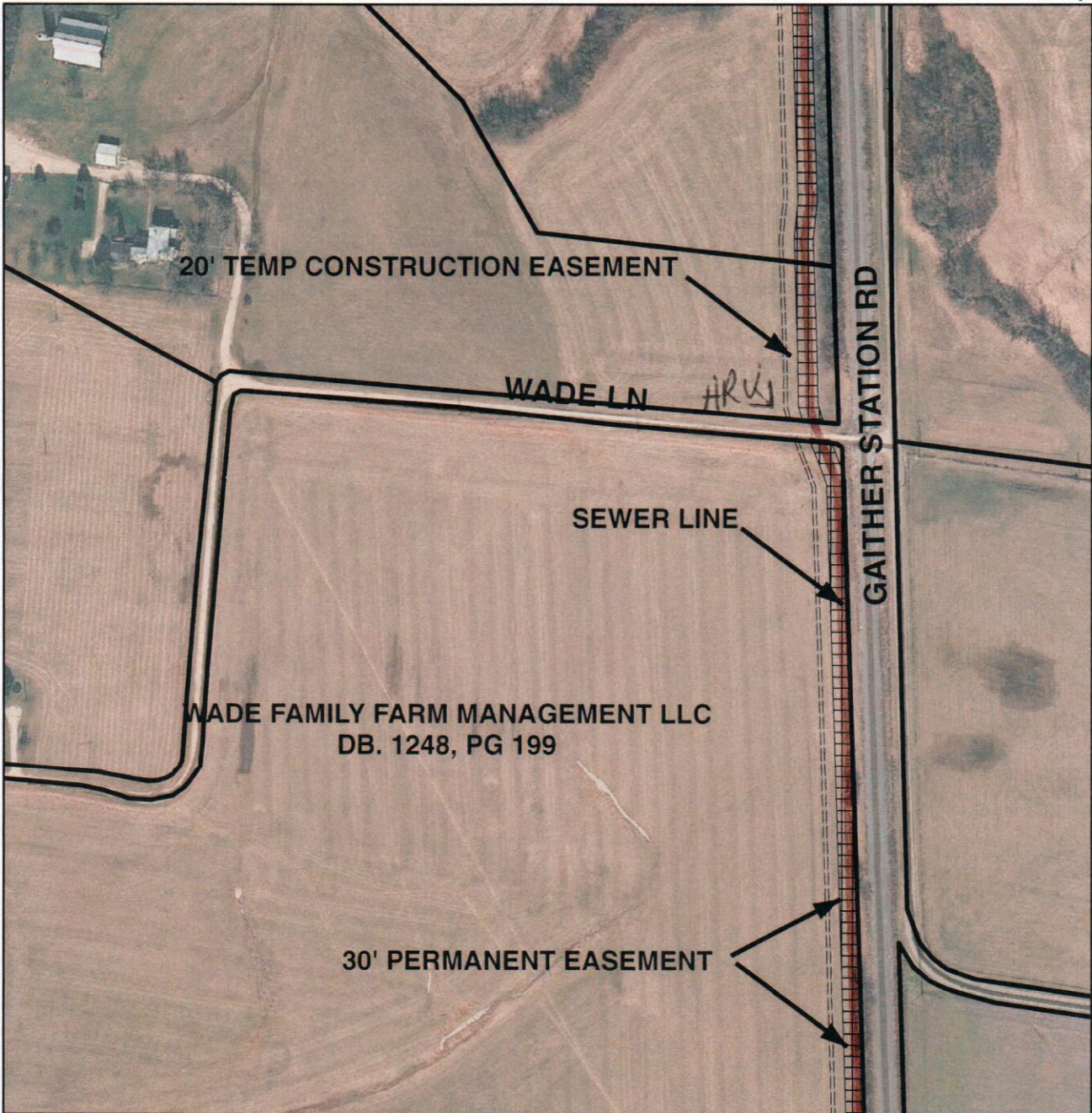


Exhibit A Easement

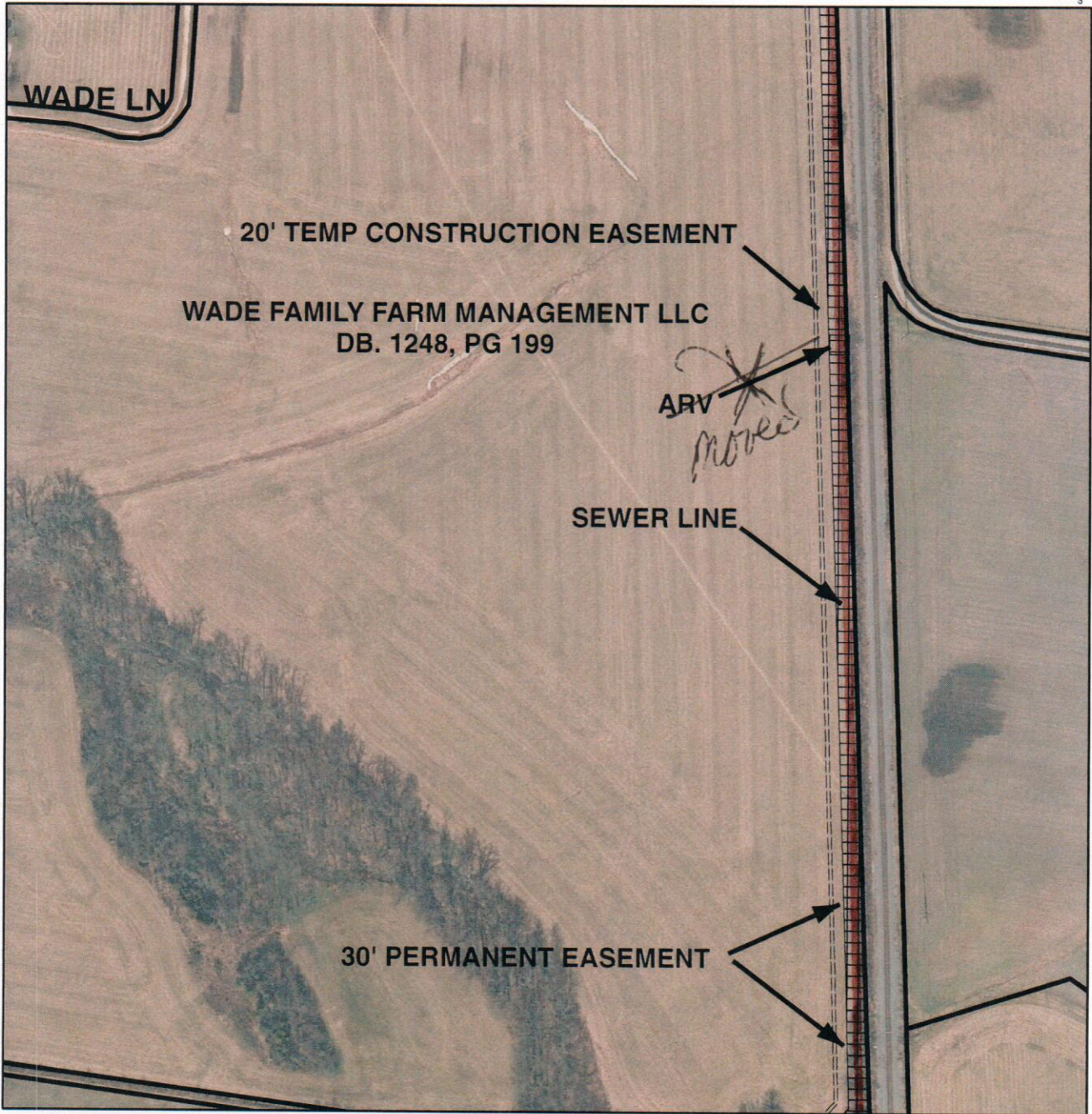
Wade Family Farm Management LLC

Parcel # 189-00-00-005.01

The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.

5-15-2013

COPY OF BID SET



**Exhibit A Easement
Wade Family Farm Management LLC
Parcel # 189-00-00-005.01
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
5-15-2013**

I, Kenneth L. Tabb, County Clerk of Hardin County, Kentucky, hereby certify that the foregoing instrument has been duly recorded in my office.


By: JANET M FIGHTS, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702

Doc ID: 009156150003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 07/19/2013 at 08:42:33 AM
Receipt#: 2013-00010901
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1381** PG **1500-1502**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Robert C Sr.^{Wade},
and Ella Mae Wade, husband and wife, Glendale, Kentucky, 42740^{Q. H.}
(the "**Grantors**"), do hereby grant unto the **Hardin County Water District No. 2**,
P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual
easement with the right to construct, install and lay, and thereafter use, operate,
inspect, repair, maintain, and replace and remove a wastewater collection,
conveyance (force main), lateral, and service line or lines over, across, and through
the land of the Grantors situated in Hardin County, Kentucky and a temporary
construction easement, said easements being described as follows:

PVA Parcel No. 189-00-00-005

The perpetual easement shall be 30 feet in width across the property of
Grantors as depicted on **Exhibit A**, which is attached hereto and
incorporated herein by reference. The temporary construction easement
shall have the width and location as depicted on **Exhibit A**. The
temporary construction easement shall terminate upon completion of the
construction.

Being a part of the property conveyed to the Grantors by Deed recorded in
Deed Book 1248, Page 196, in the Hardin County Clerk's Office.

Additional Information: Top soil to be laid aside & put
back on subsoil during construction. Any marketable
timber 14" at chest high to be laid aside for
property owner. Remove all rock after construction

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 15 day of July, 2013.

Robert C Wade
Grantor

Elle Mae Wade
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

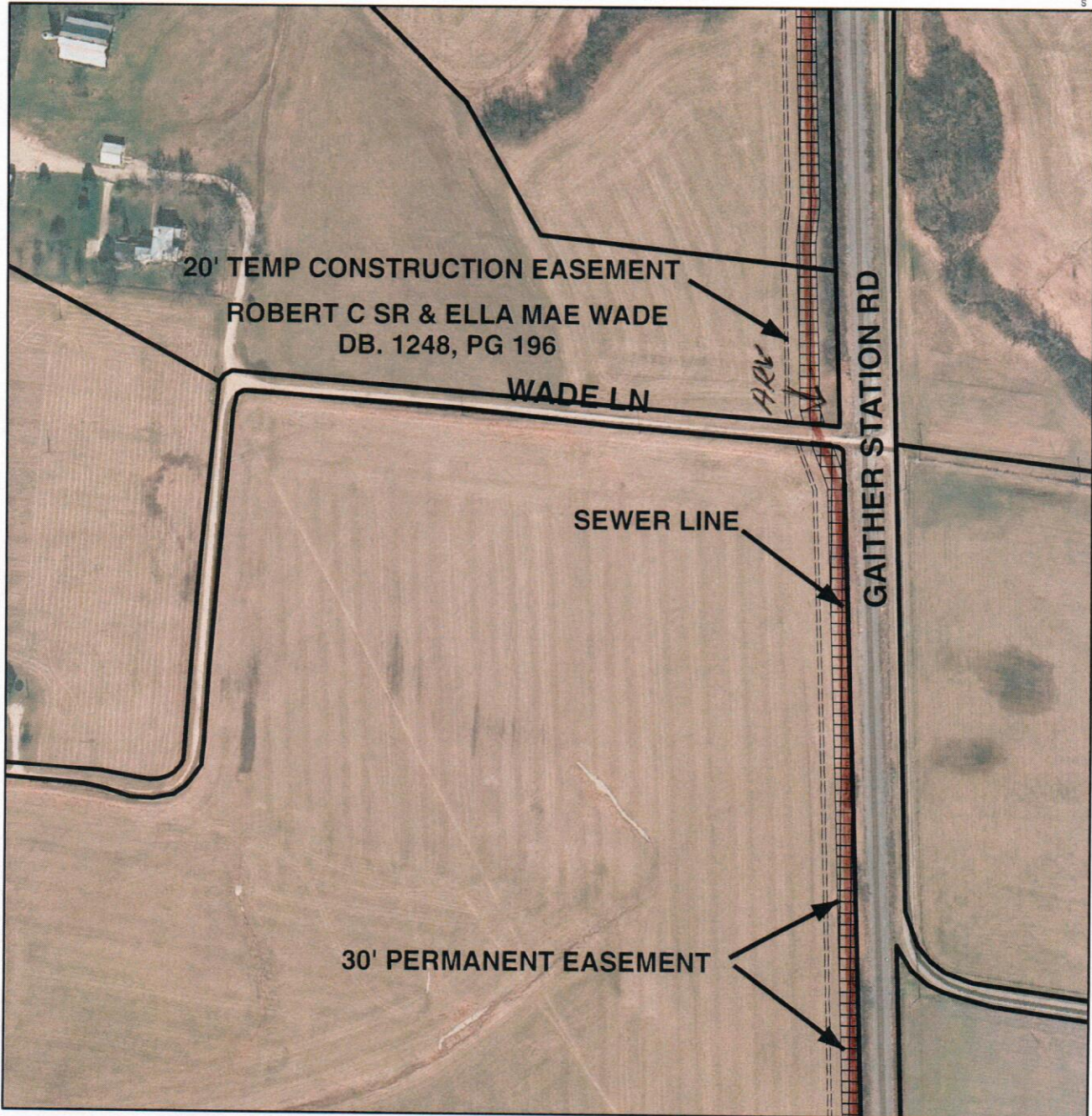
The foregoing Easement was subscribed, sworn to, and acknowledged before me this 15 day of July, 2013 by Robert C. Wade and Elle Mae Wade, husband and wife, Grantors.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:
Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET




**Exhibit A Easement
Wade, Robert C Sr & Ella Mae
Parcel # 189-00-00-005
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
5-15-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.


By: JANET M FIGHTS, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702


Doc ID: 009305790003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 01/22/2014 at 10:14:10 AM
Receipt#: 2014-00000860
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1390** PG **708-710**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration West Point Bank, 436 E Main St Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-30-00-019

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 858, Page 174, in the Hardin County Clerk's Office.

Additional Information: the line shall be ~~to~~ feet no more than
10 feet off of the property line on the west side of
Bank Building

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 16 day of January, 2013.

West Point Bank By Josh Hubbard President _____
Grantor Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 16 day of January, 2013 by West Point Bank, Grantor.

Josh Hubbard president of J.B. of Yoni Arm Prael nka Yoni Arm Cusel
NOTARY PUBLIC, State at Large

My Commission Expires: _____

PREPARED BY:

Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702



COPY OF BID SET

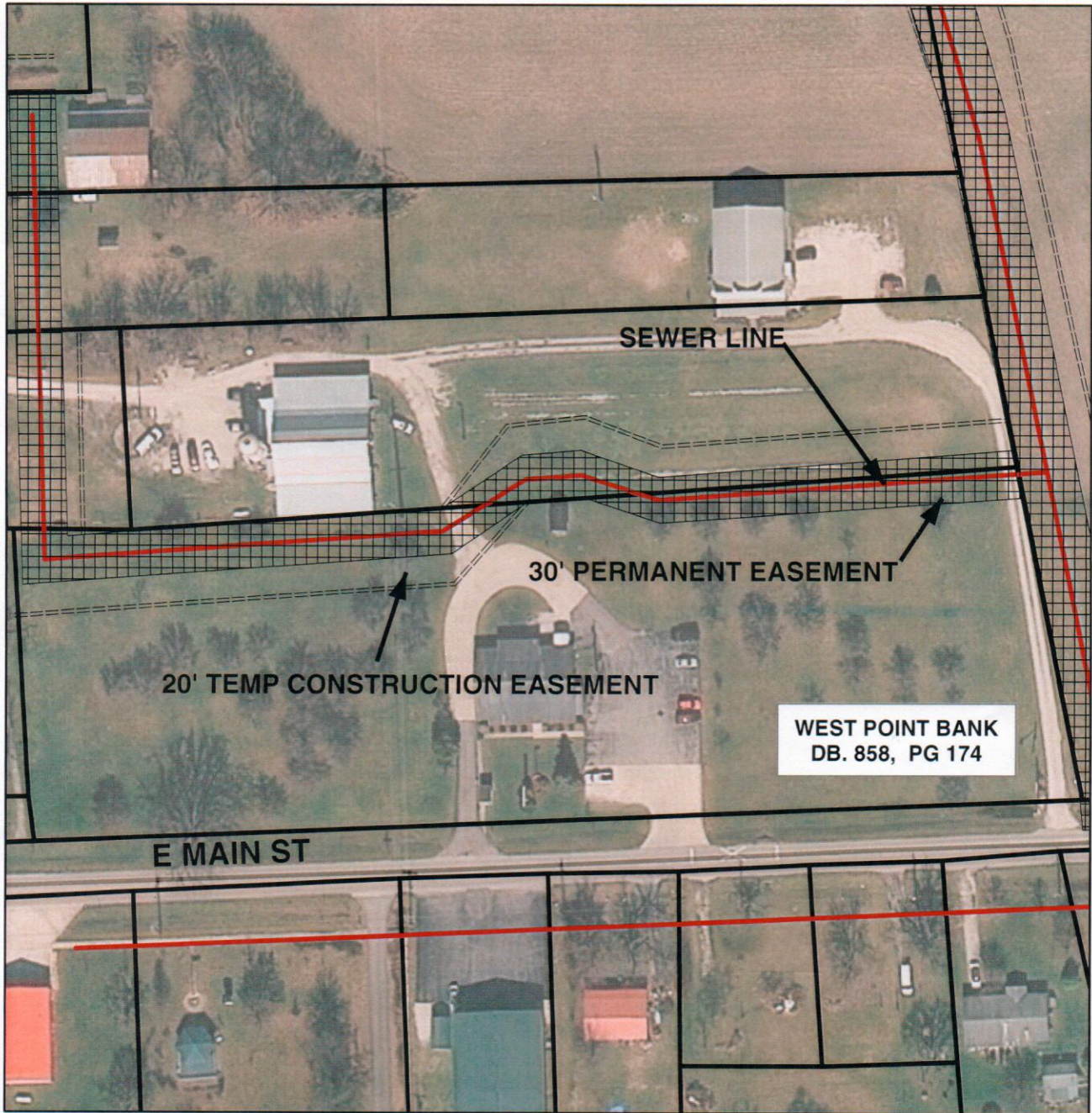


Exhibit A Easement

West Point Bank

Parcel # 190-30-00-019

The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.


12-03-2013

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
P.O. Box 970
Elizabethtown, KY 42702


Doc ID: 009183800003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 08/09/2013 at 09:19:03 AM
Receipt#: 2013-00012064
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1383** PG **39-41**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Tony P York,
201 E Main St Glendale, Kentucky, 42740 (the "**Grantor**"), does hereby grant
unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown,
Kentucky, 42702, (the "**District**"), a perpetual easement with the right to construct,
install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and
remove a wastewater collection, conveyance (force main), lateral, and service line
or lines over, across, and through the land of the Grantors situated in Hardin
County, Kentucky and a temporary construction easement, said easements being
described as follows:

PVA Parcel No. 190-30-00-035

The perpetual easement shall be 30 feet in width across the property of
Grantors as depicted on **Exhibit A**, which is attached hereto and
incorporated herein by reference. The temporary construction easement
shall have the width and location as depicted on **Exhibit A**. The
temporary construction easement shall terminate upon completion of the
construction.

Being a part of the property conveyed to the Grantors by Deed recorded in
Deed Book 1173, 627, in the Hardin County Clerk's Office.

Additional Information: Sewer line to be laid 10' from
edge of road. If contractor has trouble during
construction may move ~~to~~ more than 5' either way.
only if need be.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantor has executed this Easement on the 1 day of Aug, 2013.

Tony P York
Grantor

Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 1 day of Aug, 2013 by Tony P York, Grantor.

Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY: Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET

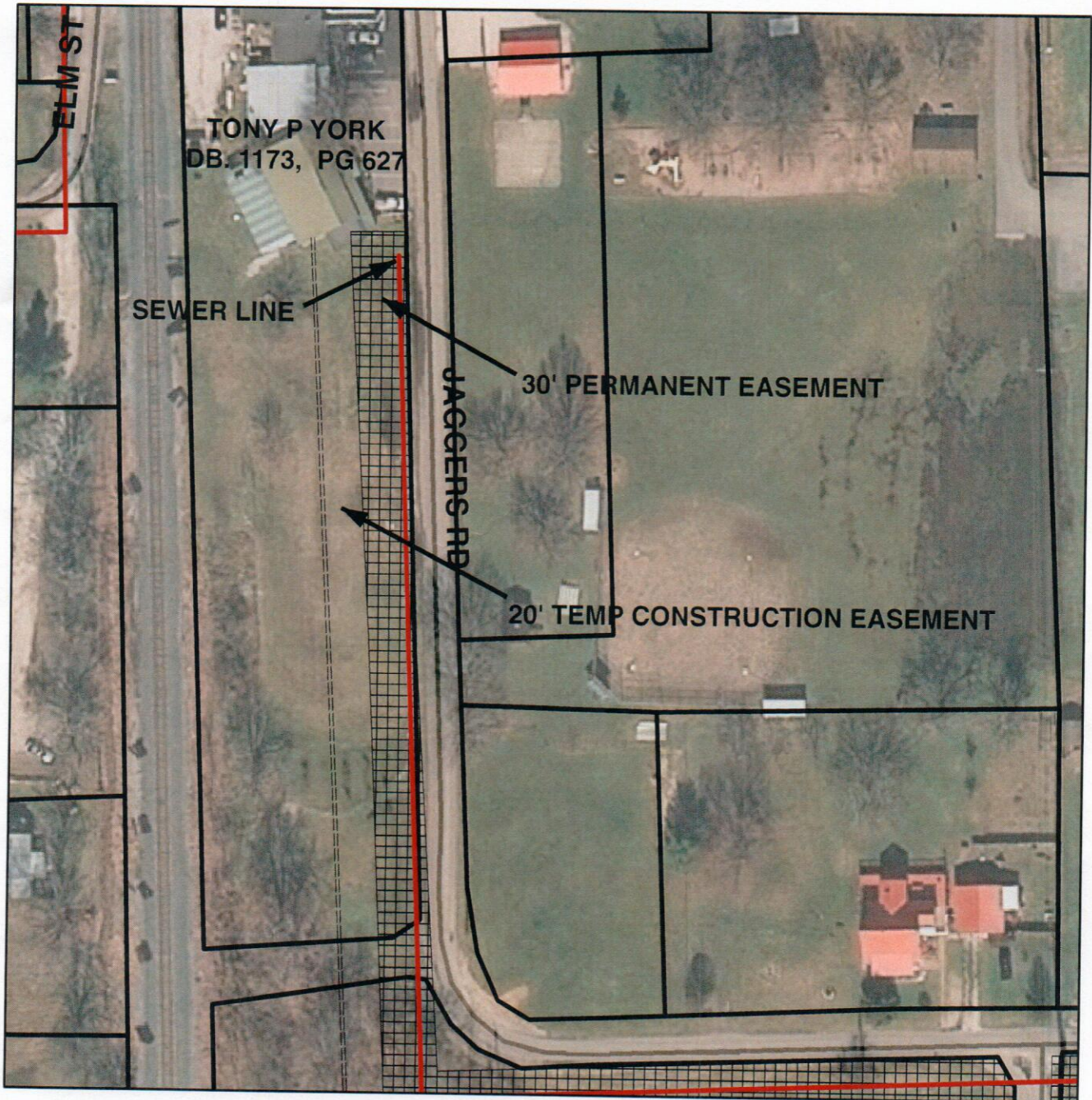


Exhibit A Easement

York, Tony P

Parcel # 190-30-00-035

The Source of Information is from the Hardin County PVA, and is drawn for Illustration Purposes Only, and has not been Surveyed.

7-23-2013

I, Kenneth L. Tabb, County Clerk of Hardin County, Kentucky, hereby certify that the foregoing instrument has been duly recorded in my office.

Kenneth L. Tabb

By: DIANE J NALL, dc

COPY OF BID SET

After recording return to:
Hardin Co. W.D. No. 2
PO Box 970
Elizabethtown, KY 42702



Doc ID: 009183810003 Type: DEE
Kind: EASEMENT - DEED
Recorded: 08/09/2013 at 09:19:34 AM
Receipt#: 2013-00012064
Page 1 of 3
Fees: \$13.00
Hardin County Clerk
Kenneth L. Tabb Clerk
BK **1383** PG **42-44**

UTILITY RIGHT-OF-WAY EASEMENT

That for a good and valuable consideration Russell L Young, and Marilyn J Young, husband and wife, 459 E Main St Glendale, Kentucky, 42740 (the "Grantors"), do hereby grant unto the **Hardin County Water District No. 2**, P.O. Box 970, Elizabethtown, Kentucky, 42702, (the "District"), a perpetual easement with the right to construct, install and lay, and thereafter use, operate, inspect, repair, maintain, and replace and remove a wastewater collection, conveyance (force main), lateral, and service line or lines over, across, and through the land of the Grantors situated in Hardin County, Kentucky and a temporary construction easement, said easements being described as follows:

PVA Parcel No. 190-30-00-026

The perpetual easement shall be 30 feet in width across the property of Grantors as depicted on **Exhibit A**, which is attached hereto and incorporated herein by reference. The temporary construction easement shall have the width and location as depicted on **Exhibit A**. The temporary construction easement shall terminate upon completion of the construction.

Being a part of the property conveyed to the Grantors by Deed recorded in Deed Book 765, Page 421, in the Hardin County Clerk's Office.

Additional Information:

*Construction cost of laying
the sewer line will not cost Mr. & Mrs. Young
any money during or after done.*

J.R.

COPY OF BID SET

The District shall repair any and all roads, driveways, sidewalks, fences, etc. damaged during the installation of the wastewater line or lines and shall restore the land to its original condition, as nearly as practical.

This easement shall constitute a covenant running with the land for the benefit of the District and its successors and assigns.

IN WITNESS WHEREOF, the Grantors have executed this Easement on the 30 day of July, 2013.

Russell L. Young
Grantor

Marilyn J. Young
Grantor

STATE OF KENTUCKY
COUNTY OF HARDIN

The foregoing Easement was subscribed, sworn to, and acknowledged before me this 30 day of July, 2013 by Russell L Young and Marilyn J Young, husband and wife, Grantors.

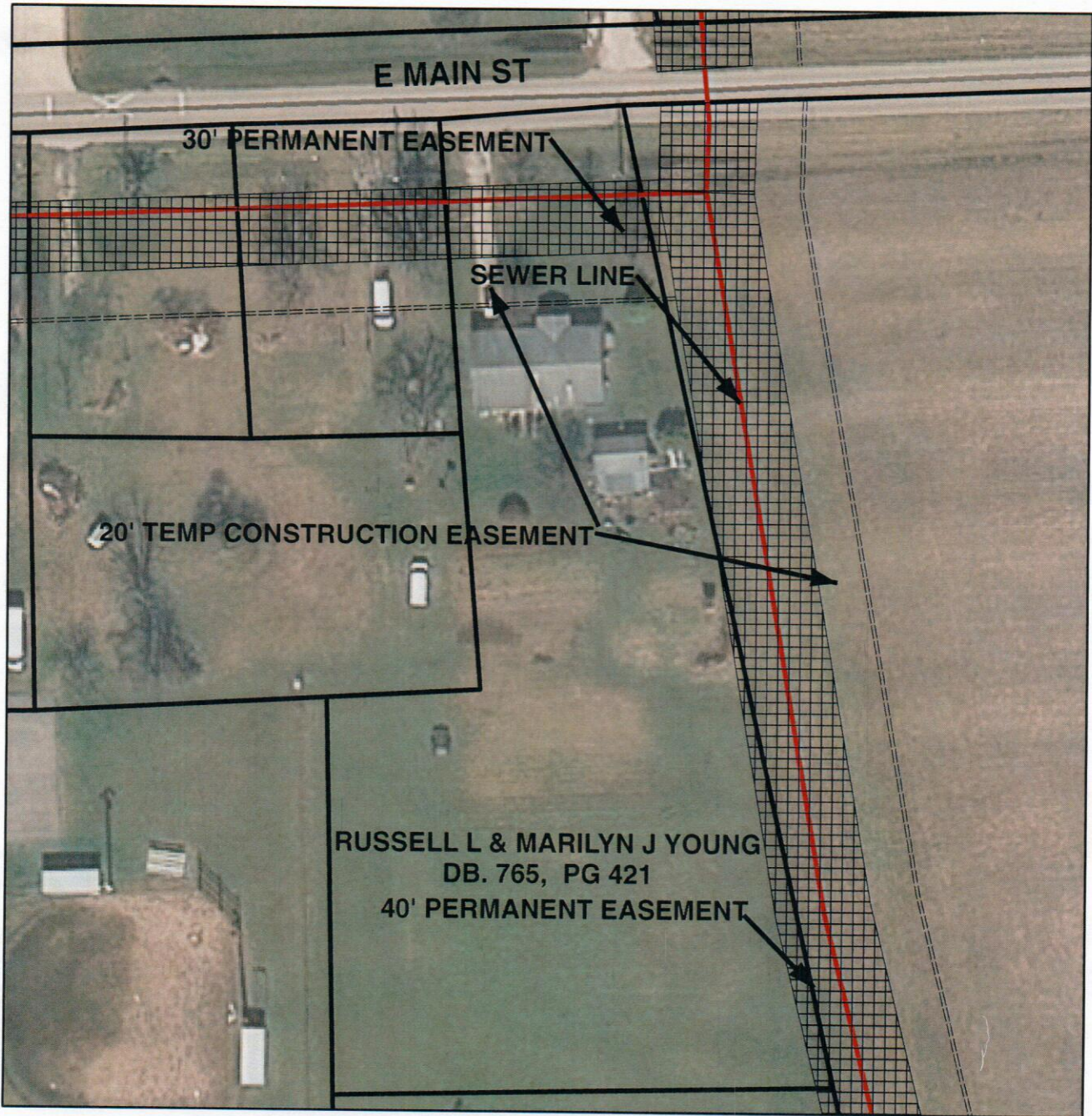
Jeff Gaddie
NOTARY PUBLIC, State at Large

My Commission Expires: Jan 19th 2016

PREPARED BY:

Jeff Gaddie
Hardin County Water District No. 2
PO Box 970
Elizabethtown, KY 42702

COPY OF BID SET



**Exhibit A Easement
Young, Russell L & Marilyn J
Parcel # 190-30-00-026
The Source of Information is
from the Hardin County PVA,
and is drawn for Illustration Purposes Only,
and has not been Surveyed.
7-18-2013**

I, Kenneth L. Tabb, County Clerk of
Hardin County, Kentucky, hereby certify
that the foregoing instrument has been
duly recorded in my office.

Kenneth L. Tabb
By: DIANE J NALL, dc

COPY OF BID SET

SECTION 02110

SITE CLEARING AND STRIPPING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Removal of surface debris.
 - 2. Removal of paving, curbs, and sidewalks.
 - 3. Removal of trees, shrubs, and other plant life.
 - 4. Strip and stockpile topsoil.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

3.01 PREPARATION

- A. CONTRACTOR shall identify existing plant life to remain and shall tag accordingly.

3.02 PROTECTION

- A. CONTRACTOR shall protect from damage utilities and structures that are to remain.
- B. CONTRACTOR shall protect trees, plant growth, and features designated to remain as final landscaping.
- C. See Division 1 for protection of survey monumentation.

3.03 CLEARING AND GRUBBING

- A. Clearing and grubbing shall consist of cutting and disposing of trees, brush, windfalls, logs, and other vegetation and the removing and disposing of roots, stumps, stubs, grubs, logs, and other timber from within the clearing limits as defined on the drawings designated to be removed on the drawings or in the specifications or fall within the excavation, embankment, or improved areas of the site.
- B. All roots and stumps shall be removed to a depth of not less than 12 inches below the original ground surface in embankment areas. In cut areas, such material shall be removed to a depth of not less than 12 inches below the subgrade.

COPY OF BID SET

3.04 REMOVALS

- A. CONTRACTOR shall remove from the site all trees, brush, and other vegetation, debris, and rocks which fall within the excavation and grading limits, as well as any paving, curb and gutter, and sidewalks shown on the drawings to be removed.
- B. CONTRACTOR to note that all trees within the construction sites and permanent easements that met the definition of Indiana Bat Habitat have already been cleared by separate contract in spring of 2016. Except for specific easements, any remaining incidental tree clearing, within an easement, can take place at any time of the year and without restriction. Refer to Special Easement Conditions before removing any tree within an easement.

3.05 STRIPPING

- A. Excavate topsoil from areas to be built upon, cut or filled, or to have surface improvements, including roadways and walks.
- B. Stockpile topsoil on-site and protect from erosion.
- C. Excess topsoil, if any, shall be removed from the site and disposed of at CONTRACTOR's expense.

END OF SECTION

COPY OF BID SET

SECTION 02140

DEWATERING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Removal of groundwater to allow below grade construction.
 - 2. Site grading to prevent surface water from entering the excavation.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.
- C. Payment:
 - 1. The expense for making all extra excavations necessary to prevent water from interfering with the proper construction of the work and for forming all dams or diversions, digging of sumps or pump wells, bailing, and installation and pumping of wells shall be borne by CONTRACTOR.
 - 2. The cost for removal of groundwater and surface water shall be included in the prices bid for the work. No separate payment will be made for dewatering whether accomplished by use of sumps and pumps, well point systems, deep wells, or any other method.

1.02 REFERENCES

- A. See Division 1, Regulatory Requirements, for permit requirements and water, erosion, and sediment control.

1.03 SYSTEM REQUIREMENTS

- A. CONTRACTOR shall, at its own expense, keep the excavation clear of water while structures, mains, and appurtenances are being built, utilities are being installed, and fill and backfill are being compacted. Under no conditions shall the work be laid in or under water. Unless otherwise approved, no water shall flow over the work until the joints are complete or the concrete has set.
- B. Dewatering shall be sufficient to lower the piezometric level to at least 2 feet below the bottom of the excavation. Additional lowering shall be provided as necessary to create a stable subgrade.
- C. In areas where rock is encountered, the water level shall be kept at or below top of rock but at least 6 inches below bottom of concrete. Additional rock shall be removed as needed to provide clearances.
- D. The control of groundwater shall be such that softening or heaving of the bottom of excavations or formation of “quick” conditions or “boils” shall be prevented.
- E. Dewatering systems shall be designed and operated so as to prevent the migration or removal of soils.

COPY OF BID SET

1.04 QUALITY ASSURANCE

- A. All dewatering shall be done in accordance with applicable federal, state, and local code requirements.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

3.01 DEWATERING

- A. Dewatering shall be started, and the water level shall be lowered as specified herein prior to beginning excavation and shall be continued until structure, main, or appurtenance has been completed and fill has been placed and compacted to final grade.
- B. CONTRACTOR shall provide at least two groundwater observation wells near each area to be excavated to aid CONTRACTOR in determining whether the minimum specified requirements have been met prior to excavation. The observation well shall be a minimum 2-inch-diameter slotted PVC pipe. The observation well shall be installed and backfilled in such a way as to allow an accurate determination of actual groundwater levels. The observation well shall be properly abandoned after use unless specified otherwise.
- C. CONTRACTOR shall provide all necessary materials and equipment to keep the excavation free from water during construction. CONTRACTOR shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outages and shall have available at all times competent workers for the operation of the pumping equipment. The dewatering systems shall not be shut down between shifts, on holidays or weekends, or during the work stoppages.
- D. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted fill or backfill, and prevent floatation or movement of all structures and pipelines.

3.02 PROTECTION

- A. CONTRACTOR shall take all necessary precautions during the dewatering operation to protect adjacent structures against subsidence, flooding, or other damage. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property. Any such facilities and structures damaged shall be repaired or replaced to the satisfaction of their owner.
- B. Prior to dewatering, CONTRACTOR shall take into account the effect of its proposed dewatering operation on existing private water supply systems and shall make arrangements with property owners for protecting their supplies or providing alternative means of supply.

COPY OF BID SET

- C. In the event that CONTRACTOR's dewatering operation adversely affects private water supply systems, CONTRACTOR shall provide property owners with alternative potable and nonpotable supplies until dewatering operations are ceased and groundwater levels return to normal. If the water in private water supply wells is contaminated through no fault of CONTRACTOR after restoration of original groundwater levels, OWNER will provide measures to restore water potability. CONTRACTOR is responsible for restoration of the water supply, not its potability after restoration.

- D. In areas where continuous operation of dewatering pumps is required, CONTRACTOR shall avoid noise disturbance to nearby residences and businesses to the greatest extent possible by using electric-driven pumps, intake and exhaust silencers, or housing to minimize noise from engine-driven generators or engine-driven pumps.

END OF SECTION

COPY OF BID SET

SECTION 02222

EXCAVATION, FILL, BACKFILL, AND GRADING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Excavating, filling, backfilling, and grading for this work includes, but is not necessarily limited to:
1. Excavating for footings, foundations, roads, and utilities.
 2. Placing and compacting all fill and backfill.
 3. Placement of granular mat vapor barrier and granular cushion below interior slabs on grade.
 4. Placement of crushed stone mat below tank slabs and manhole/vault slabs or other structures where required.
 5. Rough and finish grading prior to paving, seeding, etc.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.
- C. Allowances:
1. CONTRACTOR for Contract 1-2017 shall INCLUDE in the Bid the cost of replacing 200 cubic yards of unsuitable foundation material for structures and roads as defined in this section. The unit price shall include the cost of dewatering and slope stabilization and other incidental items associated with this work. Payment to CONTRACTOR for unsuitable foundation material for structures and roads will be adjusted, add or deduct, based upon the actual unsuitable material excavated (more or less than 200 cubic yards) and the Unit Price for replacing unsuitable foundation material. Volume shall be as measured in the ground. Extra payment will not be made for specified undercutting and filling or gravel bedding material required for placing concrete above water level as required under the concrete specifications. The Bid shall include any removal and replacement of excavated material so indicated on the drawings or specified herein.
 2. CONTRACTOR for Contract 1-2017 shall INCLUDE in the Bid the cost of replacing 200 cubic yards of unsuitable foundation material for utility trenches as defined in this section. The unit price shall include the cost of dewatering and slope stabilization and other incidental items associated with this work. Payment to CONTRACTOR for unsuitable foundation material for utility trenches will be adjusted, add or deduct, based upon the actual unsuitable material excavated (more or less than 200 cubic yards) and the Unit Price for replacing unsuitable foundation material. Volume shall be as measured in the ground. Extra payment will not be made for specified undercutting, filling, or bedding. The Bid shall include any removal and replacement of excavated material so indicated on the drawings or specified herein.
 3. Lump Sum Bid for Contract 1-2017 shall INCLUDE an Allowance of \$15,000 for Project Soils Engineer. CONTRACTOR will be compensated for the actual cost of the Project Soils Engineer by Change Order.
 4. Unit Price Bids in Contracts 2-2017, 3-2017, and 4-2017 include quantities of unsuitable foundation material on the Bid form. CONTRACTOR will be compensated for the actual quantity encountered at the unit price offered in Bid.

COPY OF BID SET

5. Unit Price Bids in Contracts 2-2017, 3-2017, and 4-2017 include a value for Project Soils Engineer on the Bid form. CONTRACTOR will be compensated for the actual cost of the Project Soils Engineer by Change Order.

D. Payment:

1. General excavation shall include all excavation specified, undercutting, fill, backfill, and grading, including rock excavation but not including unsuitable foundation material as hereinafter described.
2. All general excavation shall be included in the Lump Sum or Unit Price Bid. Changes which require additions to or deductions from the excavation will be adjusted on the basis of the unit price for changes contained in the Contract.

1.02 REFERENCES

- A. ASTM C33—Standard Specification for Concrete Aggregates.
- B. ASTM D698—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- C. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Kentucky, Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction, current edition, including all issued supplemental specifications. Unless specifically stated otherwise, the Measurement and Payment sections of the Standard Specifications shall not apply. Measurement and payment will be made in accordance with terms of the Contract Documents.

1.03 SUBMITTALS

- A. CONTRACTOR shall submit samples of materials proposed for use as fill to soils testing laboratory for analysis of their suitability and for recommendations on moisture content during compaction, compaction methods, or other appropriate information.
- B. CONTRACTOR shall submit sufficient samples of each different type or classification of soil to obtain representative values.

1.04 JOB CONDITIONS

- A. The elevations shown for existing work and ground are reasonably correct, but are not guaranteed to be absolutely accurate. No extras will be allowed because of variations between drawings and actual grades.
- B. Soil borings were made and the soils information is included in an Appendix to these Specifications. The information contained is not guaranteed to be indicative of conditions to be encountered during construction. It is CONTRACTOR's responsibility to make its own investigations to determine physical conditions at the site, which may affect the work.

COPY OF BID SET

PART 2—PRODUCTS

2.01 COMPACTED FILL

- A. This class of compaction shall apply to all fill and backfill areas under foundations and pavement.
- B. Granular backfill shall contain no stones larger than 4 inches and shall be reasonably well graded throughout the particle size range. Backfill against structures and adjacent to a rock face shall be compacted 1-inch clear crushed stone and shall meet all requirements for No. 57 stone of Section 805 of Standard Specifications.
- C. Cohesive materials (CL) with a plasticity index ≤ 20 and a Standard Proctor maximum dry density of at least 95 pcf may be used as compacted fill unless otherwise noted and as approved by the Project Soils Engineer. Cohesive materials used as compacted fill shall be approved material, free of environmental contamination, vegetation, topsoil, organic material, wet soil, construction debris, and rock fragments greater than 6 inches in diameter.
- D. Native on-site material may be used as compacted fill if it meets the above specifications.

2.02 CRUSHED STONE MAT

- A. Crushed stone mat below foundation slabs and footings shall be 1-inch clear crushed stone and shall meet all requirements for No. 57 of Section 805 of Standard Specifications.

2.03 GRANULAR CUSHION

- A. Granular cushion beneath floor slabs-on-grade shall meet requirements for 3/4-inch dense-graded aggregate of Section 805 of Standard Specifications.

2.04 EMBANKMENT FILL

- A. Embankment fill shall contain no stumps, brush, rubbish, or other perishable material. The top 12 inches of the earth embankment shall be earthy material free from large stones.

2.05 CONCRETE FILL

- A. Concrete fill shall be Class X concrete as defined in Section 03300—Cast-In-Place Concrete, or flowable fill as defined in this section.

2.06 CLAY FILL

- A. Clay fill shall contain at least 25% clay minerals (material finer than 0.002 mm).

2.07 FLOWABLE FILL

- A. Flowable fill shall be a self-compacting, self-leveling, material consisting of a mixture of fine aggregate and filler (as needed), water, and cementitious materials (Portland cement, fly ash, granulated blast furnace slag) that is in a flowable state at the time of placement meeting the requirements of the National Ready Mixed Concrete Association Guide Specification for Controlled Low Strength Materials (CLSM). The flowable fill shall be proportioned by the ready-mixed concrete supplier on the basis of field experience and/or laboratory trial

COPY OF BID SET

mixtures to produce a cohesive and nonsegregating mixture which has the following properties:

1. Minimum compressive strength: 50 psi.
2. Maximum compressive strength: 150 psi.

B. CONTRACTOR shall submit the following information well in advance of fill placement to avoid any delay in construction:

1. Gradation of fine aggregate.
2. Design mix.
3. Previous test results with 7- and 28-day compressive strengths.
4. Certified mill test results for cement identifying brand, type, and chemistry of cement to be used.
5. Brand, type, principle ingredient, and amount of each admixture if used.

PART 3-EXECUTION

3.01 GENERAL

A. Prior to all excavating, CONTRACTOR shall become thoroughly familiar with the site and site conditions.

3.02 PROTECTION

A. CONTRACTOR shall provide all necessary sheeting, shoring, or other soil retention systems including all labor, material, equipment, and tools required, or as necessary to maintain the excavation in a condition to provide safe working conditions, to permit the safe and efficient installation of all items of Contract work, and to protect adjacent property. CONTRACTOR shall be held liable for any damage which may result to property from excavation or construction operations. Sheeting, shoring, and other soil retainage systems shall be withdrawn or removed in a manner so as to prevent subsequent settlement of structures, utilities, and other improvements.

B. Design of sheet piling and other soil retaining systems shall be the sole responsibility of CONTRACTOR. Where such systems are shown on the drawings, no parameters such as embedment depth, section profile, presence or lack of walers, etc., or system type or suitability shall be inferred. CONTRACTOR is responsible for designing and providing a fully functional system compatible with construction and site requirements.

C. Nothing in this specification shall be deemed to allow the use of protective systems less effective than those required by the Occupational Safety and Health Administration (OSHA) and other applicable code requirements.

3.03 UTILITIES

A. Before starting excavations, CONTRACTOR shall locate existing underground utilities in all areas of the work.

B. If utilities are to remain in place, CONTRACTOR shall provide adequate means of protection during earthwork operations.

COPY OF BID SET

- C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for directions.
- D. Cooperate with OWNER and utility companies in keeping respective services and facilities in operation and repair any damaged utilities to satisfaction of utility owner.
- E. CONTRACTOR shall not interrupt existing utilities serving facilities occupied and used by OWNER or others, except when permitted in writing by OWNER.
- F. CONTRACTOR shall demolish and completely remove from the site existing underground utilities indicated to be removed after utility has been capped and sealed.
- G. CONTRACTOR shall accurately locate and record abandoned and active utility lines rerouted or extended on project record drawings.

3.04 FINISH ELEVATIONS AND LINES

- A. CONTRACTOR is responsible for setting and establishing finish elevations and lines.

3.05 EXCAVATION

- A. After the site has been cleared and stripped, the site shall be cut and filled to the indicated subgrade as shown or specified.
- B. All excavated material that does not meet the specification for compacted fill or embankment fill or meets the specification but is not required for backfill or fill shall be classified as excess material and shall be removed from the site and disposed of at CONTRACTOR's expense.
- C. All material other than suitable bearing soil or bedrock, as determined by the Project Soils Engineer, shall be removed from under concrete to be poured on ground.
- D. Excavation for all footings, foundation walls, pits, etc. shall be large enough to provide adequate clearance for the proper execution for the work within them.
- E. Excavations scheduled to extend below groundwater shall not be started until the area has been dewatered. See Section 02140–Dewatering.
- F. No footings or slabs shall bear on the top 2 feet of existing soil. Where planned subgrade is within 2 feet of existing grade, remove soils to 2 feet below existing grade and backfill with compacted fill up to subgrade elevation.
- G. When excavations reach subgrade elevations as shown on the drawings, or as specified herein, the Project Soils Engineer will observe the bottom material. Where, in the opinion of the Project Soils Engineer, unsuitable foundation material is found at the level of the subgrade, original material below the excavation necessary for construction according to grades shown or specified shall be removed and replaced with material and placing methods as specified under compacted fill and backfill.
- H. Excavations that are undercut beneath the foundation shall extend beyond the perimeter of the foundation one foot plus a distance at least equal to the depth of undercut below footing grade.

COPY OF BID SET

I. CONTRACTOR shall backfill and compact all overexcavated areas.

3.06 PREPARATION OF SUBGRADE

- A. After the site has been cleared, stripped, and excavated to subgrade, the subgrade shall be proofrolled with a heavy rubber-tired construction vehicle (such as a fully loaded tandem-axle dump truck) in the presence of the Project Soils Engineer. Thoroughly compact, scarify, or moisture condition the subgrade as recommended by the Project Soils Engineer.
- B. Remove all ruts, hummocks, and other uneven surfaces by surface grading prior to placement of fill.
- C. All slab-on-grade and road subgrades shall be proofrolled with a heavy rubber-tired construction vehicle (such as a fully loaded tandem-axle dump truck) in the presence of the Project Soils Engineer.

3.07 COMPACTED FILL AND BACKFILL

- A. All fill and backfill, except as otherwise specified, shall be compacted fill placed to within 4 inches of the bottom of the topsoil or to the bottom of the structure or other improvement.
- B. Unless otherwise noted, structures with a top slab shall not be backfilled until the slab is in place and has reached its specified 28-day strength.
- C. In fill areas above existing grade around structures, compacted fill shall be placed within a minimum of 10 feet from the structure.
- D. No fill shall be placed under water or over unsuitable subgrade conditions.
- E. All fill and backfill except embankment fill and clay fill shall be compacted as follows:
 - 1. Class 1 Compaction: This class of compaction shall apply to all fill areas under buildings, structures, piping, and backfill within 10 feet of existing or new structure walls. Material for backfill shall be granular or cohesive materials as specified above, except all backfill against structures and adjacent to a rock face shall be granular material as specified above. All compacted material shall be placed in uniform layers not exceeding 8 inches in loose thickness prior to compaction. Each layer shall be uniformly compacted to a dry density at least 98% of the maximum dry density as determined by a laboratory compaction test at the optimum moisture content to 2% wet of optimum (ASTM Test Designation D698). Compaction shall be obtained by compaction equipment appropriate for the conditions.
 - 2. Class 2 Compaction: This class of compaction shall apply to all fill areas under bituminous or gravel roadway, bituminous or gravel parking areas, and curb and gutter. Material for backfill shall be granular or cohesive materials as specified above. All material shall be placed in uniform layers not exceeding 8 inches in loose thickness prior to compaction. Each layer of the fill shall be compacted to at least 95% of the maximum dry density at a moisture content from optimum to 2% wet of optimum (testing same as Class 1). Compaction shall be obtained by compaction equipment appropriate for the conditions.
 - 3. Class 3 Compaction: This class of compaction shall be used in excavated areas beyond 10 feet of existing or new structures without any piping or adjacent foundations. Material for backfill shall be granular or cohesive material as specified above. The material shall be deposited, spread, and leveled in layers generally not exceeding 8 inches in

COPY OF BID SET

thickness before compaction. Each layer of the fill shall be compacted to at least 92% of the maximum dry density at a moisture content from optimum to 2% wet of optimum (testing same as Class 1). Compaction shall be obtained by compaction equipment appropriate for the conditions.

- F. No frozen material shall be placed nor shall any material be placed on frozen ground.
- G. Four inches of clay fill shall be placed and compacted to at least a firm consistency in areas to be seeded or sodded prior to placement of topsoil.

3.08 EMBANKMENT FILL

- A. Embankment fill may be placed in fill areas to be seeded or sodded if no piping exists in the fill and the areas are at least 10 feet from any structure.
- B. Embankment fill shall be deposited, spread, and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer shall be compacted to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment. The required compaction shall be obtained for each layer before any material for a succeeding layer is placed thereon. Compaction shall be obtained using the hauling and leveling equipment and, in addition, tamping rollers, pneumatic-tired rollers, vibratory rollers, or other types of equipment required to produce the desired results.

3.09 CONCRETE FILL

- A. In areas where there is inadequate room for compaction equipment and in other areas as shown or specified, Class X concrete or flowable fill shall be used as fill material.

3.10 GRADING

- A. CONTRACTOR shall perform all rough and finish grading required to attain the elevations shown on the drawings.
- B. Grading Tolerances:
 - 1. Rough grade: Buildings, parking areas, and sidewalks ± 0.1 feet.
 - 2. Finish grade: Granular cushion or crushed stone mat under concrete slabs ± 0.03 feet.
 - 3. Lawn areas away from buildings, parking areas, and sidewalks ± 0.25 feet.

3.11 PLACING GRANULAR CUSHION AND VAPOR BARRIER

- A. When subgrade is prepared for slab-on-grade areas, CONTRACTOR shall place the vapor barrier.
- B. A 6-inch layer of granular cushion shall then be placed, compacted, and finish-graded.

3.12 PLACING CRUSHED STONE

- A. The same day that the subgrade is exposed, place 8 inches of crushed stone mat below tank slabs, manholes, vault slabs, and basement floors. Compact in place.

COPY OF BID SET

3.13 COMPACTION TESTING

- A. Compaction tests shall be done by the Project Soils Engineer. Location and frequency of the tests shall be as recommended by the Project Soils Engineer and paid for by CONTRACTOR. See discussion on Allowances.

END OF SECTION

COPY OF BID SET

SECTION 02229

ROCK REMOVAL

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Removal of rock during excavation for structures and roads.
 - 2. Removal of rock during excavation for utility trenches.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.
- C. Payment: All excavation, including rock excavation, is unclassified. Costs for excavation shall be considered incidental and shall be included in CONTRACTOR's Lump Sum or Unit Price Bid for adjacent Work.

1.02 QUALITY ASSURANCE

- A. CONTRACTOR shall employ a seismic survey firm if explosives are to be used. Seismic survey firm shall be a company specializing in seismic surveys with 5 years' documented experience.
- B. If explosives are to be used, CONTRACTOR shall have 5 years' experience or shall employ a firm with 5 years' experience with use of explosives.
- C. Blaster shall hold necessary licenses for the type of work performed.

1.03 REGULATORY REQUIREMENTS

- A. CONTRACTOR shall conform to applicable federal, state, and local codes for explosive disintegration of rock, including the provisions of the Laws and Regulations Governing Explosions and Blasting, as issued by the Kentucky Division of Mines and Minerals, and the Kentucky OSHA Standards for the Construction Industry, Subpart U, Blasting as issued by the Kentucky Labor Cabinet.
- B. CONTRACTOR shall obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.
- C. No explosives shall be used without written permission from OWNER.

1.04 PROJECT CONDITIONS

- A. CONTRACTOR shall conduct survey and document conditions of buildings near locations of rock removal, both prior to and after blasting, in the presence of adjacent property owners and shall advise owners of adjacent buildings or structures in writing, prior to executing seismographic survey.

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- B. CONTRACTOR shall obtain a seismic survey prior to rock excavation to determine maximum charges that can be used at different locations in area of excavation without damaging adjacent properties or other work.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 ROCK REMOVAL

- A. CONTRACTOR shall provide seismographic monitoring during progress of blasting operations.
- B. Disintegrate rock and remove from excavation.
- C. Remove rock at excavation bottom to form level-bearing surface.
- D. Rock shall be removed 2 feet below finish grade in areas to receive seed, sod, or trees.
- E. Remove shaled layers to provide a sound and unshattered base for foundations.
- F. Unauthorized rock removal shall be corrected in accordance with backfilling and compacting requirements of Section 02222-Excavation, Fill, Backfill and Grading or with concrete fill if required by ENGINEER.
- G. All excavated rock shall be classified as undesirable backfill material and shall be disposed of as specified in Section 02222-Excavation, Fill, Backfill and Grading, unless it is crushed and screened to meet backfill requirements for use on-site.
- H. All excavations and trenches in rock shall be backfilled with approved backfill materials furnished by CONTRACTOR.

END OF SECTION

COPY OF BID SET

SECTION 02231

AGGREGATE BASE COURSE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Aggregate base course for roads and parking areas.
 - 2. Gravel roads and alleys.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.
- C. Repair or replacement of aggregate base course shall be considered incidental and included in the price bid.
- D. CONTRACTOR is cautioned that existing private and public roads and shoulders may not hold up to typical construction traffic or activities. CONTRACTOR shall repair all roads, shoulders, and gravel areas damaged in accordance with this section. All paved areas shall also be repaired in accordance with Section 02510—Asphaltic Concrete Paving.

1.02 REFERENCES

- A. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Kentucky Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction, latest edition, including all issued supplemental specifications. Unless specifically stated otherwise, the Measurement and Payment sections of the Standard Specifications shall not apply. Measurement and payment will be made in accordance with terms of the Contract Documents.

1.03 DEFINITIONS

- A. Street or road shall include streets, roads, driveways, and parking lots.

1.04 SUBMITTALS

- A. Submit sieve analysis for proposed materials in accordance with Section 01300—Submittals.

1.05 DRAINAGE DURING CONSTRUCTION

- A. CONTRACTOR shall comply with the provisions of Section 204 of the Standard Specifications.

COPY OF BID SET

PART 2—PRODUCTS

2.01 AGGREGATES

- A. Aggregate for base course shall meet the requirements of dense-grade aggregate (DGA) or crushed stone base (CSB) of Section 302 of the Standard Specifications.
- B. Base course shall be uniformly graded and shall conform to the requirements for DGA or CSB of Section 805 for the full depth of base course.
- C. Material for top layer of shoulders shall conform to the requirements for DGA of Section 805.
- D. Material to replace yielding or unstable subgrade shall conform to Size No. 2 of Section 805.

PART 3—EXECUTION

3.01 PREPARATION

- A. The subgrade shall be graded and rolled to provide uniform density and shall comply with the profile and cross sections contained in the drawings. All street subgrade in cut areas and all areas to receive fill shall be proofrolled in the presence of OWNER or ENGINEER with a heavily loaded triaxle dump truck or similar equipment prior to the placement of any fill materials or base course. The subgrade shall be prepared in accordance with Section 207 of the Standard Specifications.

3.02 CONSTRUCTION

- A. Base course grade shall be set to allow placement of thickness of asphaltic pavement shown or specified.
- B. Depth of base course shall be provided according to the standard cross sections or details provided on the drawings.
- C. Depth of base course shall be the existing depth or 8 inches, whichever is greater.
- D. Construction of base course shall conform to Section 302 of the Standard Specifications. Each layer of base course shall be wetted and rolled to provide maximum compaction in accordance with requirements therein. Maximum lift shall be 4 inches.
- E. The finished base course shall be fine graded in preparation for paving.
- F. After final grading, CONTRACTOR shall maintain the base course until asphaltic paving work has been completed.
- G. All gravel surfaces damaged during construction shall be replaced. The depth of aggregate shall match existing or 8 inches, whichever is greater.

END OF SECTION

COPY OF BID SET

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Erosion control devices.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 PAYMENT

- A. All costs associated with slope protection and erosion control shall be included in CONTRACTOR's Bid. This work shall include, but is not limited to, erecting fence, excavation, placing posts, backfilling, attaching woven wire and geotextile fabric; placing ditch checks; installing sediment traps; for removing the fence at completion of project; for cleaning and repairing; for removing or spreading accumulated sediment to form a surface suitable for seeding; for replacing silt fence and damages caused by overloading of sediment material or ponding of water adjacent to silt fence; and for furnishing labor, tools, equipment, and incidentals necessary to complete the work in accordance with the Contract.

1.03 REFERENCES

- A. Kentucky Best Management Practices for Construction Activity (Ky BMP).

1.04 REGULATORY REQUIREMENTS

- A. CONTRACTOR is required to obtain any necessary federal, state, or local permits for erosion control. The permit requirements are CONTRACTOR's responsibility and shall be included in the prices Bid.
- B. Comply with laws prohibiting pollution of any lake, stream, river, or wetland.

1.05 QUALITY CONTROL

- A. Construct and maintain erosion sediment control measures in accordance with Ky BMP.
- B. Check facilities weekly and after any rainfall event and make needed repairs within 24 hours.

PART 2–PRODUCTS

2.01 EROSION MATS

- A. Uniform web of interlocking wood excelsior fibers with a net backing on one side. The wood from which the blanket is produced shall have been properly cured to achieve adequately curled and barbed fibers. The blanket shall be of uniform thickness with the wood fibers

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evenly distributed over the entire area of the blanket. The blanket shall be furnished in rolled strips. The width of the strips shall be 48 inches \pm 1 inch. Weight of blanket measured under average atmospheric conditions shall be 78 pounds per 80 square yards \pm 10%. Net backing shall have mesh size not exceeding 1 1/2 by 3 inches and may be woven from twisted paper, cotton cord, a biodegradable plastic, or other alternate method. The blanket shall be nontoxic to vegetation.

2.02 SILT FENCE

- A. Conform to Kentucky BMP as supplemented herein.
- B. Use geotextile fabric consisting of either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride with the following requirements. Fabric shall have the minimum strength values in the weakest principal direction. Nonwoven fabric may be needle-punched, heat-bonded, resin-bonded, or combination thereof.

VALUE MINIMUM REQUIREMENTS ⁽¹⁾

Test	Method	Silty Soils ⁽⁴⁾	Sandy Soils ⁽⁵⁾
Grab Tensile-Strength/ Strip-Breaking Force	ASTM D-5034, D5035 ⁽²⁾	100	100
Mullen Burst Strength (psi)	ASTM D-3786	200	200
Equivalent Opening Size	CW-02215-77	50-140	20-50
U.S. Standard Sieve	Corps of Engineers		
Water Flow Rate (gal/min/ft. ² at 50 MM Constant Head	ASTM D-4491 ⁽³⁾	10	10
Ultraviolet Radiation Stability (percent)	ASTM D-4355	90	90

- (1) All numerical values represent minimum average roll values (i.e., the average of test results on any roll in a lot should meet or exceed the minimum values in the table.)
- (2) ASTM D-5034 Grab Test and ASTM D-5035 Breakout Force and Elongation Strip Method, Method 16, using a 4-inch by 8-inch sample, 3-inch gauge length clamped in 1-inch by 2-inch long grip, tested at a strain rate of 12 inches/min.
- (3) Water Flow Rate in gal/min/ft shall be determined by multiplying Permittivity in sec. as determined by ASTM D-4491 by a conversion factor of 74.
- (4) Silty Soil: More than 15% by weight passing No. 200 sieve.
- (5) Sandy Soil: Less than 15% by weight passing No. 200 sieve.

- C. Furnish geotextile fabric in a wrapping which will protect the fabric from ultraviolet radiation and from abrasion because of shipping and handling. Keep geotextile dry until installed.
- D. Provide posts, stakes, and wire reinforcement per Kentucky BMP standards.

2.03 GEOTEXTILE FABRIC—TYPE R

- A. For subgrade reinforcement under riprap: Either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene, or polyvinylidene chloride. Fabric shall have the minimum strength values in the weakest principle direction. Nonwoven fabric may be needle-punched, heat-bonded, resin-bonded, or combination thereof.

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- B. Insect, rodent, mildew, and rot resistant.
- C. Furnish in a wrapping which will protect fabric from ultraviolet radiation and from abrasion because of shipping and hauling. Keep geotextile dry until installed.
- D. Clearly mark fabric rolls showing fabric type.
- E. If sewn seams are used, furnish a field-sewn seam sample produced from the geotextile fabric and thread and with the equipment to be used on the project prior to installation.
- F. Comply with the following physical properties:

Test	Method	Value
Grab Tensile Strength (lbs) Puncture Strength (lbs) using 5/16-inch Flat-tipped Rod	ASTM D-4632 Modified ASTM D-3787	200 min. 80 min.
Mullen Burst (lbs/in ²)	ASTM D-3786	250 min.
Elongation at Required Strength (percent)	ASTM D-4632	20 min.
Equivalent Opening Size (U.S. Standard Sieve)	ASTM D-4751	30-140
Water Flow Rate (gal/min/ft ²) at 50 mm Constant Head	ASTM D-4491	10 min.

2.04 STRAW BALE BARRIERS

- A. Provide per Kentucky BMP standards.

PART 3-EXECUTION

3.01 GENERAL

- A. Install devices before construction activities begin.
- B. Proceed carefully with construction adjacent to stream channels to avoid washing, sloughing, or deposition of materials into the stream. If possible, the work area should be diked off and the volume and velocity of water that crosses disturbed areas be reduced by means of planned engineering works (diversion, detention basins, berms).
- C. Unless noted on drawings, do not remove trees and surface vegetation.
- D. Expose the smallest practical area of soil at any given time through construction scheduling. Make the duration of such exposure before application of temporary erosion control measures or final revegetation as short as practicable.

3.02 EROSION MAT INSTALLATION

- A. Place erosion mat immediately after seeding or sodding operations have been completed. Before mat placement, remove all material or clods over 1 1/2 inches in diameter and all

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organic material or other foreign material which interfere with the mat bearing completely on the soil or sod.

- B. Any small stones or clods which prevent contact of the mats with the soil shall be pressed in the soil with a small lawn-type roller or by other effective means. The mat shall have its lateral edge so impressed in the soil as to permit runoff water to flow over it.
- C. The matting strips shall be rolled on or laid in direction of flow. Spread mat evenly, smoothly, in a natural position without stretching and with all parts bearing on soil and place blanket with netting on top. Overlap adjacent strips at least 4 inches. Overlap strip ends at least 10 inches. Make overlaps with the upgrade section on top.
- D. Bury upgrade end of each strip of fabric or blanket at least 6 inches in a vertical slot cut in the soil and press soil firmly against the embedded fabric or blanket.
- E. Anchor mats in place with vertically driven staples driven until their tops are flush with the soil. Space staples at 3-foot centers along mat edges and stagger space at 3-foot centers through the center. Place staples at 10-inch centers at end or junction slots.
- F. Reseed areas damaged or destroyed during erosion mat placing operations as specified for original seeding.
- G. Dispose of surplus excavated materials, and all stones, clods or other foreign material removed in the preparation of the seeded soil or sodded surface before placing mat.
- H. Following mat placement, uniformly apply water to the area to moisten seedbed to 2-inch depth and in a manner to avoid erosion.
- I. Maintain erosion mat and make satisfactory repairs of damage from erosion, traffic, fires or other causes until work acceptance.

3.03 GEOTEXTILE FABRIC—TYPE R

- A. Before placing fabric, grade area smooth and remove stones, organic matter, or other foreign material which would interfere with fabric being completely in contact with soil.
- B. Place fabric loosely and lay parallel to direction of water movement. Pinning or stapling is acceptable to hold geotextile in place. Overlap or sew together separate pieces of fabric. Overlap joints a minimum 24 inches in the flow direction. After placement, do not expose fabric more than 48 hours before covering.
- C. Cover damaged areas with a patch of fabric using a 3-foot overlap in all directions.

3.04 SILT FENCE INSTALLATION

- A. Erect silt fence before starting construction operations which might cause sedimentation or siltation at site of proposed silt fence.
- B. Construct silt fence in an arc or horseshoe shape with ends pointing up slope. Construct silt fence to the dimensions and details shown on drawings. Remove silt fences after slopes and ditches have been stabilized and turf developed to the extent that future erosion is unlikely. Dispose of materials remaining after removal.

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- C. Inspect all silt fences immediately after each rainfall and at least daily. Correct deficiencies immediately. Where construction activity changes the earth contour and drainage runoff, make a daily review to ensure that silt fences are properly located for effectiveness. Where deficiencies exist, install additional silt fences.
- D. Remove and dispose of sediment deposits. Sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform with the existing grade and the area topsoiled, fertilized, and seeded as required.

3.05 STRAW BALE BARRIERS

- A. Provide as shown on the drawings and as necessary on ditch lines and other drainageways to minimize construction sediment laden runoff to downstream ditches and channels and into streams.
- B. Inspect all barriers immediately after each rainfall and at least daily. Correct deficiencies immediately. Where construction activity changes the earth contour and drainage runoff, make a daily review to ensure that barriers are properly located for effectiveness. Where deficiencies exist, install additional straw bales.
- C. Remove and dispose of sediment deposits. Sediment deposits remaining in place after the barrier is no longer required shall be dressed to conform with the existing grade and the area topsoiled, fertilized, and seeded as required.

END OF SECTION

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SECTION 02275

RIPRAP

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Furnishing and placing riprap.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Kentucky Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction, current edition, including all issued supplemental specifications. Unless specifically stated otherwise, the Measurement and Payment sections of the Standard Specifications shall not apply. Measurement and payment will be made in accordance with terms of the Contract Documents.

PART 2–PRODUCTS

2.01 MATERIALS

- A. Stone for riprap shall be durable quarry stone of approved quality. It shall be sound, hard, dense, resistant to the action of air and water, and free from seams, cracks, or other structural defects.
- B. Stone for riprap shall be in accordance with Standard Specifications, Section 805.
- C. Geotextile shall conform to Section 02270–Slope Protection and Erosion Control.

PART 3–EXECUTION

3.01 PREPARATION

- A. The bed for the riprap shall be properly trimmed and shaped before geotextile and stone is placed. Bed shall be minimum 6 inches thick.
- B. Geotextile shall be placed below riprap.

3.02 INSTALLATION

- A. Riprap shall be provided in areas as designated on the Drawings.

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- B. Stone placed above the water line shall be placed by hand. It shall be laid with close, broken joints and shall be firmly bedded into the slope and against the adjoining stones. The stones shall be laid perpendicular to the slope with ends in contact.
- C. The riprap shall be thoroughly compacted as construction progresses, and the finished surface shall present an even, tight surface.
- D. The large stone shall be placed in the lower courses. Interstices between stones shall be chinked with spalls firmly rammed into place.
- E. Unless otherwise shown or specified, riprap shall be at least 18 inches in thickness, measured perpendicular to the slope.

END OF SECTION

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SECTION 02510

ASPHALTIC CONCRETE PAVING

PART 1–GENERAL

1.01 SUMMARY

- A. Work includes asphaltic concrete paving, tack coat, and casting adjustments.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.
- C. CONTRACTOR is cautioned that existing private and public roads and shoulders may not hold up to typical construction traffic or activities. CONTRACTOR shall replace all roads, shoulders, and paved areas damaged during the project in accordance with this section. Gravel shoulders, gravel roads, and parking areas shall be repaired in accordance with Section 02231–Aggregate Base Course.
- D. Payment: Payment for asphaltic concrete paving shall be considered incidental to the project and included in the lump sum bid.

1.02 REFERENCES

- A. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Kentucky Department of Transportation Construction and Material Specifications.

1.03 DEFINITIONS

- A. Street or road shall include streets, roads, driveways, and parking lots.

1.04 SUBMITTALS

- A. Prior to the commencement of paving, mix designs and aggregate sieve analysis shall be submitted to ENGINEER for approval in accordance with Section 01300–Submittals.

PART 2–PRODUCTS

2.01 ASPHALTIC CONCRETE PAVEMENT

- A. Asphaltic material for base, binder, and surface course shall conform to the requirements of the Standard Specifications. The mixtures shall have been approved recently by the Kentucky Transportation Cabinet. Lift thickness, class, and polish-resistant aggregate designation shall be in accordance with the Kentucky Transportation Cabinet's Pavement Design Guide, unless otherwise stated.
- B. Aggregate shall conform to the requirements of the Standard Specifications.

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- C. Materials for prime coat shall conform to the requirements of the Standard Specifications and shall be Primer L.
- D. Material for tack coat shall conform to the requirements of Section 806 of the Standard Specifications.
- E. Replacement of paved surfaces shall be 3 inches in thickness or existing thickness, whichever is greater. Binder course shall be 1 3/4 inches minimum. Surface course shall be 1 1/4 inches minimum.

PART 3-EXECUTION

3.01 ALLOWABLE REMOVAL OF PAVEMENT

- A. CONTRACTOR shall remove bituminous pavement and road surface as a part of the general excavation. The width of pavement removed shall be the minimum possible and acceptable for convenient and safe installation of structures, utilities, and appurtenances.
- B. All bituminous pavement shall be cut on neat, straight lines and shall not be damaged beyond the limits of the excavation. Should the cut edge be damaged, a new cut shall be made in neat, straight lines parallel to the original cut encompassing all damaged areas. Pavement removal shall be extended to a seam or joint if seam or joint is within 3 feet of damaged pavement.

3.02 TACK COAT

- A. All work shall be in accordance with the Standard Specifications.
- B. If asphaltic surface course is applied to an existing street or is not applied the same day as binder course, the existing street or binder surface shall be tack coated prior to surface paving. Prior to placement of tack coat, the streets shall be thoroughly cleaned and broomed. Tack coat shall be applied at a rate of 0.10 gallons per square yard immediately prior to placement of asphaltic surface course.
- C. In situations where traffic must be maintained, tack coat shall not be placed on the traveled half of the street until traffic can be switched to the new pavement.

3.03 JOINTS

- A. Joints between old and new pavements or between successive days' work shall be constructed and treated to ensure thorough and continuous bond between the old and new mixtures. Transverse construction joints shall be constructed by cutting the material back for its full depth to expose the full depth of the course. Where a header is used, the cutting may be omitted provided the joint conforms to the specified thickness. These joints shall be treated with tack coat material applied with a hose and spray nozzle attachment to fully coat the joint surface.
- B. The longitudinal joint shall be made by overlapping the screed on the previously laid material for a width of not more than 2 inches and depositing a sufficient amount of asphaltic mixture so that the finished joint will be smooth and tight. Longitudinal joints in the surface course shall at no time be placed immediately over similar joints in the binder course beneath. A

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minimum distance of 12 inches shall be permitted between the location of the joints in the binder course and the location of similar joints in the surface course above.

- C. All costs for furnishing and applying tack coat to butt joints as specified above shall be considered incidental.

3.04 FINISHING ROADWAY

- A. The finished base course shall be fine-graded in preparation for asphaltic concrete paving. Base course ramps at all existing pavement shall be removed to provide a full-depth butt joint. Base course around manhole castings and valve boxes shall be hand-trimmed and compacted with a vibratory plate compactor.
- B. This item shall include all of the following preparatory and finishing items and any other incidental items of work required for construction. Asphaltic ramps around manholes on existing binder course to receive surface course shall be removed. Asphaltic ramps shall be installed on all manholes and at all butt joints in areas to receive binder course only.
- C. Finishing roadway shall be considered incidental to asphaltic paving.

3.05 TESTING ASPHALTIC CONCRETE

- A. ENGINEER may require samples of asphaltic concrete for testing. CONTRACTOR shall cut samples from the finished pavement where marked by ENGINEER and patch the sample area. Samples for sieve analysis and asphalt content will be taken by ENGINEER prior to placement.

3.06 ASPHALTIC PAVING

- A. Asphaltic paving work shall include the construction of plant-mixed asphaltic concrete pavement in the areas shown on the drawings. All work shall be performed in accordance with the Standard Specifications.
- B. Prior to commencement of paving operations, CONTRACTOR shall examine the finished road bed. CONTRACTOR shall notify ENGINEER of any areas of suspected instability.
- C. The pavement structure for new roads shall be determined from the standard cross sections provided on the drawings.

END OF SECTION

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SECTION 02521

CONCRETE SIDEWALKS AND DRIVEWAY APRONS

PART 1–GENERAL

1.01 SUMMARY

- A. Work includes concrete sidewalks and driveway aprons as shown on the drawings.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Kentucky Department of Highways, Standard Specifications for Road and Bridge Construction, current edition, including all issued supplemental specifications. Unless specifically stated otherwise, the Measurement and Payment sections of the Standard Specifications shall not apply. Measurement and payment will be made in accordance with terms of the Contract Documents.
- B. AASHTO M148 Standard Specifications for Liquid Membrane–Forming Compounds for Curing Concrete.

1.03 QUALITY ASSURANCE

- A. Unless otherwise specified, all sidewalks and driveway apron construction shall meet the requirements of the Standard Specifications.

PART 2–PRODUCTS

2.01 CONCRETE

- A. Concrete shall be Class A conforming to Section 601 of the Standard Specifications.

2.02 CURING COMPOUND

- A. Liquid curing compounds shall conform to the requirements for Liquid Membrane-Forming Compounds for Curing Concrete, AASHTO Designation M148, Type 2, White Pigmented.

PART 3–EXECUTION

3.01 BASE PREPARATION–SIDEWALKS AND DRIVEWAYS

- A. The subgrade shall be thoroughly compacted and finished to a trim, firm surface. All soft or unsuitable material shall be removed and replaced with suitable material.

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- B. A minimum 4-inch-thick layer of sand, sand and gravel, or base course shall be placed under all sidewalks. This material shall be thoroughly moistened and compacted before the concrete is placed.

3.02 FORMS

- A. Forms shall be of metal and of sufficient strength to resist distortion or displacement. Forms shall be full depth of the required work. Facing boards, if used, shall be built so as to obtain the cross section called for on the drawings. Forms shall be securely staked and held firmly to line and grade. Forms shall be cleaned thoroughly and oiled before reuse.

3.03 PLACING AND FINISHING CONCRETE

- A. Unless otherwise specified, concrete shall be placed in accordance with Section 03300-Cast-in-Place Concrete.
- B. Concrete for sidewalk shall be placed to a minimum thickness of 5 inches except at driveways and alleys which shall have a minimum thickness equal to the driveway. Driveways shall have a minimum thickness of 6 inches. The concrete shall be thoroughly spaded and tamped to remove all voids. The surface of the driveway or sidewalk shall be thoroughly troweled and finished with a brush at right angles to the driveways or sidewalk line.

3.04 JOINTING—SIDEWALKS AND DRIVEWAYS

- A. Concrete sidewalk shall be cut into rectangular blocks approximately 5 feet long. The cut must extend at least one-fifth of the total thickness of concrete. The edges of the sidewalk along forms and joints shall be rounded with an edging tool of 1/4-inch radius. All joints shall be at right angles to the centerline of the sidewalk.
- B. Concrete driveways shall be jointed in approximately square sections. The depth of the joint and the finishing of the edges shall be the same as for concrete sidewalk.

3.05 EXPANSION JOINTS

- A. A 3/4-inch-thick expansion joint shall be placed at all sidewalk corners and between sidewalks and buildings.

3.06 SLOPE

- A. Sidewalk cross slope shall be 1/4 inch per foot unless otherwise noted in the drawings or requested by ENGINEER.

3.07 CURING

- A. As soon after finishing operations as the free water has disappeared, the concrete surface shall be sealed by spraying on it a uniform coating of curing material in such a manner as to provide a continuous water impermeable film on the entire concrete surface.
- B. The material shall be applied to form a uniform coverage at the rate of not less than one-half gallon per 100 square feet of surface area.

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- C. Within 30 minutes after the forms have been removed, the edges of the concrete shall be coated with the curing compound applied at the same rate as on the finished surface.

3.08 PROTECTION OF CONCRETE

- A. CONTRACTOR shall erect and maintain suitable barricades to protect the new concrete. Where it is necessary to provide for pedestrian traffic, CONTRACTOR shall, at his own cost, construct adequate crossings. Crossing construction shall be such that no load is transmitted to the new concrete.
- B. Any part of the work damaged or vandalized prior to final acceptance shall be repaired or replaced at the expense of CONTRACTOR in a manner satisfactory to ENGINEER.
- C. Pedestrian traffic shall not be permitted over new concrete prior to 72 hours after application of curing material. Vehicular traffic shall not be permitted over newly placed concrete within seven days after completion when temperatures are 70°F or higher, 10 days when temperatures are not lower than 60°F, and up to a maximum of 21 days when the temperatures are generally lower than 60°F.

END OF SECTION

COPY OF BID SET

SECTION 02609

CULVERTS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Work includes installation of corrugated metal culverts.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Kentucky Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction, current edition, including all issued supplemental specifications, Section 701. Unless specifically stated otherwise, the Measurement and Payment sections of the Standard Specifications shall not apply. Measurement and payment will be made in accordance with terms of the Contract Documents.

PART 2–PRODUCTS

2.01 CORRUGATED STEEL CULVERT

- A. Corrugated steel culvert pipe shall conform to AASHTO M36M and shall be provided and installed as shown on the drawings.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Material and installation shall be in accordance with the Standard Specifications, Section 701. Metal apron end walls shall also be furnished and installed at the end.

END OF SECTION

COPY OF BID SET

SECTION 02640

PRECAST REINFORCED CONCRETE BOX CULVERTS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Work includes installation of precast reinforced concrete box culverts and headwalls.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Kentucky Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction, current edition, including all issued supplemental specifications, Section 611. Unless specifically stated otherwise, the Measurement and Payment sections of the Standard Specifications shall not apply. Measurement and payment will be made in accordance with terms of the Contract Documents.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with provisions of Section 01300-Submittals.
- B. CONTRACTOR shall submit construction drawings and design calculations for the precast reinforced concrete box culvert prepared and stamped by a Professional Engineer registered in the State of Kentucky. The engineering design, techniques, and material evaluations shall be in accordance with the Kentucky Transportation Cabinet requirements. Shop drawings shall include all dimensions and elevations, joint configuration, the size of rubber gaskets or butyl rubber sealants when used, the area of steel reinforcement, lift holes, and the size and location of reinforcement.
- C. Submit construction drawings and design calculations for precast concrete wing walls and headwalls prepared and stamped by a Professional Engineer registered in the State of Kentucky.

PART 2–PRODUCTS

2.01 PRECAST REINFORCED CONCRETE BOX CULVERT

- A. Precast reinforced concrete box sections shall conform to Section 611 of the Standard Specifications and ASTM C1577 and shall be provided and installed in accordance with the Standard Specifications and KDOH Standard Drawings.

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2.02 HEADWALLS

- A. Headwalls and wing walls may be precast or cast-in-place and shall conform to Section 611 of the Standard Specifications and KDOH Standard Drawings.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Material and installation shall be in accordance with the Standard Specifications, Section 611 and the KDOH Standard Drawings. Headwalls and wing walls shall also be furnished and installed at each end.

END OF SECTION

COPY OF BID SET

SECTION 02831

CHAIN LINK FENCE

PART 1–GENERAL

1.01 SUMMARY

- A. Work includes providing all chain link fencing and gates complete, as shown on the drawings.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM A121–Zinc-Coated (Galvanized) Steel Barbed Wire.
- B. ASTM A392–Zinc-Coated Steel Chain-Link Fence Fabric.
- C. ASTM A428–Weight of Coating on Aluminum-Coated Iron or Steel Articles.
- D. ASTM A491–Aluminum-Coated Steel Chain Link Fence Fabric.
- E. ASTM A1011–Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- F. ASTM A121–Metallic Coated Steel Barbed Wire.
- G. ASTM F626–Fence Fittings.
- H. ASTM F567–Installation of Chain-Link Fence.
- I. ASTM F900–Industrial and Commercial Swing Gates.
- J. ASTM F1043–Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
- K. Chain Link Fence Manufacturers’ Institute (CLFMI)–Product Manual.

PART 2–PRODUCTS

2.01 POSTS, RAILS, AND BRACES

- A. Construction:
 - 1. All posts and rails shall be either tubular pipe conforming to ASTM F1043 Group 1A, Schedule 40 with a Type A zinc coating, or Group 1C cold-formed and welded pipe with a Type B zinc coating.

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2. Post sizes shall be in accordance with the following:

LINE POSTS (MAXIMUM 10 FEET SPACING)

Height and Fence Type	Post Type	O.D. (IN.)	Weight (PLF)
6 feet or less	Group 1A	1.90	2.72
Up to 8 feet	Group 1A	2.375	3.65

CORNER AND BRACE POSTS

Height and Fence Type	Post Type	O.D. (IN.)	Weight (PLF)
7 feet or less	Group 1A	2.375	3.65
8 feet or 10 feet without wind screen, hardware cloth or privacy inserts	Group 1A	2.875	5.79

3. Gate posts shall conform to manufacturer's specifications for various width gates. Minimum sizes shall be as follows:

GATE POSTS

Leaf Width	Post Type	O.D. (IN.)	Weight (PLF)
6 feet or less	Group 1A	2.875	5.79
7 feet to 13 feet	Group 1A	4.0	9.10
14 feet to 18 feet	Group 1A	6.625	18.97

4. Terminal posts shall be braced with the same material as top rail and trussed to line posts with 3/8-inch-diameter rods and tightened. One brace assembly shall be provided with each end or gate post and two assemblies with each corner or pull post.
5. Rails shall be 1 5/8 inch OD Group 1A 2.27 pound per foot or Group 1C 1.84 pounds per foot pipe.

B. Line Posts: Line posts may not be driven posts.

C. Required Arms, Rails, and Tension Wires: Provide rampart arm, top rail, and bottom tension wire.

2.02 FABRIC

A. Construction:

1. Fabric to be No. 9 gauge steel aluminum-coated steel wire woven in a 2-inch mesh; top selvage to have barbed finish, bottom selvage to be knuckled.
2. Fabric height shall be 8 feet.
3. The designated height of the fence shall be the fabric height.
4. Fasteners:

COPY OF BID SET

- a. Fasteners shall be galvanized steel wire clips and tie wires in accordance with ASTM A-641 Class III or aluminum coat in conformance with fence fabric specifications.
- b. Provide fasteners for posts, top and intermediate rails, bottom rails, top tension wires, and braces of 9 gauge steel or 0.179-inch-diameter aluminum tie wires.
- c. Provide fasteners for bottom tension wire of not smaller than 12 gauge, or 0.149-inch-diameter aluminum tie wires.

2.03 GATES

A. General:

1. Provide additional horizontal and vertical members as necessary to assure proper gate operation and attachment to fabric and hardware.
2. Provide diagonal braces made of crossed adjustable length 3/8-inch-diameter truss rods on nonwelded gate frames and on welded frames where corner rigidity is not sufficient to prevent sag.
3. Gate frames shall be covered with the same fabric as the fence.
4. Weld or assemble gate frames with malleable or pressed steel fittings and rivets to provide rigid connections. Install fabric with stretcher bars at vertical edges. Attach to frame at 15 inches o.c. all sides. Provide caps for all gate frame work ends.

B. Gate Hardware:

1. Provide heavy-duty hinges of malleable iron, pressed or forged steel, nonlift-off type, adjusted to permit 180-degree gate opening. Provide two hinges for each leaf.
2. Provide heavy-duty forked-type or plunger bar-type latches for all single-leaf gates. Provide center stop and keeper for all double-leaf gates. Provide spring latch for all sliding gates. Provide padlock eye as an integral part of all latches.
3. Provide heavy-duty track, ball bearing hanger sheaves framing and supports, guides, stays stops, and bracing necessary for sliding gates.

2.04 ACCESSORIES

- ### A. General:
- All accessories, except tie wires and barbed wire, shall be galvanized to comply with ASTM F626.

B. Barbed Wire:

1. Provide three strands of barbed wire at top of fence.
2. Barbed wire shall be 2-strand, 12 1/2 gauge wire with 14 gauge, 4-point round barbs spaced approximately 5-inch o.c.
3. Finish shall be galvanized to meet ASTM A 121, Class 3 or aluminized to meet ASTM A 585, Class 2.

C. Barbed Wire Supporting Arms:

1. Arms shall be heavy pressed steel complete with provisions for anchorage to tubular end, corner, and pull posts attaching three rows of barbed wire to each arm.
2. Arms not required on roll formed terminal posts.
3. Single arms shall be integral with a post top weather cap.
4. Intermediate arms shall have hole for passage of top rail.
5. Arms shall be capable of withstanding, without failure, 250 pounds of downward pull at outermost end of arm.

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- D. Post Tops:
 - 1. Material shall be pressed steel or malleable iron.
 - 2. Top shall be weathertight.
 - 3. Top shall permit passage of top rail.

- E. Stretcher Bars:
 - 1. Stretcher bars required for tubular end, corner, pull, or gate posts.
 - 2. Bars shall be one-piece lengths equal to full height of fabric with minimum cross section of 3/16 inches by 3/4 inches.
 - 3. Provide one stretcher bar for each gate and end post and two stretcher bars for each corner and pull post.

- F. Stretcher Bar Bands:
 - 1. Material shall be heavy pressed steel.
 - 2. Spacing shall be 15 inches maximum o.c. to secure stretcher bar to tubular end, corner, pull, and gate post.

- G. Tension Wire: 7 gauge zinc-coated steel wire.

- H. Ground Rods: Provide a 1/2-inch-diameter 6-foot-long copper clad rod to provide a ground. Provide one for each 1,000 feet of fence and one for each separated fence section.

2.05 CONCRETE

- A. Concrete shall be Type A or A-FA, as specified in Section 03300–Cast-in-Place Concrete.

PART 3–EXECUTION

3.01 SITE WORK

- A. Prior to fence construction, remove and dispose of all trees, brush, logs, stumps, and other debris for a width of at least 12 inches each side of the proposed fence alignment.

3.02 CONCRETE FOOTINGS

- A. Excavate holes for footings to neat dimensions in firm ground to ensure the post will be centered. Remove rock or other obstructions encountered to the required depth. Use forms in unstable soil, and allow them to remain in place for at least 24 hours after concrete is poured. Backfill, after forms are removed, with suitable material thoroughly compacted in place in layers to prevent settlement.

- B. Footings shall be 36 inches deep and 10 inches minimum diameter. The bottom of the post shall be 3 inches above the bottom of the hole. Corner, gate, and end post bases shall be 12 inches minimum diameter. Gate posts larger than 4 inches o.d. shall have a base with a minimum diameter of 18 inches. Concrete bases shall be domed at the post and have a smooth troweled finish. Concrete footings shall cure for seven days before placing tension wires.

COPY OF BID SET

3.03 POSTS AND BRACES

- A. Set posts in a vertical position at the required location and alignment. Set tops at the required elevation to provide a smooth profile at the top rail or tension wire without abrupt changes and in conformity with the general contour.
- B. Place an end post at each end of each run of fence. Place a corner post whenever a break of 30 degrees or more occurs in the horizontal alignment. Set an intersection post in line with an intersecting chain link fence and brace it to the adjacent posts of the intersecting fence.
- C. Place an intermediate-braced post where the vertical alignment changes by more than 5 degrees, or a change in fence grade of more than 9% occurs.
- D. Place an intermediate braced post at 660-foot intervals for fence with a top rail and at 1,000-foot intervals for fence with a top tension wire on all long runs of fence. Set an intermediate brace post at the approximate midpoint when runs of fence are less than 1,320 feet but more than 660 feet for fence with top rail, or less than 2,000 feet but more than 1,000 feet for fence with top tension wire.

3.04 POST BRACING ASSEMBLY

- A. Post bracing assemblies consist of one or more brace rails and a 3/8-inch truss rod as hereafter specified. Provide brace rails the same size as the top rail. Provide truss rods with an adjustable take-up adapter.
- B. Install a single bracing assembly at each gate and end post location.
- C. Install a double bracing assembly at each corner post and all intermediate braced posts.
- D. Provide the bracing assembly with one horizontal brace rail and one diagonal truss rod on all fences which have a top rail. Locate the horizontal brace rail in accordance with the manufacturer's specifications.

3.05 STRETCHER BARS

- A. Provide one stretcher bar for each gate and end post and two for each corner and pull post, except roll form posts with integral loops. Attach to posts with heavy-duty pressed steel or malleable iron bands spaced at 15 inches o.c.

3.06 GROUND RODS

- A. Connect at least three fence wires to the ground rod by clamping, bolting, or brazing. Ground rod shall be installed on line with fence.
- B. Where required, install ground rods as specified for each run of fence, and install additional rods for each 1,000 feet on long runs of fence.

3.07 FABRIC

- A. Install, stretch, and anchor tension wires to each end, corner, gate, and brace post and properly attach to each line post before the fabric is placed. Pass top tension wire (when required) through the post top rail opening. Install top rail at proper location.

COPY OF BID SET

- B. Hang fabric on the inside secure side of all installations.
- C. Attach the end of the fabric to the end, corner, gate, or brace posts (except roll form posts with integral loops) by means of a stretcher bar threaded through the end loops of the fabric and stretched to remove all slack with proper stretching equipment. Secure the stretched fabric to posts, rails, and tension wires with specified fabric fasteners. Install fabric fasteners on all posts at not greater than 14 inches o.c. and on rails and bottom tension wires at not more than 24 inches o.c. Where a top tension wire is installed, fasten to the fabric at not more than 18 inches o.c.
- D. Repeat stretching operations at approximately every 100 feet for each run of fence.
- E. Make splices in fabric by interweaving a wire picket through each end loop of each piece of fabric. Each splice shall be subject to ENGINEER's review.

3.08 GRADE CLEARANCE

- A. For line and property fences, provide a clearance of 3 inches.

3.09 GATES

- A. Install gates plumb and level and adjust for smooth operation as intended without binding or hanging up.

3.10 BARBED WIRE

- A. Install barbed wire properly fastened to the rampart arms.

3.11 CLEANUP

- A. After chain link fence construction is completed, clean up all storage and work areas. Replace or repair, as required, all landscape features damaged or disturbed under this Contract.

END OF SECTION

COPY OF BID SET

SECTION 02936

SEEDING AND SODDING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Preparation of subsoil.
 - 2. Placing topsoil.
 - 3. Seeding, sodding, mulching, and fertilizing.
 - 4. Maintenance.
- B. Except for paved, riprapped, or built-up areas all areas of the site which are disturbed and areas noted on the drawings shall be seeded or sodded. Surfaces on 3 to 1 slope or less may either be seeded or sodded, but surfaces on greater than 3 to 1 slope shall be sodded.
- C. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. FS O-F-241–Fertilizers, Mixed, Commercial.
- B. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Kentucky Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction, current edition, including all issued supplemental specifications. Unless specifically stated otherwise, the Measurement and Payment sections of the Standard Specifications shall not apply. Measurement and payment will be made in accordance with terms of the Contract Documents.

1.03 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Sod: Minimum age of 18 months with root development that will support its own weight without tearing when suspended vertically by holding the upper two corners. Submit sod certification for grass species and location of sod source.

PART 2–PRODUCTS

2.01 SEED MIXTURE

- A. Seed mix No. II per Section 212 of the Standard Specifications. Each seed lot will be subject to sampling and testing by the state seed laboratory.
- B. Weed content shall not exceed requirements of Standard Specifications.

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2.02 SOD

- A. Sod per Section 827 of the Standard Specifications.
- B. Netting for reinforcing sod shall be a heavy duty, degradable polypropylene plastic net weighing not less than 2.5 pounds per 1,000 square feet. Jute fabric weighing not less than 92 pounds per 100 square yards may be used in lieu of plastic netting. Fabric shall be nontoxic to vegetation.
- C. Staples for anchoring netting or fabric placed over sod shall be U-shaped, made of No. 11 gauge or larger diameter, have a width not less than 1 to 2 inches and a length not less than 8 inches.

2.03 SOIL MATERIALS

- A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.
- B. Topsoil from the site may be used if it meets the above requirements.

2.04 FERTILIZER

- A. Fertilizer shall be FS O-F-241, Type I, Grade A; recommended for grass with 50% of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the following proportions: Nitrogen 10%, phosphoric acid 10%, soluble potash 10%. Submit composition deviations to suit site conditions for ENGINEER's review.

2.05 MULCH

- A. Mulching material shall be oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

2.06 WATER

- A. Water shall be clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.

2.07 FABRIC

- A. Erosion fabric shall be jute matting, open weave.

PART 3—EXECUTION

3.01 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

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- B. Deliver sod on pallets or in rolls. Protect exposed roots from dehydration. Do not deliver more sod than can be laid within 24 hours.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

3.02 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

3.03 PREPARATION OF SUBSOIL

- A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds, and undesirable plants and their roots. Remove contaminated subsoil in accordance with local, state, and federal regulations.
- C. Scarify subsoil to a depth of 3 inches where topsoil is to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

3.04 PLACING TOPSOIL

- A. Spread topsoil to a minimum depth of 4 inches over area to be seeded. Rake until smooth.
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign nonorganic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- E. Manually spread topsoil around trees, plants, and buildings to prevent damage.
- F. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.05 FERTILIZING

- A. Apply fertilizer at a rate of 17 pounds per 1,000 square feet.
- B. Apply after smooth raking of topsoil and prior to installation of seed or sod, no more than 18 hours before seeding or 48 hours before sodding.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.06 SEEDING

- A. Apply seed at a total rate of 3 1/2 pounds per 1,000 square feet. Apply evenly in two intersecting directions. Rake in lightly, or roll the seeded area after seeding.

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- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Planting season shall be between March 1 and May 15 or between September 1 and November 1.
- D. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- E. Immediately following seeding, apply mulch.
 - 1. Spread Rate: 1 1/2 to 3 tons per acre.
 - 2. Maximum Depth: 1 1/2 inches to 2 inches.
- F. Apply water with a fine spray immediately after each area has been mulched and on a daily basis to keep straw in place. CONTRACTOR may use asphalt tackifier at rate of 75 to 100 gallons per ton of straw in lieu of water.
- G. Seeding shall be maintained by CONTRACTOR until grass is well established. Grass is well established when it covers the entire seeded areas to a height of 2 inches.
- H. Place erosion control mats per Section 02270–Slope Protection and Erosion Control.

3.07 LAYING SOD

- A. Moisten prepared surface immediately prior to laying sod.
- B. Lay sod immediately after delivery to site to prevent deterioration.
- C. Lay sod tight with no open joints visible and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- D. Lay smooth. Align with adjoining grass areas.
- E. Place bottom elevation of sod 1 inch below top of adjoining edging, paving, or curbs.
- F. On slopes 4 to 1 and steeper, sod will be secured with wooden pegs at a maximum of 24 inches on center.
- G. On slopes 2 to 1 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.
- H. All sod placed in ditches, flumes, or other appurtenances where a concentrated flow of water may be expected shall be staked regardless of the slope.
- I. Water sodded areas immediately after installation. Saturate sod to 4-inch depth of soil.

3.08 MAINTENANCE

- A. Seeding/sodding shall proceed concurrently with construction. Seeding/sodding shall be maintained by CONTRACTOR until grass is well established.
- B. Mow sod at regular intervals to maintain at a maximum height of 2 1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

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- C. Immediately remove clippings after mowing.
- D. Water to prevent seed/sod and soil from drying out.
- E. Roll surface to remove minor depressions or irregularities.
- F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- G. Immediately reseed areas which fail to show adequate catch. Bare spots shall not exceed 5 square feet in area and not exceed 3% of the total seeded areas.
- H. Immediately replace sod in areas which show bare spots or deterioration.
- I. Protect seeded areas with warning signs during maintenance period.
- J. Correct damage resulting from erosion, gullies, rills, or other causes by filling with topsoil, tamping, refertilizing, and reseeding or resodding if damage occurs prior to acceptance of work.

END OF SECTION

COPY OF BID SET

SECTION 02950

TREES, PLANTS, STONE MULCH, AND EDGING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Trees and plants.
 - 2. Hardwood mulch.
 - 3. Plastic and aluminum edging.
 - 4. Maintenance.
 - 5. Tree Pruning.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 QUALITY ASSURANCE

- A. Nursery Qualifications: Company specializing in growing and cultivating the plants with three years' experience. Plant materials shall be free of disease and hazardous insects.
- B. Installer Qualifications: Company specializing in installing and planting the plants with three years' experience.
- C. Tree Pruner Qualifications: Company specializing in pruning trees with proof of Arborist Certification.

1.03 WARRANTY

- A. All plant material is to be fully guaranteed throughout the correction period. Only those plants that are alive and normally healthy for the first year will be accepted. Unaccepted material shall be removed and replaced by CONTRACTOR at no cost to OWNER during the next suitable growing season.
- B. Replacement plants shall be the same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

PART 2–PRODUCTS

2.01 PLANT MATERIALS

- A. All plant materials shall conform to American Standard for Nursery Stock (current edition). Plants shall be true to species and variety specified and nursery grown in accordance with good horticultural practices.
- B. Plant Materials: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the project for at least two years.

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- C. Trees with multiple leaders, unless specified, will be rejected. Trees with a damaged, cut, or crooked leader, included bark, abrasion of bark, sunscald, disfiguring knots, insect damage, mold, or prematurely opened buds are cause for rejection.

2.02 MULCH MATERIALS

- A. Hardwood Mulch: Organic hardwood mulch free from deleterious materials, weeds, stones, sticks and growth or germination-inhibiting ingredients.

2.03 ACCESSORIES

- A. Edging: Black Diamond by Valley View Industries; Commercial edging by COL-MET, or equal. Metal edging shall be Commercial grade 1/8 inch by 4 inches. Plastic edging shall have a minimum 4-inch side wall and 1-inch-diameter head and shall have a v-lip configuration for added stiffness and anchor-holding power.
- B. Membrane: 20 mil thick, water permeable polyolefin fabric.
- C. Wrapping Materials: Burlap or other commercial grade tree wrap.
- D. Stakes: Softwood lumber, pointed end or mild steel angle, galvanized, pointed end.
- E. Cable, Wire, Eye Bolts: Noncorrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.
- F. Tree Protectors: Rubber sleeves over cable to protect tree stems, trunks, and branches.

PART 3-EXECUTION

3.01 PLANTING

- A. Plant pits shall be excavated with vertical sides. These holes shall be no deeper than the depth of the ball, container, or root system when the plant is at its proper grade. Set plants vertical.
- B. Place topsoil in holes around roots or balls mixed with fertilizer and peat moss or compost. Topsoil around roots shall be compacted and watered. After plant pit is backfilled, shallow basin shall be formed with ridge of soil to facilitate watering.
- C. Place plants where indicated on the drawings. Position plants for best appearance.
- D. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.
- E. Remove nonbiodegradable root containers.

3.02 TREE REMOVAL AND REPLACEMENT

- A. Trees marked for removal within street and road rights-of-way and in easements shall be removed by CONTRACTOR and properly disposed. Trees within street and road rights-of-way marked for removal need not be replaced unless specifically noted otherwise

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on drawing. CONTRACTOR shall replace all other removed and damaged trees and shrubs with new stock at its expense. New trees shall be located as requested by OWNER or ENGINEER.

- B. Trees shall be replaced as follows. Diameters shall be measured 4 feet above the ground.

Deciduous Trees

Up to 1 1/2 inches

Like size and type

Greater than 1 1/2 inches

Min. 1 1/2 inches of like type

Coniferous Trees

Up to 6 feet tall

Like size and type

Greater than 6 feet tall

Min. 6-foot tree of like type

- C. All bushes and shrubs removed during construction shall also be restored to their original position and condition. If the bush or shrub is damaged or dies after restoring, CONTRACTOR shall replace it with one of same kind and size up to a height of 4 feet. Bushes and shrubs beyond this height shall be replaced by one that is 4 feet.
- D. It is intended that as many trees as possible be saved during construction. No trees, except those so designated, shall be removed without prior approval of OWNER. CONTRACTOR shall conduct the work to protect all trees to remain. CONTRACTOR shall provide suitable fencing installed at the tree drip line for all trees trunks the construction area to protect trees from damage and siltation.
- E. Trees that are damaged during construction shall be repaired. CONTRACTOR shall retain the services of a professional nurseryman who is a member of the National Arborist Association to direct CONTRACTOR on the proper repair of damaged trees. Damaged limbs and roots shall be pruned or dressed according to recommendations of the nurseryman. Backfill shall be replaced as soon as possible to reduce exposure of roots to air. Scarfed areas on trees shall be suitably dressed. Compaction of root areas under the drip line of the tree is to be avoided whenever possible.
- F. When removing trees, special care shall be taken to not damage surrounding private property. Costs for tree removal or replacement and construction around trees shall be included in the price bid for the work.
- G. CONTRACTOR shall relocate and bore and jack under or by such trees as desired to minimize construction damage. Cost for such construction shall be included in the price bid for the work.

3.03 INSTALLATION OF ACCESSORIES

- A. Place edging around hardwood mulch and planting areas where shown on the Drawings. Install edging using stakes at approximately 4 feet on center.
- B. Place membrane (weed barrier) in all areas to receive hardwood mulch.
- C. Wrap deciduous shade and flowering tree trunks and place tree protectors.

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3.04 PLANT SUPPORT

- A. Brace plants vertically with plant protector-wrapped guy wires and stakes to the following:

Tree Caliper	Tree Support Method
1-inch	1 stake with one tie
1 to 2 inches	2 stakes with two ties
2 to 4 inches	3 guy wires
Over 4 inches	4 guy wires

3.05 TREE PRUNING

- A. Each tree and shrub shall be pruned in accordance with good horticulture practice to preserve natural character of plant and to facilitate growth.

3.06 MULCH

- A. Place organic hardwood mulch to a depth of 3 to 4 inches over membrane for all trees and plants unless mulched with other materials as indicated on the Drawings.

3.07 MAINTENANCE

- A. Maintain plant life for three months after date of substantial completion.
- B. Neatly trim plants where necessary.
- C. Immediately remove clippings after trimming.
- D. Water to prevent soil from drying out.
- E. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.
- F. Apply pesticides in accordance with manufacturer's instructions.

3.08 SCHEDULE-PLANT LIST

- A. See Drawings for schedule.

END OF SECTION

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SECTION 03100

CONCRETE FORMWORK

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Forms for cast-in-place concrete.
 - 2. Form accessories.
 - 3. Openings for other work.
 - 4. Form stripping.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ACI 117–Tolerances for Concrete Construction.
- B. ACI 301–Structural Concrete for Buildings.
- C. ACI 318–Building Code Requirements for Reinforced Concrete.
- D. ACI 347–Recommended Practice for Concrete Formwork.
- E. PS1–Construction and Industrial Plywood.

1.03 DESIGN

- A. All formwork shall comply with ACI 347 and ACI 301.
- B. CONTRACTOR shall assume the responsibility for the complete design and construction of the formwork.

1.04 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300–Submittals for form ties, form coatings, form liners (if any), and any other form accessories.
- B. Submit geometry of forms for circular structures.

PART 2–PRODUCTS

2.01 FORMS

- A. Forms shall be of wood, plywood, steel, fiberboard lined, or other approved materials which will produce concrete which meets the specified requirements. The type, size, quality, and shape of all materials of which the forms are made are subject to the review of ENGINEER.

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- B. Caution shall be exercised in the use of wood or composition forms or form liner to be certain that no chemical reaction will take place which causes a damaging effect on the concrete surface.

2.02 FORM TIES–NONREMOVABLE

- A. Internal wall ties shall contain positive stops at the required wall thickness. The exterior clamp portions of the tie shall be adjustable in length. Ties shall have cones on the water side of water-containing structures. Ties shall also have cones on the exterior side of all structures which have PVC water-stopped construction joints. Ties shall provide a positive disconnection on both ends 1 to 1 1/2 inches inside the finished face of the concrete.
- B. All wall ties used in the placement of structures which have PVC or hydrophilic water-stopped construction joints shall contain integral waterstops. All such ties shall be crimped or deformed in such a manner that the bond between concrete and tie cannot be broken in removal of the outer units. This portion of the tie shall not be removed prior to 24 hours after completion of the concrete placement.
- C. The use of wood spacers and wire ties will not be approved.

2.03 FORM TIES–REMOVABLE

- A. Taper ties which are designed to be removed entirely from the wall may be used with forms designed for this tie type and spacing.
- B. Tie holes shall be plugged with either a neoprene plug, Sure-Plug by Dayton Superior, Inc., or an EPDM rubber plug, X-Plug by Sika Greenstreak, or equal.
- C. Cementitious waterproofing material for patching taper tie holes shall be Hey Di K-11, Xypex Patch-N-Plug, or equal. Taper tie holes above the normal operating water surface shall be patched with mortar mix as specified in Section 03300–Cast-in-Place Concrete for patching tie holes.

2.04 FORM COATINGS

- A. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

2.05 CHAMFER STRIPS

- A. Provide 3/4-inch by 3/4-inch wood or plastic chamfer strips at all exposed corners, except as noted.

2.06 KEYWAYS

- A. Keyways shall be formed with wood inserts.

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PART 3-EXECUTION

3.01 CONSTRUCTION

- A. Forms shall conform to the shape, line, grade, and dimensions as shown on the drawings. They shall be mortar-tight and sufficiently rigid to prevent displacement or sagging between supports and shall support the loads and pressures without deflection from the prescribed lines. They shall be properly braced or tied together so as to maintain position and shape. Spacing of ties shall be recommended by the tie manufacturer.
- B. Formwork and finished concrete construction shall meet the tolerances specified in ACI 117.
- C. All exposed curved surfaces shall be formed to the continuous surface of the radius specified. Where segmented forms are proposed, a form system which deviates more than 3/8 inches from a circle through pan edges will not be allowed.
- D. Architectural surfaces and surfaces to be fitted with equipment shall be formed to match the shape intended. Where indicated on the drawings, the form shall be lined with minimum 3/8-inch masonite and shimmed as required.
- E. When forms are placed for successive concrete placement, thoroughly clean concrete surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.
- F. At the request of ENGINEER, temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and observation immediately before depositing concrete.
- G. Provide inserts and provide openings in concrete form work to accommodate work of other trades. Verify size and location of openings, recesses, and chases with the trade requiring such items. Securely support items to be built into forms.
- H. Provide top forms for inclined surfaces where the slope is too steep to place and vibrate concrete.
- I. Bevel wood inserts for forming keyways (except in expansion joints where inserts shall have square edges), reglets, recesses, and the like to assure ease of removal. Inserts shall be securely held in place prior to concrete placement. Unless otherwise shown, chamfer strips shall be placed in the angles of the forms to provide 3/4-inch bevels at exterior edges and corners of all exposed concrete.
- J. The forms shall be oiled with a field-applied commercial form oil or a factory-applied nonabsorptive liner. Oil shall not stain or impede the wetting of surfaces to be cured with water or curing compounds. The forms shall be coated prior to placing reinforcing steel. Oil on reinforcement will not be permitted.
- K. All form surfaces shall be thoroughly cleaned, patched, and repaired before reusing and are subject to review of ENGINEER.

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3.02 FORM REMOVAL

- A. Supporting forms and shoring shall not be removed until the member has acquired sufficient strength to support its own weight and the construction live loads on it.
- B. All form removal shall be accomplished in such a manner that will prevent injury to the concrete.
- C. Forms shall not be removed before the expiration of the minimum times as stated below or until the concrete has attained its minimum 28-day design strength as confirmed by concrete cylinder tests, unless specifically authorized by ENGINEER.
 - 1. Wall and vertical faces: 24 hours.
 - 2. Columns: 24 hours.
 - 3. Beams and elevated slabs: 14 days.

END OF SECTION

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SECTION 03200

CONCRETE REINFORCEMENT

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes providing complete, in-place, all steel and fibers required for reinforcement of cast-in-place concrete as shown on the Drawings.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. Applicable standards listed in this section include, but are not necessarily limited to the following:
 - 1. ACI 315—Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 - 2. ACI 318—Building Code Requirements for Reinforced Concrete.
 - 3. ASTM A1064—Standard Specifications for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - 4. ASTM A615—Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 5. ASTM A996—Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcing.
 - 6. ASTM C1116—Standard Specification for Fiber-Reinforced Concrete.
 - 7. CRSI—Manual of Standard Practice.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01300—Submittals.
- B. Provide complete shop drawings of all material to be furnished and installed under this section:
 - 1. Before fabrication of the reinforcement is begun, CONTRACTOR shall obtain the approval of ENGINEER on reinforcing bar lists and placing drawings.
 - 2. These drawings and lists shall show in detail the number, size, length, bending, and arrangement of the reinforcing. Reinforcing supports shall also be located on the shop drawings.
 - 3. Shop drawings shall be in accordance with ACI 315.

1.04 PRODUCT HANDLING

- A. Delivery:
 - 1. Deliver reinforcement to the job site bundled, tagged, and marked.
 - 2. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.
- B. Storage: Store reinforcement at the job site on blocks and in a manner to prevent damage and accumulation of dirt and excessive rust.

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PART 2-PRODUCTS

2.01 MATERIALS

- A. Reinforcing bars shall comply with ASTM A615 or A996 Type R, Grade 60. Reinforcing bars required to be welded shall be ASTM A706 low alloy.
- B. Steel wire and welded wire fabric shall comply with ASTM A1064. Fabric shall be provided in flat sheets. Rolled fabric shall not be used.
- C. Reinforcement supports including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place shall be:
 - 1. Wire bar-type supports complying with CRSI recommendations, unless otherwise indicated.
 - 2. For slabs on grade, supports with sand plates, or horizontal runners where base material will not support chair legs.
 - 3. For exposed-to-view concrete surfaces or where the concrete surface will be exposed to weather or moisture, where legs of supports are in contact with forms, supports with either hot-dipped galvanized or plastic protected legs.
 - 4. When supports bear directly on the ground and it is not practical to use steel bar supports, precast concrete blocks may be used to support only the bottom lift of reinforcement. The precast blocks must be solid, be of an equal or higher strength than the concrete being placed, must provide adequate support to the reinforcement, and be of proper height to provide specified reinforcing cover. The use of face bricks, hollow concrete blocks, rocks, wood blocks, or other unapproved objects will not be permitted.
- D. Fibrous Reinforcing:
 - 1. Fibrous concrete reinforcement shall be Fibermesh 300, manufactured by Propex Concrete Systems, or equal.
 - 2. Reinforcement shall be 100% virgin polypropylene fibrillated, multi-length graded fiber containing no reprocessed olefin materials and specifically manufactured for use as concrete secondary reinforcement.
 - 3. Physical Characteristics:
 - a. Specific Gravity: 0.91.
 - b. Fiber Length: Multidesign gradation.

2.02 FABRICATION

- A. General:
 - 1. Fabricate reinforcing bars to conform to required shapes and dimensions with fabrication tolerances which comply with CRSI Manual.
 - 2. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.
 - 3. Unless otherwise shown on the Drawings, all end hook dimensions shall conform with "ACI Standard Hooks."
- B. Reinforcement with any of the following defects shall be deemed unacceptable and will not be permitted in the work:
 - 1. Bar lengths, depths, and bends exceeding specified fabrication tolerances.
 - 2. Bend or kinks not indicated on Drawings or final shop drawings.

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3. Bar with reduced cross section because of excessive rusting or other cause.

PART 3-EXECUTION

3.01 INSPECTION

- A. Examine the substrate, formwork, and the conditions under which concrete reinforcement is to be placed.
- B. Correct conditions detrimental to the proper and timely completion of the work.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General:
 1. Comply with the specified standards for details and methods of placing reinforcement and supports.
 2. Clean reinforcement to remove loose rust, mill scale, earth, and other materials which reduce or destroy bond with concrete.
- B. Placing Reinforcement:
 1. All reinforcing shall be placed in accordance with Contract drawings and with shop drawings stamped and approved by ENGINEER.
 2. Position, support, and secure reinforcing against displacement by formwork, construction, or concrete placement operations.
 3. Support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as needed.
 4. Unless otherwise shown on the Drawings, the reinforcement is to be so detailed and placed as to allow the following concrete protection:
 - a. Three inches of cover where the concrete is placed directly against ground.
 - b. Two inches of cover where the concrete is placed in forms but is to be exposed to weather, liquid, or the ground.
 - c. One-inch cover in slabs and walls not exposed to weather, liquid, or the ground.
 - d. One and one-half-inch cover in beams, girders, and columns not exposed to weather, liquid, or the ground. This cover applies to beam stirrups and column ties where applicable.
 5. Reinforcement shall be positioned within $\pm 3/8$ -inch for members with depth to tension reinforcing from compression face less than or equal to 8 inches. Tolerance shall be $\pm 1/2$ inch for members with depth to tension reinforcing from compression face greater than 8 inches. Tolerance on dimension between adjacent bars in slab and wall reinforcing mats shall be 1 inch. Secure against displacement by anchoring at the supports and bar intersections with wire or clips.
 6. Bars shall be securely tied at all intersections except where spacing is less than 1 foot in each direction when alternate intersections shall be tied. To avoid interference with embedded items, bar spacing may be varied slightly if acceptable to ENGINEER. Tack welding of reinforcing will not be permitted.
 7. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
 8. If reinforcing must be cut because of openings or embedded items in the concrete, additional reinforcing must be provided adjacent to the opening at least equal in cross sectional area to that reinforcing which was cut, and it shall extend a minimum of 36 bars

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- diameters beyond the opening on each side or as shown on the Drawings. At sumps or depressions in slabs, bars shall be bent and/or extended under sumps or depressions.
9. Wall reinforcing mats shall be secured in a vertical plane by providing clearance from forms with bar supports and by using Z-shaped bars at ± 4 feet on center wired between two mats of steel, spacing and staying both of them. Nails shall not be driven into the forms to support reinforcement and neither shall wire for this purpose come in contact with the forms. Alternate top transverse bars in slab shall be supported by individual bar chairs at approximately 3-foot 0-inch centers. Bottom longitudinal bars shall be supported by continuous bar chairs at approximately 4-foot 0-inch centers.
 10. If carrier bars are to be used, CONTRACTOR shall provide reinforcing bars for this purpose in addition to the reinforcing called for by the Drawings and specifications.
- C. Reinforcement Supports:
1. Strength and number of supports shall be sufficient to carry reinforcement.
 2. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support.
 3. Do not use supports as bases for runways for concrete-conveying equipment and similar construction loads.
- D. Welded Wire Fabric:
1. Install welded wire fabric in as long of lengths as practicable.
 2. Lap adjoining pieces at least one full mesh.
 3. Fabric shall be supported with bar supports.
- E. Splices:
1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying.
 2. Lap splices in reinforcing shall be provided as shown on the Drawings. Where lap splice lengths are not shown on the Drawings, provide Class B, Category 1 lap splices in accordance with ACI 318.
 3. Adjacent splices of tangential bars in circular slabs and horizontal bars in circular walls shall be staggered a minimum of one full lap splice length or 3 feet, whichever is greater, unless otherwise shown. Stagger dimension shall be measured from center to center of lap splices.
 4. For circular walls, horizontal bar lap splices shall not coincide in vertical arrays more frequently than every third bar.
 5. Mechanical splices and threaded dowel bar inserts may be used where approved by ENGINEER. Splices shall be capable of developing at least 125% of the yield strength of the reinforcing bar.
- F. Embedded Items:
1. Allow other trades to install embedded items as necessary.
 2. Particularly after bottom layer of reinforcing is placed in slabs, allow electrical contractors to install conduit scheduled for encasement in slabs prior to placing upper layer of reinforcing.
- G. Minimum Reinforcing: Where reinforcing is not shown, provide a minimum of No. 4 at 8-inch centers each way in members 10 inches or less in thickness and No. 5 at 12-inch centers each way in each face in members greater than 10 inches thick.

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H. Fibrous Reinforcing:

1. Fibrous concrete reinforcing shall be used in all slab-on-grade concrete and all precast concrete topping.
2. Add fibers at a minimum rate of 1.5 pounds per cubic yard.
3. Mix concrete in strict accordance with reinforcement manufacturer's recommendations.

END OF SECTION

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. All cast-in-place concrete as shown except as noted otherwise.
 - 2. PVC and hydrophilic waterstops, expansion joint fillers, bonding agents, patching mortars, curing compounds, nonshrink grout, floor sealer, and other related items and accessories.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ACI 211.1—Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- B. ACI 301—Specifications for Structural Concrete.
- C. ACI 304R—Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- D. ACI 305R—Guide to Hot Weather Concreting.
- E. ACI 306R—Guide to Cold Weather Concreting.
- F. ACI 308—Specification for Curing Concrete.
- G. ACI 309—Guide for Consolidation of Concrete.
- H. ACI 318—Building Code Requirements for Structural Concrete and Commentary.
- I. ASTM C31—Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- J. ASTM C33—Standard Specification for Concrete Aggregates.
- K. ASTM C39—Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- L. ASTM C40—Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
- M. ASTM C88—Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- N. ASTM C94—Standard Specification for Ready-Mixed Concrete.
- O. ASTM C143—Standard Test Method for Slump of Hydraulic-Cement Concrete.
- P. ASTM C150—Standard Specification for Portland Cement.

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- Q. ASTM C156–Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete.
- R. ASTM C172–Standard Practice for Sampling Freshly Mixed Concrete.
- S. ASTM C231–Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- T. ASTM C260–Standard Specification for Air-Entraining Admixtures for Concrete.
- U. ASTM C309–Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- V. ASTM C494–Standard Specification for Chemical Admixtures for Concrete.
- W. ASTM C618–Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- X. ASTM C652–Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
- Y. ASTM D994–Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- Z. ASTM D1752–Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.03 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01300–Submittals.
- B. Submit the following information:
 - 1. Gradation of fine and coarse aggregate–ASTM C33.
 - 2. Specific gravity and dry rodded density of each aggregate.
 - 3. Test of deleterious substances in fine and coarse aggregate–ASTM C33.
 - 4. Design mix of each individual concrete mix to be used.
 - 5. Previous test results or trial batch results with 7- and 28-day compressive strengths for each concrete mix proposed.
 - 6. Certified mill test results for cement identifying brand, type, and chemistry of cement to be used.
 - 7. Brand, type, principal ingredient, and amount of each admixture to be used.
- C. It is important that the above data be submitted to ENGINEER well in advance of anticipated concreting operations to avoid any delay in construction.

PART 2–PRODUCTS

2.01 CEMENT

- A. Cement shall be Portland cement conforming to ASTM C150. Cement used for structures exposed to wastewater, sludge, combined sewage, or sanitary sewage shall be Type II or Type I/II. All other cement shall be Type I or Type I/II. Type III cement shall be used only

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when permitted by ENGINEER. All cement shall be the product of one reputable manufacturer and mill.

- B. Cement shall be stored in a dry, weathertight, properly ventilated structure with the floor raised not less than 1 foot above the ground.

2.02 FLY ASH

- A. All fly ash used as an admixture in Portland cement concrete shall be Class C or F conforming to the requirements of ASTM C618.

2.03 AGGREGATE

- A. All aggregates shall be washed and shall consist of natural sand, gravel, or crushed rock and shall have clean, hard, durable, uncoated grains of strong minerals. The amounts of deleterious substances present in the fine and coarse aggregate expressed in percentages by weight shall not exceed the following:

Deleterious Substance	Aggregate	
	Fine	Coarse
Clay Lumps and Friable Particles	3.0	3.0
Coal and Lignite	0.5	0.5
Mineral finer than No. 200 sieve	3.0	
Soft Fragments	3.0	3.0
Chert*	---	5.0
Sum of Chert and Clay Lumps		5.0

* Material classified as chert and having a bulk specific gravity of less than 2.45. The percentage of chert shall be determined on the basis of the weight of chert in the sample retained on a 3/8-inch sieve divided by the weight of the total sample.

- B. The combined amount of all deleterious substances in an aggregate shall not exceed 5% of the weight of the aggregate.
- C. If required by ENGINEER, sodium sulfate soundness tests (ASTM C88) shall be performed on the aggregate. When the aggregate is subjected to 5 cycles, the weight loss shall not exceed 12%. Samples of proposed aggregates shall be submitted to an independent laboratory for testing in advance of concrete work. All testing shall be performed in accordance with ASTM C33. Certified test results shall be submitted to ENGINEER confirming that aggregate complies with all stated specifications. Report shall identify source of aggregate and absorbed water.
- D. Fine aggregate shall be well-graded from coarse to fine and shall conform to the following requirements:

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Percentage by Weight	
Passing 3/8-inch sieve	100
Passing No. 4 sieve	95-100
Passing No. 8 sieve	80-100
Passing No. 16 sieve	50-85
Passing No. 30 sieve	25-60
Passing No. 50 sieve	5-30
Passing No. 100 sieve	0-10

- E. Gradation of fine aggregate shall be reasonably uniform and not subject to the extreme percentages of gradation specified above. The fineness modulus shall be not less than 2.3 or more than 3.1, nor shall the fineness modulus of any sample vary by more than +0.20 from the fineness modulus of the representative sample used in proportioning the concrete.
- F. If required by ENGINEER, fine aggregate shall be subjected to the color-metric test for organic impurities (ASTM C40) and shall not produce a color darker than Figure 1, unless they pass the mortar strength test. Aggregate producing color darker than Figure 2 shall not be used in any event.
- G. Coarse aggregate shall be well-graded from coarse to fine, and when tested by laboratory sieves having square openings, shall conform to the following requirements:

	Percentage by Weight Aggregate	
	3/4-inch Stone	1 1/2-inch Stone
Passing 2-inch sieve	---	100
Passing 1 1/2-inch sieve	---	90-100
Passing 1-inch sieve	100	20-55
Passing 3/4-inch sieve	90-100	0-15
Passing 3/8-inch sieve	20-55	0-5
Passing No. 4 sieve	0-10	---
Passing No. 8 sieve	0-5	---

- H. The 3/4-inch aggregate shall be used in concrete members no thinner than 4 inches and less than 10 inches thick. A blend of 3/4-inch and 1 1/2-inch aggregate shall be used in members 10 inches thick and thicker with the 3/4-inch aggregate comprising between 35% and 65% of the total course aggregate. When members thinner than 10 inches are placed monolithically with members thicker than 10 inches, the aggregate requirements for the thinner member shall apply.
- I. Aggregates must be allowed to drain for at least 12 hours before being used. The ground upon which aggregates are stored must be hard, firm, well-drained, and free from all vegetable matter. Various sizes of aggregates must be stored separately, and if they have become contaminated or merged with each other, they shall not be used.

2.04 WATER

- A. Water used in mixing concrete shall be clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious substances.

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2.05 ADMIXTURES

- A. Water Reducing Admixture shall be Master Pozzolith® 200 by BASF Admixtures, Inc., Daracem 19 by Grace, or equal. Water reducing admixture shall conform to ASTM C494, Type A and Type F. Water reducing admixture shall not reduce durability, shall increase strength 10%, and shall not affect bleeding characteristics over reference mix.
- B. Air-Entraining Admixture shall be equal to MasterAir® AE 90 by BASF Admixtures, Inc., Darex by Grace Construction Products, or equal. Air-entraining admixture shall conform to ASTM C260.
- C. No other admixture will be allowed without written approval of ENGINEER. All admixture shall be compatible with cement, aggregate, and water used.

2.06 ANTI-MICROBIAL ADDITIVE

- A. Antimicrobial additive shall be Con^{mic}Shield®, or equal, or manufactured by ConShield Technologies, Inc.
- B. The liquid antibacterial additive shall be an EPA registered material and the registration number shall be submitted for approval prior to use in the project.
- C. The amount to be used shall be as recommended by the manufacturer of the antibacterial additive. This amount shall be included in the total water content of the concrete mix design.
- D. The additive shall be added into the concrete mix water to insure even distribution of the additive throughout the concrete mixture.
- E. The ready-mix supplier shall submit a letter of certification to the project owner stating that the correct amount and correct mixing procedure were followed for all antimicrobial concrete.
- F. The antibacterial additive shall have successfully demonstrated prevention of MIC in sanitary sewers for ten or more years. After the concrete takes initial set, Con^{mic}Shield® color identifier-indicator (CS IDENTIFIER) shall be applied to the interior surface.
- G. The concrete producer shall retain two cured pieces of concrete from each batch made with Con^{mic}Shield® for possible verification by an independent lab. The pieces must have a minimum dimension of 1 square inch but they need not be uniform. Pieces may be obtained from remnants of cylinder break tests. The specimens shall be placed in plastic baggies and clearly labeled with the date, batch number, pipe or manhole dimension and specific project.

2.07 PROPORTIONING

- A. The proportions of aggregate to cement shall be such as to produce a workable mixture that can be thoroughly compacted and that will work readily in the forms and around reinforcement without permitting materials to segregate or excess water to collect on the surfaces. The combined aggregates shall be such that when separated on the No. 4 sieve, the weight passing the sieve shall not be less than 30% nor greater than 50%.

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- B. Concrete of various classes shall have the following maximum water/cement or water/(cement + fly ash) ratio minimum compressive strengths at 28 days and minimum cement and fly ash contents:

Class	Maximum Water/ Cement or Water/ (Cement+Fly Ash)	Minimum 28 Day Strength-Pounds per Square Inch	Cement Content-Pounds per Cubic Yard	Fly Ash- Pounds per Cubic Yard		Anti-Microbial Additive
				Type C	Type F	
A	0.45	4,000	564	---	---	---
A-AM	0.45	4,000	564	---	---	*
A-FA	0.45	4,000	480	110	125	---
A-FA-AM	0.45	4,000	480	110	---	*
B	0.53	3,500	517	---	---	---
C	0.53	3,000	517	---	---	---
X	---	2,000	376	---	---	---

* Quantity per manufacturer's recommendation.

- C. Except as otherwise indicated on the Drawings or specified, all concrete shall be Class A or Class A-FA concrete.
- D. Concrete in the following locations shall be Class A-AM or A-FA-AM: New channel floors and walls and concrete fill in the parshall flume structure. See Drawings for clarification.
- E. All concrete mixes shall be designed for a strength of 15% above that specified to allow for job variations. All mixes shall be designed in accordance with ACI 211.1 by a competent concrete engineer or competent laboratory technician. Required materials test data shall be submitted with design mixes for review and approval by ENGINEER. Mix computations shall be submitted if requested by ENGINEER.
- F. The slump for all concrete shall be 3 inches and concrete with a slump within the range of 2 to 3 1/2 inches will be acceptable unless otherwise stated.
- G. A water-reducing admixture shall be used in all concrete. A qualified representative of the manufacturer shall be available to assist in proportioning the concrete, advise on the proper addition of the admixture to the concrete, and advise on adjustments of concrete proportions to suit job conditions.
- H. An air-entraining admixture shall be used in all concrete except as noted. Air content shall be tested by the pressure method as outlined in ASTM C231 and shall be between 4% to 7% by volume. An air-entraining admixture is not required for concrete patching and for concrete floors, equipment pads, and supports in interior heated buildings where the concrete will be protected from freezing during and after construction.
- I. CONTRACTOR shall submit to ENGINEER concrete cylinder compressive strength results from previous projects for the same concrete mixes proposed on the current project. If this information is not available, one cubic yard trial batches of each individual mix proposed for use shall be made prior to use in the work. Four test cylinders shall be made for each trial batch, two to be tested at 7 days and two at 28 days. The trial batches shall be made preceding actual placement operations so that the results of the 7-day tests can be obtained.

COPY OF BID SET

All costs for material, equipment, and labor incurred during design of concrete mixes shall be borne by CONTRACTOR.

- J. All aggregates shall be measured by weight. The concrete mixer is to be equipped with an automatic water-measuring device that can be adjusted to deliver the desired amount of water.

2.08 WATERSTOPS

- A. PVC waterstops shall be as manufactured by Greenstreak, Inc., W.R. Meadows, Grace Construction Products, or equal. Provide serrated center bulb-type, nontapered 3/8-inch minimum thickness waterstops manufactured from virgin polyvinyl chloride with no reclaimed/scrapped material or pigment whatsoever conforming to Corps of Engineers CRD-C-572. The waterstop shall have an integral fastening system consisting of hogrings or grommets. For 6-inch PVC waterstops in construction joints, use Greenstreak, Inc. Profile No. 732, or equal. For expansion joints, use Greenstreak, Inc. Profile No. 735, or equal. Where 4-inch PVC waterstops are called for in the Drawings, use Greenstreak, Inc. Profile No. 702, or equal.
- B. Hydrophilic waterstop shall be a flexible hydrophilic natural rubber strip composed of nonvulcanized rubber and urethane polymer hydrophilic agent creating a moisture-activated, self-healing waterproofing compound.
- C. Hydrophilic waterstop shall be Adeka Ultraseal, or equal, products as follows:
 - 1. Construction Joints:
 - a. Wall/slab thickness greater than 9 inches with double mat of reinforcing: MC-2010MN (3/4 inch by 3/8 inch) with embedded stainless steel wire mesh for expansion control. The waterstop shall develop a minimum of 400 psi expansion pressure and withstand a minimum 150-foot hydrostatic head. Expansion amount shall not exceed 120%.
 - b. Wall/slab thickness between 4 inches and 9 inches with 1-inch minimum cover and single or double mat of reinforcing: KBA-1510FP (9/16 inch by 3/8 inch). Expansion amount shall not exceed 30%.
 - 2. Pipe Penetrations:
 - a. Wall/slab thickness between 4 inches and 9 inches and pipe diameter greater than 4 inches and less than or equal to 24 inches: KBA-1510FP (9/16 inch by 3/8 inch).
 - b. Wall/slab thickness greater than 9 inches and pipe diameter greater than 4 inches and less than or equal to 24 inches: MC-2005T (3/4 inches by 3/16 inches).
 - c. Wall/slab thickness greater than 9 inches and pipe diameter greater than 24 inches: MC-2010MN (3/4 inch by 3/8 inch) with embedded stainless steel wire mesh for expansion control.

2.09 JOINT FILLER

- A. Expansion joints shall have standard 1/2-inch-thick cork expansion joint filler, W. R. Meadows, or equal, meeting ASTM D1752–Type II. Exceptions to this are expansion joints in exterior concrete walks and between concrete walks and other structures which shall be asphalt expansion joint filler, 1/2-inch-thick, Grace, W.R. Meadows, or equal, meeting ASTM D994.

2.10 BONDING AGENT

- A. Acceptable manufacturers include MasterEmaco® P 124 by BASF or equal.

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2.11 PATCHING ADDITIVE

- A. Acceptable manufacturers include MasterEmaco® A 660 by BASF, Sonocrete by Sonneborn Contech Co., or equal.

2.12 NONSHRINK GROUT

- A. Acceptable manufacturers include Dayton Superior, Master Builders, or equal. Grout shall be nonshrink, nonmetallic and shall achieve a strength of 7,500 psi in 28 days.

2.13 CURE-SEAL HARDENER

- A. Penetrating sealer for interior building floors shall be Ashford Formula by Curecrete Chemical Company, Inc., or equal. See finish schedule for locations to be used.

PART 3-EXECUTION

3.01 MIXING

- A. Ready-mixed concrete shall be batched, mixed, and delivered in accordance with ASTM C94 and ACI 304R. In general, concrete shall be mixed 50 revolutions at plant, 20 upon arrival at site, and 20 each time water is added; maximum of 110 revolutions at mixing speed. Concrete shall be delivered and discharged within 1 1/2 hours or before the drum has revolved 300 times after introduction of water to the cement and aggregates or the cement to the aggregates. Truck mixers shall be equipped with drum revolution counters. In no event shall concrete which has taken its initial set be allowed to be used. Retempering of concrete is not permitted.
- B. A representative of ENGINEER may be at the batching plant periodically to observe the batching and mixing.
- C. No water shall be added on the job unless required by CONTRACTOR and with the knowledge of ENGINEER; the amount of water, if added, shall be recorded on all copies of the delivery tickets. If water is added, CONTRACTOR shall verify that the required water-cement ratio is not exceeded.
- D. Concrete shall have a temperature not less than 60°F nor more than 80°F as delivered to the jobsite.
- E. With each load of concrete, CONTRACTOR shall obtain delivery tickets and shall make these tickets available for review by ENGINEER. Delivery tickets shall provide the following information:
 - 1. Date.
 - 2. Name of ready-mix concrete plant, job location, and CONTRACTOR.
 - 3. Type of cement and admixtures, if any.
 - 4. Specified cement content in sacks per cubic yard of concrete and approved concrete mix number or designation.
 - 5. Amount of concrete in load, in cubic yards.
 - 6. Water-cement ratio.
 - 7. Water added at job, if any.
 - 8. Truck number and time dispatched.
 - 9. Number of mixing drum revolutions.

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- F. For job-mixed concrete, all concrete materials shall be mixed in a machine batch mixer for at least 1 1/2 minutes after all ingredients are in the mixer and shall continue until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. The mixer shall not be loaded beyond the capacity given by the manufacturer and shall be rotated at the speed recommended by the manufacturer. The mixer is to be provided with positive timing device that will positively prevent discharging the mixture until the specified mixing time has elapsed.

3.02 JOINTS

- A. CONTRACTOR shall place all joints as shown on the Drawings or specified herein. If approved by ENGINEER, CONTRACTOR may, at his own expense, place construction joints in addition to and at places other than those shown on the Drawings. Unless otherwise shown, all joints shall be straight, truly vertical or horizontal, and proper methods shall be employed to obtain this result.
- B. Where joints are not shown on the Drawings or specified elsewhere, CONTRACTOR shall provide joints as follows:
 - 1. Walls shall have vertical joints at 60 feet on center maximum but not more than 15 feet from corners or intersections and shall have horizontal joints at 15 feet on center maximum.
 - 2. Slabs shall have joints at 20 feet on center maximum in each direction.
- C. Immediately after completion of the first pour at a joint, the concrete surface, reinforcement, and waterstop projecting beyond the joint shall be thoroughly cleaned and laitance removed. The waterstops shall not be disturbed after the concrete in the first pour at a joint has set. Concrete around waterstops shall be thoroughly compacted by hand spading and vibrating. Immediately before the second pour, all extraneous matter shall be removed from the joint, the waterstop and steel cleaned, and the surface thoroughly wetted.
- D. Concrete at all joints shall have been in place at least 48 hours before abutting concrete is placed. At least two hours must elapse after depositing concrete in columns or walls before depositing in beams, girders, or slab supported thereon. Beams, girders, brackets, column capital, and haunches shall be considered as part of the floor system and shall be placed integrally therewith.

3.03 WATERSTOPS

- A. Unless noted otherwise, PVC waterstops shall be provided at all expansion joints and at construction joints in floors and walls of structures exposed to ground or liquid on one side and occupied by personnel or nonsubmerged equipment on the other side.
- B. PVC waterstops shall be made continuous by splicing. Waterstops shall be spliced using a corner, tee, or cross splice, as applicable, at intersections. Waterstops shall be mitered to maintain the continuity of the ribs and center bulb. Splices shall be made using a hot metal plate or an electric splicer and full butt weld. Direct flame will not be allowed. Sample field-splices shall be submitted to ENGINEER for approval prior to construction.
- C. PVC waterstops placed in all joints shall be securely held in place by an approved method. PVC waterstops shall be installed and secured prior to concrete placement. PVC waterstops shall not be inserted into wet concrete. No nails will be permitted through the waterstop. Great care shall be taken when concrete is placed to ensure that the waterstop remains erect and is not bent over.

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- D. Either hydrophilic or PVC waterstop shall be provided at all construction joints in liquid holding tanks and channels that are not adjacent to areas occupied by personnel and at joints between new and existing concrete. Waterstop shall be placed as shown on Drawing details, if any, and in accordance with the manufacturer's recommendations.

3.04 BONDING TO EXISTING CONCRETE

- A. When placing new concrete adjacent to existing concrete, the existing concrete shall be thoroughly roughened, cleaned, and saturated with water 24 hours before pouring new concrete. Existing concrete is defined as concrete more than six months old. At time of new pour, remove any standing water and apply bonding agent. Bonding agent shall be applied in accordance with manufacturer's recommendations.
- B. For new concrete containing antimicrobial additive, repair voids and damaged areas with Con^{mic}Shield[®] Joint Set Grout pre-portioned and factory packaged.

3.05 EMBEDDED ITEMS IN CONCRETE

- A. All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting.
- B. All contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.
- C. Embedded items shall be positioned accurately and supported against displacement. Reinforcing bars shall clear embedded items a minimum of 2 inches.

3.06 PLACING CONCRETE

- A. Before placing concrete, all equipment, forms, ground, reinforcements, and other surfaces with which the concrete will come in contact are to be thoroughly cleaned of all debris, ice, and water. Ground shall be wetted prior to placement of concrete on it.
- B. After reinforcement is placed and before concrete is placed over it, ENGINEER shall be allowed sufficient time to observe the reinforcing.
- C. Unless otherwise authorized by ENGINEER, all concrete shall be placed in the presence of ENGINEER.
- D. Concrete shall be conveyed from the mixer to the place of final deposit as rapidly as practicable by methods that will prevent the segregation or loss of materials. Chuting for conveying purposes must be accomplished in such a manner as to prevent segregation or loss of materials. Receiving hoppers shall be installed at the chute discharge and at no point in its travel from the mixer to place of final deposit shall the concrete pass through a free vertical drop of more than 3 feet. Elephant trunks or tremies shall be used in all wall pours to prevent coating of forms and reinforcing bars.
- E. Care shall be taken to avoid an excess of water on the concrete surface. Excess water shall be drained or otherwise removed from the surface. Dry cement or a mixture of cement and sand shall not be sprinkled directly on the surface to absorb water.
- F. Concrete in wall and beam pours shall be deposited in approximately horizontal layers not to exceed 18 inches in thickness. Each layer shall be well worked into the preceding layer while both layers are still soft.

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- G. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation from rehandling or flowing. The maximum allowable lateral movement of the concrete after being deposited is 3 feet. Once concreting is started, it shall be carried on as a continuous operation until the placing of the section or panel is completed.
- H. All concrete shall be placed with the aid of mechanical vibrating equipment in accordance with ACI 309. In congested areas, vibration shall be supplemented by hand spading adjacent to the forms. Vibration should secure the desired results within 5 to 15 seconds at intervals of 18 inches apart maximum. The vibrator shall penetrate the preceding layer of concrete. Vibrators shall have a frequency of not less than 10,000 impulses per minute when in operation submerged in concrete.
- I. A sufficient number of spare vibrators shall be kept in ready reserve to assure adequate vibration in case of breakdown of those in use.
- J. In placing concrete in beams where it is intended to be continuous and monolithic with the slab above, a delay to provide for settlement of the deep concrete shall be scheduled before placing the upper concrete in the slab. The length of delay shall be as long as possible and still permit the revibration of the deep concrete.
- K. Concrete is not to be placed under water. A suitable means shall be provided for lowering the water level below surfaces upon which concrete is to be placed. This may require excavating approximately 12 inches below the bottom of the concrete surface and refilling with gravel and compacting. The groundwater shall not be allowed to rise to the bottom of the concrete until 24 hours after the concrete pour has been completed. Water shall not be allowed to fall upon or run across the concrete during this period.
- L. No extra payment will be allowed for dewatering, undercutting, and gravel fill.

3.07 MOIST CURING

- A. All concrete shall be maintained in a moist condition for at least 7 days after being deposited except that for high-early strength concrete, a 3-day period will be sufficient. Moist curing shall be accomplished by one of the following methods:
 - 1. Wood forms left in place and kept wet at all times. If the forms are not going to be kept wet, they shall be removed as soon as practicable and other methods of moist curing shall be started without delay.
 - 2. Use of a curing compound conforming to ASTM C309, Type I as approved by ENGINEER. Curing compound shall be applied at a uniform rate as indicated by the manufacturer sufficient to comply with the requirements of the test water retention of ASTM C156. Curing compound applied to vertical concrete surfaces after forms are removed shall be specially adapted to provide required coverage on the vertical surface. On nonformed surfaces, the curing compound shall be applied immediately after the disappearance of the water sheen after finishing of the concrete. Curing compound shall not be used on concrete surfaces that are to be painted, receive ceramic tile or resilient flooring, or be waterproofed. Care shall be taken not to get curing compound on construction joints, reinforcing steel, and other surfaces against which new concrete will be poured.
 - 3. Use of plastic film. Plastic film shall have a minimum thickness of 4 mils. It shall be placed over the wet surface of the fresh concrete as soon as possible without marring the surface and shall be weighted so that it remains in contact with all exposed surfaces of the concrete. All joints and edges shall be lapped and weighted. Any tears in the film shall be immediately repaired.

COPY OF BID SET

4. Application of wet coverings weighing 9 ounces per square yard such as burlap, cotton mats, or other moisture-retaining fabrics. The covering system shall include two layers and shall be kept continuously moist so that a film of water remains on the concrete surface throughout the curing period.
 5. Use of an approved waterproof curing paper. Edges of adjacent sheets shall be overlapped several inches and tightly sealed.
 6. Ponding of water or continuous sprinkling of water is permitted. Sprinkling at intervals will not be permitted.
 7. Construction joints shall be moist cured by one of the methods listed above except by Method "2."
- B. The use of moist earth, sand, hay, or another method that may discolor hardened concrete will not be permitted.

3.08 HOT WEATHER CONCRETING

- A. When the atmospheric temperature exceeds 80°F during concrete placement, this section and ACI 305 shall apply in addition to all other sections of the specifications.
- B. The temperature of the delivered concrete shall not exceed 85°F.
- C. Care shall be exercised to keep mixing time and elapsed time between mixing and placement at a minimum. Ready-mix trucks shall be dispatched so as to avoid delay in concrete placement, and the work shall be organized to use the concrete promptly after arrival at the jobsite.
- D. The subgrade, forms, and reinforcing shall be sprinkled with cool water just prior to placement of concrete. Prior to placing concrete, there shall be no standing water or puddles on the subgrade.
- E. If approved by ENGINEER, an admixture for retarding the setting of the concrete may be used.
- F. Exposed concrete surfaces shall be carefully protected from drying. Continuous water curing is preferred. Curing compounds shall be white pigmented.

3.09 COLD WEATHER CONCRETING

- A. Conditions of this section shall apply, in addition to all other sections of the specifications, when placing concrete in cold weather. Cold weather is defined as a period when, for more than 3 successive days, the average daily temperature drops below 40°F. When temperatures above 50°F occur during more than half of any 24-hour period, the period will no longer be regarded as cold weather. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. Cold weather concreting shall conform to all requirements of ACI 306.1, except as modified by the requirements of these specifications.
- B. Detailed procedures for the production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather shall be submitted to ENGINEER. Cold weather concreting shall not begin until these procedures have been accepted.
- C. All concrete materials, forms, ground, mixing equipment, and other surfaces with which the concrete is to come in contact shall be free from frost, and the temperature of contact surfaces shall be 35°F or above. Ground upon which concrete is to be placed shall not be frozen at any depth.

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- D. The mixing water and aggregates shall be heated and when entering the mixer shall have temperatures not exceeding 175°F and 80°F, respectively. Concrete temperature as mixed shall not exceed 80°F and shall typically be between 55°F and 70°F. Concrete, when placed in the forms, shall have a temperature of not less than 50°F.
- E. Freshly placed concrete shall be protected by adequate covering, insulating, or housing and heating. If heating is used, ambient temperature inside the housing shall be maintained at a minimum of 70°F for 3 days or 50°F for 5 days. The maximum ambient temperature during curing shall not exceed 80°F. If insulating methods are used, recommendations contained in ACI 306R shall be followed. Surface temperature shall be maintained at 50°F for 7 days. After the curing period, the temperature of the concrete shall be reduced uniformly at a rate not to exceed 40°F per 24 hours until outside air temperature is reached. Heating of enclosure shall continue if it is anticipated that the outside air temperature will drop more than 20°F in the next 24 hours. The concrete temperature shall be obtained by attaching a thermometer provided by CONTRACTOR to the concrete surface. Concrete shall be kept moist.
- F. If heating is used, the housing shall be constructed weathertight and shall be constructed in a manner that will provide uniform air circulation and air temperatures over the complete concrete area that is being cured. Special attention shall be given to the edges and ends of a concrete pour with the housing extending at least 5 feet beyond any concrete surface being protected. The housing shall be in place and heat applied within 2 hours after concrete placement.
- G. Heating may be by steam or hot air. Heaters shall be vented to outside of the housing. Open burning salamanders will not be permitted. Heating devices shall not be placed so close to the concrete as to cause rapid drying or discoloration from smoke.
- H. If heating is used, CONTRACTOR shall provide sufficient 24-hour inspection of the heaters to ensure compliance with the above-specified temperature requirements during the curing period. CONTRACTOR shall provide maximum-minimum thermometers for ENGINEER's use.
- I. The use of calcium chloride, salts, or other chemical admixtures for the prevention of freezing is prohibited.
- J. Salts or other deleterious materials shall not be used on temporary or permanent structures above concrete surfaces that are being placed, finished, or cured.

3.10 FINISHING

- A. Flat Work:
 - 1. Floated Finish: Place, consolidate, strike off, and level concrete eliminating high spots and low spots. Do not work concrete further until it is ready for floating. Begin floating with a hand float, a bladed power float equipped with float shoes, or a powered disk float when the bleed water sheen has disappeared and the surface has stiffened sufficiently to permit the operation. Immediately refloat the slab to a uniform texture.
 - 2. Light Troweled Finish: Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks.
 - 3. Hard Troweled Finish: Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled.
 - 4. Tolerance for concrete floors shall be 1/4 inch within 10 feet in any direction. Straight edge shall be furnished by CONTRACTOR.

COPY OF BID SET

5. Broom or Belt Finish: Immediately after concrete has received a floated finish, give the concrete surface a coarse transverse scored texture by drawing a broom or burlap belt across the surface.
 6. The above finishes shall be used in the following locations:
 - a. Float Finish: Surface to receive roofing, waterproofing, or sand bed terrazzo.
 - b. Light Troweled Finish: Submerged tank slabs.
 - c. Hard Troweled Finish: Building floors.
 - d. Broom or Belt Finish: Exterior slabs, sidewalks, tops of walls, and tank slabs to receive grout topping.
- B. Formed Surfaces:
1. Within 2 days after removing forms and prior to application of a curing compound, all concrete surfaces shall be observed and any poor joints, voids, stone pockets, or other defective areas shall be patched at once before the concrete is thoroughly dry. Defective areas shall be chipped away to remove all loose and partially bonded aggregate. The area shall be thoroughly wetted and filled with as dry as practical mortar mix placed to slightly overfill the recess. Mortar shall include a bonding agent. After partial set has taken place, the excess mortar shall be removed flush with the surface on the concrete using a wood float. All patching shall be cured, protected, and covered as specified for concrete. All cracks, leaks, or moist spots that appear shall be repaired. No extra compensation will be allowed CONTRACTOR for such work.
 2. The exterior or removal portion of nonremovable ties shall be removed with the use of a special tool designed for this purpose. Cutting or chipping of concrete to permit removal of exterior portion will not be permitted.
 3. For nonremovable ties, tie rod holes left by the removal of the exterior portion of the tie and cone shall be thoroughly wetted and filled by ramming with as dry as practical mortar mix in such a manner such that it completely fills the hole. Mortar shall include a bonding agent. All patching shall be cured, protected, and covered as specified for concrete. The holes are to be filled immediately after removal of the exterior portion of the tie.
 4. Holes left by removable ties shall be filled by installing a neoprene plug near the center of the wall. The balance of the hole shall be filled with mortar as specified above to within 1 inch of the face of the wall. The remainder of the hole shall be filled with a waterproofing compound.
 5. All finished or formed surfaces shall conform accurately to the shape, alignment, grades, and sections as shown or prescribed by ENGINEER. All surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness. All sharp angles, where required, shall be rounded or beveled. Any formed surface to be painted shall be free of any material that will be detrimental to the paint. The surface of the concrete shall be given one of the following finishes immediately after form stripping:
 - a. Finish A shall be referred to as a sack finish. Surfaces shall be free of contaminants prior to sacking. After wetting the surface, a grout shall be rubbed in using a rubber float or burlap. After the grout hardens sufficiently, it shall be scraped from the surface with the edge of a steel trowel without disturbing the grout in the air holes. After further drying, the surface shall be rubbed with burlap to remove all surface grout. The entire surface shall be finished to secure a continuous, hard, dust-free uniform texture surface free from pinholes and other minor imperfections. Finish A will be required for all unpainted surfaces (See Section 09900 for painted surfaces), interior surfaces of equipment rooms, operation areas, and permanently exposed vertical surfaces. Where steel-faced forms are used to form walls, the portion of wall to receive the sack finish shall first be roughened by brush blasting or other acceptable method to achieve a texture similar to 40 to 60 grit sandpaper.
 - b. Finish B shall be the same as Finish A, except that the final burlap rubbing may be omitted, providing the steel trowel scraping removes the loose buildup from the

COPY OF BID SET

surface. Finish B shall be provided for waterproof- and moistureproof-coated surfaces.

- c. Finish C shall be referred to as a finish that has surface imperfections less than 3/8 inches in any dimension. Surface imperfections greater than 3/8 inches shall be repaired or removed and the affected areas neatly patched. Finish C or smoother shall be provided for interior surfaces of wet wells, tanks, and channels from 1 foot below minimum water surfaces and down and otherwise unfinished interior surfaces.
- d. Finish D shall be the finish for surfaces that may be left as they come from the forms, except that tie holes shall be plugged and defects greater than 1/2 inch in any dimension shall be repaired. Finish D shall be provided for surfaces to be buried or covered by other construction such as masonry veneer.

- C. All precautions shall be taken to protect the concrete from stains or abrasions, and any such damage shall be removed or repaired under this Contract.

3.11 LOADING OF CONCRETE STRUCTURES

- A. No concrete structure or portion thereof shall be loaded with its design load until the concrete has obtained its specified 28-day compressive strength. This shall include but not be limited to vertical live load, equipment loading, water loading, groundwater loading, and backfill load. Concrete strength at time of loading shall be determined by testing field-cured concrete cylinders.
- B. Extreme care shall be taken to ensure that construction loads do not exceed design loading of the structure.

3.12 NONSHRINK GROUT

- A. Nonshrink, nonmetallic grout shall be used for filling recesses and pockets left for equipment installation and for setting of base plates. The material used shall be approved by ENGINEER. Store, mix, and place the nonshrinking compound as recommended by the manufacturer. The minimum compressive strength shall be 5,000 psi at age 7 days and 7,500 psi at age 28 days.

3.13 TESTING AND SAMPLING

- A. The following tests of fresh concrete shall be performed by CONTRACTOR. CONTRACTOR shall prepare, protect, transport, and have tested all cylinders at his expense.
 - 1. Sampling of concrete for slump tests, air tests, temperature tests, and for making concrete test cylinders shall be performed in accordance with ASTM C172.
 - 2. Cylinders:
 - a. Three test cylinders shall be made for each pour less than 25 cubic yards, four test cylinders shall be made for each pour between 25 and 100 cubic yards, and eight test cylinders shall be made for each pour in excess of 100 cubic yards. Each concrete mix shall be represented by at least four cylinders for the entire job. Concrete for cylinders shall be collected near the middle of the load and/or as requested by ENGINEER.
 - b. Cylinders shall be made and tested in accordance with ASTM C31 and ASTM C39, respectively. The cylinders must be kept moist and at temperatures between 60°F and 80°F and shall remain undisturbed and stored in a location free from vibration. In hot weather, the cylinders shall be covered with wet burlap and stored in a shaded area. It is CONTRACTOR's responsibility to provide a suitable protected location for storing cylinders on the jobsite.

COPY OF BID SET

- c. After 24 hours, the cylinders shall be transferred to an independent testing laboratory acceptable to OWNER. The cylinders shall be packed in sawdust or other cushioning material for transit to avoid any bumping or jarring of the cylinders.
 - d. Cylinders shall be broken at 7 and 28 days or as requested by ENGINEER. Test results shall be mailed immediately and directly to ENGINEER. Test data shall include date and location of pour and concrete mix used.
3. Slump Test: CONTRACTOR shall make one slump test near the beginning of all pours with two tests being made for all pours in excess of 25 yards or as requested by ENGINEER. Slump tests shall conform to ASTM C143.
 4. Air Test:
 - a. When air-entrained concrete is used, the air content shall be checked by CONTRACTOR near the beginning of all pours with at least two checks being made for all pours in excess of 25 cubic yards, or as requested by ENGINEER.
 - b. The air contents shall be checked using the pressure method in accordance with ASTM C231. The pocket-sized alcohol air indicator shall not be used unless it is first used in conjunction with the pressure method test.
- B. All costs of additional testing and sampling of fresh or hardened concrete needed because of suspected or actual violation of the specifications shall be borne by CONTRACTOR.
 - C. All concrete testing costs shall be borne by CONTRACTOR.

3.14 RECORDS

- A. A record is to be kept of all concrete work. The record shall include the date, location of pour, concrete mix, slump, air content, test cylinder identification, concrete temperature, and ambient air temperature. In addition, for cold weather concreting the record shall include the daily maximum-minimum thermometer readings of all thermometers during the entire curing period for all concrete pours. The project representative will keep this record, and CONTRACTOR shall assist in obtaining needed information.

3.15 CURING AND SEALING INTERIOR BUILDING FLOORS

- A. Install cure-seal hardener product in accordance with manufacturer's instructions. Apply only to those floors noted to be sealed in the finish schedule.
- B. Where product will be used for moist curing, sealing and hardening, apply to new concrete as soon as the concrete is firm enough to walk on after troweling. Where product will be used for sealing and hardening only, surface must be free of dust, dirt, laitance, curing compounds, and any material that would inhibit the penetration of the product. In some instances, the floor may need to be stripped and neutralized before application.
- C. Spray on at rate of 200 square feet per gallon.
- D. Keep surfaces wet with cure-seal hardener for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather, slipperiness may appear before the 30-minute time period has elapsed. If that occurs, apply more cure-seal hardener as required to keep entire surface in a nonslippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a nonslippery state.
- E. After this period, when treated surface becomes slippery, lightly mist with water until slipperiness disappears.

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- F. Wait for surface to become slippery again and then flush entire surface with water removing all residue of cure-seal hardener.
- G. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
- H. Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.
- I. Protect installed floors until chemical reaction process is complete; at least 3 months.
- J. Clean up spills immediately and spot-treat stains with good degreaser or oil emulsifier.
- K. Protection and cleaning of floors are the responsibility of CONTRACTOR until final completion. Replace concrete that becomes stained because of improper precautions or lack of cleaning.

END OF SECTION

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SECTION 04100

MORTAR AND MASONRY GROUT

PART 1—GENERAL

1.01 SUMMARY

- A. The work includes mortar and grout for masonry.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. Kentucky Building Code.
- B. ASTM C144—Aggregate for Masonry Mortar.
- C. ASTM C150—Portland Cement.
- D. ASTM C207—Hydrated Lime for Masonry Purposes.
- E. ASTM C404—Aggregates for Masonry Grout.
- F. ASTM C476—Grout for Masonry
- G. ASTM C979—Pigments for Integrally Colored Mortar/Concrete.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300—Submittals.
- B. Submit information on Portland cement, integral waterproofing compound, and hydrated lime for mortar. Include design mix with proportions of materials being used. Submit gradation on aggregates.
- C. Submit design mix for grout including gradation of aggregates.
- D. Manufacturer's certificate: Certify that products meet or exceed specified requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. All cement shall be stored in a dry, weatherproof, properly ventilated structure which will protect it from dampness and freezing.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. See Section 04300—Unit Masonry System, for cold weather requirements.

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PART 2-PRODUCTS

2.01 MORTAR

- A. Mortar shall be Type S Portland cement-lime mortar with proportion restrictions as stated in the Kentucky Building Code. Mortar and masonry cements will not be permitted. Provide integral waterproofing compound in mortar for all exterior masonry mortar.
- B. Portland cement shall conform to ASTM C150, Type I or III.
- C. Hydrated lime shall conform to ASTM C207, Type S.
- D. Integral waterproofing compound shall be Dry-Block by W.R. Grace Company, or equal.
- E. Mortar aggregate for ordinary tile, brick, stone, and block shall consist of clean, sharp sand, conforming to ASTM C144. The sand shall be graded within the following limits:

Sieve Number	Percent by Weight Passing
4	100
8	95 to 100
16	70 to 100
30	40 to 75
50	10 to 35
100	2 to 15
200	---

- F. Sand from any one source shall not vary over the extreme limits shown above. For unusually thin joints, such as occur with a unit having cut or ground edges, the aggregate used shall conform to these specifications except that 95% shall pass a No. 16 sieve.
- G. Water used in mixing water shall be clean and free of injurious materials.
- H. Mortar shall be thoroughly mixed until of uniform color and consistency. Only sufficient mortar to meet the immediate requirements of the work shall be mixed at one time. No mortar shall be retempered after it has begun to set, and no partially set mortar shall be used. No antifreeze material shall be used in the mortar to lower the freezing point.

2.02 GROUT

- A. Grout shall conform to ASTM C476-Mortar and Grout for Reinforced Masonry.
- B. Aggregates shall conform to ASTM C404-Aggregates for Masonry Grout.
- C. Grout shall have a minimum 28-day compressive strength of 2,500 psi with the following proportions:
 - 1. Fine Grout: 1 Portland Cement: 0 to 1/10 lime: 2 1/2 to 3 fine aggregate.
 - 2. Coarse Grout: 1 Portland Cement: 0 to 1/10 lime: 2 1/2 to 3 fine aggregate: 1 to 2 coarse aggregate.

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- D. Fine grout shall be used in spaces with least horizontal dimension greater than 3/4 inches and less than 2 1/2 inches. Coarse grout shall be used in all spaces with least dimensions 2 1/2 inches or greater.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Brace masonry for wet grout pressure.
- B. Work grout into masonry cores and cavities.
- C. Where joints occur in grout, they shall be made 2 inches below the block joint so that a key is provided.
- D. Grout full masonry walls from top of floor to underside of all lintels at openings for a distance of 16 inches adjacent to each side of opening, unless shown otherwise on the drawings.

END OF SECTION

COPY OF BID SET

SECTION 04300

UNIT MASONRY SYSTEM

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Concrete block.
 - 2. Split-face block.
 - 3. Reinforcement, anchorage, control joints, and accessories.
 - 4. Cold weather requirements.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. Kentucky Building Code.
- B. ASTM C67—Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- C. ASTM C90—Standard Specification for Loadbearing Concrete Masonry Units.
- D. ASTM C744—Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
- E. UL—Fire Resistance Directory.

1.03 QUALITY ASSURANCE

- A. Variation from the plumb in the lines and surfaces of walls shall not exceed 1/4 inch in 10 feet, 3/8 inch in a story height or 20 feet maximum or 1/2 inch in 40 feet or more. Variation from plumb for external corners, expansion joints, and other conspicuous lines shall not exceed 1/4 inch in any story or 20 feet maximum or 1/2 inch in 40 feet or more.
- B. Variation from the level of the grades indicated on the drawing for exposed lintels, sills, horizontal grooves, and other conspicuous lines shall not exceed 1/4 inch in any bay or 20 feet or 1/2 inch in 40 feet or more.
- C. Variation of the linear building line from an established position in plan and related portion of walls and partitions shall not exceed 1/2 inch in any bay or 20 feet maximum or 3/4 inch in 40 feet or more.
- D. Variation in cross-sectional dimensions of thickness of walls shall not exceed minus 1/4 inch or plus 1/2 inch from the dimensions indicated on the drawings.

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1.04 DELIVERY, STORAGE, AND HANDLING

- A. Masonry units, when delivered to the site, shall be thoroughly cured and shall be dry. When stored on the site, they shall not be in contact with the ground, shall be kept clean, and shall be covered with waterproof cover.

1.05 COLD WEATHER REQUIREMENTS

- A. All masonry units delivered to use in freezing weather shall be fully protected by a weathertight covering to prevent accumulation of ice on the units. Loose board covering will not be permitted.
- B. Cold Weather Protection:
 - 1. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
 - 2. Remove all masonry determined to be frozen or damaged by freezing conditions.
 - 3. Perform the following construction procedure while the work is progressing. When air temperature is from 40°F (4°C) to 32°F (0°C), heat sand or mixing water to produce mortar temperature between 40°F (4°C) and 120°F (49°C):
 - a. When air temperature is from 32°F (0°C) to 25°F (-4°C), heat sand or water to produce mortar temperature between 40°F (4°C) and 120°F (49°C); maintain temperature of mortar on boards above freezing.
 - b. When air temperature is from 25°F (-4°C) to 20°F (-7°C), heat sand and mixing water to produce mortar temperatures between 40°F (4°C) and 120°F (49°C); maintain temperature of mortar on boards above freezing; use salamanders or other heat sources on both sides of walls under construction; use wind breaks when wind is in excess of 15 mph.
 - c. When air temperature is from 20°F (-7°C) and below, heat sand and mixing water to produce mortar temperatures between 40°F (4°C) and 120°F (49°C); provide enclosures and auxiliary heat to maintain air temperature above 32°F (0°C); do not lay units which have a surface temperature of 20°F (-7°C).
 - 4. Perform the following protections for completed masonry and masonry not being worked on:
 - a. When the mean daily air temperature is from 40°F (4°C) to 32°F (0°C), protect masonry from rain or snow for at least 24 hours by covering with weather-restrictive membrane.
 - b. When the mean daily air temperature is from 32°F (0°C) to 25°F (-4°C), completely cover masonry with weather-restrictive membrane for at least 24 hours.
 - c. When the mean daily air temperature is from 25°F (-4°C) to 20°F (-7°C), completely cover masonry with insulating blankets or similar protection for at least 24 hours.
 - d. When mean daily temperature is 20°F (-7°C) and below, maintain masonry temperature above 32°F (0°C) for 24 hours using enclosures, blankets, and supplementary heat.

COPY OF BID SET

PART 2-PRODUCTS

2.01 CONCRETE BLOCK

- A. Concrete block shall be load bearing and shall conform to the requirements of ASTM C90 and the Kentucky Building Code. Bond shall be running bond. Concrete block shall be the two-cell type and shall be made with normal weight aggregate.
- B. Unless otherwise indicated, interior concrete block at window sills and lintels, and the top course of walls at roof lines shall be constructed of solid concrete block, lintel block filled with grout, or the cores of the block filled with grout. Interior block at window sills shall be solid concrete block unless otherwise noted. Bullnose block shall be used at all door, window, and wall corners that remain exposed.

2.02 DECORATIVE CONCRETE BLOCK

- A. Split Face and Smooth Face Block:
 - 1. Split face units shall be used for the Control Buildings. Smooth face units shall be used where shown on the drawings. Nominal face size of units shall be 8 inches by 16 inches. Nominal thickness shall be as shown on the drawings.
 - 2. The block shall be made with an integral coloring compound and an integral waterproofing compound. The block shall be made with normal weight aggregate and shall meet ASTM C33 and ASTM C90.
 - 3. The integral waterproofing compound shall be DRY-BLOCK SYSTEM, Block Admixture as manufactured by W.R. Grace & Co., Cambridge, MA, or equal. The admixture manufacturer shall determine the amount of compound to be used. The admixture used in the block shall be of the same manufacture as used in the mortar.
 - 4. Block colors shall be selected by OWNER.

2.03 REINFORCEMENT AND ANCHORAGE

- A. For concrete block walls, masonry wall reinforcement shall be 120 Truss-Mesh manufactured by Hohmann & Barnard, Inc., Series 300 Truss 2 Wire Mesh Reinforcement, manufactured by Wire-Bond, or equal.
- B. For cavity walls, masonry wall reinforcement shall be 170-ML Truss Adjustable Eye-Wire, or Series 900 Level Eye Truss (Hook & Eye), or equal.
- C. Wall reinforcement and ties shall be hot-dipped galvanized having a minimum 1.50 ounce/square foot zinc coating in accordance with ASTM A153 Class B2.
- D. Side rods shall be 9 gauge wire, and cross rods and tabs shall be 9 gauge wire. Maximum spacing of tabs shall be 24 inches.
- E. Prefabricated corner and tee sections shall be used to form continuous reinforcement around corners and for anchoring abutting walls and partitions.
- F. Reinforcing Bar Positioners: Where vertical reinforcing bars are required, provide bar positioners by Hohmann and Barnard, or equal.

COPY OF BID SET

2.04 ACCESSORIES

- A. Cellular or honeycomb cell vents, 2 1/2 inches high, shall be provided at weep holes. Cell vents shall be UV-resistant polypropylene, QV-Quadro-Vent, or equal.
- B. Vertical expansion control joints shall be located as shown on the drawings. Control joints shall be constructed with a factory-extruded section of rubber equal to RS Series–Rubber Control Joint, Rubber Control Joint by Wire-Bond, or equal, and shall extend for the entire height of the wall. Care shall be taken to ensure that the gap is free of mortar or debris. Control joint shall be caulked on exposed faces with caulk of a color to match mortar.
- C. See Section 07620–Flashing and Sheet Metal for masonry flashing specifications.
- D. See Section 07191–Vapor and Air Barrier for air barrier on masonry walls.

PART 3–EXECUTION

3.01 MASONRY WORKMANSHIP

- A. All masonry shall be laid plumb and true to lines.
- B. All masonry shall be laid in running bond, unless specified otherwise.
- C. In laying block masonry, the mason shall avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after being set in position. Where an adjustment must be made after the mortar has started to harden, the mortar shall be removed and replaced with fresh mortar.
- D. In building cavity walls, the cavity shall be kept clean by slightly beveling the mortar bed to incline toward the cavity or by placing wood strips with attached wire pulls on the metal ties. The strips shall be withdrawn and cleaned before placing the next row of metal ties. Any mortar fins that protrude into the cavity space as the wall is built shall be troweled flat onto the inner face of the wythe.
- E. Where cutting of exposed masonry is necessary, the cuts shall be made with a motor-driven masonry saw or by other methods that provide cuts that are straight and true.
- F. Where flashing is to be laid on or against masonry, the surface of the masonry shall be smooth and free from projections that might puncture the flashing material. Through-wall flashing shall be placed on a bed of mortar, and mortar shall be placed above the flashing.
- G. Weep holes spaced 32 inches on center 2 1/2 inches high shall be provided in the first course immediately above all flashing. Weep holes shall be kept free of mortar droppings.
- H. Outside joints around the perimeter of exterior door and window frames or other wall openings shall be not less than 1/4 inch nor more than 3/8 inch wide and shall be cleaned out to a uniform depth of at least 3/4 inch ready for placement of caulk.
- I. All walls shall be adequately braced until they are completed and anchored to the roof construction.

COPY OF BID SET

- J. Construction designated as requiring “special observation” shall be constructed only in the presence of ENGINEER.

3.02 MORTAR JOINTS

- A. All joints shall be laid plumb to lines. Unless specified otherwise, mortar beds shall be full 3/8 inch thick and shall be spread smooth or only slightly furrowed. Vertical joints shall be shoved not over 3/8 inch thick, unless otherwise shown. All joints shall be completely filled.
- B. Interior and exterior joints shall be tooled concave. All joints shall be tooled to uniform depth and shall be straight and true. Mortar joints shall be cut flush with masonry where rigid thermal insulation will be applied to interior masonry surfaces.

3.03 REINFORCEMENT AND ANCHORAGE

- A. Reinforcement shall be installed in the first and second bed joint 8 inches apart immediately above lintels and below sills at openings. Elsewhere, spacing shall be at 16-inch vertical intervals or as shown on the drawings. Reinforcement in the second joint above and below openings shall extend 2 feet beyond the jambs. All other reinforcing shall be continuous.
- B. Side rods shall be lapped 6 inches minimum at splices. Reinforcement units shall be of widths required for wall thicknesses as shown. Reinforcement shall be placed to assure a 5/8-inch mortar cover on the exterior face of walls and 1/2-inch mortar cover on interior faces.
- C. Vertical reinforcing bars shall be installed using prefabricated bar positioners. Provide one positioner at the top of the first course of block and one additional positioner at a maximum spacing of 200 bar diameters.

3.04 BUILT-IN WORK

- A. As work progresses, install all built-in work (such as window and door frames, anchor bolts, plates, and lintels) to be provided by other sections.
- B. Install built-in items plumb and level.
- C. Bed anchors of metal door frames in adjacent mortar joints. Grout all steel door frames full with mortar except those called for to be “removable.”
- D. Do not use built-in organic materials subject to deterioration.
- E. Steel members embedded in exterior masonry shall be “battered” with not less than 1/2 inch of setting mortar on all surfaces.

3.05 JOINING OF WORK

- A. Where fresh masonry joins masonry that is partially set or totally set, the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond with the new work. All loose mortar shall be removed. If it becomes necessary to “stop-off” a horizontal run of masonry, this shall be done only by racking back block in each course, and if grout is used, stopping grout 4 inches back of the rack. Tothing will not be permitted.

COPY OF BID SET

3.06 PROTECTION OF WORK

- A. During erection, all walls shall be kept dry by covering at the end of each day or shutdown period with a canvas or waterproof covering. Partially completed walls not being worked on shall be similarly protected at all times. All covering shall overhang at least 2 feet on each side of the wall and shall be securely anchored.

3.07 MASONRY CONTROL JOINTS

- A. Provide vertical masonry control joints in block as detailed on the drawings.
- B. Where control joint locations are not shown on the Drawings, they shall be provided as follows:

	Block Veneer
Distance from wall corner (maximum)	12 feet
Spacing between joints (maximum)	20 feet

- C. Where possible, joints shall be located at edges of door, window, and louver openings and at changes in wall height.

3.08 CLEANING NEW WORK

- A. Masonry faces to remain exposed shall be wiped with a damp cloth as the work progresses and thoroughly cleaned and pointed upon completion. If stiff brushes and water will not suffice, the surface shall be thoroughly wetted with plain water and then scrubbed with a 5% or 10% solution of hydrochloric acid. Alternatively, a commercial cleaner such as Sure Klean, or equal, may be used. Immediately after, the surface shall be washed to remove all traces of acid. All surfaces not being cleaned shall be protected from the acid. All mortar shall be removed from surfaces other than masonry.

END OF SECTION

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SECTION 05500

METAL FABRICATIONS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Shop-fabricated carbon steel, stainless steel, and aluminum items, including lintels.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM A36—Carbon Structural Steel.
- B. ASTM A53—Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A123—Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A143—Practice for Safeguarding Against Embrittlement of Hot-Dipped Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
- E. ASTM A153—Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- F. ASTM A176—Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip.
- G. ASTM A276—Stainless Steel Bars and Shapes.
- H. ASTM A307—Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
- I. ASTM A384—Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
- J. ASTM A385—Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
- K. ASTM A500—Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- L. ASTM A780—Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- M. ASTM A992—Structural Steel Shapes.
- N. ASTM A1008—Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

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- O. ASTM A1011—Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- P. ASTM B209—Aluminum and Aluminum-Alloy Sheet and Plate.
- Q. ASTM B211—Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.
- R. ASTM B221—Aluminum and-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
- S. AWS A2.0—Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- T. AWS A5.4—Stainless Steel Electrodes for Shielded Metal Arc Welding.
- U. AWS D1.1—Structural Welding Code—Steel.
- V. AWS D1.2—Structural Welding Code—Aluminum.
- W. AWS D1.6—Structural Welding Code—Stainless Steel.

1.03 DESIGN REQUIREMENTS

- A. All fabrications shall meet applicable code requirements including OSHA.

1.04 SUBMITTALS FOR REVIEW

- A. Comply with pertinent provisions of Section 01300—Submittals.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, sections, elevations, and details where applicable.
- C. Mill Test Reports: Submit indicating structural strength and composition.
- D. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

- A. Fabricate steel members in accordance with AISC Code of Standard Practice.
- B. Welders Certificates: Certify welders employed on the work, verifying AWS qualification within the previous 12 months.

1.06 QUALIFICATIONS

- A. Qualify welding processes and welding operators in accordance with AWS *Standard Qualifications Procedures*.

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1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials to job site properly marked to identify the structure for which it is intended and at such intervals to ensure uninterrupted progress of the work. Marking shall correspond to markings indicated on the shop drawings.
- B. Store all members off the ground using pallets, platforms, or other supports.
- C. Do not store materials on the structure in a manner that might cause distortion or damage to the members of the supporting structures.
- D. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to OWNER.

PART 2–PRODUCTS

2.01 MATERIALS–CARBON STEEL

- A. Steel Sections:
 - 1. ASTM A36 (channels, angles, plates).
 - 2. ASTM A992 (wide flange sections).
 - 3. Pipe: ASTM A53, Grade B.
 - 4. Tubes: ASTM A500, Grade B.
 - 5. Silicon content of steel members to be hot-dipped galvanized shall be in the range of 0 to 0.04%. Submit mill test reports confirming compliance.
- B. Sheet Steel: ASTM A1011.
- C. Plain Washers: Round carbon steel complying with FS FF-W-92.
- D. Bolts and Nuts: ASTM A307 Grade A, or galvanized to ASTM A153 for galvanized components for exterior use and where built into exterior walls.
- E. Lock Washers: Helical spring-type carbon steel complying with FS FF-W-84.
- F. Welding Electrodes: Comply with AWS D1.1. E70XX electrodes for carbon steel. For ASTM A992 steel and any other steel with 50 ksi or greater yield strength, use only E7018 or other E70XX electrodes specifically permitted by AWS D1.1.
- G. Select fasteners for the type, grade, and class required.

2.02 MATERIALS–STAINLESS STEEL

- A. Unless otherwise noted, all stainless steel shall meet the requirements of ASTM A276 and shall be Type 316L.
- B. If components are not available in Type 316L, other 300 Series type shall be used as approved by ENGINEER.

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- C. Welding Electrodes:
 - 1. Comply with AWS D1.6.
 - 2. Use ER316L electrodes for 316L stainless steel.
 - 3. Use ER308L electrodes for 304L stainless steel.

2.03 MATERIALS—ALUMINUM

- A. Extruded Aluminum: ASTM B221, Alloy 6061, Temper T6.
- B. Sheet Aluminum: ASTM B209, Alloy 3005.
- C. Aluminum-Alloy Bars: ASTM B211, Alloy 6061, Temper T6.
- D. Bolts, Nuts, and Washers: Stainless steel.
- E. Welding Materials: AWS D1.2; type required for materials being welded.

2.04 FABRICATION

- A. Fabrication and Assembly:
 - 1. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on the approved shop drawings.
 - 2. Properly mark and match-mark materials for field assembly and for identification as to structure and site for which intended.
 - 3. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 - 4. Where finishing is required, complete the assembly, including welding of units, before start of finishing operation.
 - 5. Provide finish surfaces of members exposed in the final structure free of markings, burrs, and other defects.
- B. Connections:
 - 1. Bolts and washers of all types and sizes shall be provided for completion of all field erection.
 - 2. Comply with AWS Code for procedures, appearance, and quality of welds used in correcting welded work.
 - 3. Assemble and weld built-up sections to produce true alignment of axes without warp.
 - 4. Welding shall be done by the shielded arc process.
 - 5. All welds shall be chipped, ground smooth, and primed immediately after fabrication.
- C. Workmanship:
 - 1. Use materials of size and thickness shown or, if not shown, of size and thickness to produce strength and durability in the finished product.
 - 2. Work to dimensions shown or accepted on the Shop drawings using proven details of fabrication and support.
 - 3. Form exposed work true to line and level, with accurate angles and surfaces, and with straight sharp edges.
 - 4. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing works.
 - 5. Cap all open ends of pipe and structural tubing.

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6. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush; match and blend with adjoining surfaces.
7. Provide for anchorage of the type shown. Coordinate with supporting structures. Fabricate and space the anchoring devices to provide adequate support for intended use.
8. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive hardware and similar items.

2.05 FINISHES

- A. Carbon steel surfaces shall be prepared by abrasive blasting to SSPC-SP10 as specified in Section 09900–Painting.
- B. Do not prime surfaces where galvanizing or field welding is required.
- C. Immediately after surface preparation, prime paint carbon steel items with one coat in accordance with manufacturer’s instructions and Section 09900–Painting.
- D. Structural Steel Members: Galvanize after fabrication to the requirements in this section and ASTM A123.
- E. Surfaces that will be inaccessible after assembly or erection shall be finish painted prior to assembly or erection.
- F. Galvanizing:
 1. All items, except piping designated to be galvanized, shall be hot-dipped galvanized in accordance with ASTM Specification A123 and A153. Piping shall be hot-dipped galvanized in accordance with ASTM A53. Furnish a Certificate of Compliance stating that the galvanizing complies with ASTM Specifications and Standards and all other applicable requirements specified herein.
 2. Fabrication of items to be galvanized shall be in accordance with ASTM A143, A384, and A385. Structural steel shall be fabricated generally in accordance with Class 1 guidelines as shown in *Recommended Details for Galvanized Structures* as published by the American Hot Dip Galvanizer’s Association, Inc.
 3. Galvanized items shall be handled, transported, and stored to prevent damage or staining to the coating. Maintain adequate ventilation and continuous drainage.
 4. Silicon content for steel to be hot-dipped galvanized shall be in the range of 0 to 0.04%.
 5. Steel work shall be precleaned utilizing a caustic bath, acid pickle and flux, or shall be blast cleaned and fluxed. In either case, all surface contaminants and coatings shall be removed.
 6. All welding shall be performed in accordance with the American Welding Society publication D19.0-72, *Welding Zinc Coated Steel*. All uncoated weld areas shall be touched up.
- G. Aluminum shall have a mill finish unless otherwise specified. Any aluminum in contact with concrete or dissimilar metal shall be coated with multiple coats of bituminous paint, minimum 10 mils dry.

COPY OF BID SET

PART 3-EXECUTION

3.01 EXAMINATION

- A. Correct conditions detrimental to the proper and timely completion of the work.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Furnish setting drawings, diagrams, templates, instructions, and directions for installation of anchorages such as concrete inserts, anchor bolts, and miscellaneous items having integral anchors which are to be embedded in concrete construction.
- B. Coordinate delivery of such items to project.
- C. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

- A. Setting Precast Anchorages:
 - 1. Clean bearing surfaces free from bond-reducing materials, and roughen to improve bond to surfaces. Clean the bottom surface of bearing plates.
 - 2. After the bearing members have been positioned and plumbed, tighten and anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 - 3. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- B. 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 inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- C. Cutting, Fitting, and Placement:
 - 1. Perform cutting, drilling, and fitting for installation of miscellaneous metal fabrications.
 - 2. Set work accurately in location, alignment, and elevation and make plumb, level, true, and free from rack measured from established lines and levels.
 - 3. Fit exposed connections accurately together to form tight hairline joints.
 - 4. Weld connections that are not to be left as exposed joints, grind joints smooth, and touchup shop paint coat or galvanizing repair.

3.04 FIELD WELDING

- A. Comply with AWS Code for procedures of manual shielded metal arc welding (steel, stainless steel) and gas metal arc welding (aluminum), appearance and quality of weld made, and methods in correcting welding work.

3.05 TOUCH-UP PAINTING

- A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting in accordance with Section 09900-Painting.

COPY OF BID SET

3.06 GALVANIZING REPAIR

- A. Areas damaged by welding, flame-cutting, or during handling, transport, or erection shall be repaired by one of the following methods whenever damage exceeds 3/16 inch in width.
 - 1. Cold Galvanizing Compound:
 - a. Surfaces to be reconditioned with zinc-rich paint shall be clean, dry, and free of oil, grease, and corrosion products.
 - b. Areas to be repaired shall be power disc-sanded to bright metal. To ensure that a smooth reconditioned coating can be effected, surface preparation shall extend into the undamaged galvanized coating.
 - c. Touch-up paint shall be an organic cold-galvanized compound having a minimum of 94% zinc dust in the dry film.
 - d. The paint shall be spray- or brush-applied in multiple coats until a dry film thickness of 8 mils minimum has been achieved. A finish coat of aluminum paint shall be applied to provide a color blend with the surrounding galvanizing.
 - e. Coating thickness shall be verified by measurements with a magnetic or electromagnetic gauge.
 - 2. Zinc-Based Solder:
 - a. Surfaces to be reconditioned with zinc-based solder shall be clean, dry, and free of oil, grease, and corrosion products.
 - b. Areas to be repaired shall be wire-brushed.
 - c. Heat shall be applied slowly and broadly close to but not directly onto the area to be repaired. The zinc-based solder rod shall be rubbed onto the heated metal until the rod begins to melt. A flexible blade or wire brush shall be used to spread the melt over the area to be covered. The zinc-based solder shall be applied in a minimum thickness of 2 mils.
 - d. Coating thickness shall be verified by measurements with a magnetic or electromagnetic gauge.

3.07 SCHEDULE

- A. The following schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.
- B. Guard Posts: Steel pipe, concrete-filled, crowned cap, as detailed-galvanized and field finish paint in accordance with Division 9.
- C. Lintels: Shop prime paint finish for interior wall lintels; galvanized and field finish paint in accordance with Division 9 for exterior wall lintels. Lintels approved by ENGINEER shall be placed over all masonry openings, even though not shown on the Drawings. See lintel schedule on the Drawings.

END OF SECTION

COPY OF BID SET

SECTION 05560

ANCHOR BOLTS AND POST-INSTALLED ANCHORS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Anchor bolts, expansion bolts, adhesive anchors, and screw anchors.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM A36/A36M–Standard Specification for Carbon Structural Steel.
- B. ASTM F1554–Anchor Bolts, Steel, 36, 55, and 105-ksi yield strength.
- C. ICC-ES International Code Council–Evaluation Service.
- D. AC 193–Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- E. AC 308–Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete.
- F. ACI 355.2–Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary.
- G. ACI 355.4–Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary.

PART 2–PRODUCTS

2.01 ANCHOR BOLTS

- A. Anchor bolts complete with washers and nuts shall be fabricated as shown or as specified by the equipment manufacturer and unless otherwise indicated shall be hot-dip galvanized carbon steel or 316 stainless steel. Anchor bolts shall, as a minimum, conform to the requirements of ASTM F1554-Grade 36.
- B. Stainless steel anchor bolts shall be used in all submerged locations, below final grade, and in contact with aluminum and other items not to be painted. Galvanized anchor bolts shall be used elsewhere.

2.02 EXPANSION BOLTS

- A. Expansion bolts shall be KWIK Bolt TZ by Hilti, Inc., TruBolt+ by ITW Red Head, Power-Stud + SD2, SD4, or SD6, by Powers Fastening Systems, Strong-Bolt, or Strong-Bolt 2, by Simpson Strong-Tie Anchor Systems, or approved equal.

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- B. All expansion bolts shall comply with the Kentucky Building Code, AC 193, and ACI 355.2. They shall be ICC-ES approved for use in cracked and uncracked concrete.
- C. Expansion bolts will not be permitted as substitutes for embedded anchor bolts except with the prior written acceptance of ENGINEER or where otherwise specifically called for.
- D. Unless indicated otherwise on the Drawings or specified, use the following bolt material for the various installation situations:
 - 1. Stainless Steel: For all submerged locations, below final grade, and in contact with aluminum appurtenances and other items not to be painted. Also for anchoring equipment, unless otherwise specified.
 - 2. Steel: In other locations in contact with items to be painted or encased in concrete.

2.03 ADHESIVE ANCHORS

- A. Adhesive anchors shall be HIT HY 200 by Hilti, Inc., Red Head Epcon C6+ or Red Head Epcon S7 by ITW, PE 1000+ by Powers Fastening Systems, Set-XP by Simpson Strong-Tie Anchor Systems, or approved equal.
- B. All adhesive anchors shall comply with the Kentucky Building Code, AC 308, and ACI 355.4. They shall be ICC-ES approved for use in cracked and uncracked concrete.

2.04 SCREW ANCHORS

- A. Screw anchors shall be KWIK HUS-EZ by Hilti, Inc., Wedge-Bolt+ by Powers Fastening Systems, Titen-HD by Simpson Strong-Tie Anchor Systems, or approved equal.
- B. All screw anchors shall comply with the Kentucky Building Code. They shall be ICC-ES approved for use in cracked and uncracked concrete.

PART 3-EXECUTION

3.01 ANCHOR BOLTS

- A. Anchor bolts for structural members shall be located as shown and specified.
- B. Anchor bolts for mechanical equipment shall have embedment length, edge distances, and spacing as required by the equipment manufacturer.
- C. All dirt or foreign materials shall be removed prior to embedding into concrete. After anchor bolts have been embedded, their threads shall be protected by grease and by installing the nuts or by other means until the time of installation of the equipment or metal work.

3.02 EXPANSION BOLTS

- A. Unless otherwise noted on the Drawings, expansion bolt edge distance and spacing shall be in accordance with manufacturer's printed installation instructions.
- B. Bolt embedment shall at least equal 6-bolt diameters.

COPY OF BID SET

- C. Installation procedures shall be in accordance with the manufacturer's printed installation instructions.
- D. Where location of bolts is adjustable, reinforcing steel shall be located prior to drilling holes and bolts shall be located to clear reinforcing steel.

3.03 ADHESIVE ANCHORS

- A. At locations shown on the Drawings, reinforcing bars or threaded rod shall be provided in existing concrete by drilling holes, injecting epoxy adhesive, and inserting the reinforcing bar.
- B. All existing surfaces to receive adhesive anchors, including the entire area in contact with the new concrete, shall be cleaned and roughened to amplitude of 1/4 inch.
- C. Installation procedures shall be in accordance with the manufacturer's printed installation instructions.
- D. Where location of anchors is adjustable, reinforcing steel shall be located prior to drilling holes and anchors shall be located to clear reinforcing steel.
- E. CONTRACTOR shall arrange an anchor manufacturer's representative to provide on-site installation training for installation of their adhesive anchor system products. Submit documentation that all CONTRACTOR's personnel or subcontractors who install adhesive anchors have been trained prior to the announcement of anchor installation.
- F. Adhesive anchors in horizontal and upwardly inclined orientations to resist sustained tension loads are subject to the following requirements:
 - 1. They shall be installed by personnel certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program, or equivalent, as approved by ENGINEER.
 - 2. They require continuous special inspection during installation. CONTRACTOR shall notify ENGINEER and Special Inspector of the schedule for these anchor installations to permit coordination of inspections.

3.04 SCREW ANCHORS

- A. Unless otherwise noted on the Drawings, screw anchor edge distance and spacing shall be in accordance with manufacturer's recommendations.
- B. Anchor embedment shall at least equal 6-bolt diameters.
- C. Installation procedures shall be in accordance with the manufacturer's printed installation instructions.
- D. Where location of anchors is adjustable, reinforcing steel shall be located prior to drilling holes and anchors shall be located to clear reinforcing steel.

END OF SECTION

COPY OF BID SET

SECTION 06112

WOOD FRAMING AND SHEATHING

PART 1–GENERAL

1.01 SUMMARY

- A. Work included:
 - 1. Structural roof framing.
 - 2. Roof sheathing.
 - 3. Miscellaneous framing and sheathing.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ALSC–American Lumber Standards Committee.
- B. APA–American Plywood Association.
- C. AWWA–American Wood Preservers Association.
- D. NFPA–National Forest Products Association.
- E. NLGA–National Lumber Grades Authority.
- F. SPIB–Southern Pine Inspection Bureau.
- G. WCLIB–West Coast Lumber Inspection Bureau.
- H. WWPA–Western Wood Products Association.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Protect lumber and other building materials and keep under cover both in transit and at the job site. Protect from dampness. Stack framing lumber and plywood to insure proper air circulation. Locate stacks on well-drained areas. Support 6 inches above grade and protect with waterproof cover.

PART 2–PRODUCTS

2.01 MATERIALS

- A. Lumber shall be kiln-dried with moisture content not to exceed 19% at time of installation and grade marked according to the National Lumber Manufacturer's Association.
- B. All studs shall be 2 inches by 4 inches nominal or 2 inches by 6 inches nominal as shown on the Drawings and shall be No. 2 Douglas Fir, No. 2 Southern Pine, or better.

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- C. All roof joists, ceiling joists, and floor joists shall be No. 2 Southern Pine or better.
- D. Plywood roof, wall, and ceiling sheathing shall be grade C-D (CDX), Exposure 1, or better, graded in accordance with the American Plywood Association.
- E. Wood sills, plates, blocking, etc., to be same grade as studs.

PART 3—EXECUTION

3.01 FRAMING

- A. General: All rough framing lumber and all other wood framing, studs blocking, and furring shall be accurately set to required lines and levels, closely fitted, shimmed, and rigidly secured in place.
- B. Construct load bearing, framing, and curb members full length without splices.

3.02 PLYWOOD SHEATHING

- A. Plywood sheathing shall be nailed at 6 inches on center at edges and 12 inches on center at intermediate supports with 10d common nails.
- B. Secure roof sheathing perpendicular to framing members with ends staggered and sheet ends over firm bearing. Use sheathing clips between sheets between roof framing members, or provide solid edge blocking between sheets.

3.03 CONNECTIONS

- A. All framing connections and nailing shall be in accordance with the details shown and/or the Kentucky Building Code minimum requirements, whichever is more restrictive.
- B. Framing connectors shall be Simpson Strong Tie or equal. Connector numbers shown on details are Simpson. Submit engineering data on any substitutes.
- C. Connectors shall be installed in accordance with manufacturer's requirements.

END OF SECTION

COPY OF BID SET

SECTION 06114

WOOD BLOCKING AND CURBING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Roof curbs and cants.
 - 2. Wood blocking.
 - 3. Wood furring and grounds.
 - 4. Preservative treatment of wood.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ALSC–American Lumber Standards Committee.
- B. AWWPA–American Wood Preservers Association.
- C. NFPA–National Forest Products Association.
- D. NLGA–National Lumber Grades Authority.
- E. SPIB–Southern Pine Inspection Bureau.
- F. WCLIB–West Coast Lumber Inspection Bureau.
- G. WWPA–Western Wood Products Association.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01300–Submittals.
- B. Certification of type of wood and wood treatment to be used.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be thoroughly sealed and protected from weather during transport and at the jobsite. Protect from dampness.

COPY OF BID SET

PART 2-PRODUCTS

2.01 MATERIALS

- A. Lumber for roof curbs, cants, blocking, furring, and grounds shall be "standard" grade Douglas Fir, No. 2 Southern Pine, or better, graded in accordance with the WWPA, WCLIB, NLGA, or SPIB grading rules as applicable. Lumber shall bear the grading agency's stamp.
- B. Wood shall be kiln-dried with moisture content not to exceed 19% at time of installation.
- C. All lumber furnished under this section shall be pressure-treated with a chromated copper arsenite (CCA) waterborne preservative to a minimum retention of 0.40 pounds per cubic foot. Acceptable products include Hoover Treated Wood Products CCA, Wood Preserving Co. Osmose CCA, or equal. Cuts shall be treated in the field with a brush-on waterborne preservative compatible with the pressure treatment.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Provide and install wood curbs, cants, blocking, furring, and grounds of proper size and shape where shown on the Drawings and where required to secure other work or equipment in place.
- B. Members shall be installed true to lines, level, plumb, and secure.
- C. Connections and nailing shall be in accordance with the details shown and/or the Kentucky Building Code minimum requirements, whichever is more restrictive.
- D. Apply brush-on wood preservative treatment to cuts in accordance with manufacturer's recommendations.

END OF SECTION

COPY OF BID SET

SECTION 06193

PLATE CONNECTED WOOD TRUSSES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. All materials, equipment, and labor necessary for the prefabrication, delivery, and permanent setting of wood trusses on buildings.
 - 2. Bridging.
 - 3. Temporary and permanent bracing.
 - 4. Related hardware.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ALSC—American Lumber Standards Committee.
- B. APA—American Plywood Association.
- C. ASTM A653—Sheet Steel, Zinc-Coated (Galvanized) by the Hot Dip Process, (Structural Physical) Quality.
- D. AWPA—American Wood Preservers Association.
- E. NFPA—National Forest Products Association.
- F. SPIB—Southern Pine Inspection Bureau.
- G. TPI—Truss Plate Institute.
- H. WWPA—Western Wood Products Association.

1.03 DESIGN REQUIREMENTS

- A. The basic design loads shall be in accordance with the Kentucky Building Code.
- B. Dead Loads and Collateral Loads: Trusses shall be designed for a Top Chord dead load of 10 psf, a bottom chord dead load of 5 psf, plus bottom chord collateral load of 5 psf.
- C. Live Loads:
 - 1. Roof live loads shall be computed in accordance with the Kentucky Building Code using a ground snow load of 15 psf, a snow load importance factor of 1.0, and snow exposure and thermal factors as per Code. Minimum roof live load shall be 19 psf. Snow load and minimum roof live load shall be applied to the top chord.
 - 2. Design for unbalanced snow loads in accordance with the building code.
 - 3. Design for sliding and drifted snow loads as shown on the drawings.

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4. Roof live loads shall be applied to the horizontal projection of the roof.
 5. Bottom chord Live Load shall be 10 psf.
- D. Wind Loads: Wind loads shall be computed in accordance with the Kentucky Building Code using a 3-second gust wind speed of 115 mph, exposure category C, and an importance factor of 1.0.

1.04 SUBMITTALS

- A. Submittals shall be as in Section 01300–Submittals.
- B. Professional Engineer: All truss designs shall bear the name and seal of a State of Kentucky licensed professional engineer. CONTRACTOR shall be responsible for submitting the required additional copies of truss drawings with original stamp and signature for submittal to the State of Kentucky. These materials must be submitted prior to installation.
- C. Truss designs shall include the following information: Pitch, span, dimensions, and spacing of trusses; truss bearing sizes and locations; design loading of truss and allowable stress increase; axial forces in each truss member; nominal sizes and location of connector plates at all joints; size, species, and stress of grade of lumber for all truss members; camber; permanent lateral bracing as required by design to reduce buckling length of individual truss members; and handling and erection recommendations. Where sheathing is not attached directly to truss bottom chords, provide bottom chord bracing and bridging as required by design to resist wind uplift loads.

1.05 QUALITY ASSURANCE

- A. The design and fabrication criteria of all wood trusses shall meet the following:
 1. “National Design Specifications for Stress-Grade Lumber and its Fastenings,” by National Forest Products Association (latest revision).
 2. “Timber Construction Standards,” by American Institute of Timber Construction (latest revision).
 3. “Design Specifications for Light Metal Plate Connected Wood Trusses,” by Truss Plate Institute (latest revision).
 4. Kentucky Building Code.
- B. Fabricator Manufacturer: Minimum three years experience in successful fabrication of trusses comparable to type indicated for this project.
- C. Design Trusses under direct supervision of a professional engineer experienced in design of this work and licensed in the State of Kentucky.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Fabricated trusses and subcomponents shall be so handled and stored that they are not subject to damage.
- B. If the trusses are to be stockpiled prior to erection, sufficient bearing points and/or bracing shall be provided to prevent excessive lateral bending or tipping over.

PART 2–PRODUCTS

COPY OF BID SET

2.01 MATERIALS

A. Lumber:

1. All lumber used for truss members shall be Spruce-Pine-Fir, Douglas Fir, Southern Pine, Hem-Fir, or Western Larch and shall conform to lumber for trusses and shall have a minimum nonrepetitive fiber bending strength of 1,050 psi. If design calls for use of a lumber with greater strength, then that lumber shall be used for the associated members.
2. At the time of delivery, the moisture content of all lumber shall not exceed 19% kiln-dried.
3. All lumber shall conform to the species and shall be fully recognized nominal sizes shown on the Drawings or truss engineering design.
4. All members shall be cut from lumber which bear the proper grade-mark stamps of a licensed lumber inspection agency.

B. Connectors:

1. All truss connector plates shall be manufactured from ASTM A653, Grade A, prime commercial quality galvanized sheet steel of no less than 20-gauge thickness which has a minimum yield of 33,000 psi and a minimum ultimate tensile strength of 45,000 psi.
2. The corrosion-resistant coating shall be ASTM A924—Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements, Coating Designation C90 or G60, ASTM A879—Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface, Coating Class C, or such treatment as will give equivalent corrosion protection.
3. The connectors shall have a series of nail-like projections which are designed to separate the fibers of the wood into which they are pressed in accordance with accepted nailing practices.
4. Where field-assembly of truss subcomponents is necessary, the connections shall be in accordance with the details shown on the truss design drawings, approved by a Professional Engineer.

2.02 FABRICATION

- A. All trusses and other roof structural components shall be fabricated in a properly equipped manufacturing facility of a permanent nature. They shall be manufactured by experienced workmen using precision cutting and truss fabricating equipment under the direct supervision of a qualified foreman. All trusses shall be fabricated under strict rules of inspection and quality control as the local code may require and be open to the observation of ENGINEER or his representative at all times.
- B. All truss members shall be accurately cut to length, angle, and be true to line to assure tight joints for finished truss.
- C. All truss members and connector plates shall be properly placed in special jigs and the members tightly clamped in place remaining in that position until the connector plates have been pressed into the lumber simultaneously on both sides of the joints.
- D. Camber shall be built into the trusses, as noted on the engineering truss designs, by properly positioning the members in the fabricating jig. No camber will be allowed on the bottom chord.

COPY OF BID SET

PART 3-EXECUTION

3.01 ERECTION

- A. Install trusses in accordance with manufacturer's instructions and TPI BWT (latest revision).
- B. Framing anchors and/or truss hangers shall be provided by CONTRACTOR, as required, or detailed to withstand all loads, both dead and live, as well as wind and transfer loads to bearing.
- C. Field erection of the trusses, including items such as handling, safety precautions, and temporary bracing to prevent toppling or the domino effect on the trusses during erection, and any other safeguards or procedures consistent with good workmanship and good building erection practices, shall be employed.
- D. During the entire construction period, all contractors shall provide means for adequate distribution of concentrated loads so that the carrying capacity of any one truss and/or other component is not exceeded.
- E. Proper erection bracing shall be installed to hold the trusses true and plumb and in safe condition until permanent truss bracing and bridging can be solidly nailed in place to form a structurally sound roof framing system. All erection and permanent bracing shall be installed and all components permanently fastened before the application of any loads. Provide all permanent bracing necessary for truss stability. Where sheathing is not attached directly to truss bottom chord and where required by design, provide bottom chord bracing and bridging as required to resist wind uplift loads.
- F. Frame openings between trusses with lumber in accordance with Section 06112-Wood Framing and Sheathing.

END OF SECTION

COPY OF BID SET

SECTION 07191

VAPOR AND AIR BARRIER

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes:
 - 1. Vapor barrier under concrete floors on grade, in exterior and roof construction.
 - 2. Air barrier in masonry double wythe walls on concrete block backup wall.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

PART 2—PRODUCTS

2.01 MATERIALS

- A. Vapor barrier for below slabs: Vapor barrier shall consist of 10 mil ASTM E1745 Class B polyethylene sheeting with less than 0.3 perm water vapor permeance in accordance with ASTM E96.
- B. Vapor barrier for exterior construction and roof construction: Vapor barrier shall consist of 6 mil ASTM D4397, Class B polyethylene sheeting with less than 0.3 perm water vapor permeance in accordance with ASTM E96
- C. Air barrier for masonry cavity wall construction shall be fluid applied air and vapor barrier membrane, ExoAir 120 by Tremco, or equal. Apply to outside face of inner wythe of concrete block prior to installation of rigid insulation. Apply in strict accordance with manufacturer's instructions. Air barrier shall be included in all new cavity wall construction on the project.

PART 3—EXECUTION

3.01 INSTALLATION—UNDER CONCRETE FLOORS ON GRADE

- A. Provide continuous vapor barrier under concrete floors on grade that are 8 inches or less in thickness, lap all joints a minimum of 12 inches.
- B. Place 6 inches of granular cushion under vapor barrier.

3.02 INSTALLATION ON ROOF CONSTRUCTION

- A. Provide continuous vapor barrier on underside of roof framing.

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3.03 INSTALLATION OF AIR BARRIER

- A. Install air barrier on outside face of inner wythe of concrete block in cavity wall construction.
- B. Install air barrier per manufacturer's recommendations and approved details.

END OF SECTION

COPY OF BID SET

SECTION 07212

BOARD INSULATION

PART 1–GENERAL

1.01 SUMMARY

- A. Work includes board insulation for cavity wall construction, for perimeter foundation walls, and under floor-slabs on-grade.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

PART 2–PRODUCTS

2.01 CAVITY WALL INSULATION

- A. Cavity wall insulation shall be 1 1/2-inch-thick polyisocyanurate foam board with foil facing on both sides. Aged thermal resistance (R-value) at 72°F shall be a minimum of 10.0.
- B. Acceptable products include the following, or equal. DOW Thermax by DOW Corporation.
- C. Adhesive for adhering insulation to backup wall shall be as recommended by the insulation manufacturer.

2.02 FOUNDATION AND UNDER-SLAB INSULATION

- A. Foundation and under-slab insulation shall be 2-inch-thick extruded polystyrene closed cell rigid foam board with continuous skins on both sides. Aged thermal resistance (R-value) at 75°F shall be a minimum of 10.0.
- B. Acceptable products include the following, or equal:
 - 1. Styrofoam Square Edge by Dow Chemical Company.
 - 2. Foamular 250 by UC Industries, Inc.

PART 3–EXECUTION

3.01 INSTALLATION–CAVITY WALLS

- A. Insulation shall be installed horizontally within the cavity space between masonry wythes.
- B. Take care during installation to ensure all insulation boards are butted and installed between ties and fit flush against inner wythe or backup wall.
- C. Cut insulation neatly to fit around obstructions across the cavity such as vents, louvers, pipes, and conduits.

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- D. Secure insulation in place against backup wall with mastic adhesive and observe label directions.

3.02 INSTALLATION—FOUNDATION WALLS AND UNDER FLOORS

- A. Rigid insulation shall be laid dry against the foundation walls as backfill is placed. Insulation shall be located at all perimeter frost walls and below-grade walls of buildings and structures containing areas that may be occupied by personnel.
- B. At perimeter frost wall foundations, insulation shall be 18 inches high and located on the inside of foundation walls.
- C. Insulation under edges of slab-on-grade floors shall be 24 inches wide.

END OF SECTION

COPY OF BID SET

SECTION 07213

BATT INSULATION

PART 1–GENERAL

1.01 SUMMARY

- A. Work includes batt insulation for attic spaces and insulation vent system between roof trusses as called for on the drawings.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM C665–Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

PART 2–PRODUCTS

2.01 EXTERIOR WALL AND ROOF INSULATION

- A. Batt insulation placed on top of ceiling panel in attic spaces shall be unfaced fiberglass batt 12 inches thick conforming to ASTM C665, Type 1, and providing a minimum R-value of 38. Two layers of 6-inch batt placed perpendicular to each other may be used in place of one layer of 12-inch batt.
- B. All batt insulation in attic spaces shall be unfaced or foil-reinforced kraft-faced meeting the Kentucky Building Code or governing local building code requirements.
- C. Acceptable manufacturers include the following, or equal:
 - 1. Owens Corning.
 - 2. Manville.
 - 3. Certainteed.

2.02 INSULATION VENTS

- A. Insulation vents shall be 2 inches high by 14 inches wide by 48 inches long, tear-resistant high-impact plastic as manufactured by proVent, or equal.

PART 3–EXECUTION

3.01 INSTALLATION–ROOF INSULATION

- A. Prior to installing insulation, vapor barrier shall be in place (See Section 07191–Vapor Barrier).

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- B. Insulation shall be loose laid on the ceiling panel over the vapor barrier. If two layers of insulation are used to make up the required thickness, upper layer shall be installed perpendicular to the lower layer.

3.02 INSULATION VENTS

- A. Insulation vents shall be installed between roof trusses at the truss bearing ends providing an unobstructed air channel from the soffit into the attic.

END OF SECTION

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SECTION 07311

ASPHALT SHINGLE ROOFING

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes granular-surfaced asphalt shingle roofing, including shingles, underlayment, eave protection membrane, shingle-over ridge vents, sheet flashing, drip edging, and related accessories.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM D226—Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- B. ASTM D3018—Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.
- C. ASTM D3462—Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
- D. ASTM D4586—Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- E. UL 580—Tests for Wind Uplift Resistance of Roof Assemblies.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with the provisions of Section 01300—Submittals.
- B. Submit two copies of shingle warranty for review.
- C. Submit shingle color samples for selection by OWNER.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply felts or shingles in cold weather. Storage of bundles in heated area several days prior to use can permit shingling where unheated shingles would crack.

1.05 WARRANTY—SHINGLES

- A. Provide 30-year material warranty covering cost to replace defective shingles, exclusive of labor, in the event of manufacturing defect(s) in the shingles. In addition, provide a 5-year material/labor warranty covering cost to repair or replace defective shingles, including cost of roof tear-off and excluding costs of flashing and metal work, up to the full replacement cost of the shingles.

COPY OF BID SET

- B. Material warranty shall be equal to the Certainteed Corporation 30-year limited warranty. Material and labor warranty shall be equal to the Certainteed Corporation 5-year Sure Start Protection warranty.

PART 2-PRODUCTS

2.01 ASPHALT SHINGLES

- A. Asphalt shingles shall be 12 inches by 36 inches two-piece laminated, 245 pounds per square, self-sealing, UL Class A, wind-resistant, fiberglass shingles surfaced with mineral granules, and conforming to ASTM D3018 and ASTM D3462.
- B. Acceptable products include the following, or equal:
 - 1. Certainteed Landmark Shingle.
 - 2. GAF Materials Corporation. Timberline Prestique High Definition 30.
- C. Color shall be as selected by OWNER.

2.02 UNDERLAYMENT AND EAVE PROTECTION MEMBRANE

- A. Underlayment for all areas, except along eaves, shall be No. 15 unperforated asphalt saturated felt conforming to ASTM D226.
- B. Eave (ice dam) protection shall be a sheet membrane of rubberized asphalt bonded to sheet polyethylene, 40 mils minimum total thickness, with strippable release paper. Acceptable products include the following, or equal:
 - 1. Ice and Water Shield by W.R. Grace Company.
 - 2. Winter Guard Waterproofing Shingle Underlayment by Certainteed Corporation.

2.03 ACCESSORIES

- A. Nails shall be annular-barbed or ring-barbed galvanized roofing nails with minimum 3/8-inch-diameter head and sufficient length to penetrate through the plywood sheathing.
- B. Plastic cement shall be asphalt type with mineral fiber components conforming to ASTM D4856. It shall be free of asbestos and toxic solvents and shall be capable of setting within 24 hours at temperatures of 75°F and 50% RH.
- C. Lap cement shall be fibrated cutback asphalt type recommended for use in underlayment and shall be free of asbestos and toxic solvents.
- D. Continuous shingle-over ridge vents shall be constructed of plastic and shall be formed with vent openings that do not permit direct water or weather entry or insect/bird entry. Vents shall provide minimum 12.2 square inches of net-free ventilation per linear foot. Acceptable products include the following:
 - 1. Ridge Master by Mid-America Building Products Corporation.
 - 2. Series 4 or Series 5 by North American Building Products, Inc. Manufacturer shall provide 40-year limited material warranty on product.

COPY OF BID SET

2.04 FLASHING

- A. Sheet flashing shall be minimum 0.03-inch-thick aluminum, mill finish, conforming to ASTM B209.
- B. Exposed edges of flanges shall be hemmed a minimum 1/4 inch on the underside. Underside shall be coated with acid and alkali-resistant bituminous paint.
- C. Drip cap edging shall be aluminum style "D".
- D. Provide aluminum pipe boots for roof pipe penetrations.

PART 3-EXECUTION

3.01 EXAMINATION

- A. CONTRACTOR shall examine all roof decks on which roofing is to be applied and shall notify ENGINEER in writing prior to starting work of any defects which he may consider detrimental to the proper installation of his materials. Roof deck shall be smooth, dry, free from dirt and foreign material before starting roofing.
- B. Verify that roofing penetrations are in place and properly flashed and that roof openings are correctly formed.

3.02 INSTALLATION-EAVE (ICE DAM) PROTECTION

- A. Place eave edge and gable edge metal flashings tight with fascia boards. Weather lap joints 2 inches and seal with plastic cement. Secure flange with galvanized nails spaced 8 inches o.c.
- B. Apply eave protection membrane in accordance with manufacturer's instructions. Extend eave protection membrane minimum 4 feet upslope beyond interior face of exterior wall.

3.03 INSTALLATION-PROTECTIVE UNDERLAYMENT

- A. Place one ply of underlayment over areas not protected by eave protection. Install underlayment perpendicular to slope of roof. Underlayment shall be weather-lapped a minimum 4 inches over eave protection membrane, and weather-lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place.
- B. If the roof slope is 4 in 12 or flatter, place a second ply of underlayment over first layer with ends and edges weather-lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place.
- C. Weather-lap and seal water-tight with plastic cement items projecting through or mounted on roof.

3.04 INSTALLATION-METAL FLASHING AND ACCESSORIES

- A. Weather-lap joints minimum 2 inches and seal weather-tight with plastic cement.

COPY OF BID SET

- B. Secure in place with nails at 8 inches o.c. Conceal fastenings.
- C. Flash and seal work weather-tight projecting through or mounted on roofing with plastic cement.

3.05 INSTALLATION-ASPHALT SHINGLES

- A. Place shingles in straight coursing pattern with 4-inch weather exposure on slopes of 4-in-12 or flatter and 5-inch weather exposure on slopes 5-in-12 and steeper.
- B. Project first course of shingles 3/4 inches beyond fascia boards.
- C. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
- D. Cap hips and ridges with individual shingles maintaining 5-inch weather exposure. Place to avoid exposed nails.
- E. Coordinate installation of roof-mounted components of work projecting through roof with weather-tight placement of counter flashings.
- F. Complete installation to provide weathertight service.

END OF SECTION

COPY OF BID SET

SECTION 07620

FLASHING AND SHEET METAL

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes masonry wall flashing, custom-fabricated sheet metal flashing and counter flashing at: Eave, gable, and ridge lines; vent stacks; and other locations.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM A653—Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- B. ASTM A924—General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.
- C. ASTM B32—Solder Metal.
- D. ASTM B209—Aluminum and Alloy Sheet and Plate.
- E. ASTM D4586—Asphalt Roof Cement, Asbestos-Free.
- F. SMACNA—Architectural Sheet Metal Manual.

1.03 SUBMITTALS

- A. See Section 01300—Submittals for general submittal requirements.
- B. Shop drawings: Submit fabrication details, jointing details, fastening methods, and termination details.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA standard details and requirements.

1.05 QUALIFICATIONS

- A. Fabricator and installer shall be a company specializing in sheet metal fabrication work with a minimum of 5 years of verifiable experience in that field.

1.06 WARRANTY

- A. Kynar 500 coating shall be provided with a 20-year guarantee against cracking, chipping, peeling, and fading.

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PART 2-PRODUCTS

2.01 MATERIALS

- A. Masonry wall flashing and flashing around windows, doors, and other openings shall be 32 mil of self-adhesive rubberized asphalt integrally bonded to 8 mil of cross-laminated, high-density polyethylene film to provide a minimum 40 mil thick membrane. Flashing shall be PERM-A-BARRIER wall flashing as manufactured by Grace Construction Products, or equal. Provide primer or surface conditioner as recommended by manufacturer.
- B. Galvanized Steel Sheet: 26 gauge meeting ASTM A525, Grade A with G90 zinc coating.
- C. Aluminum Sheet: 0.032 inches thick meeting ASTM B209.
- D. Fasteners: Same material and finish as flashing sheet. Stainless steel fasteners may be used with any flashing material. Provide soft neoprene washers with fasteners.
- E. Primer: Zinc chromate type.
- F. Protective Backing Paint: Bituminous type.
- G. Sealant: See Section 07900-Caulking and Sealants.
- H. Bedding Compound: Rubber asphalt or butyl type.
- I. Plastic Cement: ASTM D4586, Type I or II.
- J. Reglets: Galvanized steel or PVC, surface-mounted or recessed, or as shown on the Drawings.
- K. Solder: ASTM B32. Soldering is not permitted on aluminum or stainless steel sheet.

2.02 FABRICATION

- A. All flashing and fascia shall be formed to the configurations shown on the Drawings and/or the applicable manufacturer's details, or in accordance with SMACNA standard details where not shown on the Drawings, or in manufacturers details. Form sections true to shape, accurate in size, square, and free from buckles, kinks, or other defects.
- B. All exposed edges shall be folded or returned on themselves at least 1/2 inch. Corners shall be mitered and seamed.
- C. Form pieces in the longest possible lengths. Form material with flat lock seams.
- D. All sections shall be provided with slip joints at 8 feet on center.
- E. Cleats shall be fabricated of the same materials as the flashing sheets and shall be interlockable with the sheets.
- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form a drip.

COPY OF BID SET

- G. Fabricate corners from one piece with minimum 18-inch-long legs. Seam or solder for rigidity and seal with sealant.

2.03 FINISH

- A. Back paint all sheet metal with asphaltum paint where sheet metal surfaces come in contact with masonry or steel.
- B. Flashing and fascia shall be painted where exposed to view from the ground. Galvanized steel shall be painted in accordance with Section 09900–Painting. Aluminum shall be coated with a Kynar 500 coating system.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Through-wall flashing shall be installed 1/2 inch back of the outside face of the wall, carried through the outside wythe, turned up in the collar, and adhered to back-up wall as shown on the Drawings. At no time should any portion of the flashing be allowed to hang or drape beyond the width of the wall. All laps shall be sealed and shall not be less than 3 inches in width. Flashing around openings shall extend at least 3 inches beyond each side of opening.
- B. Fit flashing tight in place. Make corners square, surfaces true and straight in planes, and line accurate to profiles. Seal metal joints watertight.
- C. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted by ENGINEER.
- D. Insert flashings into reglets where shown on the Drawings. Seal flashings into reglets with sealant.
- E. CONTRACTOR shall provide copper sleeves for hot pipes penetrating the roof as approved by the roofing manufacturer. The annular space between the sleeve and the pipe shall be packed with insulation capable of withstanding the maximum temperature of the pipe. CONTRACTOR to provide a galvanized steel rain collar welded to the hot pipe.

END OF SECTION

COPY OF BID SET

SECTION 07631

GUTTERS AND DOWNSPOUTS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Aluminum gutters and downspouts.
 - 2. Precast concrete splash pads.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM B209–Aluminum and Aluminum Alloy Sheet and Plate.
- B. SMACNA–Architectural Sheet Metal Manual.

1.03 DESIGN REQUIREMENTS

- A. Conform to SMACNA manual for sizing components for a 10-year storm event.

1.04 REGULATORY REQUIREMENTS

- A. Conform to the Kentucky Building Code or governing local building code for size and method of rainwater discharge.

PART 2–PRODUCTS

2.01 GUTTERS AND DOWNSPOUTS

- A. Gutters and downspouts shall be constructed of 0.032-inch-thick aluminum sheet conforming to ASTM B209 and shall be made from the same manufacturer as the fascia and soffit system.

2.02 ACCESSORIES

- A. Anchorage devices shall meet SMACNA or manufacturer's requirements.
- B. Gutter supports shall be straps and fasteners at maximum 3 feet 0 inches on center.
- C. Downspout supports shall be brackets of the appropriate size and spacing.
- D. Fasteners shall be aluminum or stainless steel.

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2.03 SPLASH PADS

- A. Splash pads shall be precast concrete of the appropriate size with minimum 28-day compressive strength of 3,000 psi and minimum 5% air entrainment.

2.04 FABRICATION

- A. Form gutters and downspouts to SMACNA requirements.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion of defects detrimental to appearance or performance. Allow for expansion by providing expansion joints as required.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

2.05 FINISHES

- A. Finish on gutters and downspouts shall match finish on fascia system. All components, including fasteners and supports, shall be prefinished to match gutters and downspouts.

PART 3—EXECUTION

3.01 INSTALLATION

- A. Install gutters, downspouts, and accessories with manufacturer's instructions.
- B. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
- C. Install gutters level.
- D. Seal metal joints watertight.
- E. Set splash pads under downspouts.

END OF SECTION

COPY OF BID SET

SECTION 07710

MANUFACTURED ROOF SPECIALTIES

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Metal soffit.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. SMACNA–Architectural Sheet Metal Manual.

1.03 SUBMITTALS

- A. Submittals shall comply with requirements of Section 01300–Submittals.
- B. Submit sample panels for selection of anodized or Kynar 500 finish colors.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA standard details.

1.05 WARRANTY

- A. Kynar 500 coating shall be provided with a 20-year guarantee against cracking, chipping, peeling, and fading.

PART 2–PRODUCTS

2.01 SOFFIT

- A. Metal soffit system shall be constructed of 0.032-inch-thick aluminum sheet and shall include all necessary channels, angles, clips, flashing, fasteners, and other accessories of the same material as the soffit panels. Soffit panels shall be fully vented to allow for ventilation and shall have stiffener grooves spaced at 6 inches on center.
- B. Acceptable products include the following, or equal: Fabral, PAC 750 by Peterson Aluminum Corporation, and shall be made by the same manufacturer as the sheet metal roofing in Section 07611.

2.02 FINISHES

- A. Finish on all products shall be a 1.0 mil DFT two-coat factory-applied 70% Kynar 500 fluoropolymer coating over an epoxy prime coat. Colors shall be selected by OWNER. All exposed fasteners shall be provided with the same finish as the sheet metal products.

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PART 3-EXECUTION

3.01 INSTALLATION

- A. Install components in accordance with the drawings and the manufacturer's instructions.
- B. Installation details shall be such as to allow for thermal expansion and contraction of the components and to provide for a complete weatherproof installation.

END OF SECTION

COPY OF BID SET

SECTION 07900

CAULKING AND SEALANTS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Caulking and sealants on the project, including primers and backer rod material.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM C920–Elastomeric Joint Sealants.

1.03 SUBMITTALS

- A. Submittals shall comply with provisions of Section 01300–Submittals.
- B. Submit color chart for each sealant used on project. Colors will be selected by ENGINEER.
- C. Submit copies of warranty.

1.04 WARRANTY

- A. Caulked joints shall be weathertight and guaranteed watertight by installer for 2 years from the earlier of either the date established for partial utilization in accordance with GC14.04 and 14.05, as modified in the Supplementary Conditions or Substantial Completion of the project. Deliver original guarantee to OWNER with copies to ENGINEER.
- B. Provide manufacturer's standard 5-year product warranty.

PART 2–PRODUCTS

2.01 CAULK–NONSUBMERGED APPLICATIONS–GENERAL

- A. Caulk for nonsubmerged applications in all locations except floor joints shall be a one-part polyurethane sealant.
- B. Acceptable products include the following, or equal:
 - 1. Masterseal NP1 by BASF Construction Chemicals, LLC.
 - 2. Vulkem 116 by Tremco, Inc. (exterior applications only).
 - 3. Dymonic 100 by Tremco, Inc.

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2.02 CAULK–NONSUBMERGED APPLICATIONS–FLOOR JOINTS

- A. Caulk for floor joints in nonsubmerged applications shall be a one-part, self-leveling, polyurethane sealant.
- B. Acceptable products include the following, or equal:
 - 1. SL1 by BASF Construction Chemicals, LLC.
 - 2. Vulkem 45 SSL by Tremco, Inc.

2.03 CAULK–SUBMERGED APPLICATIONS–GENERAL

- A. Caulk in all submerged applications except at potable water contact shall be a two-part, polysulfide base synthetic rubber sealant.
- B. Acceptable products include the following, or equal:
 - 1. Sonolastic Polysulfide Sealant by BASF Construction Chemicals, LLC.
 - 2. Thiokol 2235M by PolySpec.

2.04 ACCESSORIES

- A. Backer rod shall be flexible, closed-cell polyethylene rod stock sized to be under at least 25% compression when positioned in the joint. In shallow joints and where backer rod is not used, polyethylene bond breaker tape shall be used. It is essential that the caulk bond to the side of the joint but not to the base of the joint.
- B. Primer(s) shall be used where required by the manufacturer for the specific product(s) used and the specific application(s) intended. Specific product(s) shall be as recommended by the manufacturer.
- C. Cleaning fluid shall be methyl ethyl ketone (MEK), methyl isopropyl ketone (MIK), or similar solvent material which will not etch or mar metal finishes and shall be the product of a nationally recognized manufacturer, of type expressly recommended for use with the caulking or sealant compound used.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Seal completely all joints around entire perimeter of all openings in all exterior walls (inside and outside faces), including joints at all exterior doors, windows, louvers, sills, and elsewhere as noted on the drawings and as necessary to seal all open joints in the building in a complete manner. Joints in exterior walls shall be caulked in a completely weathertight manner. Joints between interior walls and concrete ceilings and other interior joints shall be caulked as indicated on the drawings. Caulking not specified in other sections shall be performed under this heading.
- B. All caulking shall be done in accordance with manufacturer's specifications. Allow minimum 28-day curing period for concrete, grout, or mortar prior to caulking unless requested otherwise. Caulking work shall be done before the final coat of paint is applied except at moving joints which shall be finish painted before caulking or caulking shall be protected during painting. All caulking shall occur only when the temperature is above 40°F.

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- C. Joints shall be thoroughly cleaned and primed before caulking in accordance with manufacturer's instructions. Unless otherwise shown, joints shall be square in cross section 1/2-inch by 1/2-inch and shall comply with manufacturer's joint width/depth ratio limitations.
- D. Backer rod shall be used in all openings 3/4 inches or more in depth and shall be tightly packed to completely fill the space to 1/2-inch back of face. The 1/2-inch shall then be filled with caulking compound.
- E. Caulking shall be done by hand gun. Compound shall be driven into joint grooves with sufficient pressure to force out all air and fill joint grooves solidly. Caulking where exposed shall be free of wrinkles and shall be uniformly smooth.
- F. At completion of caulking, clean off all excess material from adjoining surfaces and material. Entire installation shall be left in a perfect appearing weathertight condition.

END OF SECTION

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SECTION 08110

STANDARD STEEL DOORS AND FRAMES

PART 1–GENERAL

1.01 SUMMARY

- A. Work included: Thermally-insulated steel doors and frames.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ANSI/SD1-100–Standard Steel Doors and Frames.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with provisions of Section 01300–Submittals.
- B. In addition to shop drawings and product data, indicate type of primer paint to be used and verify compatibility with field paint system specified.

PART 2–PRODUCTS

2.01 THERMALLY-INSULATED DOORS

- A. Thermally-insulated doors shall be hollow full flush, 1 3/4-inch-thick, 16 gauge steel sheet in accordance with ANSI/SD1-100 with polyurethane core rigid reinforcing full thickness.
- B. Acceptable products include the following, or equal:
 - 1. Ceco Imperial.
 - 2. Curries 707 Series.

2.02 FABRICATION–DOORS

- A. Doors shall be fully-sealed, continuously-welded construction with all surface welds, joints, and seams filled and ground smooth.
- B. Tops and bottoms of doors shall be completely closed with 16 gauge channels. Outside edges of doors shall be flush without depressions. No inverted channels will be allowed.
- C. Mortise, reinforce, drill, and tap doors to receive hardware. Reinforcement shall be welded within the stiles and rails. Reinforce top rails to accommodate closers on either side and reinforce bottom for kickplate.

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2.03 FRAMES

- A. Steel door frames shall be made of 14 gauge, cold-rolled, prime-quality steel in accordance with ANSI/SD1-100.

2.04 FABRICATION–FRAMES

- A. Fabricate frames as welded unit.
- B. Frames shall be 2 inches by 5 3/4 inches. Frames shall have 4-inch head member at 7 feet 0-inch doors in masonry walls.
- C. Fabricate frames with hardware reinforcement plates welded in place.
- D. Provide anchors appropriate to wall type.
- E. Provide frames for all steel doors.

2.05 FINISH

- A. Doors and frames shall receive one coat of rust-inhibitive, shop-applied primer paint. Primer paint must be compatible with field-paint system specified.
- B. Frames shall be finish-painted as specified in Section 09900–Painting prior to installation. This includes back sides of door frames.

PART 3–EXECUTION

3.01 INSTALLATION–FRAMES

- A. Install frames in accordance with ANSI/SD1-100.
- B. Coordinate installation of frames with wall construction for anchor placement.
- C. Coordinate installation of frames with installation of doors, hardware, joint sealers, and field painting.
- D. Set all frames as supplied by manufacturer.
- E. Frames in masonry walls shall be grouted full.

3.02 INSTALLATION–DOORS

- A. Install doors in accordance with ANSI/SD1-100.
- B. Coordinate installation of doors with installation of frames, hardware, and field painting.
- C. Set all doors as supplied by manufacturer. Hang all doors allowing for expansion and contraction at time of setting.
- D. Set all hardware in accordance with templates as supplied by hardware supplier.

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- E. Cover all exposed hardware until completion of painting and finishing.
- F. Examine hardware at completion; test, oil, grease, and adjust for perfect operation.

3.03 SCHEDULE

- A. See Door Schedule on drawings.

END OF SECTION

COPY OF BID SET

SECTION 08305

ACCESS DOORS AND FRAMES

PART 1–GENERAL

1.01 SUMMARY

- A. Work included: Aluminum floor doors and frame units.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

PART 2–PRODUCTS

2.01 ALUMINUM FLOOR DOORS AND FRAMES

- A. Acceptable products include the following, or equal: The Bilco Company, Type J as scheduled.
- B. Type J doors shall be designed for a minimum live load of 300 psf with a maximum deflection of 1/150 of span.
- C. Doors shall be constructed of stiffened 1/4-inch aluminum diamond-pattern plate.
- D. Channel frame for Type J doors shall be 1/4-inch extruded aluminum with bend-down anchor tabs. Depth of frame shall be 6 inches. A continuous EPDM gasket shall be mechanically attached to the frame around the entire perimeter.
- E. Hinges shall be through bolted to the door and frame with tamper-proof Type 316 stainless steel lock bolts.
- F. Provide 1 1/2-inch drain coupling located in corner of channel frame for Type J doors.
- G. Type J doors shall be equipped with required number and size of compression spring operators for door to operate easily and smoothly. Provide heavy-forged cam-action hinges to open door so edge of door does not open into channel. Doors shall have smooth controlled operation and not be affected by temperature.
- H. Provide hold-open arm that automatically locks in open position. Provide snap lock with fixed handle mounted to underside of cover. Provide removable exterior turn/lift handle with spring-loaded ball detent to open cover. All hardware shall be Type 316 stainless steel for corrosive environment.

2.02 FINISH

- A. Aluminum floor doors and frames shall have mill finish. Apply bituminous coating to portions of frames in contact with concrete.

COPY OF BID SET

2.03 ACCESSORIES

- A. Provide Bilco Ladder-Up, or equal, at all floor doors that have a ladder access. Materials and finishes shall be aluminum, mill finish.
- B. All aluminum floor/door openings shall be fitted with a permanently installed, fall-through prevention rail and net system that is easily retractable for access to the opening below. This system shall be Hatch Net 121 as manufactured by Safe Approach, Inc., Poland, Maine, or approved equal.
- C. The fall-through prevention system shall consist of the following components:
 - 1. A polyester safety net manufactured to ANSI A10.11 specification for personnel nets.
 - 2. Extruded aluminum side rails: Aluminum Alloy 6061-T-6 with an ultimate tensile strength of 18 KSI, a yield strength of 8 KSI, and a shear strength of 12 KSI.
 - 3. 316 stainless steel corner hooks.
- D. Each net assembly will come with a permanently attached label with the following information: Name of manufacturer, identification of net material, date of manufacture, date of prototype test, name of testing agency, and serial number.
- E. All stainless steel hardware and instructions necessary for proper installation of the net system shall be provided by the net system manufacturer. Installation shall be in accordance with the manufacturer's instructions.
- F. The complete assembly, including the net, shall be warranted against defects in material and workmanship for manufacturer's standard time period.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.
- B. Provide piping from channel frames for Type J floor doors from outlet to base of wall nearest floor drain or through wall to ground for tank structures. Terminate pipe in minimum 1 cubic foot of clear stone if termination is below ground.

3.02 ADJUSTING AND CLEANING

- A. Clean exposed surfaces using methods acceptable to the manufacturer that will not damage finish.
- B. Test units for proper function and adjust until proper operation is achieved.
- C. Repair finishes damaged during installation.
- D. Restore finishes so no evidence remains of corrective work.

END OF SECTION

COPY OF BID SET

SECTION 08710

DOOR HARDWARE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Hardware to fully equip all doors.
 - 2. Thresholds and weatherstripping.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REGULATORY REQUIREMENTS

- A. Hardware for the Control Buildings shall comply with barrier-free requirements.

PART 2—PRODUCTS

2.01 EXIT DEVICES

- A. Exit devices shall be Sargent 8813 x ETL Series, or equal, and shall be equipped with reinforced cross bars and functions as indicated on the hardware sets. The exit device shall be operated by a lockable lever from the exterior side.

2.02 HINGES

- A. Butt hinges shall be Stanley FBB 191, Hager BB 1191, or equal, full mortise, ball bearing, nonferrous, nonrising, loose pin, and flat bottom tip, unless otherwise specified. Provide three 4 1/2-inch by 4 1/2-inch hinges per door for doors 7 feet or less in height with one additional hinge for each additional 30 inches or fraction thereof, unless otherwise specified. Provide additional hinges or heavyweight hinges for all doors that are over 36 inches wide, unless specified otherwise. Finish on aluminum entrance doors shall match framing.

2.03 DOOR CLOSERS

- A. Door closers shall be LCN Series 1460 for exterior doors or equal. Provide aluminum finish on closers. Provide full covers. Door closers specified in paragraph 3.02 are LCN. (H-Hold Open).

2.04 OVERHEAD DOOR HOLDERS

- A. Overhead door holders shall be Glynn Johnson GJ 81H Series, or equal, unless otherwise specified. Numbers specified in paragraph 3.02 are Glynn Johnson.

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2.05 SURFACE BOLTS

- A. Surface bolts shall be 8-inch Ives 1630 series, or equal.

2.06 KICKPLATES

- A. Kickplates shall be Rockwood, or equal, 6 inches high. Kickplate width shall be 2 inches less than door width.

2.07 THRESHOLD AND WEATHERSTRIPPING

- A. All exterior doors shall be weatherstripped with Reese DS75, National Guard Products, Inc. 156, or equal, weatherstripping. Provide Reese 323C, Pemko 315AN, or equal, sweeps; and Reese S425A, Pemko 171A or equal, thresholds. Exterior doors without mullion shall have Reese No. 87, Pemko 352A, or equal, positive sealing astragal.

2.08 KEYING

- A. Door keys shall be keyed alike. Provide two keys per lock. Doors shall have temporary construction cylinders. Provide permanent cylinders at project completion.

2.09 FINISH

- A. Finish for all hardware, except as noted below, shall be US 26D or US 32D where stainless steel (ss) hardware is specified in paragraph 2.
- B. Finish for surface bolts shall be US 26D; finish for kickplates shall be 32D.
- C. Where stainless steel (ss) is specified, all hardware, including threshold and weatherstripping, shall be installed with stainless steel fasteners.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Provide finish hardware to fully equip all doors.
- B. Install hardware in accordance with manufacturer's instructions.

3.02 SCHEDULE

- A. Provide the following hardware groups in the amounts indicated on the door schedule or required for a complete and proper installation:

Group 1

Exit Device 8813
Door Closer-1460 BF (Regular arm)
Hinges and Kickplates

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Group 2

Lever-Rigid, each face
Surface bolts-One top and bottom
Overhead Door Holder GJ 81 H-HD
Hinges and Kickplate

END OF SECTION

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SECTION 09450

FRP CEILING PANEL SYSTEMS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: FRP laminated composite ceiling panels and trim.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM E84-Standard Test Method for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with provisions of Section 01300.

1.04 REGULATORY REQUIREMENTS

- A. Conform to the Kentucky Building Code for fire-rated assemblies.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles, bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside, under cover, and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Damaged or deteriorated material shall be removed from premises.

PART 2—PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers include the following, or equal: Crane Composites.

2.02 MATERIALS

- A. FRP Laminated Composite Ceiling Panels:
 - 1. Provide Kemply ceiling panels with Glasbord-P FRP facing panel laminated to one side of a 5/8-inch-thick plywood substrate. FRP facing panel shall be 0.09 inch thick and have an embossed surface and Surfaseal finish. Panel size shall be 48 inches by 96 inches.
 - 2. Provide trim pieces of similar material at all corners, openings, and joints in panels as required to provide a finished ceiling surface.

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3. Panels shall meet Class C flame spread and smoke development ratings per ASTM E84. Color to be chosen by OWNER.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Coordinate panel layouts with light fixture and ceiling diffuser layouts shown on electrical and mechanical drawings.
- B. Manufacturer's FRP trim shall be installed at the perimeter of the ceiling and at all openings and of other locations as required for a finished installation.
- C. FRP laminated composite ceiling panel systems shall be installed per manufacturer's recommendations. Provide FRP manufacturer's trim and accessories for a finished addition.

3.02 CLEANING AND ADJUSTING

- A. Remove and replace units which are damaged or improperly installed.
- B. Following installation, clean soiled or discolored surfaces of units.

3.03 SCHEDULE

- A. FRP ceiling systems shall be installed in rooms indicated on the Finish Schedule on the drawings.

END OF SECTION

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SECTION 09882

TANK AND CHANNEL LINING SYSTEM

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Surface preparation and application of tank and channel lining system.

1.02 SCHEDULE

- A. Pump Station Wet Wells and Flow Division Manholes: Apply product to walls and underside of top slab.
- B. Parshall Flume Structure: Apply product to walls.
- C. Select manholes downstream of force main discharges, as noted on the plans.

1.03 DEFINITIONS

- A. DFT: Dry Film Thickness.

1.04 SUBMITTALS

- A. Submittals shall be in accordance with provisions of Section 01300–Submittals. Include only two copies of the Material Safety Data Sheet (OSHA Communication Standard).

1.05 PREINSTALLATION MEETING

- A. CONTRACTOR shall convene a meeting with ENGINEER, applicator, and material supplier to discuss approved application products, finishes, and curing methods.

1.06 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in the manufacture of industrial-grade coatings with a minimum of 15 years of documentable satisfactory experience.
- B. Applicator: Product manufacturer shall provide written certification that applicator has been trained in the application of the product. Applicator shall have a minimum of 5 years of satisfactory documented experience in the business of similar coating applications and project size.
- C. Single Source: Except as noted, furnish field primers, pretreatments, and thinners by the same manufacturer as finish coats.
- D. Prepare and finish sample surfaces for observation by ENGINEER to establish acceptable standards for the work.

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1.07 ENVIRONMENTAL CONDITIONS

- A. Do not apply coating unless surface and surrounding air temperatures are above 50°F. Concrete surface temperature must be decreasing during time of application.
- B. Do not apply product in cold, foggy, damp, or rainy weather.

1.08 WARRANTY

- A. Refer to General Conditions.
- B. Correction Period: 5 years.

PART 2—PRODUCTS

2.01 APPROVED MANUFACTURERS

- A. Raven Lining Systems, 1024 North Lansing Avenue, Tulsa, Oklahoma 45106, (800) 324-2810, (918) 584-2810, fax (918) 582-4311, www.ravenlining.com.
- B. Sauereisen, 160 Gamma Drive, Pittsburg, Pennsylvania 15238-2989, fax (412) 963-7620, www.sauereisen.com
- C. Tnemec Company, Inc., 6800 Corporate Drive, Kansas City, Missouri 64120-1372, (800) TNE MEC1 [(800) 863-6321], www.tnemec.com.

2.02 APPROVED SYSTEMS

- A. Raven Lining Systems:
 - 1. Raven 760 High Performance Polymer Concrete (HPPC).
 - 2. Raven 405 Ultra High-Build epoxy coating.
- B. Sauereisen:
 - 1. Filler Compound No. 209.
 - 2. SewerGard No. 210S.
- C. Tnemec Company, Inc.
 - 1. Series 218 Mortarclad resurfacer.
 - 2. Series 436 Perma-Shield F.R.

PART 3—EXECUTION

3.01 GENERAL

- A. Provide dry heat and ventilation as needed to obtain the recommended drying conditions.
- B. Starting of work shall be construed as acceptance of surfaces and conditions by the applicator.
- C. Do not apply product to improperly prepared, wet, or damp surfaces.

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- D. Material shall not be applied when surfaces are subjected to direct sunlight or when air and surface temperatures are rising.
- E. Correct deficiencies in the total film by applying additional coats and in accordance with manufacturer recommendations.

3.02 FIELD QUALITY CONTROL

- A. Provide high-low thermometers to verify temperatures and any other instrumentation needed to verify that ambient surface and material conditions are within the recommended application parameters.
- B. Thickness:
 - 1. During application, a wet film thickness gauge meeting ASTM D4414—Standard Practice for Measurement of Wet Film Thickness of Organic Coating by Notched Gauges, shall be used to ensure a monolithic coating and uniform thickness during application.
 - 2. Compute gallons required to each coat prior to application based on the square footage to be coated.

3.03 SURFACE PREPARATION

- A. General:
 - 1. Examine all surfaces to be coated and the conditions affecting proper performance.
 - 2. Correct unsatisfactory conditions.
 - 3. Perform preparation and cleaning procedures in accordance with manufacturer instructions to obtain a clean and dry surface.
- B. Concrete Surfaces: Formed, Trowel Finish, or Flatwork:
 - 1. Allow concrete to cure a minimum of 28 days:
 - a. Verify dryness by performing ASTM D4263 “Plastic Film Tape-Down Test.”
 - b. Surfaces where the opposite side is exposed to earth shall be tested by performing ASTM F1869 “Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.” Moisture shall not exceed 3 pounds per 1,000 square feet in a 24-hour period.
 - 2. pH Testing:
 - a. Check pH of the concrete surface to verify it is between 10.0 and 13.0.
 - b. Check pH a minimum of once for every 1,000 square feet of surface area, with no two tests closer than 50 feet apart.
 - 3. Moisture Testing:
 - a. Verify dryness by testing for moisture with an ASTM D 4263 “plastic film tape-down test.”
 - b. Verify dryness a minimum of once for each of each structure.
 - 4. Moisture Vapor Transmission Testing:
 - a. Verify the moisture vapor transmission is less than 3 pounds per 1,000 square feet in a 24-hour period by the ASTM F1869 “Standard test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.”
 - 5. Prepare surfaces by abrasive blasting according to SSPC-SP 13.
 - a. Walls shall have large burrs, fins, and form irregularities ground uniformly prior to other preparation.

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- b. Abrasive-blast horizontal surfaces to remove laitance, curing compounds, sealers, or other contaminants. The surface shall expose the fine aggregate resembling 60-grit coarse sandpaper.
- c. Abrasive-blast vertical surfaces to open bug holes and remove laitance, form release agents, curing compounds, or other contaminants. The surface shall expose the fine aggregate resembling coarse sandpaper.
6. Allow concrete to cure a minimum of 28 days.
 - a. Verify dryness by performing ASTM D4263 "Plastic Film Tape-Down Test."
 - b. Surfaces where the opposite side is exposed to earth shall be tested by performing ASTM F1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride." Moisture shall not exceed three pounds per 1,000 square feet in a 24-hour period.

3.04 APPLICATION

- A. No application shall be performed until all substrate preparation and testing is complete for the structure being coated.
- B. Spray apply the first coat only to areas that can be final coated within the manufacturer's recoat window. If the recoat window is exceeded, the surface shall be prepared according to the manufacturer's recommendations and recoated. Contact the manufacturers for information and times in addition to that provided in their literature.
 1. Raven system:
 - a. Fill bug holes and irregularities with Raven 760 HPPC.
 - b. Raven does not recommend using a primer.
 - c. Thoroughly wash the surfaces prior to application of the first coat and thoroughly wash the first coat surfaces prior to application of the second coat.
 - d. Spray apply two coats of 405 at a minimum 100 mils total to concrete fillet, walls, and ceilings.
 - e. Raven typically has a maximum 24-hour recoat window at 75°F.
 2. Sauereisen system:
 - a. Fill bug holes and irregularities with 209.
 - b. Sauereisen does not recommend a primer with 210S.
 - c. Spray apply one or two coats of 210S at a minimum 100 total mils total to concrete fillet, walls and ceilings.
 - d. Comply with all manufacturer's temperature requirements for material and substrate.
 3. Tnemec system:
 - a. Fill bugholes and irregularities with 218.
 - b. Spray apply one or two coats of 436 at a minimum 100 total mils to concrete fillet, walls, and ceilings.
- C. Finish coats shall be applied at a minimum 30 square feet per gallon (50 mils) each coat. Spray apply the first coat only to areas that can be final coated within the manufacturer's recoat window. If the recoat window is exceeded, the surface shall be prepared according to the manufacturer's recommendations and recoated. Contact the manufacturers for information and times in addition to that provided in their literature.
 1. Raven typically has a maximum 24-hour recoat window at 75°F.
 2. The Sauereisen data sheet lists the recoat window at between 4 and 24 hours at 70°F.
 3. The Tnemec data sheet lists the recoat windows to be a minimum of 8 to 24 hours to recoat within 7 days to maximum recoat at 75°F and 10 to 24 hours to recoat with 7 days to maximum recoat at 55°F.

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3.05 PROTECTION OF OTHER WORK

- A. Protect adjacent surfaces including floors, equipment, or refinished materials by covering with drop cloths or other acceptable means.
- B. Maintain safe conditions at all times. Remove solvent-soaked rags and other flammables daily from the area or keep in airtight metal containers.

3.06 INSPECTION AND ACCEPTANCE

- A. Immediately repair improperly prepared surfaces, misapplied materials, or inferior workmanship.
- B. Touch up or reapply product to surfaces which have been damaged.
- C. Holiday Inspection:
 - 1. After the protective coating has set hard to the touch, it shall be inspected with high-voltage holiday detection equipment. Surfaces shall first be dried, an induced holiday shall then be made on to the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil of film thickness applied but may be adjusted as necessary to detect the induced holiday (refer to NACE RPO188-99).
 - 2. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper marked or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touchup/repair procedures shall follow the protective coating manufacturer's recommendations.
- D. Costs of specified tests shall be paid by CONTRACTOR.
- E. Costs for any reinspection or retesting due to defective workmanship or materials shall be paid by CONTRACTOR.

3.07 CLEANING

- A. Clean all splattered surfaces by methods which will not scratch, mar, or otherwise cause damage to finishes.

END OF SECTION

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SECTION 09900

PAINTING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Surface preparation and application of paints and coatings.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM B117–Standard Practice for Operating Salt Spray (Fog) Apparatus.
- B. ASTM D2247–Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity.
- C. ASTM D3363–Standard Test Method for Film Hardness by Pencil Test.
- D. ASTM D4060–Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- E. ASTM D4541–Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- F. ASTM D4585–Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.
- G. SSPC–The Society for Protective Coatings–Steel Structures Painting Manual.
- H. NACE–National Association of Corrosion Engineers.
- I. ICRI–International Concrete Repair Institute.
- J. Federal Register–Code of Federal Regulations (CFR).
- K. Federal Register–Resource Conservation and Recovery Act (RCRA).
- L. Federal Register–Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

1.03 SUBMITTALS

- A. Submittals shall be in accordance with provisions of Section 01300–Submittals.
- B. Shop primer proposed for use shall be submitted with all material and equipment submittals. All shop primers shall be of the same generic type and quality as those specified herein.

COPY OF BID SET

- C. Submit two copies of manufacturer's Material Safety Data Sheets (MSDS) for each type of paint with each shop drawing submittal. MSDS sheets shall be posted at the construction site at all times painting is in progress.
- D. Substitution submittals shall include performance test data, as certified by a qualified testing laboratory, for the ASTM tests specified in paragraph 2.01.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: All paints, surface preparation, and application methods shall conform to federal requirements for allowable exposure to lead and other hazardous substances.
- B. Prepainting Meeting:
 - 1. A prepainting meeting shall be held immediately following the project preconstruction conference. The prepainting meeting is to be held prior to any material and equipment that requires painting is delivered to the site.
 - 2. CONTRACTOR, the paint subcontractor, and the paint manufacturer's representative shall be present to review the specifications and project scope.
 - 3. The paint manufacturer's representative shall review progress at the site as requested by ENGINEER. These are generally expected to be prior to monthly progress meetings.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered to the site in original containers with labels intact and seals unbroken.
- B. Drop cloths shall be used in all areas where painting is done to fully protect other surfaces.
- C. Oily rags and waste must be removed from the building each night or kept in an appropriate metal container.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. CONTRACTOR shall dry-heat, dehumidify, and ventilate to obtain painting conditions recommended by the paint manufacturer during surface preparation, application, and cure.
- B. Relative humidity conditions as specified by the paint manufacturer's data sheet shall be adhered to. This includes times in which supplemental heat is used. Supplemental heat shall be indirect-fired hot air furnaces or electric heat. Open-flame heaters shall not be used.
- C. No unprotected, unheated exterior painting shall be undertaken when damp weather appears probable, nor when the temperature of the substrate is below 55°F, unless approval in writing is received from the paint manufacturer.

1.07 COLOR SELECTIONS

- A. Provide color charts for all coatings being used on the project. After initial selection of colors by OWNER, provide draw down samples of selected colors for OWNER's final approval.
- B. CONTRACTOR shall provide a summary sheet at the completion of the project listing the finish paint products used and the manufacturer's color identification for each item painted. This summary sheet should be submitted to ENGINEER and OWNER for review.

COPY OF BID SET

PART 2–PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. All materials required for painting shall be types and quality as manufactured by Tnemec Company, Inc., Sherwin Williams Company, International Devoe, Carboline, or equal, unless noted otherwise in the schedule.
- B. Where thinning is necessary, only the products of the manufacturer furnishing the paint will be allowed. All such thinning shall be done strictly in accordance with the manufacturer's instructions.
- C. Paint and paint products of Tnemec Company and Sherwin Williams, listed in the following specifications, are set up as standard of quality. International Devoe and Carboline have preapproved equivalent products that shall be used. Other manufacturer's products will be considered as a substitution if CONTRACTOR and paint manufacturer certify that the products offered are recommended for the service intended, are compatible with the shop primers used, are equal in solids content and composition, and are of the same type. Submittal shall include the following performance data as certified by a qualified testing laboratory. ASTM Specifications shall be the latest revision:
 - 1. Abrasion–ASTM D4060, CS-17 Wheel, 1,000 grams load.
 - 2. Adhesion–ASTM D4541.
 - 3. Hardness–ASTM D3363.
 - 4. Humidity–ASTM D2247 and D4585.
 - 5. Salt (Fog) Spray–ASTM B117.

PART 3–EXECUTION

3.01 SURFACE PREPARATION

- A. General:
 - 1. All surfaces to be painted shall be prepared as specified herein and by the manufacturer's published data sheet and label directions. The objective shall be to obtain a uniform, clean, and dry surface.
 - 2. No field painting shall be done before the prepared surfaces are observed by ENGINEER. Surfaces painted without such observation shall be abrasive-blast-cleaned and repainted.
 - 3. Prior to field-blasting, a sample of the blast abrasive shall be provided to ENGINEER for pH testing. Additional samples of subsequent deliveries or batches of blast abrasive shall be provided to ENGINEER for pH testing.
 - 4. For on-site abrasive-blasting, low-dust, low-silica content material shall be used. Coal slag abrasive shall be used on pipe and ferrous materials. Stauroilite abrasive shall be used on concrete and concrete block.
 - 5. Quality of surface preparations listed below are considered a minimum. If paint manufacturer requires a better preparation for a particular application, it shall be considered a requirement of this specification.
 - 6. All concrete surfaces shall be tested for moisture in accordance with ASTM D4263 and, if necessary, F1869. Surfaces shall also be verified that the pH of the cleaned concrete surface to be coated is within the range of 8 to 11.

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- B. Ferrous Metal:
1. All ferrous metal to be primed in the shop shall have all rust, dust, and mill scale, as well as all other foreign substances, removed by abrasive blasting. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting.
 2. All ferrous metals not primed in the shop shall be abrasive-blasted in the field prior to application of the primer, pretreatment, or paint.
 3. Abrasive blasting of metals in the shop shall be in accordance with SSPC-SP 10 Near White Blast Cleaning. Abrasive blasting of metals in the field for immersion service shall be in accordance with SSPC-SP 10 Near White Blast Cleaning. Abrasive blasting of metals in the field for nonimmersion service shall be in accordance with SSPC-SP6 Commercial Blast Cleaning.
 4. Solvent cleaning in accordance with SSPC-SP1 shall precede all abrasive-blasting operations.
 5. Ductile iron pipe shall be prepared by abrasive blasting per National Association of Pipe Fabricators NAPF 500-03-04 Abrasive Blast Cleaning.
 6. Prior to finish coating, all primed areas that are damaged shall be cleaned and spot-primed.
- C. Concrete:
1. All concrete surfaces, including precast concrete to be painted, shall be cleaned of all form oil, curing compound, and other foreign matter. Concrete floors containing oil and grease residues shall be cleaned with detergent to remove all residues.
 2. All new concrete and precast concrete walls, floors, and ceilings shall be abrasive-blast cleaned in accordance with SSPC-SP13/NACE No. 6 in order to prepare the surfaces for adherence of the painting systems as specified. Abrasive blasting of concrete shall result in a surface profile in accordance with ICRI No. 03732 at CSP-3 to CSP-5.
 3. Bug holes, pits, voids, and cracks shall be filled as specified in Section 03300–Cast-in-Place Concrete without placing a friable sand-cement surface overall. The dried surface shall be stoned down.
 4. Paint manufacturer shall observe and approve the surface preparation method and the prepared surface prior to painting.
 5. After cleaning, the surface shall be washed and all dust, sand, and loose particles shall be removed by vacuuming. If CONTRACTOR elects to blow the surfaces off with air, it shall be oil-free air, and the methods shall conform to OSHA requirements.
- D. Galvanized: Where galvanized items are not submerged or buried, they shall be cleaned with nonhydrocarbon solvent cleaner (such as Clean N Etch, or equal) in accordance with SSPC-SP1 and shall be abrasive-blasted in accordance with SSPC-SP16 Brush-Off Blast Cleaning.
- E. Copper: Where copper piping is not submerged or buried, it shall be solvent-cleaned in accordance with SSPC-SP1 and shall be lightly sanded.
- F. PVC and CPVC: All PVC and CPVC to be painted shall be solvent-cleaned in accordance with SSPC-SP1 and shall be lightly sanded.
- G. Aluminum: Where listed in the Schedule to be painted, it shall be solvent-cleaned in accordance with SSPC-SP1 and shall be lightly sanded.

3.02 APPLICATION

- A. All materials shall be used as specified by the manufacturer's published data sheets and label directions.

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- B. No paint shall be applied on a wet or damp surface and in no case until the preceding coat is dry and hard. Each coat shall be allowed to dry in accordance with manufacturer's data sheets before the next coat is applied.
- C. Drying time shall be construed to mean "under normal conditions." Where conditions are other than normal because of the weather or because painting must be done in confined spaces, other drying times will be necessary.
- D. Additional coats of paint shall not be applied, nor shall units be returned to service until paints are thoroughly dry and cured.
- E. Steel that will be inaccessible in the completed work shall receive the final coat before enclosure.
- F. Paint shall be applied to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, or other surface imperfections will not be acceptable. Tops and bottoms of walls and areas that are "cut-in" by brush prior to rolling shall have a uniform appearance in comparison with adjoining surfaces.
- G. Concrete block walls shall be back-rolled to achieve a pinhole-free surface coat.
- H. Walls and ceiling surfaces shall receive a minimum of one coat of paint before surface-mounted items such as conduits, boxes, piping, etc., are installed on these surfaces.
- I. Crevices and other hard-to-apply areas shall be back-rolled/back-brushed in conjunction with application of the first field coat of primer or intermediate coat. This includes, but is not limited to, between pipe flanges, pipe flange/pipe barrel joints, equipment fittings, and other narrow openings.
- J. No paint shall be applied to new or existing surfaces until joints have been caulked according to Section 07900 requirements, except at moving joints which shall be finish-painted before caulking or caulking shall be protected during painting.
- K. For PVC and CPVC piping, unions and valves shall not be painted.

3.03 FIELD QUALITY CONTROL

- A. Examination of work on the site by the manufacturer's representative shall be performed when requested by ENGINEER.

3.04 CLEANING

- A. All stains and marks shall be removed from other surfaces upon completion of the work.

3.05 SCHEDULE

- A. General:
 - 1. At the completion of the project, all painted surfaces which have been damaged shall be repainted or touched-up.
 - 2. See Finish Schedule on the drawings for an additional reference for areas to be painted.

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3. The painter shall use some discretion in what should and should not be painted. Do not paint over labels and other information, bronze, machined surfaces, moving parts where painting may impair movement, hot surfaces which may peel, etc. If in doubt whether a part should be painted, ask ENGINEER.
4. Products listed first are Tnemec and second are Sherwin Williams.

B. New Work:

1. All new work done by all trades shall be painted by CONTRACTOR in accordance with the following schedule and in accordance with paint manufacturer's recommendation. It is the intent of these specifications that all non-galvanized ferrous metal items scheduled for painting be shop-primed. If items are not shop-coated, surfaces shall be prepared and painted in the field as specified. If any items of new construction are not listed, CONTRACTOR shall request paint system from ENGINEER, and the items shall be painted as part of this Contract without additional cost.
2. Interior concrete floors, including equipment bases: See Section 03300 for sealed concrete floors.
3. Interior concrete block walls: One filler coat of Epoxoblock WB 1254, Kem Cati-Coat HS, and two coats HB Tneme-Tufcoat 114, Pro Industrial Water Based Epoxy B73-300.

Note: Paint shall be roller- or brush-applied to concrete sound-absorptive block.

4. Cast or ductile iron; not submerged or buried (including pipes to be insulated):
 - a. One shop coat of N69-1255 Hi-Build Epoxoline, Macropoxy 646 Beige as primer;
 - b. Touch-up prime coat prior to finish coating; and apply either:
 - (1) Two coats of N69 Hi-Build Epoxoline II, Macropoxy 646 for interior surfaces,
or
 - (2) One coat of N69 Hi-Build Epoxoline II, Macropoxy 646, and one coat of 1074 Endura-Shield, Acrolon 218HS for exterior surfaces.
5. Cast or ductile iron, tar coated; buried: Not painted.
6. Cast or ductile iron, submerged:
 - a. One shop coat Series 1 Omnithane (N140 or N69-1255 Epoxoline), Dura-Plate 235 Beige as primer.
 - b. Touch-up prime coat prior to finish coating and one stripe coat on all edges of N69 Epoxoline, Dura-Plate 235.
 - c. Two coats of Series N69-Hi-Build Epoxoline II, (one coat) Sher-Glass FF.
7. Steel, machinery, and equipment; not submerged (including pipes to be insulated):
 - a. One shop coat of N69-1255 Hi-Build Epoxoline, Macropoxy 646 Beige as primer.
 - b. Touch-up primer prior to finish coat, and either:
 - (1) Two coats of N69 Hi-Build Epoxoline II, Macropoxy 646 for interior surfaces;
or
 - (2) One coat of N69 Hi-Build Epoxoline II, Macropoxy 646; and one coat of 1074 Endura-Shield, Acrolon 218HS for exterior surfaces.

FIRST FIELD COAT SHALL BE APPLIED PRIOR TO INSTALLATION TO SURFACES INACCESSIBLE AFTER INSTALLATION INCLUDING BACK SIDES OF DOOR FRAMES. SEE DIVISION 8 FOR FACTORY-APPLIED DOOR PRIMERS.

8. Motors, gear drives, and doors delivered with nonepoxy primers:
 - a. Degrease per SSPC-SP1.
 - b. Lightly hand-sand per SSPC-SP2.
 - c. Apply one coat 135-1255 Chembuild Beige, Macropoxy 646 Beige.
 - d. Apply two finish coats as follows:

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- (1) Two coats of N69 Hi-Build Epoxoline II, Macropoxy 646 for interior surfaces,
or
 - (2) One coat of N69 Hi-Build Epoxoline II, Macropoxy 646, and one coat of 1074 Endura-Shield, Acrolon 218HS for exterior surfaces.
9. Steel, machinery, and equipment, submerged:
 - a. One shop coat Series 1 Omnithane (N140 or N69-1255 Epoxoline), Dura-Plate 235 Beige as primer.
 - b. Touch-up prime coat prior to finish coating, and one stripe coat on all edges of N69 Hi-Build Epoxoline, Dura-Plate 235.
 - c. Two coats of N69 H-Build Epoxoline, (one coat) Sher-Glass FF.
 10. Galvanized, copper, brass, CPVC, and PVC; not submerged or buried:
 - a. One coat of N69-1255 Hi-Build Epoxoline II, Macropoxy 646, and either:
 - b. Two coats of N69 Hi-Build Epoxoline, Macropoxy 646 for interior surfaces, or
 - c. One coat of N69 Hi-Build Epoxoline, Macropoxy 646, and one coat of 1074 Endura-Shield, Acrolon 218HS for exterior surfaces.
 11. Insulation of equipment, pipes, and ductwork:
 - a. Two coats of Series 6 Tnemec-Cryl, DTM Acrylic B66100.
 - b. Colored PVC jacketing shall not be painted.
 12. Galvanized, copper, CPVC, and PVC; submerged or buried: Not painted.
 13. Aluminum items:
 - a. Exposed areas of structural items such as railings and grating shall not be painted.
 - b. For structural items in contact with concrete, See Division 5.
 14. Stainless steel: Not painted.
- C. Coverage:
1. Dry mil thickness shall conform to those specified. Mil test measurement shall conform to SSPC Steel Structures Painting Manual. Dry Film Thickness (DFT) shall be verified in accordance with SSPC-PA2.
 2. The coatings listed will provide the mil thickness given when applied at the coverages listed. Upon the request of ENGINEER, such surfaces shall be checked by the painter with a calibrated mil thickness gauge and any deficiencies found in the film shall be remedied by additional coat(s) at the expense of CONTRACTOR.
 3. On masonry, application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative pinhole-free finish either by decreasing the coverage rate or by applying additional coats of paint.
 4. Coverages reflect manufacturer's recommendations using spray application techniques. Where brushing or rolling is specified or performed at the discretion of the painter, one additional coat, minimum, will be required to achieve total DFT thickness as specified and recommended by the manufacturer.

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	Sq. Ft.** Coverage	Dry Mil** Thickness Per Coat
Products		
6 Tnemec-Cryl, DTM Acrylic B66100	200	
N69 Hi-Build Epoxoline II, Macropoxy 646		
Steel or Impervious Substrate Primer Coat	---	4.0
Steel or Impervious Substrate Intermediate Coat(s)	---	5.0
Steel or Impervious Substrate Finish coat	---	5.0
135-1255 Chembuild, Macropoxy 646	335	4.0
Steel Doors	---	3.0
140 Pota-Pox Plus, Macropoxy 646 NSF		
Steel or Impervious Substrate Primer	---	4.0
Steel or Impervious Substrate Intermediate Coat(s)	---	5.0
Steel or Impervious Substrate Finish Coat	---	5.0
1074 Endura-Shield II, Acrolon 218HS	---	2.5
201 Epoxoprime, ArmorSeal 1000 HS Epoxy	250	
280 Tneme-Glaze, ArmorSeal 1000 HS Epoxy	250	
Epoxoblock WB 1254, Kem Cati-Coat HS	80	
HB Tneme-Tuffcoat 114, Pro Industrial Water Based Epoxy B73-300	160	
Series1 Omnithane, DuraPlate 235 (Primer)		3.0, 5.0
N69 HI-Build Epoxoline (Submerged)		6.0
Sher-Glass FF (Submerged)		12.0
WB Tneme-Crete 180, Sher-Cryl HPA	150	
Sherwin-Williams Products		
ProMar 200 Primer (sprayed)	200	
ProMar200 Primer (rolled/brushed)	260	
ProMar 200 Enamel (sprayed)	280	
ProMar 200 Enamel (rolled/brushed)	360	

** Roller or brush application requires two or more coats to obtain recommended film thickness. No allowance is made here for overspray, waste in handling, mixing, or application. Final total dry film thickness (DFT) shall be equal to that specified. Paint submittals shall note where roller or brush application is proposed and the paint manufacturer's recommendations of number of coats to achieve the required thickness shall be noted.

Primer, intermediate and/or final surface colors shall be of contrasting colors to assure coverage.

- D. Pipe Colors:
- Colors are to be selected by OWNER.
- E. Shop Finish Painting: The following items shall have factory-applied finishes and will not require field painting. CONTRACTOR shall field touch-up any damaged areas with factory-provided touch-up coating.
- Factory-finished HVAC equipment.
 - Chemical feed system pumps and accessories.
 - Submersible pumps.
 - Propeller submersible pumps.

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5. Samplers.
6. Parshall flume liners.
7. Motor control centers.
8. Supervisory control centers.
9. Switchgear.
10. Standby power systems.

END OF SECTION

COPY OF BID SET

SECTION 15195

PIPING AND EQUIPMENT IDENTIFICATION

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Perform all work required to furnish and install equipment, valve, pipe, and wire identification with supplementary items necessary for proper installation as specified herein, or shown on the drawings. CONTRACTOR shall identify including, but not limited to, all equipment, valves, piping, ductwork, dampers, pumps, and wires.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.
- B. Schedule:
 - 1. Submit valve schedule complete with building number, room number, valve tag numbering system, valve function, valve type, area served, year installed, manufacturer, model number, size, rated pressure, temperature rating and normal position.
 - 2. Valve schedule shall be developed using OWNER's valve naming convention. Provide OWNER with electronic version (Microsoft Excel) of the final approved valve schedule at or before Project closeout.
 - 3. Submit equipment schedule complete with building number, room number, equipment tag numbering system, equipment function, equipment type, area served, year installed, manufacturer, model number, size, emergency power (Y or N) and rated capacity.

PART 2–PRODUCTS

2.01 NAMEPLATES

- A. Type "A" Nameplates:

Use: Fans.

Unit heaters.

Size: 4-inch by 4-inch.

Material: 3-layer laminated Micarta.

Background Color: Black.

Character Color: White.

Character Size: 1 1/4 inches.

Engraving: Equipment label.

Mounting Location: Equipment–Top wireway.

COPY OF BID SET

2.02 LABELING TAGS

A. Valve Tags:

1. All new and existing valves shall be tagged. All stop plates, slide gates, and sluice gates shall also be tagged. CONTRACTOR shall provide on valves, engraved 2 1/2-inch by 2 1/2-inch plastic laminated tags, Seton "Setonply Series M4550-H," or equal. Nomenclature for tagging (letters and numbers) will be provided by ENGINEER. Colors will be selected by OWNER. CONTRACTOR shall affix tags to valves with Brady 38091, or equal, stainless steel wire and Brady 38090, or equal, zinc wire clamps.
2. Valve tags shall be fastened next to valve box cover on valve manholes with stainless steel fasteners. Each stop plate and slide gate and each stop plate and slide gate grooves shall both be labeled with tags using stainless steel fasteners.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state, and local requirements and referenced standards and conform to code and ordinances of authorities having jurisdiction.
- B. Degrease and clean surfaces to receive nameplates.
- C. Install nameplates parallel to equipment lines.
- D. Affix nameplates with stainless steel screws or sticky-back adhesive.

END OF SECTION

COPY OF BID SET

SECTION 15290

HEATING, AIR CONDITIONING, AND VENTILATION INSULATION

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes:
 - 1. Rigid board fiberglass insulation.
 - 2. Adhesives, mastic, sealants, and reinforcing materials.
 - 3. Jacketing.
 - 4. Insulation inserts and pipe shields.
 - 5. Accessories.

- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. ASTM B117—Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 2. ASTM C168—Standard Terminology Relating to Thermal Insulation.
 - 3. ASTM C272—Water Absorption of Core Materials for Sandwich Constructions.
 - 4. ASTM C533—Calcium Silicate Block and Pipe Thermal Insulation.
 - 5. ASTM C547—Standard Specification for Mineral Fiber Pipe Insulation.
 - 6. ASTM C518—Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 7. ASTM C591—Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - 8. ASTM C612—Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - 9. ASTM C916—Standard Specification for Adhesives for Duct Thermal Insulation.
 - 10. ASTM C1071—Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
 - 11. ASTM C1290—Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 - 12. ASTM C1427—Standard Specification for Extruded Preformed Flexible Cellular Polyolefin Thermal Insulation in Sheet and Tubular Form.
 - 13. ASTM D1000—Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications.
 - 14. ASTM E84—Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 15. ASTM E96—Standard Test Methods for Water Vapor Transmission of Materials.
 - 16. FED L-P-535E: Plastic Sheet (Sheeting): Plastic Strip: Poly (Vinyl Chloride) And Poly (Vinyl Chloride-Vinyl Acetate), Rigid.
 - 17. EPA Method 8260B—Volatile Organic Compounds By Gas Chromatography/Mass Spectrometry (Gc/Ms).
 - 18. NFPA 262—Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

COPY OF BID SET

1.03 SUBMITTALS

- A. Submit a schedule of all insulating materials shall be used on the project, including adhesives, fastening methods, and fitting materials, along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

1.04 GENERAL REQUIREMENTS

- A. Unless otherwise indicated, all pipe and duct covering, jackets, insulation, vapor barriers, adhesive, and mastics shall have flame spread rating of 25 or less and smoke spread rating of 150 or less when tested in accordance with ASTM E84.
- B. Exposed ductwork shall be painted in accordance with Section 09900–Painting. CONTRACTOR shall coordinate colors with OWNER.

PART 2–PRODUCTS

2.01 RIGID BOARD FIBERGLASS INSULATION

- A. Acceptable manufacturer is Manville Spin-Glas Series 814, Owens Corning Type 703, or Knauf Insulation Board.
- B. Insulation shall be mineral fiber type conforming to ASTM C612.
- C. Minimum nominal density shall be 3 lbs/ft³.
- D. K-factor shall not exceed 0.23 (btu-in)/(hr-ft²-°F) at 75°F mean.
- E. Insulation shall be rated for service to 450°F.

2.02 ADHESIVES, MASTIC, SEALANTS, AND REINFORCING MATERIALS

- A. Products shall be compatible with surfaces and materials on which they are applied, and shall be suitable for use at operating temperatures of systems to which they are applied.
- B. All adhesives used for ductwork insulation shall conform to ASTM C916, Type II.
- C. Fiberglass Insulation Adhesive. Acceptable Manufacturers: Foster 85-60, Childers CP-127, and Duro Dyne SSG.

2.03 JACKETING

- A. Foil Scrim Jackets (FSJ): Glass fiber reinforced foil kraft laminate, factory applied to insulation. Maximum permeance of .02 perms and minimum beach puncture resistance of 25 units.

2.04 ACCESSORIES

- A. All products shall be compatible with surfaces and materials on which they are applied, and be suitable for use at operating temperatures of the systems to which they are applied.

COPY OF BID SET

- B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.
- C. Insulation bands shall be 3/4-inch wide, constructed of aluminum or stainless steel. Minimum thickness shall be 0.015-inch for aluminum and 0.010-inch for stainless steel.
- D. Staples shall be clinch style.
- E. Tack fasteners shall be stainless steel ring grooved shank tacks.
- F. Joint sealants and metal jacketing sealants shall be non-shrinking and permanently flexible.

PART 3-EXECUTION

3.01 GENERAL

- A. All insulation damaged during construction shall be replaced in accordance with these specifications.
- B. All insulation shall be applied in accordance with the manufacturer's written recommendations. Destructive methods such as sheet metal screws are not acceptable. All pipe insulation shall be installed with joints butted firmly together.
- C. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates.

3.02 SUPPORT INSTALLATION

- A. Load distributing corrosion-resistant metal shields shall be installed around the lower one-third circumference of the insulation.
- B. Blocks and shields shall be provided at all supports regardless of orientation, except inserts may be omitted on 3/4-inch and smaller copper piping provided 12-inch long 22 gauge pipe shields are used.

3.03 RIGID BOARD FIBERGLASS INSULATION INSTALLATION

- A. Provide finished edges at all access doors and ends of insulation.
- B. Provide additional insulation trim pieces over flanged ductwork joints to completely insulate and seal to the thickness specified.
- C. For exterior ductwork, insulate duct such that minimum thickness is maintained and is sloped/peaked to shed water.
- D. Flexible connections from ducts to HVAC equipment shall not be insulated.

COPY OF BID SET

3.04 PROTECTIVE JACKET INSTALLATION

- A. Foil Scrim Jackets (FSJ): Install according to manufacturer's recommendations using factory supplied lap seals and butt strip seals.

3.05 DUCTWORK INSULATION

- A. Provide insulation on new ductwork as indicated in the following schedule:

Service	Insulation	Jacket	Thickness
Exhaust/Relief Ducts from Exterior to 12 Inches Beyond Damper	Rigid Board Fiberglass	FSJ	2.0"
Intake and Exhaust Damper Frames	Rigid Board Fiberglass	FSJ	2.0"

END OF SECTION

COPY OF BID SET

SECTION 15835

TERMINAL HEAT TRANSFER UNITS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Electric heaters.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. NFPA 70—National Electric Code.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300—Submittals.
- B. Drawings and specifications are based on the scheduled manufacturer and model number. CONTRACTOR shall be responsible for the cost of any changes because of substitutions or alternates of other manufacturers or model numbers including, but not limited to, structural, mechanical, and electrical work. CONTRACTOR shall pay all costs for revisions of drawings by ENGINEER. Any changes shall be coordinated and provided at no additional cost to OWNER.

1.04 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from the earlier of either the date established for partial utilization in accordance with GC14.04 and 14.05, as modified in the Supplementary Conditions, or Substantial Completion of the project.

PART 2—PRODUCTS

2.01 ELECTRIC HEATERS

- A. CONTRACTOR shall provide electric heaters of the type, size, capacity, and accessories as listed on the equipment schedule. All units shall be UL listed.
- B. All electric unit heaters shall be factory-assembled and tested.
- C. Electric Unit Heaters (Standard):
 1. Acceptable manufacturers are Chromalox, QMark, Indeeco, or equal.
 2. The cabinet shall be constructed of heavy gauge, die-formed steel with baked enamel coating. Manufacturer shall provide mounting bracket.
 3. Provide a propeller fan with direct-drive, totally enclosed motor.

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4. Provide an aluminum-finned copper-clad steel sheath heating element.
5. Provide an automatic reset thermal cutout to protect the element.
6. Unit-mounted equipment disconnect shall be ABB OT Series, or equal, provided by manufacturer and meet the requirements of Division 16.
7. Mount units to provide 8 feet 0-inch clearance below, unless otherwise shown on the drawings.
8. Unit shall include a thermal fan delay to dissipate heat when coil deenergizes, and prevent cold air drafts when it starts.
9. Line voltage thermostat shall be provided by Division 16.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's recommendations and local codes, including minimum mounting heights above floor.
- B. CONTRACTOR shall provide all mounting hardware and accessories necessary to complete installation.
- C. Installation of all equipment furnished under this Contract shall be supervised by a qualified representative of the equipment manufacturer. All equipment shall be placed in operation, and plant operators shall be trained to the satisfaction of OWNER by a qualified representative of the equipment manufacturer. OWNER may videotape training presentations given by manufacturer's representatives. Final payment for various items of equipment will not be made by OWNER until the equipment is operating to their satisfaction.

END OF SECTION

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SECTION 15860

HVAC FANS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Ceiling or cabinet fans.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. AMCA 99–Standards Handbook.
- B. AMCA 210–Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- C. AMCA 300–Reverberant Room Method for Sound Testing of Fans.
- D. AMCA 301–Method for Calculating Fan Sound Ratings from Laboratory Test Data.
- E. ASTM B117–Standard Practice for Operating Salt Spray (Fog) Apparatus.
- F. NFPA 70–National Electrical Code.
- G. NEMA MG 1–Motors and Generators.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300–Submittals.
- B. Submittal shall include fan-specific performance curves showing airflow, head, and motor horsepower.

1.04 QUALITY ASSURANCE

- A. Fans shall bear AMCA-certified rating seals.

1.05 DELIVERY, STORAGE AND HANDLING

- A. All fans shall be stored and handled in accordance with manufacturer's instructions.
- B. Motors, shafts, and bearings shall be protected from weather and dust.

COPY OF BID SET

1.06 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from the earlier of either the date established for partial utilization in accordance with GC14.04 and 14.05, as modified in the Supplementary Conditions, or Substantial Completion of the project.

PART 2—PRODUCTS

2.01 CEILING FANS OR CABINET FANS

- A. Acceptable manufacturers are Greenheck, Cook, or Twin City Fans.
- B. Fans shall have acoustically insulated housings and shall have maximum sound level rating not to exceed 4.0 sones in accordance with AMCA Bulletin 300-74. Fans shall bear the AMCA-certified ratings and seal for air capacity, sound, and UL label.
- C. Unit shall be equipped with integral chatter proof backdraft damper.
- D. Fans shall have centrifugal wheel with inlet perpendicular to grille. Ceiling grille shall be aerodynamically designed and shall provide 80% free area.
- E. Terminal box shall be furnished with cord, plug, and receptacle inside housing. Entire fan, motor, and wheel assembly shall be removable without disturbing the housing. Motor speed shall not exceed 1,100 rpm.
- F. Fan shall be mounted on vibration isolators furnished by fan manufacturer.
- G. Manufacturer shall furnish line voltage internally-mounted variable speed controller for fan. Controller shall be used for balancing only and shall be inaccessible to room occupants unless otherwise indicated on the drawings.

PART 3—EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions and drawings.
- B. CONTRACTOR shall provide all mounting hardware and accessories necessary to complete installation.
- C. Provide flexible duct connections on inlet and outlet of all fans.
- D. Drawings and specifications are based on the scheduled manufacturer and model number. CONTRACTOR shall be responsible for the cost of any changes because of substitutions or alternates of other manufacturers or model numbers. CONTRACTOR shall pay all costs for revisions of drawings by ENGINEER. Any changes shall be coordinated and provided at no additional cost to OWNER.

COPY OF BID SET

- E. Installation of all equipment furnished under this Contract shall be supervised by a qualified representative of the equipment manufacturer. All equipment shall be placed in operation, and plant operators shall be trained to the satisfaction of OWNER by a qualified representative of the equipment manufacturer. OWNER may videotape training presentations given by manufacturer's representatives. Final payment for various items of equipment will not be made by OWNER until the equipment is operating to their satisfaction.

END OF SECTION

COPY OF BID SET

SECTION 15890

DUCTWORK

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Duct Pressure/System Class.
 - 2. Duct Materials.
 - 3. Fasteners, Hangers and Supports.
 - 4. Duct Sealants and Gaskets.
 - 5. Ductwork Fabrication.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASTM A36–Standard Specification for Carbon Structural Steel.
- B. ASTM A90–Standard Test Method for Weight (Mass) of Coating on Iron or Steel Articles with Zinc or Zinc Alloy Coatings.
- C. ASTM A167–Standard Specification for Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet, and Strip.
- D. ASTM A480–Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- E. ASTM A653–Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- F. ASTM B209–Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- G. AWS D9.1–Sheet Metal Welding Code.
- H. NBS PS 15–Voluntary Product Standard for Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment.
- I. NFPA 90A–Installation of Air Conditioning and Ventilating Systems.
- J. NFPA 90B–Installation of Warm Air Heating and Air Conditioning Systems.
- K. SMACNA–HVAC Air Duct Leakage Test Manual.
- L. SMACNA–HVAC Duct Construction Standards–Metal and Flexible.
- M. UL 181–Factory-Made Air Ducts and Connectors.

COPY OF BID SET

N. SMACNA–Thermoplastic Duct (PVC) Construction Manual.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300–Submittals.
- B. Provide layout drawing for review prior to ductwork fabrication. Layout drawings shall be coordinated between all other trades prior to review.

1.04 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700–Contract Closeout.
- B. Record actual locations and sizes of ducts and duct fittings. Record changes in fitting location sizes and types. Show additional fittings used.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA–HVAC Duct Construction Standards–Metal and Flexible.

1.06 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A standards.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain recommended minimum temperatures during and after installation of duct sealants.
- C. Ductwork shall be stored indoors or in durable, waterproof, abovegrade packing.

1.08 DUCTWORK DESIGN

- A. Duct layout and design shown on the drawings are based on design of supply, return and exhaust system components. Any changes to the design for installation shall be submitted to and approved by OWNER and ENGINEER. Proposed changes shall be submitted with layout and pressure drop calculations. CONTRACTOR shall be responsible for the cost of any changes to the duct system or any system components.

PART 2–PRODUCTS

2.01 DUCT PRESSURE/SYSTEM CLASS

- A. Ductwork shall be constructed to the static pressure class as shown below, unless otherwise noted:
 - 1. Exhaust air ductwork: 2-inch negative pressure class.
 - 2. Outside air ductwork: 2-inch negative pressure class.

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2.02 DUCT MATERIALS

- A. All sheet metal used for construction of duct shall be 24 gauge, or heavier, except for round ductwork 12 inches and smaller shall be 26 gauge where allowed by SMACNA.
- B. Galvanized steel ducts shall be ASTM A653 galvanized steel sheet, lock-forming quality, having G90 zinc coating in conformance with ASTM A90, A653. Sheet metal for ductwork noted or specified to be painted shall include "Paint Grip" finish.

2.03 FASTENERS, HANGERS, AND SUPPORTS

- A. Ductwork shall be supported in accordance with SMACNA–HVAC Duct Construction Standards–Metal and Flexible. Secure wire method of support is not acceptable.
- B. Inserts and Fasteners:
 - 1. Concrete inserts installed prior to pouring shall be manufactured inserts.
 - 2. Concrete fasteners installed after pouring shall be powder-actuated except for lightweight aggregate concrete or in slabs less than 4 inches thick.
 - 3. Fasteners to ductwork shall be 316 stainless steel unless otherwise indicated.
- C. Hangers: Hanger rod shall be ASTM A36 galvanized steel for galvanized ducts or 316 stainless steel for ducts other than galvanized. Rods shall be threaded at both ends (maximum of 3 inches) or continuously threaded.
- D. Supports:
 - 1. Duct support material shall be galvanized steel for galvanized duct. Material for supports in corrosive spaces shall be electro-galvanized.
 - 2. Acceptable supports for trapeze hangers are steel angles or uni-strut. Exposed ductwork shall be supported by steel angle supports painted to match duct.
 - 3. Riser supports shall be angles or channels secured to the sides of the duct with welds or fasteners.

2.04 DUCT SEALANTS AND GASKETS

- A. Duct sealant shall be United McGill–United Duct Sealer, or equal for indoor applications and United McGill–Uni-Weather Duct Sealer, or equal for outdoor applications. Sealant shall be UL classified for flame and smoke development and shall be suitable for mating materials.
- B. Gaskets at flanged joints shall be butyl rubber or EPDM.

2.05 DUCTWORK FABRICATION

- A. Rectangular Field and Shop Fabricated Ductwork:
 - 1. Fabricate and support in accordance with SMACNA–Duct Construction Standards–Metal and Flexible. Duct material, gauges, reinforcing, joint types and sealing shall be in accordance with required pressure class in the standard.
 - 2. Construct tees, bends, and elbows with radius of not less than 1 1/2 times width of duct on centerline. Where not possible, rectangular elbows may be used with turning vanes in accordance with Section 15910-Ductwork Accessories.

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3. Increase duct sizes gradually, not exceeding 15 degree divergence wherever possible; maximum 30 degree divergence upstream of equipment and 45 degree convergence downstream.
4. Provide 45 degree expanded entry takeoffs unless otherwise indicated. Flange ductwork for attachment to grille registers and outlets, unless otherwise noted.
5. Provide reinforcement and rigidity required for pressure class.
6. Provide cross breaking or cross beading on duct sides larger than 18 inches.
7. Seal all joints airtight with gaskets and sealants.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards–Metal and Flexible.
- C. Duct sizes are inside clear dimensions.
- D. Provide openings in ductwork to accommodate testing equipment and controllers. Where openings are provided in insulated ductwork, install a metal insulation sleeve of same material as ductwork.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities. Make all necessary incidental changes in cross-section, offsets, etc., to avoid interference with other equipment and supports.
- F. Use double nuts and lock washers on threaded rod supports.
- G. Exposed ductwork shall be painted per Division 9–Finishes.
- H. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- I. Provide an experienced installer to go through the air distribution system with the balancer.
- J. Any modifications to the ductwork shown on the drawings must be reviewed by ENGINEER prior to installation.
- K. The weight of the ductwork shall be supported independently of connected equipment.
- L. Inserts shall be coordinated with general contractor for installation concrete.
- M. Where ducts pass through non-fire rated partitions in interior or exterior walls, provide flange on four sides on both sides of partition concealing opening. Flange shall overlap opening all around by 2 inches. Fill space with insulation if duct is insulated on either side of partition.

END OF SECTION

COPY OF BID SET

SECTION 15910

DUCTWORK ACCESSORIES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Duct access doors.
 - 2. Duct test holes.
 - 3. Flexible duct connections.
 - 4. Duct screens.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. NFPA 90A—Installation of Air Conditioning and Ventilating Systems.
- B. SMACNA—HVAC Duct Construction Standards—Metal and Flexible.
- C. UL 33—Heat Responsive Links for Fire-Protection Service.
- D. UL 555—Fire Dampers and Ceiling Dampers.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300—Submittals.
- B. Damper submittals shall include actual pressure drop, free area, and torque requirements for each type of damper provided.

1.04 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700—Contract Closeout.
- B. Record actual locations of access doors, flexible duct connections, dampers, and screens.

PART 2—PRODUCTS

2.01 DUCT ACCESS DOORS

- A. Provide Ductmate Model FD&H, or equal, access doors for ductwork. Access door hinge and cover shall be constructed of material similar to that specified for ductwork. Provide insulated access doors where ductwork is insulated. All access doors shall be gasketed.

COPY OF BID SET

2.02 DUCT TEST HOLES

- A. Provide Ventfabrics, Inc. No. 699 Instrument Test Holes, or equal, complete with gaskets and screw caps. Coordinate test hole height with insulation thickness.
- B. On uninsulated ductwork only, plastic pull-tab centered tapered plugs may be used. Plugs shall be Caplugs CPT-3, or equal, with minimum diameter of 0.36-inch.

2.03 FLEXIBLE DUCT CONNECTIONS

- A. Flexible duct connections in unrated spaces shall be Ventfabrics, Inc. "Ventglas®", or equal, neoprene-coated glass fabric. Fabric shall be suitable for continuous operation up to 200°F. Fabric shall have zero leakage at ±10 inches water column.

2.04 DUCT SCREENS

- A. Provide screens equal to Ryerson Ryex Standard, 3/4 inches, 12-gauge sheet metal with border frame for protection on open duct inlets and outlets, and as indicated on the drawings. Frame and screen shall be of similar material to ductwork.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards-Metal and Flexible. Refer to Section 15890-Ductwork for duct construction and pressure class.
- B. Provide duct access doors for inspection and cleaning before and after intake louver screens, filters, coils, fans, automatic dampers, at fire dampers, underneath duct smoke detectors, and elsewhere as indicated. Provide minimum 8-inch by 8-inch size for hand access, 18-inch by 18-inch size for shoulder access, and as indicated.
- C. Division 15 shall be responsible for coordinating with testing and balancing agency and providing test holes in all locations required for testing and balancing agency to complete their scope of work.
- D. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment. Metal-to-metal gap shall be approximately 4 inches.

END OF SECTION

COPY OF BID SET

SECTION 15940

AIR OUTLETS AND INLETS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Louvers.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ADC 1062—Certification Rating and Test Manual.
- B. AMCA 500—Test Method for Louvers, Dampers, and Shutters.
- C. ARI 650—Air Outlets and Inlets.
- D. ASHRAE 70—Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
- E. NFPA 90A—Installation of Air Conditioning and Ventilating Systems.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300—Submittals.
- B. Submittal shall include a louver schedule that includes louver model, screen type, louver size, finish type, free area, face velocity, and pressure drop for each louver.
- C. For product requiring color selection, provide a hard copy color chart to OWNER for color selection.

1.04 QUALITY ASSURANCE

- A. Performance of air terminals shall be in accordance with ADC 1062.
- B. Louvers shall be tested and certified in accordance with AMCA 500 and shall bear the AMCA seal.

PART 2—PRODUCTS

2.01 LOUVERS (EXTRUDED ALUMINUM)

- A. Acceptable louvers are Greenheck ESD 635, or equal. See drawings for sizes and locations.
- B. Blades and frame shall be extruded aluminum 6063-T5 alloy and 0.08 inch thickness.

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- C. Blades shall be 35 degree drainable type spaced at 4 inches on center. Louver shall be capable of a velocity of 1,077 fpm with no water penetration. Performance shall include AMCA-certified air and moisture penetration data and louver shall bear the AMCA seal. Vertical and horizontal mullions and connections between panels shall not be exposed.
- D. Provide channel frame unless noted otherwise on the drawings.
- E. Provide aluminum screen on louver in accordance with louver schedule on drawings. All fastenings shall be stainless steel or aluminum in accordance with louver schedule on drawings.
- F. Louver free area shall be equal to or greater than attached ductwork and damper free area.
- G. Louvers shall be furnished with 3 coats of 70% Kynar 500 finish with custom color selected by OWNER. Submit manufacturer's standard color chart with shop drawings.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install louvers in accordance with manufacturer's recommendations and drawing details.

END OF SECTION

COPY OF BID SET

SECTION 15980

TEMPERATURE CONTROLS AND INSTRUMENTATION

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Dampers and actuators.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit under provision of Section 01300–Submittals.
- B. Submittal shall include control schematics with wiring and logic diagrams in addition to equipment information. All wiring shall be color coded and labeled at each end with corresponding numbers in accordance with 15195–Equipment Identification. This numbering shall be shown on the shop and record drawings. Wiring diagrams shall be job-specific and indicate all point-to-point wiring connections. Manufacturer’s standard wiring diagrams are not acceptable.

1.03 QUALITY ASSURANCE

- A. Temperature control equipment including panels and other standard marketed apparatus shall bear the nameplate of the manufacturer. The entire system including temperature control wiring shall be installed by mechanics employed by or under contract to the temperature control provider, a factory-licensed distributor, or factory-licensed dealer. The provider shall be responsible for the quality and satisfactory operation of all materials.
- B. All control panels shall bear a serialized UL label.
- C. Comply with the National Electric Code (NFPA 70) and any and all local codes as applicable to construction of electrical wiring devices, material, and equipment herein specified.

PART 2–PRODUCTS

2.01 DAMPERS AND ACTUATORS

- A. Outside Air Intake and Exhaust Outlet:
 - 1. Dampers shall be TAMCO Series 9000 BF, Alumavent Series 3900SS, or Arrow AFDTI-25LT, thermally insulated control damper with aluminum construction.
 - 2. Dampers shall be parallel blade.
 - 3. Extruded aluminum (6063T5) damper frame shall be thermally broken, minimum 0.080 inch thickness. Damper frame to be 4 inches deep and shall be insulated with polystyrene on four sides. Damper shall be rated at a leakage of less than 8.0 cfm per square foot at 4.0 inches of water column pressure differential at 20°F.

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4. Blades to be extruded aluminum (6063T5), internally insulated with non-CFC, expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.
5. Blade gaskets shall be extruded EPDM; blade seals shall be silicone.
6. Shaft to actuator shall be hex type, material to match damper construction.
7. Side seals shall be silicone.
8. Dampers shall be flanged to duct type. Clear opening in damper shall be same size as ductwork.

B. Actuators:

1. Actuators shall be Belimo NFBUP, Honeywell MS4110, or Siemens GCA, maintenance-free actuator rated at minimum 88 in-lb. of torque. Dampers shall be power-to-open, spring-closed unless otherwise specified. Provide auxiliary switch where noted on drawings. Actuator shall be capable of accepting 120-volt power for operation and control.
2. Actuators shall include electronic overload protection and visual position indication throughout range of motion.
3. Actuators shall include a manual override via a manufacturer-supplied hex crank.
4. All actuators shall be direct-coupled to damper and mounted outside the air stream utilizing TAMCO motor mounting bracket model AL-0001, or equal unless otherwise noted. CONTRACTOR shall verify suitability of mounting bracket prior to ordering.
5. If auxiliary switch is not used, terminate cord in nearest junction box.
6. All actuators shall be of the same manufacturer. Manufacturer shall be responsible for furnishing quantity of actuators required to meet minimum damper torque rating, plus an additional 10% torque.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install all equipment in accordance with manufacturer's recommendations and Division 16.
- B. Install all dampers in accessible locations with ample space to install direct-coupled actuator, housing and accessories.

3.02 SEQUENCE OF OPERATION

- A. Controls for electric unit heaters (EUH) shall be provided by Division 16 contractor. Thermostats shall be suitable to meet room electrical rating. Control power shall be from control power transformer at unit.
- B. The following fans shall be controlled by a room thermostat by Division 16.
 1. EF-01.
 2. EF-02.
 3. EF-03.
 4. EF-04.

END OF SECTION

COPY OF BID SET

SECTION 15990

TESTING, ADJUSTING, AND BALANCING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Balancing air systems.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ASHRAE 11—Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air Conditioning, and Refrigeration Systems.
- B. SMACNA—HVAC Systems Testing, Adjusting, and Balancing.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01300—Submittals.
- B. Prior to final balancing, submit a preliminary report that includes the following design information for all control modes. Design information shall be from approved shop drawings. Report shall compare design and field tested data.
 - 1. For each supply, return and exhaust register, and ceiling outlet:
 - a. Room number.
 - b. Type of register and outlet and catalog size.
 - c. Air flow factor.
 - d. Design CFM and velocity.
 - e. Actual CFM and velocity.
 - f. Percent of design CFM.
 - g. Room pressure relationship.
 - 2. For each fan:
 - a. Unit number.
 - b. Fan size and wheel type.
 - c. Motor horsepower.
 - d. Motor nameplate voltage and amps.
 - e. Design CFM and static pressure (total pressure).
 - f. Actual CFM and static pressure (total pressure).
 - g. Actual fan RPM.
 - h. Actual motor voltage and amps (each phase).
- C. Provide summary sheet describing mechanical system deficiencies. Where not physically observable, provide pressure and/or flow readings to demonstrate suspected deficiencies. Describe objectionable noise or drafts found during testing, adjusting, and balancing. All deficiencies shall be corrected prior to final balancing.

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- D. Upon completion of final balancing, provide updated report indicating changes to system during final balancing for all control modes including updated airflows, pressures, velocities, etc. Final report shall be submitted prior to substantial completion.

1.04 QUALITY ASSURANCE

- A. Obtain services of an independent testing organization to perform testing and balancing work. The organization shall have a certified membership in the Associated Air Balance Council (AABC) or certification by the National Environmental Balancing Bureau (NEBB).
- B. Division 15 shall provide a technician and/or controls contractor to observe and assist in balancing the system. Balancing report must include verification of participation, including name and contact information of assisting party.

PART 2--PRODUCTS

2.01 BALANCING EQUIPMENT

- A. CONTRACTOR shall have the following minimum equipment for balancing systems:
 1. Duct air velocities below 1,000 fpm: Pitot tube and Micro-Manometer or Alnor velometer and duct-jet using zero to 1,000 fpm range.
 2. Supply Register Velocities: Alnor velometer and applicable jet or Anemotherm.
 3. Fan Rotative Speed: Timec tachometer or RPM counter and stop watch (1-minute reading, minimum).
 4. Contact pyrometer 0 to 300°F range.
 5. Amprobe model RS-3, or equal.
 6. Inclined manometer 0 to 30 inches of water.
 7. Instruments used for measurements shall be accurate, and calibration shall be calibrated by the manufacturer or an AABC-approved method.
 8. Instruments shall be applied in accordance with manufacturer's instructions.
- B. All instruments used for measurements shall be accurate, and calibration histories for each instrument to be available for examination upon request. Calibration and maintenance of all instruments to be in accordance with the requirements of NEBB or AABC Standards.

PART 3--EXECUTION

3.01 PRELIMINARY BALANCING

- A. Division 15 shall provide an experienced installer to review the air distribution system with the testing and balancing agency for completion to confirm the test openings and volume dampers indicated on the drawings or called for in the specifications are installed, that dampers are in the open position, that the fans operate properly during all control modes, air filters are clean, and that the system is ready for balancing. Add test openings, volume dampers, air scoops, deflectrols, turning vanes, etc., as required. Adjust and change fan drives and belts, remove and reinstall ceilings, air terminals, access doors, and air devices as required to balance the system. Maintain the air handling equipment in good operating condition during the testing and balancing procedures.

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3.02 SCHEDULE OF TOLERANCES

- A. Final air system measurements shall be within the following range of specified cfm:
Fans: 0% to +10%.

3.03 GENERAL REQUIREMENTS

- A. Perform testing, balancing, and adjusting procedures in accordance with AABC or NEBB, unless specified below.
- B. Contact Division 16 for assistance in operation and adjustment of controls during testing, adjusting, and balancing procedures. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation for all control modes and any deficiencies found.
- C. Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.
- D. Division 15 shall correct any installation deficiencies found by the test and balance agency that were specified and/or shown on the Contract Documents to be performed as part of that division of work, including sheave and pulley replacement or corrections to the controls system. Test and balance agency shall notify CONTRACTOR of these items and instructions will be issued to Division 15 for correction of the deficient work. Testing and balancing reports shall be submitted only after all deficiencies have been corrected and balancing completed upon the corrected system.

END OF SECTION

COPY OF BID SET

SECTION 16010

GENERAL ELECTRICAL REQUIREMENTS

PART 1–GENERAL

1.01 SUMMARY

- A. Work includes general requirements for all electrical work.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern Work in this section.

1.02 REFERENCES

- A. ANSI/NFPA 70–National Electrical Code (NEC).
- B. ANSI/IEEE C2–National Electrical Safety Code.

1.03 CONTRACT DOCUMENTS

- A. Any equipment roughed in improperly and/or not positioned on implied centerlines or as dictated by good practice shall be repositioned at no cost to OWNER.
- B. The drawings are generally diagrammatic, and CONTRACTOR shall coordinate the Work so that interferences are avoided. Provide all offsets in conduit, fittings, etc., necessary to properly install the work. All offsets, fittings, etc., shall be provided without additional expense to OWNER.
- C. Hazardous or classified locations, where referenced in the Specifications or on the Drawings, shall be as defined in the NEC.

1.04 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 70.
- B. Conform to ANSI/IEEE C2.
- C. The rules and regulations of the federal, state, local, and civil authorities and utility companies in force at the time of execution of the Contract shall become a part of this specification.
- D. Obtain electrical permits and inspections from authority having jurisdiction. Costs for permits and inspections shall be by CONTRACTOR.

1.05 CODES AND ORDINANCES

- A. CONTRACTOR is expected to know or to ascertain, in general and in detail, the requirements of all codes and ordinances applicable to the construction and operation of systems covered by this Contract. CONTRACTOR shall know or ascertain the rulings and

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interpretations of code requirements being made by all authorities having jurisdiction over the work to be performed by them.

- B. In preparing a Bid, CONTRACTOR shall include the cost of all items and procedures necessary to satisfy the requirements of all applicable codes, ordinances, and authorities, whether or not these are specifically covered by the drawings and specifications. All cases of serious conflict or omission between the drawings, specifications, and codes shall be brought to ENGINEER's attention, as herein before specified. CONTRACTOR shall carry out work and complete construction as required by applicable codes and ordinances and in such a manner as to obtain approval of all authorities whose approval is required.
- C. When requested by ENGINEER, CONTRACTOR shall provide written calculations to show compliance with applicable codes or the Contract Documents. This shall include, but not be limited to, conduit and wire sizing, junction and pull box fill and sizing, manhole/handhole sizing, conductor derating, and voltage drop. CONTRACTOR shall indicate calculation method used as well as compliance with applicable code, drawing, or specification.

1.06 EQUIPMENT PROVIDED UNDER OTHER DIVISIONS

- A. Included in this Contract are electrical connections to equipment provided under other divisions. CONTRACTOR shall refer to final shop drawings for equipment being furnished under other divisions, for exact location of electrical equipment, and the various connections required.

1.07 ELECTRICAL DISTRIBUTION SYSTEM

- A. Provide a complete electrical distribution system consisting of components indicated on the drawings or specified herein including, but not limited to:
 - 1. All miscellaneous equipment coordination and related appurtenances required by power company.
 - 2. 480-volt, three-phase, 4-wire service entrance conductors.
 - 3. Feeders, branch wiring, and electrical distribution equipment.
 - 4. All control wiring.
 - 5. Wiring between system components if equipment is not prewired.
 - 6. Lighting fixtures, lighting controls, and associated wiring.
 - 7. Support system design and supports for electrical raceways.
 - 8. Code-required disconnects.
- B. Provide a standby power system consisting of components indicated on the drawings (see Section 16230–Standby Power System and Section 16231–Standby Power System-Portable).
- C. CONTRACTOR shall connect the following equipment furnished by Divisions 15 and 25 consisting of components indicated on the drawings or specified herein, including, but not limited to:
 - 1. Unit heater fans.
 - 2. HVAC unit starters.
 - 3. Pumps, starters, and control panels.
 - 4. Air intake and exhaust fans.
- D. Provide balancing and adjusting of electrical loads.

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- E. CONTRACTOR shall instruct OWNER's representative in the operation and maintenance of all equipment. The instruction shall include a complete operating cycle on all apparatus.
- F. Provide miscellaneous items for a complete and functioning system as indicated on the drawings and specified herein.
- G. A partial list of work not included in Division 16 is as follows: Painting (except as otherwise specified herein).

1.08 NOISE

- A. Eliminate any abnormal noises that are not considered by ENGINEER to be an inherent part of the systems as designed. Abnormal buzzing in equipment components will not be acceptable.

1.09 DRAWINGS

- A. The drawings indicate approximate locations of the various items of the electrical systems. These items are shown approximately to scale and attempt to show how these items should be integrated with building construction. Locate all the various items by on-the-job measurements in conformance with Contract Documents and cooperation with other trades.
- B. Prior to locating equipment, confer with ENGINEER as to desired location in the various areas. In no case should equipment locations be determined by scaling drawings. Relocate equipment and bear cost of redoing work or other trades' work necessitated by failure to comply with this requirement.
- C. In certain instances, receptacles, switches, light fixtures, or other electrical devices and equipment, etc., may be relocated. Where relocation is within 10 feet of location shown on the drawings, and when CONTRACTOR is informed of necessary relocation before work is begun on this portion of the job, the relocation shall be at CONTRACTOR's expense.
- D. The drawings are schematic in nature and are not intended to show exact locations of conduit, but rather to indicate distribution, circuitry, and control.

1.10 EXISTING UNDERGROUND UTILITIES

- A. Record drawings of existing underground electrical utilities are not available for these facilities. CONTRACTOR shall excavate and verify the location of all underground electrical prior to installing new electrical equipment. This shall include, but not be limited to, feeders to structures and equipment, branch circuit wiring, phone and communication cabling, instrument wiring, and control wiring. CONTRACTOR shall temporarily relocate existing underground electrical to keep the existing facility in operation and for any new construction, and all costs for relocating existing electrical shall be included in the Bid.

1.11 SUBMITTALS

- A. CONTRACTOR shall submit to ENGINEER for approval prior to beginning work, shop drawings on the equipment and materials proposed to be furnished and installed. See Section 01300-Submittals for requirements.

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- B. CONTRACTOR shall, in addition, submit drawings and/or diagrams for review and for job coordination in all cases where deviation from the Contract drawings are contemplated because of job conditions, interference or substitution of equipment, or when requested by ENGINEER for purposes of clarification of CONTRACTOR's intent. CONTRACTOR shall also submit detailed drawings, rough-in sheets, etc., for all special or custom-built items or equipment. Drawings and details under this section shall include, but not be limited to, the following, where applicable to this project: Electrical interconnection wiring diagrams; see Section 16480—Motor Control and Section 16940—Controls and Instrumentation.
- C. These drawings and diagrams shall show applicable electrical switch and breaker sizes as well as the manufacturer's name and catalog number for each piece of equipment used.
- D. Equipment and material submittals must show sufficient data to indicate complete compliance with Contract Documents as follows:
 - 1. Proper sizes and capacities.
 - 2. That the item will fit in the available space in the manner that will allow proper service.
 - 3. Construction materials and finishes.
- E. When the manufacturer's reference numbers are different from those specified, provide correct cross-reference number for each item. The shop drawings shall be clearly marked and noted accordingly.
- F. When equipment and items specified include accessories, parts, and additional items under one designation, shop drawings shall be complete and include all components.
- G. See additional requirements of shop drawings under Division 1—General Requirements.

PART 2—PRODUCTS

2.01 STANDARD PRODUCTS

- A. All equipment and products shall be of new manufacture per applicable specifications.
- B. All equipment shall be UL and NEMA approved.
- C. Unless specified otherwise, major distribution equipment such as panelboards, motor control centers, motor starters, SPD, transformers, etc., shall each be by the same manufacturer.
- D. All equipment and wiring shall be selected and installed for conditions in which it will perform (e.g., general purpose, weatherproof, raintight, explosionproof, dustproof, or any other special type).

2.02 SUBSTITUTION OF MATERIALS AND EQUIPMENT

- A. While it is not the intention of OWNER to discriminate against any manufacturer of equipment which may be equivalent to specified equipment, a strict interpretation of such equivalency will be exercised in considering any equipment offered as a substitute for specified equipment. CONTRACTOR shall submit with each request for approval of substitute material or equipment sufficient data to show conclusively that it is equivalent to that specified in the following respects:
 - 1. Performance:

COPY OF BID SET

- a. Capacity at conditions and operating speeds scheduled shall be equal to or greater than that of the specified equipment.
 - b. Energy consumption at the point of rating shall not exceed that of the specified equipment.
 - c. Vibration and noise production at the point of rating shall not exceed that of the specified equipment.
 2. Materials of construction.
 3. Gauges, weights, and sizes of all portions and component parts.
 4. Design arrangements, methods of construction, and workmanship.
 5. Coatings, finishes, and durability of wearing parts.
 6. National reputation of the manufacturer as a producer of first quality equipment of the type under consideration.
 7. Availability of prompt, reliable, and efficient service facilities franchised by or affiliated with the equipment manufacturer. This shall include the maintenance of local stocks of critical replacement parts equal to those maintained for the specified equipment.
- B. Requests for substitution shall include CONTRACTOR's reason for the request.
- C. If ENGINEER does not consider the items equivalent to those specified, CONTRACTOR shall provide those specified.
- D. See General Conditions for additional requirements.

PART 3-EXECUTION

3.01 UTILITY SERVICES

- A. Utility connection requirements shall be determined. All costs for coordinating utility service shall be included in the price bid as described in Section 16420-Electrical Service System of these specifications.
- B. All costs for temporary service, temporary routing of piping, or any other requirements of a temporary nature associated with the utility service shall be included in the Base Bid.
- C. It is the intent that in the latter stages of construction, the permanent electrical service will be used and the temporary construction service discontinued. The following requirements shall govern the use of the permanent services:
 1. No permanent service shall be available until structure is enclosed, watertight, and heated.
 2. Only permanently connected and protected circuits and outlets shall be available.
 3. Temporary wiring shall not be connected to permanent distribution equipment.
 4. Under the above conditions, the use of permanent service equipment shall in no way affect the Contract conditions of the guarantee.
- D. It shall be CONTRACTOR's responsibility to police this situation and protect its equipment.

3.02 CLEANUP AND REMOVAL OF RUBBISH

- A. All lighting and appliance panelboards, MCCs, motor starter and disconnect switch enclosures, junction boxes, and pullboxes shall be cleaned of debris and wires neatly arranged with surplus length cut off before installation of covers.

COPY OF BID SET

- B. Where louvers are provided in switchgear, MCCs, or transformer enclosures, louvers shall be vacuumed free of all dust and dirt. Where air filters are provided in equipment such as control panels, motor control centers and transformers, CONTRACTOR shall replace all filters with new at the time of final completion.
- C. All lighting fixture lenses and lamps (interior and exterior fixtures) shall be cleaned at the time of installation, and all lens exteriors shall be cleaned just prior to final inspection.
- D. Equipment shall be thoroughly cleaned of all stains, paint spots, dirt, and dust. All temporary labels not used for instruction or operation shall be removed.

3.03 CONCRETE WORK

- A. All cast-in-place concrete for new electrical equipment bases shown on the drawings shall be provided by CONTRACTOR, except where specifically noted to be provided by others. All new equipment shall be set on 3 1/2-inch minimum leveling slabs including MCCs. Pads shall be 3 inches larger than equipment being supported.
- B. Concrete shall comply with Section 03300–Cast-In-Place Concrete.
- C. Provide all anchor bolts, metal shapes, and templates to be cast in concrete or used to form concrete for support of electrical equipment.

3.04 PAINTING

- A. All painting of electrical equipment shall be done by CONTRACTOR unless equipment is specified to be furnished with factory-applied finish coats.
- B. All electrical equipment shall be provided with factory-applied prime finish, unless otherwise specified.
- C. If the factory finish on any equipment furnished by CONTRACTOR is damaged in shipment or during construction, the equipment shall be refinished by CONTRACTOR.
- D. One can of touch-up paint shall be provided for each different color factory finish which is to be the final finished surface of the product.

3.05 CAULKING

- A. Caulk with a caulking sealant where indicated on the electrical drawings or hereinafter specified.
- B. Caulking sealant shall be silicone construction sealant as manufactured by General Electric or two-part polysulfide conforming to the requirements and bearing the seal of the Thiokol Chemical Corporation.
- C. Caulking sealant shall contain no acid or ingredients that will stain stone, corrode metal, or have injurious effect on painting. It shall be colored to match adjacent surroundings.
- D. Caulking shall be performed by craftsman skilled at such work.

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3.06 BUILDING ACCESS

- A. CONTRACTOR shall arrange for the necessary openings in the building to allow for admittance of all apparatus.
- B. When the installation requires openings and access through existing construction and the openings are not provided, CONTRACTOR shall provide the necessary openings.

3.07 COORDINATION

- A. Provide wiring for all motors and all electrically powered or electrically controlled equipment.
- B. All starters, disconnects, relays, wire, conduit, push buttons, pilot lights, and other devices for the power and control of motors or electrical equipment shall be provided by CONTRACTOR except as specifically noted elsewhere in these specifications or on the drawings.
- C. Where starters or other devices are provided by others, they shall be connected and wired by CONTRACTOR.
- D. CONTRACTOR's drawings and specifications shall show number and horsepower rating of all motors furnished, together with their actuating devices. Should any change in size, horsepower rating, or means of control be made to any motor or other electrical equipment after the Contract is awarded, any additional costs because of these changes shall be the responsibility of CONTRACTOR.
- E. All motors shall be provided for starting in accordance with local utility requirements and shall be compatible with starters as specified herein or under the various trades' sections of these specifications.
- F. CONTRACTOR shall provide all line voltage power and control wiring (100 volts and above), including temperature control wiring for operation, control, and supervision of all motorized equipment, including wiring between motor starters, and control devices as specified herein and as shown on the drawings. Low-voltage control wiring (below 100 volts) shall be provided by CONTRACTOR supplying the equipment that has low-voltage wiring, unless otherwise noted. CONTRACTOR shall provide raceways for ALL low-voltage wiring.
- G. CONTRACTOR shall connect and wire all apparatus according to approved wiring diagrams furnished by the various trades.
- H. Motors 1/2 hp and larger shall be NEMA rated 460 volts, three-phase, 60 Hz, unless otherwise shown. Motors 1/3 hp and below shall be 115 volts, single-phase, 60 Hz, unless otherwise shown.

3.08 EXCAVATION AND BACKFILL

- A. Backfill of exterior trenches shall be compacted granular fill, unless otherwise noted. Compaction shall meet the requirements of Section 02222–Excavation, Fill, Backfill, and Grading. Refer to Section 16110–Conduit for additional requirements associated with PVC conduit installed in earth.
- B. Lines passing under foundation walls shall have a minimum of 1 1/2-inch clearance.

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- C. Care shall be taken to ensure no disturbance of bearing soil under foundations.
- D. CONTRACTOR shall follow underground pipe runs where possible to avoid additional rock excavation. See Division 2 for rock excavation requirements.

3.09 EQUIPMENT ACCESS AND LOCATION

- A. CONTRACTOR shall coordinate work of this division with that of other divisions so that all systems, equipment, and other components of the building will be installed at the proper time, will fit the available space, and will allow proper service access to those items requiring maintenance. This means adequate access to all equipment not just that installed under this division. Any components for the electrical systems that are installed without regard to the above shall be removed and relocated as required to provide adequate access at CONTRACTOR's expense.
- B. Where various items of equipment and materials are specified and scheduled, the purpose is to define the general type and quality level, not to set forth the exact trim to fit the various types of ceiling, wall, or floor finishes. Provide materials that will fit properly the types of finishes actually installed.
- C. All equipment, junction and pull boxes, and accessories shall be installed to permit access to equipment for maintenance. Any relocation of conduits, equipment, or accessories to provide maintenance access shall be accomplished by CONTRACTOR at no additional cost.
- D. Electrical equipment, devices, instruments, hardware, etc., shall be installed with ample space allowed for removal, repair, calibration or changes to the equipment. Ready accessibility to equipment and wiring shall be provided without moving other equipment that is to be installed or that is already in place.
- E. Locate electrical outlets and equipment to fit the details, panels, decorating, or finish of the space. ENGINEER shall reserve the right to make minor position changes of the outlets before the work has been installed. Verify door swings before installing room lighting switch boxes, and install boxes on the latch side of door unless noted otherwise.

3.10 WORKMANSHIP

- A. All work shall be performed in compliance with the NEC.
- B. Install work using procedures defined in NECA Standard of Installation.
- C. Location of process equipment as shown on the drawings is approximate.
- D. Utilization equipment and control devices required under these specifications shall be mounted in a code-approved manner.
- E. Locations of utilization equipment and control devices as shown on the drawings are within 10 feet of actual positions. Any mounting of this equipment within this 10-foot distance will be performed at no additional cost to OWNER.
- F. Unless otherwise noted, conduit shall be fastened to building structure or equipment framework and not placed on the floor.

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- G. Where materials, equipment apparatus, or other products are specified by manufacturer, brand name, and type or catalog number, such designation is to establish standards of desired quality and style and shall be the basis of the Bid.
- H. Materials and equipment of the types for which there are National Board of Fire Underwriters Laboratories (UL) listings shall be so labeled and shall be used by CONTRACTOR.

3.11 AREA CLASSIFICATION

- A. As noted on the Drawings.

END OF SECTION

COPY OF BID SET

SECTION 16110

CONDUIT

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Rigid metal conduit and fittings.
 - 2. PVC externally and internally coated galvanized rigid metal conduit.
 - 3. Polyvinyl chloride conduit and fittings.
 - 4. Liquidtight flexible metal conduit and fittings.
 - 5. Conduit seals and special fittings.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ANSI C80.1—Electrical Rigid Steel Conduit (ERSC).
- B. ANSI/NEMA FB 1—Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable.
- C. NEMA RN 1—Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit.

1.03 QUALITY ASSURANCE

- A. Manufacturers of Raceways: Firms regularly engaged in the manufacture of electrical raceways of the types and capacities required whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that for the project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide electrical cable, raceways, wire, connectors, outlets, switches, etc., which have been listed and labeled by Underwriters Laboratories.
- E. Prior to shipment to the site, all conduit provided shall be new, unused material and may not have been stored outdoors or exposed to weather.
- F. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

COPY OF BID SET

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Provide color-coded thread protectors on the exposed threads of threaded rigid metal conduit.
- B. Handle conduit carefully to prevent end damage and to avoid scoring the finish.
- C. Store conduit inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.

PART 2–PRODUCTS

2.01 RIGID METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1 and UL6. Heavy wall seamless tubing with hot-dipped galvanized coating.
- B. Conduit bodies for rigid steel conduit shall be as manufactured by Appleton, Form 35, or equal, and be constructed of stamped steel for sizes 2 inches and under, and cast malleable iron for sizes over 2 inches. Conduit bodies shall have built-in pulling rollers, domed gasketed covers, and stainless steel screws. Covers for conduit bodies must have bolts that thread into the conduit body. Snaptight and wedgenut covers are not allowed. CONTRACTOR shall select body style and size according to application.
- C. PVC-coated conduit and fittings shall be internally and externally hot dipped galvanized rigid metal conduit with hot dipped galvanized threads and PVC coating. PVC coating shall be UL listed with rigid metal conduit as the primary means of corrosion protection for the conduit, and PVC coating shall have an external 40 mil thickness with an internal 2 mil urethane coating. Acceptable manufacturers shall be Plasti-bond RedH₂OT by Robroy Industries, Ocal-Blue by Thomas & Betts, or equal. PVC-coated conduit and fittings shall meet the following listings and manufacturing standards, without exception. All installers shall be field-certified from the factory for installation and shall provide proof of certification:
 - 1. ANSI C80.1.
 - 2. UL6.
 - 3. NEMA RN1.
- D. Conduit bodies for PVC-coated rigid conduit shall be as manufactured by Plasti-bond RedH₂OT by Robroy Industries, Ocal-Blue by Thomas & Betts, or equal, and have a 40 mil PVC exterior coating and 2 mil red urethane interior coating. Conduit bodies shall be Form 8 style or pulling elbow and include pulling rollers, domed, gasketed covers and stainless steel screws. Covers for conduit bodies must have bolts that thread into the conduit body. Snaptight and wedgenut covers are not allowed. CONTRACTOR shall select body style and size according to application.

COPY OF BID SET

- E. Fittings and Conduit Bodies: ANSI/NEMA FB 1 and UL 514B; threaded-type material to match conduit. For hazardous locations, fittings and conduit bodies shall meet the requirements of UL 886. Split couplings are not allowed.
- F. Supports: One-hole or two-hole pipe straps may be used for surface-mounted conduit. Where one-hole straps are used, provide conduit clamp and back spacer. Where standoffs are required, provide pipe straps and supporting devices as specified in Section 16190–Supporting Devices. Support material shall match that of the conduit type provided.

2.02 POLYVINYL CHLORIDE CONDUIT (PVC) AND FITTINGS

- A. Conduit: Heavy wall rigid, Schedule 40, Schedule 80 where noted, UL listed for underground, encased, and aboveground applications. PVC conduit installed in exterior locations shall be UV resistant.
- B. Conduit bodies for PVC conduit shall be as manufactured by Carlon, or equal, and be suitable for use with Schedule 40 or Schedule 80 PVC conduit. Conduit bodies shall have smooth hubs, textured lids, and foam-in-place gaskets. CONTRACTOR shall select body style and size per application.
- C. Supports: Two-hole nonmetallic clamps or conduit support straps may be used for surface-mounted conduit. Where standoffs are required, provide pipe straps and supporting devices as specified in Section 16190–Supporting Devices. Support material shall match that of the conduit type being provided.

2.03 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

- A. Liquidtight Flexible Metal Conduit:
 - 1. Conduit: Spiral-wound, electrogalvanized, single-strip steel with integral grounding conductor continuously enclosed within the entire length of the convolutions. The flexible PVC jacket shall be sunlight-resistant, flame-retardant, and resistant to damage from mild acids. Conduit shall be UL Listed and be rated for installation in Class I, Division 2, Groups C and D locations. Conduit shall be Liqueflex Type LA, or equal.
 - 2. Fittings: UL listed with thermoplastic elastomer sealing gasket.
 - a. Provide stainless-steel fittings outdoors and in NEMA 4X locations, unless noted otherwise.
 - b. Provide electro-zinc plated steel fittings in all other areas, unless noted otherwise.

2.04 CONDUIT SEALS AND SPECIAL FITTINGS

- A. Conduit seal-offs for Class I Locations: Robroy Industries Plasti-Bond Red H₂O_T Series EYS seal fittings and Crouse Hinds “Chico A” sealing compound, Arrow-Hart, or equal.
- B. Conduit Seals: Duct sealing compound, OZ Gedney Type DUX, or equal.
- C. Expansion Fittings: Crouse Hinds or Robroy type XJG, or equal, for rigid or PVC-coated rigid conduit. Crouse Hinds, type XD, or equal for PVC conduit.
- D. Expansion Deflection Fittings: O-Z type “DX,” Crouse Hinds, type XD (PVC conduit only), or Appleton.

COPY OF BID SET

- E. Ground Bushings: Crouse Hinds Model GLL, or equal.
- F. Mechanical Seals: 316 stainless steel, Link Seal, or equal. Link seals shall be provided with 316 stainless steel bolts, nuts, and fasteners.
- G. Watertight Hubs: Diecast, insulated and gasketed, rated for wet or dry locations indoors or outdoors. Watertight hubs shall be Appleton HUBXXXDN, Crouse-Hinds Myers Hubs, or equal.
- H. Conduit Plugs: Kwik N Sure pipe plug as manufactured by Cherne Industries, or equal. Plug shall include natural rubber O-ring with galvanized wing nut and hex nut.

PART 3-EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size conduits for branch circuit conductors, control wires, and instrumentation cables so as to have not less than 25% spare capacity after installation; 3/4 inch minimum size. Minimum size for liquidtight flexible metal conduit is 1/2 inch except 3/8 inch for lighting fixtures.
- B. Maintain at least 1 inch of separation between conduit sizes to 1 1/2 inches and 2 inches between conduits 1 1/2 inches or larger. Maintain 1 foot of separation between signal conduits (below 100 volts) and power conduits (100 volts and above).
- C. All conduit shall be supported in accordance with the NEC and as specified herein. This shall apply to all conduit types, including flexible conduit.
- D. Provide for the proper application, installation, and location of inserts, supports, and anchor bolts for a satisfactory raceway system. Where any component of the raceway system is damaged, replace or provide new raceway system.
- E. Run conduits concealed to avoid adverse conditions such as heat and moisture, to permit drainage, and to avoid all materials and equipment of other trades. Maintain a minimum clearance of 6 inches from all hot water pipes, flues, or any high-temperature piping or ductwork.
- F. Conduits shall be attached to building surfaces and not suspended unless installed in a Unistrut-type conduit rack as specified herein. Individual conduits shall not be suspended. Clevis hangers are not allowed.
- G. Center conduit in structural slabs (other than topping), clear of reinforcing steel and spaced on centers equal to or exceeding three times the conduit diameter. Outside diameter of conduit shall not exceed one-third the slab thickness for each run of conduit 1 1/4 inches or larger. Provide shop drawings when it will be installed in structural slabs. Conduits shall not be run in slabs-on-grade or structural topping slabs.
- H. Independently support or attach the raceway system to structural parts of construction in accordance with good industry practice. Conduits through roofs shall be rigid metal conduit and be equipped with pitch pockets.

COPY OF BID SET

- I. Conduit attached to building surfaces that may be damp shall be spaced out to avoid rust and/or corrosion using fittings approved for the use. Use back straps on all conduit in damp or wet locations, or mount conduit with Unistrut straps, or equal. Watertight hubs shall be used in all damp locations. Damp locations shall include, but not be limited to, all wet wells, all areas below grade, and exterior locations.
- J. Conduits shall be securely fastened to building structure at intervals not exceeding 8 feet or closer, if necessary. Where hangers are necessary, 3/8-inch rod/eyelets/rings/or trapeze type in Unistrut channel and pipe clamps shall be used. Wire or perforated strap iron is not acceptable. PVC conduit shall be securely fastened to building structure at intervals not exceeding 3 feet.
- K. Vertical conduit runs 1 1/4 inches and larger passing through floors shall be supported at each floor with conduit riser grips.

3.02 GENERAL CONDUIT INSTALLATION REQUIREMENTS

- A. Interior conduit shall be run concealed in walls, building cavities, chases, attic spaces, and buried below floor slabs. Exterior conduit shall be buried below grade and concealed in structure walls. Exposed conduit runs shall be avoided. Conduit may be run exposed only where it is impossible to conceal.
- B. Conduit may be run exposed on the underside of precast or poured concrete floor slabs. Run exposed conduit grouped and parallel or perpendicular to construction. Do not route exposed conduits over high-temperature machinery nor in contact with such equipment. All conduit shall be run exposed in structures below grade.
- C. All conduit installed below grade shall be buried a minimum of 2 feet 0 inches. All conduit installed below floor slabs shall be buried a minimum of 1 foot below slab.
- D. PVC conduit installed in earth (interior and exterior) shall be bedded in compacted sand with a minimum of 6-inch cover on all sides.
- E. In all PVC conduit runs below grade 200 feet and longer, PVC coated rigid steel conduit shall be used for all 90 degree bends.
- F. Ream conduit smooth at ends, cap upon installation, rigidly attach to structural parts of the building, and securely fasten to all outlet boxes, panel cabinets, junction boxes, pull boxes, splicing chambers, safety switches, and all other components of the raceway system.
- G. Conduits installed for future equipment or electrical work shall be cut off and capped flush with finished floor. Conduit ends shall have threaded fittings to accommodate future conduit installation.
- H. Provide all empty raceways 2 1/2 inches and over with No. 10 galvanized fishwire, and nylon cord for conduits smaller than 2 1/2 inches. Empty raceways and fishwire/nylon cord shall be identified with permanent label, and label shall include conduit termination point. All empty conduits shall be threaded, capped and flush with finished floor or wall. Exposed conduits shall be threaded and capped.
- I. Provide conduit raceway for exposed cables that are not UV resistant. This shall include, but not be limited to, instrument wiring, motor terminators, pump cables, float cables, etc.

COPY OF BID SET

- J. Conduit seals shall be provided for intrinsically safe circuits, where conduits pass from the interior to exterior of the building, where conduits enter a room which at any time is a low or high temperature room, where conduits enter a room which at any time is subject to internal air pressures above or below normal, and any conduit entering a wet location.
- K. Liquidtight flexible conduit shall be installed in such a manner that liquids tend to run off the surfaces and not drain toward the fittings.
- L. All runs of flexible conduit and flexible conduit couplings to equipment and devices shall be as short as practicable, of the same size as the conduit it extends, and with enough slack to reduce the effects of vibration to a minimum. A minimum of 18 inches of flexible conduit shall be installed for each motor.
- M. Provide conduit expansion-deflection fittings as specified herein in all conduit runs where movement perpendicular to axis of conduit may be encountered.
- N. Conduits shall be pitched so that drainage is away from all structures.
- O. Conduit bends for PVC conduit shall be made using a hot box, heat blanket, or glycol bender. Open flame or point heat sources of any type are not allowed.
- P. The PVC-coated rigid conduit manufacturer's touch-up compound shall be used on all conduit interior and exterior bare steel exposed because of nicks, cuts, abrasions, thread cutting, and reaming; minimum six coats.
- Q. Where below-grade PVC conduit is connected to rigid metal conduit, the length of PVC conduit shall be a minimum of 10 feet. For short, below-grade conduit runs where required lengths of rigid metal conduit limit the length of PVC conduit to less than 10 feet, rigid metal conduit shall be used for the entire run.
- R. Conduit bodies shall not be used for antenna cable routing. Provide pull boxes sized as required for antenna cable bending radius.

3.03 CONDUIT PENETRATIONS AND TERMINATIONS

- A. Where fittings are brought into an enclosure with a knockout, a gasket assembly consisting of an O-ring and retainer shall be installed on the outside. Fittings shall be insulated throat type.
- B. Conduit penetrations for control panels or enclosures containing electronic equipment shall utilize watertight hubs and enter the sides or bottom of the enclosure. Conduits shall not penetrate the top of the enclosure.
- C. Conduit penetrations for all exterior enclosures (e.g., disconnects, junction boxes, control panels) shall utilize watertight hubs and enter the sides or bottom of the enclosure. Conduits shall not penetrate the top of the enclosure.
- D. Provide conduit expansion fittings as specified herein in all conduit runs that cross a structural expansion joint and for conduits protruding from earth where the conduit is terminated within 5 feet of finished grade.

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- E. All conduits that protrude from poured concrete or earth shall be PVC-coated rigid conduit. Conduit shall extend continuously (i.e., no joints) a minimum of 4 feet beyond the poured concrete (both sides).
- F. Conduits passing through masonry, concrete, or similar construction shall be cast in place using PVC-coated rigid conduit extending completely through the construction.
- G. Where above-grade conduits pass through cores in existing structures or through masonry walls, grout openings between conduit and walls or floors with sand cement mortar.
- H. All spare conduits that terminate in a building or structure below grade shall be plugged with conduit plugs as specified herein.

3.04 CONDUIT INSTALLATION IN HAZARDOUS LOCATIONS

- A. All conduits installed in or passing through “hazardous locations” as defined by the NEC, NFPA, or as noted on the drawings, shall be installed with seal-offs as specified herein.
- B. All conduits in hazardous locations shall be installed in accordance with the NEC.
- C. Conduits for intrinsically-safe circuits shall be dedicated to intrinsically-safe wiring. Conduits shall be installed and identified by labeling or color coding in accordance with Article 504 of the NEC.

3.05 CONDUIT INSTALLATION FOR EMERGENCY LIGHTING AND POWER CIRCUITS

- A. All emergency egress lighting and power circuits shall be installed in dedicated conduits.
- B. Conduits for emergency egress lighting and power circuits shall be installed and permanently marked in accordance with the NEC.

3.06 CONDUIT INSTALLATION SCHEDULE

- A. The following schedule lists specific conduit types allowed in designated areas. Those areas not listed under a specific conduit type shall not have that type of conduit installed:
 - 1. Rigid steel:
 - a. Structural slabs.
 - b. Interior locations requiring mechanical protection.
 - c. All exposed interior locations.
 - d. All concealed interior locations.
 - e. Class I, Division 2 locations.
 - 2. PVC-coated rigid steel:
 - a. Class I, Division 1 locations.
 - b. Conduits protruding from concrete or earth.
 - c. Interior and exterior locations requiring mechanical protection.
 - d. Earth.
 - e. Exterior locations and locations exposed to weather.
 - f. Within 6 feet of building or structure footing or wall.
 - 3. PVC:
 - a. Earth, except within 6 feet of a building or structure footing or wall. PVC conduit under pavement or roadways shall be Schedule 80.
 - b. Service entrance ground conductors.

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- c. Buried below slabs on grade.
- 4. Liquidtight flexible metal conduit not over 3 feet in length for final connections to:
 - a. Equipment in wet locations.
 - b. Equipment with sliding bases or flexible positioning.
 - c. Equipment with vibration isolation mounting.
 - d. Equipment housing ferromagnetic cores or with integral moving components capable of generating noise or vibrations, including transformers and motors.
 - e. All pumps and associated equipment.

END OF SECTION

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SECTION 16120

WIRE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Wire.
 - 2. Terminal blocks and accessories.
 - 3. Wiring connections and terminations.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 QUALITY ASSURANCE

- A. Manufacturers of Wire: Firms regularly engaged in the manufacture of electrical wire products of the types and ratings needed whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that in this project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide electrical raceways, wire, connectors, outlets, switches, etc., which have been listed and labeled by Underwriters Laboratories.
- E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.03 SUBMITTALS

- A. Submit shop drawings and product data under the provisions of Section 01300—Submittals.
- B. Submit shop drawings for wiring system including layout of distribution devices, branch circuit conduit and cables, circuiting arrangement, and outlet devices.
- C. Submit manufacturer's instructions.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Provide factory-wrapped, waterproof, flexible-barrier material for covering wire on wood reels, where applicable, and weather-resistant fiberboard containers for factory-packaging of wire, connectors, outlets, boxes, lamps, fuses, etc., to protect against physical damage in transit. Do not install damaged wire or other material; remove from project site.

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- B. Store wire and other material in factory-installed coverings in a clean, dry, indoor space which provides protection against the weather.

PART 2--PRODUCTS

2.01 WIRE

- A. All wire for permanent installation shall be new stranded copper delivered to project in unopened cartons or reels, except where specifically noted and be UL listed for the use intended. No wire smaller than 12 AWG shall be used unless specifically noted. The use of multiconductor cable is NOT ALLOWED.
- B. Motor circuit branch wiring and associated control wiring:
 - 1. Insulation type shall be THHN (indoors).
 - 2. Minimum size for motor control wiring shall be 14 AWG.
 - 3. Control wiring for supervisory equipment shall be shielded, sized per equipment manufacturer's recommendations, or as shown on drawings.
- C. All wiring within control panels, supervisory control centers, and motor control centers that does not extend outside of the enclosure or the motor control center bucket shall be insulation-type MTW, minimum size 16 AWG.
- D. Wiring in dry locations shall be THHN. Wiring in damp and wet locations shall be XHHW-2. Damp and wet locations shall include, but not be limited to, unconditioned spaces, exterior buried conduits, wet wells, and exterior locations.
- E. Refer to Section 16195--Electrical Identification for required wire color coding. Initial phase color shall be used throughout the run, even for switch legs. Colors must meet code requirements for each class voltage. Do not duplicate colors, including neutral, on different voltages.
- F. All wiring for intrinsically safe circuits shall be light blue. Refer to Section 16940--Controls and Instrumentation for additional wire color requirements.
- G. Refer to Section 16195--Electrical Identification for conductor labeling and insulation color requirements.
- H. Branch circuit wiring for exterior lights in excess of 75 feet shall be minimum 10 AWG. Circuits 150 feet or over shall be sized for a maximum 2% voltage drop.

2.02 LOW-VOLTAGE WIRING (LESS THAN 100 VOLTS)

- A. Low-voltage wiring specified in this section shall be applicable to all systems installed that utilize low-voltage wiring where such wiring is not specified in other technical sections.
- B. All wiring shall have copper conductors with 300-volt insulation rating and meet the requirements of NEC Article 725.
- C. All conductors must be suitable for the application intended. Conductors 16 AWG and larger shall be stranded. Conductors 18 AWG and smaller may be solid or stranded.

COPY OF BID SET

- D. Control Cable for Class 1 Remote Control and Signal Circuits: Individual conductors twisted together, shielded, and covered with an overall PVC jacket. Cable shall be UL listed, temperature rated, and plenum or nonplenum rated for the application as required in the National Electrical Code.
- E. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits shall be constructed, UL listed, temperature rated, and plenum or nonplenum rated for the application as required in the NEC Article 725.

2.03 WIRING CONNECTIONS AND TERMINATIONS

- A. Provide crimp type UL or ETL listed terminations for 6 AWG and smaller stranded conductor connections to electrical devices and equipment such as receptacles, switches, and terminal strips. Crimp devices shall be Sta-kon, or equal.
- B. Provide insulated, **silicone-filled** spring wire connectors with plastic caps for 8 AWG conductors and smaller. Connectors shall be King Silicone-Filled Safety Connectors, or equal. Spring wire connectors shall only be allowed in junction, outlet, or switch boxes. Spring wire connectors are not allowed for terminating motor conductors.
- C. All feeder cable connections to motor leads up to 600 volts shall be insulated and sealed with factory-engineered kits. Motor connection kits shall consist of one-hole copper compression lugs for 6 AWG and larger, split-bolt connector for 8 AWG and smaller, and motor-lead pigtail splice kit. Individual components shall be as follows:
 - 1. Split-bolt connectors shall be for use with copper conductors only.
 - 2. One-hole copper compression lugs shall be as manufactured by 3M, or equal, 30000 series. Lug size shall be selected based on motor and feeder wire sizes installed.
 - 3. Pigtail splice kit shall consist of one-hole lug cover, silicone grease, and mastic sealing strip. Pigtail splice kit shall have locking pins for conductors 2 AWG and larger. Kit shall be as manufactured by 3M, or equal, 5300 series, and be selected based on motor, feeder, and lug sizes installed.
- D. No splices will be allowed unless reviewed by ENGINEER. Where allowed, provide in-line splices for all conductor connections, 6 AWG and larger. Splice crimp component shall be Burndy UGSKIT2 or equal. Splice shall be made with crimp tool by manufacturer that allows expanded conductor ranges. Splice insulation component shall be Raychem heavy-wall, low-voltage tubing, type WCSM, or equal.

2.04 TERMINAL BLOCKS AND ACCESSORIES

- A. Terminal Blocks: ANSI/NEMA ICS 4: UL listed or UL recognized under UL 467, UL 486E, UL1059, and UL 1953 (power terminals only).
- B. Power Terminal Blocks: Unit construction type, closed-back type, tin-plated copper, with tubular pressure screw connectors, rated 600 volts as manufactured by Allen-Bradley 1492-PDL, or equal.
- C. Signal and Control Terminal Blocks:
 - 1. General-Purpose Terminal Blocks:
 - a. Terminal blocks shall be rated up to 600 volts AC/DC.
 - b. Terminal blocks shall accept center-mounted jumper bars without increasing the installed space.

COPY OF BID SET

- c. Terminal blocks shall be Allen-Bradley Bulletin 1492-J, or equal.
- d. Terminal block color shall be gray.
2. Grounding Terminal Blocks:
 - a. Terminal blocks shall be Allen-Bradley Bulletin 1492-JG, or equal.
 - b. Terminal block color shall be green/yellow.
3. Disconnect-type Terminal Blocks (300-Volt Class):
 - a. Terminal blocks shall be feed-through type with a knife-blade disconnect.
 - b. Terminal blocks shall be Allen-Bradley Bulletin 1492-JKD, or equal, depending on the application.
 - c. Terminal block color shall be gray.
4. Fuse-type Terminal Blocks with Indicator (300-Volt Class):
 - a. Terminal blocks for applications from 100 to 300 volts AC shall be Allen-Bradley Bulletin 1492-H4, or equal, with neon blown-fuse indicator.
 - b. Terminal blocks for applications from 10 to 50 volts AC/DC shall be Allen-Bradley Bulletin 1492-H5, or equal, with LED blown-fuse indicator.
 - c. Terminal block color shall be black.
5. Fuse-type Terminal Blocks with Indicator (600-Volt Class):
 - a. Terminal blocks shall be Allen-Bradley Bulletin 1492-J3P, or equal, with associated indicating-type fuse plug.
 - b. Terminal block color shall be gray.
6. Terminal Blocks for Power Meters and Current Transformers: Provide test-disconnect terminal blocks for disconnecting, shorting, and testing current transformers and for disconnecting and testing voltage sensing inputs. Provide test-disconnect terminals for individual current transformer or voltage sensing installations, and provide a group of terminals for all current transformer and voltage sensing inputs for each power meter installation.
 - a. Provide a pair of terminal blocks for each current transformer including one feed-through terminal block, one sliding disconnect terminal block with a cross-connection short-circuit slider. The pair of terminal blocks shall include the following:
 - (1) Feed-through terminal block shall be Weidmüller Model WTD 6/1 EN, or equal.
 - (2) Sliding disconnect terminal block shall be Weidmüller Model WTL 6/1 EN, or equal.
 - (3) Short-circuit slider shall be Weidmüller Model WKS 2/2, or equal. The short-circuit slider shall cover the terminal block conductor screws on the meter-side of the terminal blocks when in the non-shorting position, and expose the terminal block conductor screws when slid into the shorting position.
 - (4) Provide two cross-connection sliders Weidmüller Model STB, or equal, with connecting sleeves Weidmüller Model VH, or equal. Provide one slider fixing screw Weidmüller Model BS, or equal. Connecting sleeves and fixing screws shall be color coded for each current transformer.
 - b. Provide disconnecting terminal blocks for each voltage sensing and neutral connection. The terminal blocks shall include the following:
 - (1) Sliding disconnect terminal block shall be Weidmüller Model WTL 6/1 EN, or equal.
 - (2) Provide one cross-connection slider Weidmüller Model STB, or equal, with connecting sleeve Weidmüller Model VH, or equal, for each voltage sensing and neutral connection terminal block. Provide one slider fixing screw Weidmüller Model BS, or equal. The neutral connecting sleeve shall be a different color than the voltage sensing connecting sleeves.

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- c. Terminal block colors shall be gray. Provide end plates and end brackets as required to complete the test-disconnect terminal block assembly.
 7. Terminal blocks shall have self-locking screw compression clamps rated for the size of conductors being terminated and upstream overcurrent protection for each application.
 8. The same manufacturer and style of terminal block shall be used throughout the entire project for all applications.
 9. Terminal blocks shall have tin-plated copper current bars and tin-plated steel screws. Terminal housings shall be completely finger safe from all live circuits and be constructed of self-extinguishing material with minimum UL 94-V0 flammability rating.
 10. Terminal blocks shall accept pre-printed, snap-in labeling cards on both sides without increasing the installed space. Provide terminal block manufacturer's end barriers and screw-type retainers for all terminal block groupings.
 11. Terminal blocks shall mount on standard DIN rail and shall be able to be removed without removing adjacent terminal blocks.
 12. Multi-level terminal blocks and stacked, single-level terminal block installations are not acceptable.
- D. Refer to Section 16195—Electrical Identification for terminal block labeling requirements.

PART 3—EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which the work is to be installed and notify CONTRACTOR of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 GENERAL WIRING METHODS

- A. Install electrical wire and connectors in accordance with the manufacturer's written instructions, applicable requirements of the NEC, the National Electrical Contractors Association's "Standard of Installation," and in accordance with recognized industry practices to ensure that products serve the intended functions. Use appropriate wiring methods and materials for the equipment or environment.
- B. Stranded conductors shall be terminated using crimp-type devices specified herein. Conductors may not be wrapped around a terminal screw.
- C. Place an equal number of conductors for each phase of a circuit in same raceway.
- D. Torque conductor connections and terminations with calibrated torque wrench to manufacturer's recommended values. Provide permanent marking on lug, bolt, nut, or connection for conductors larger than 4 AWG.
- E. Splice only in junction or outlet boxes. Splicing is not allowed in disconnects, motor control centers, panelboards, control panels, equipment, etc. Avoid splices between terminals of interconnecting power and control wiring.
- F. Spring wire connectors shall only be used in junction, outlet, or switch boxes. Equipment wireways (e.g., motor control centers, panelboards, disconnects, etc.), and control panels

COPY OF BID SET

shall not have any spring-wire connectors installed; all terminations shall be on terminal strips.

- G. Neatly train, lace, and tie wrap all wiring inside boxes, equipment, control panels, MCCs, and panelboards.
- H. Make conductor lengths for parallel circuits equal.
- I. The same color shall be used for each numbered wire throughout its entire length.
- J. Terminate all wiring on terminal blocks in control panels, starter cubicles, and similar equipment. This shall include all spare or unused wires.
- K. Provide a dedicated neutral for each branch circuit or feeder requiring a neutral. Ampacity of neutral conductor shall match that of the branch circuit or feeder.
- L. Do not use a pulling means that can damage the raceway.
- M. Signal wiring (below 100 volts) and intrinsically safe wiring must be in a conduit separate from power and/or control wiring (over 100 volts). Signal wire shall include, but not be limited to, loop-powered devices and communication wiring (i.e., Ethernet, RS-232, etc.). Analog wiring shall be in a conduit separate from all other wiring. Intrinsically safe wiring shall be separated and identified in accordance with Article 504 of the NEC.
- N. Provide junction or pull boxes to facilitate the “pulling in” of wires or to make necessary connections. All raceways and apparatus shall be thoroughly blown out and cleaned of foreign matter prior to pulling in wires.
- O. Thoroughly clean wires before installing lugs and connectors.
- P. Make splices, taps, and terminations to carry full capacity of conductors without perceptible temperature rise.
- Q. Terminate spare conductors within equipment, MCCs, control panels, etc., on terminal strips and label as “SPARE.” Spare wiring in pull or junction boxes may be terminated with electrical tape and labeled as “SPARE.” All spare conductor labels shall indicate where the conductors terminate. Refer to Section 16195–Electrical Identification, for additional requirements.
- R. Feeder connections to motors shall be installed within the motor junction box utilizing factory engineered kits as specified herein. Spring wire connectors are not allowed for connections to motors.

3.03 GENERAL LOW-VOLTAGE WIRING METHODS (LESS THAN 100 VOLTS)

- A. Low-voltage wiring installation requirements specified herein shall be applicable to all systems installed that utilize low-voltage wiring where such wiring installation is not specified in other technical sections.
- B. Low-voltage wiring shall be installed in conduit.
- C. Control wiring for HVAC shall be installed in conduit.

COPY OF BID SET

- D. Do not use wire smaller than 14 AWG for control wiring greater than 60 volts, or 18 AWG for voltages less than 60 volts. All sizes subject to NEC 725 requirements.
- E. Low-voltage cable splices shall only be allowed in junction boxes.

3.04 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL-listed wire-pulling lubricant for pulling 4 AWG and larger wires. Wax-based pulling lubricant is not allowed unless it includes a Teflon additive.
- B. Install wire in raceway after interior of building is enclosed, watertight, and dry, and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.
- D. Conductors No. 6 AWG and larger shall be pulled into conduits utilizing a tugger with built-in tension meter. CONTRACTOR shall provide a report to ENGINEER for each pull indicating maximum tension reached during the pull along with manufacturer's maximum pulling tension. Motorized machines of any type are NOT ALLOWED for any wire pulling.
- E. Conductors shall be installed in conduit system in such a manner that insulation is not damaged, conductors are not overstressed in pulling, and walls are not damaged. No splices are permitted except in junction boxes or outlet boxes.
- F. CONTRACTOR shall observe code limitation on the number and size of wires in an outlet box. CONTRACTOR shall either lay out work so that the wires do not exceed the particular box limitation or provide larger boxes approved for additional capacity.
- G. Panel riser feeder conductors shall be identified with colored tape at panel lugs. The same phase relation shall be maintained throughout.
- H. Circuiting is indicated diagrammatically on the drawings.

3.05 TERMINAL BLOCK INSTALLATION

- A. A maximum of one conductor shall be installed on the field-wired side of each terminal block. If rated to accept more than one conductor, a maximum of two conductors shall be installed on the enclosure-wired side of each terminal block. Provide additional terminal blocks and shorting jumpers as required.
- B. Provide a separate ground-type terminal block for each shielded-cable drain conductor.
- C. Provide ten percent spare terminal blocks for each type of connected terminal block, minimum five spare terminal blocks total. For each grouping of terminal blocks, provide 25% spare DIN rail space. Refer to Section 16951—Spare Parts for additional spare terminal block requirements.
- D. Maintain a minimum of 1 1/2 inches between terminal blocks and adjacent devices and enclosure wireways.

COPY OF BID SET

- E. For current transformer shorting terminal blocks, the short-circuit slider shall cover the terminal block conductor screws on the meter-side of the terminal blocks when in the non-shorting position, and expose the terminal block conductor screws when slid into the shorting position.
- F. Provide terminal blocks where required to extend current transformer lead wires. Terminal blocks shall be mounted in a small junction box or have a removeable barrier covering the terminals to prohibit wire removal without first opening the enclosure or removing the barrier. Provide a nameplate on the junction box/barrier reading: "DANGER: DO NOT DISCONNECT CT WIRES UNDER LOAD."

3.06 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connection.
- B. Prior to energizing, check conduit, raceways, outlet boxes, and wire for continuity of circuitry and for short circuits. Correct malfunction when detected.
- C. Subsequent to wire hookups, energize circuitry and demonstrate functionality in accordance with these specifications.
- D. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.
- E. Perform field inspection and testing according to provisions of this section.

3.07 ACCEPTANCE TESTS

- A. CONTRACTOR shall furnish all materials, labor, and equipment necessary for the acceptance tests specified herein. Acceptance tests shall be performed in the presence of OWNER or OWNER's representative and must be passed before final acceptance of the work.
- B. CONTRACTOR shall be responsible for powered tests of each field-installed device unless specifically noted otherwise. CONTRACTOR shall be responsible for device operation as powered from its power source and signals as received at the I/O modules.
- C. Operation Test: By operational testing, OWNER will give final acceptance of the wiring system when all of the wiring is considered a complete system. All equipment shall function and operate in the proper manner as indicated in the details of the specifications and on the drawings. All motors shall be properly connected to protective devices, and motor rotation shall be in the correct direction.
- D. At the request of OWNER's representative, demonstrate by test the compliance of the installation with these specifications and drawings, the National Electrical Code, and the accepted standards of good workmanship. These tests shall include operation of equipment, continuity of the conduit system, grounding resistance and insulation resistance.
- E. A written record of performance tests on electrical and control and instrumentation systems and equipment shall be supplied to OWNER. Such tests shall show compliance with governing codes.

COPY OF BID SET

- F. The transformer, feeder, and subfeeds to the lighting panels shall be completely phased out as to sequence and rotation. Phase sequence shall be A-B-C as follows:
 - 1. Front-to-rear, top-to-bottom, or left-to-right when facing equipment.
 - 2. Phasing shall be accomplished by using distinctive colors for the various phases. The same color or variation of it shall be used for a particular phase throughout the building and project.

3.08 WIRE INSTALLATION SCHEDULE

- A. Install all wiring in raceways except as otherwise noted. This includes all low-voltage wiring such as instruments, etc.

END OF SECTION

COPY OF BID SET

SECTION 16130

BOXES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Switch, outlet, and small junction boxes.
 - 2. Pull and junction boxes.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern Work in this section.

1.02 REFERENCES

- A. NEMA 250—Enclosures for Electrical Equipment (1000 Volts Maximum).

1.03 QUALITY ASSURANCE

- A. Manufacturers of switches, outlets, boxes, lamps, fuses, lugs, etc.: Firms regularly engaged in the manufacture of these products, of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation Work similar to that in this project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide electrical cable, boxes, raceways, wire, connectors, outlets, switches, etc., which have been listed and labeled by Underwriters Laboratories.
- E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300—Submittals.

PART 2—PRODUCTS

2.01 SWITCH, OUTLET, AND SMALL JUNCTION BOXES

- A. Masonry and Partition Boxes: Galvanized steel, nongangable. Thomas & Betts, GW Series, or equal. Provide number of gangs for devices shown on the drawings.

COPY OF BID SET

- B. Cast Boxes: Aluminum or cast ferrous, deep-type, gasketed cover, threaded hubs, Crouse-Hinds FD Series, or equal.
- C. PVC-Coated Cast Boxes: Boxes shall be by the same manufacturer as the conduit.
- D. Covers for switch and outlet boxes used as junction boxes shall have covers that match box type.

2.02 PULL AND JUNCTION BOXES

- A. Cast Boxes: NEMA 250; Type 4, flat-flanged, surface-mounted junction box, UL-listed as watertight. Cast aluminum or ferrous box and cover with ground flange, neoprene gasket, and stainless steel cover screws, Crouse-Hinds WCB Series, or equal.
- B. PVC-Coated Cast Boxes: Provide PVC-coated cast boxes in areas where PVC-coated conduit is used. Boxes shall be by the same manufacturer as the conduit.
- C. Boxes Larger Than 12 inches in Any Dimension: Hinged enclosure in accordance with Section 16160—Cabinets and Enclosures.
- D. Boxes specified in this section are not allowed to have knockouts and are not allowed to be used as enclosures for control panels.

PART 3—EXECUTION

3.01 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on the drawings and as necessary for splices, taps, wire pulling, cable bending radii, equipment connections, and code compliance.
- B. Electrical box locations shown on the drawings are approximate. Verify location and size of floor boxes and outlet boxes in all work areas prior to rough-in.
- C. Where dedicated raceways are provided for different voltage systems or wiring, (e.g., motor power wiring and motor space heaters), separate boxes shall also be provided unless acceptable to ENGINEER. Where acceptable to ENGINEER, combined boxes shall be physically divided to separate the wiring.
- D. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of access doors.
- E. Locate and install to maintain headroom and to present a neat appearance.
- F. All boxes attached to building surfaces that may be damp shall be spaced to avoid rust and/or corrosion. All boxes in damp locations shall be on 1/2-inch standoffs. Damp locations shall include, but not be limited to, exterior locations, all wet wells, and all areas below grade.

3.02 SWITCH, OUTLET, AND SMALL JUNCTION BOX INSTALLATION

- A. Locate boxes in masonry walls for cutting of masonry unit corners only. Coordinate masonry cutting to achieve neat openings for boxes.

COPY OF BID SET

- B. Provide knockout closures for unused openings.
- C. Support boxes independently of conduit.
- D. Use multiple gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- E. Install boxes in walls without damaging wall insulation.
- F. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- G. Switch and outlet boxes provided for branch circuits and feeders shall not contain control wiring. Control wiring, wiring for emergency egress lighting, and intrinsically safe wiring shall each have dedicated pull and junction boxes provided. Wiring for different voltage systems (e.g., 24 V, 120 V, 480 V) shall have dedicated pull and junction boxes for each voltage.
- H. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- I. In plaster or concrete walls, single receptacle, single- or double-switch outlets, use 4-inch-square masonry boxes fitted with raised plaster covers. In poured concrete walls belowgrade, use cast boxes.
- J. In unplastered brick or block walls, use masonry boxes.
- K. For weatherproof switches, devices, and exterior fixtures, use cast boxes with proper cover and gasket.
- L. All exterior outlet boxes shall be NEMA 4X.
- M. All interior exposed wall and ceiling outlet boxes shall be cast boxes, unless otherwise noted.
- N. Knockout punches or saws shall be used for holes; boxes with prepunched holes are not acceptable.
- O. Boxes shall be of a depth to accommodate wires and splices and shall be equipped with both fixture hanging studs and tapped fixture ears. Boxes shall be installed so that they will support the weight of the fixture. Conduit will not be considered as adequate supports.
- P. Cast boxes with 3/4-inch hubs and aluminum fittings and enclosures may be used with all conduit types.
- Q. Provide PVC-coated cast boxes in all areas where PVC-coated conduit is used. Boxes in hazardous locations shall be rated for Class I, Division 1, Groups C and D locations. Boxes shall be by the same manufacturer as the PVC-coated conduit.

3.03 PULL AND JUNCTION BOX INSTALLATION

- A. Locate pull boxes and junction boxes in unfinished areas.
- B. Support pull and junction boxes independent of conduit.

COPY OF BID SET

- C. Knockout punches or saws shall be used for holes; boxes with prepunched holes are not acceptable.
- D. Refer to Section 16195—Electrical Identification for junction box labeling requirements.
- E. All interior exposed junction and pull boxes shall be cast type with cover, unless noted otherwise.
- F. All exterior junction and pull boxes shall be NEMA 4X. Boxes in areas subject to damage shall be stainless steel.
- G. Boxes in hazardous locations shall be rated for Class I, Division 1, Groups C and D locations. Boxes shall be by the same manufacturer as the PVC-coated conduit.

END OF SECTION

COPY OF BID SET

SECTION 16141

WIRING DEVICES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Wall switches.
 - 2. Receptacles.
 - 3. Cover plates.
 - 4. Thermostats.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. NEMA WD 1—General-Color Requirements for Wiring Devices.
- B. NEMA WD 5—Specific-Purpose Wiring Devices.
- C. Drawings—Bill of Materials.

1.03 QUALITY ASSURANCE

- A. Manufacturers of switches, outlets, boxes, lamps, fuses, lugs, etc.: Firms regularly engaged in the manufacture of these products, of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that in this project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide electrical cable, raceways, wire, connectors, outlets, switches, etc., which have been listed and labeled by Underwriters Laboratories.
- E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300—Submittals.
- B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

COPY OF BID SET

PART 2–PRODUCTS

2.01 WALL SWITCHES

- A. A-C general use Industrial specification grade, snap switch, 20 amperes, 277 volts, one of the following: Cooper 222*, Leviton 122*, or Pass and Seymour PS20AC*.
- B. Provide ivory-colored handles.

2.02 RECEPTACLES

- A. Twenty ampere, 125-volt, NEMA 5-20R, Industrial specification grade, straight blade, 3-wire duplex grounded outlets, one of the following: Cooper 5362, Leviton 5362, Pass and Seymour 5362. 208-volt receptacles shall be grounded type, rated same as circuit indicated on the drawings. Provide ivory color.
- B. GFCI Receptacle: GFCI receptacles shall be UL 943 listed, Pass and Seymour 2097, Cooper TRVGF20 receptacle with integral ground fault current interrupter. Provide ivory color.
- C. Specific-Use Receptacle Configuration: NEMA WD 1 or WD 5; type as indicated on drawings.
- D. Provide spare receptacles as described in Section 16951–Spare Parts.

2.03 COVER PLATES

- A. Each and every flush box shall be provided with standard 302 series stainless steel plates, blank, receptacle, switch, or cord as designated by outlet symbol. Surface boxes shall have plates to match Crouse-Hinds, Appleton, or equal, cast boxes.
- B. While in use, receptacle covers for exterior use shall be Leviton M5979, or equal.

2.04 THERMOSTATS

- A. Line voltage thermostats for single-stage heating or single-stage cooling, and for high- and low-temperature alarms shall be PECO Model TF115-001, or equal. Thermostats shall be rated NEMA 4X with a 40°F to 110°F temperature range and fixed 3°F deadband.
- B. Thermostats shown on the drawings shall be single-stage unless otherwise noted.

PART 3–EXECUTION

3.01 INSTALLATION

- A. All receptacles shall be mounted vertically.
- B. GFCI receptacles shall not be series wired.

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- C. Install wall switches 48 inches above floor (top of box), "Off" position down, except as otherwise noted.
- D. Install convenience receptacles 15 inches above floor (bottom of box), grounding pole on bottom except as otherwise noted.
- E. Install specific-use receptacles above furniture, countertops, or at heights shown on the Drawings.
- F. Install thermostats 48 inches above floor (top of box).
- G. Convenience Receptacles: Specification grade self-grounding.
- H. Install devices and cover plates flush and level.
- I. Back wiring is not allowed for switches and receptacles. Wires shall be terminated with the device screw terminal.
- J. Individual labels shall be placed on the back of all switch faceplates and receptacle faceplates indicating the lighting panel and circuit from which the switch or receptacle is fed. Labels shall be White background with Black lettering no smaller than 12-point font. Provide permanently attached self-adhesive type, machine fed, and self-laminating labels, or equal. All labels must be by the same manufacturer, same size, and same font. Handwritten labels are not acceptable.

END OF SECTION

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SECTION 16160

HINGED-COVER ENCLOSURES

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Hinged cover enclosures.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern Work in this section.

1.02 REFERENCES

- A. NEMA 250–Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. ANSI/NEMA ICS 1–Industrial Control and Systems.
- C. ANSI/NEMA ICS 6–Enclosures for Industrial Control Equipment and Systems.

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.

PART 2–PRODUCTS

2.01 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250, larger than 12 inches in any dimension. Acceptable manufacturers: Hoffman, B-Line, or equal.
- B. Covers: Continuous hinge, applicable NEMA rating with hasp and staple for padlock.
- C. Back Panel for Mounting Terminal Blocks or Electrical Components: 14 gauge steel, white enamel finish.
- D. All enclosures with double doors or that are free-standing shall have a 3-point latch.

2.02 FABRICATION

- A. Shop-assembled enclosures housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.
- B. Provide conduit hubs on all enclosures.
- C. Provide protective pockets inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

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D. Provide gasketed surfaces for all enclosure doors and covers.

2.03 ENCLOSURE RATING

A. Enclosures shall be rated as listed below, unless noted otherwise on the Drawings:

1. Indoor dry locations: NEMA 12, steel.
2. Outdoor or wet locations: NEMA 4X, stainless steel.
3. Hazardous locations: NEMA 7, cast aluminum, rated for Class I, Division 1, Groups C and D locations.

PART 3—EXECUTION

3.01 INSTALLATION

- A. Install enclosures plumb. Anchor securely to wall and structural supports at each corner minimum.
- B. Refer to Section 16195—Electrical Identification for enclosure labeling requirements.
- C. Provide accessory feet for free-standing equipment enclosures.
- D. All enclosures attached to building surfaces which may be damp shall be spaced out to avoid rust and/or corrosion. All enclosures in damp locations shall be on 1-inch standoffs. Damp locations shall include, but not be limited to, all wet wells, all areas below grade, and exterior locations.

END OF SECTION

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SECTION 16190

SUPPORTING DEVICES

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Conduit and equipment support members.
 - 2. Fastening hardware.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.

PART 2–PRODUCTS

2.01 MATERIAL

- A. Support Members:
 - 1. 316 stainless steel or fiberglass in exterior locations. PVC-coated steel in Class I locations and where used with PVC-coated conduit.
 - 2. Galvanized steel in all other areas.
- B. Hardware:
 - 1. Stainless steel in exterior locations and Class I locations.
 - 2. Galvanized steel in all other areas.
- C. Manufacturers: Unistrut P-1000, B-line, Superstrut, or equal.

PART 3–EXECUTION

3.01 INSTALLATION

- A. All supporting devices and support structures shall be constructed such that the structure adequately supports the load of the equipment installed on it including any wind and/or snow loads. Provide additional support members to those shown on the Drawings to adequately support load.

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- B. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors or support members. Do not use spring steel clips and clamps. Provide standoffs as specified in other technical sections.
- C. Use toggle bolts or hollow wall fasteners in hollow masonry partitions and walls; expansion anchors or preset inserts in solid masonry walls; and self-drilling anchors or expansion anchors on concrete surfaces.
- D. Where support members are used for conduit, cutoff ends shall be ground smooth. Cutoff PVC-coated support members shall be ground smooth and touched up with PVC coating material from the manufacturer.
- E. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- F. Do not use powder-actuated anchors.
- G. Fabricate supports with welded end caps and all welds and surfaces ground smooth for neat appearance. Use hexagon head bolts with steel spring-lock washers under all nuts.
- H. In wet locations, install free-standing electrical equipment on concrete pads. Anchor all equipment to adjacent walls with standoffs and caulk.
- I. Install surface-mounted cabinets and panelboards with a minimum of four anchors.
- J. Do not use chain, wire rope, or perforated strap hangers.
- K. All welds shall be continuous and ground smooth.

END OF SECTION

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SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Nameplates.
 - 2. Labeling tags.
 - 3. Wire markers.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.
- B. Provide schedule for nameplates and labeling tags with shop drawings. Reference drawings for type used.

PART 2–PRODUCTS

2.01 NAMEPLATES

- A. Type “A”:
 - 1. Use:
 - a. Motor starters.
 - b. Each device in main distribution panels.
 - c. Each device in motor control centers.
 - d. SPD.
 - e. Each device on Supervisory Control Center exterior.
 - f. Cabinets, enclosures, pull, and junction boxes.
 - 2. Size: 2-inch by 3-inch.
 - 3. Material: 3-layer laminated Micarta.
 - 4. Background Color: Black.
 - 5. Character Color: White.
 - 6. Character Size: 1/4-inch.
 - 7. Engraving: See MCC schedule, one-line, and I/O list for labels, or as requested by ENGINEER. Label shall include equipment number and description (i.e., SCAL-60-01, Fluoride Scale).
 - 8. Mounting Location: Front exterior.
- B. Type “B”:
 - 1. Use: Standby power systems as in “A” above.
 - 2. Size: 2-inch by 3 5/8 inch.
 - 3. Material: 3-layer laminated Micarta.
 - 4. Background Color: Red.
 - 5. Character Color: White.

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6. Character Size: 1/4-inch.
7. Engraving: See MCC schedule and one-line for labels, or as requested by ENGINEER.
8. Mounting Location: As requested by ENGINEER.

C. Type "C":

1. Use:
 - a. Motor Control Centers.
 - b. Supervisory Control Centers.
 - c. Panelboards.
 - d. Transformers.
2. Size: 4-inch by 4-inch.
3. Material: 3-layer laminated Micarta.
4. Background Color: Black.
5. Character Color: White.
6. Character Size: 2 1/4-inch.
7. Engraving: Equipment label. Label shall include equipment number and description (i.e., LP-10-01, First Floor Power).
8. Mounting Location: Equipment: Top wire way.

D. Type "D":

1. Use: Thermostats, etc.
2. Size: 3/8-inch by 2-inch.
3. Material: 3-layer laminated Micarta.
4. Background Color: Black.
5. Character Color: White.
6. Character Size: 1/8-inch.
7. Engraving: Equipment number and description (e.g., T-15-01, Chlorine Room).
8. Mounting Location: Device front at top.

2.02 LABELING TAGS

A. Use: Field-Mounted Devices (Level Transmitters, etc.).

1. Size: 2-inch diameter round.
2. Material: 3-layer laminated Micarta.
3. Character Size: 1/8-inch.
4. Engraving: As requested by ENGINEER.

2.03 WIRE AND CABLE MARKERS

A. Wire and cable markers shall be permanently-attached, heat-shrink type labels.

1. Sleeve: Permanent, PVC, white, with legible machine-printed black markings.
2. Acceptable Manufacturers: Raychem Model D-SCE or ZH-SCE, Brady Model 3PS, or equal.
3. Grounding Conductor: Provide green wire marker; minimum 2 inches wide.

B. Wire or cable numbering preprinted on the conductor or cable insulation, flag-type labels, and individual wraparound numbers (such as Brady preprinted markers) are not acceptable. All wire markers shall be the same throughout the project.

COPY OF BID SET

PART 3-EXECUTION

3.01 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Affix nameplates with weatherproof, UV-resistant adhesive in outdoor locations and sticky back adhesive in indoor locations.
- D. Affix labeling tags with stainless steel leaders; vinyl locking wire ties are not acceptable. Provide 3/8-inch hole to accommodate wire tie.
- E. Prepare and install neatly-typed directions in all panels, including existing panels where Work is done under this Contract.

3.02 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor, including neutral and spare conductors, in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Neutral conductor labels shall include the associated branch circuit number. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring. Spare conductors shall have control wire number or shall indicate termination point of wire.
- B. Conductors in pull boxes, motor control centers, supervisory control panels, control panels, cabinets, and panelboards shall be grouped as to circuits and arranged in a neat manner. All conductors of a feeder or branch circuit shall be grouped, bound together with nylon ties, and identified. Phase identification shall be consistent throughout the system. All wiring labels shall be able to be read without removing wire management (i.e., wiring trough covers, spiral windings, etc.) or twisting the wire/cable.
- C. Power Conductor Insulation Color Code:
 - 1. 6 AWG and Larger: Provide general-purpose, flame-retardant, permanent tape at each termination and at accessible locations such as manholes, handholes, junction and pull boxes, panelboards, motor control centers, switchboards, switchgear, etc. Apply tape with at least six full, overlapping wraps; minimum 2 inches wide.
 - 2. 8 AWG and Smaller: Provide conductors with color-coded insulation.
 - 3. Colors:

System	Conductor	Color
All Systems	Equipment Grounding	Green
120/208 Volts Three-Phase, Four Wire	Grounded Neutral	White*
	Phase A	Black
	Phase B	Red
	Phase C	Blue
277/480 Volts Three-Phase, Four Wire	Grounded Neutral	White*
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow

Note: Phase A, B, C implies direction of positive phase rotation.

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System	Conductor	Color
* When installed as part of a 120-volt or 277-volt branch circuit, provide a color-coded stripe on the white neutral conductor insulation matching the branch circuit insulation.		

- D. Control Panel and Field-Installed Control Conductor Insulation Color Code:
1. All conductors shall have color-coded insulation.
 2. Colors:

System	Conductor	Color
Supply Voltage	Ungrounded Circuit Conductors Neutral	Black White
Discrete 120-volt AC Input/Output	Control Circuit Conductor Neutral	Red White
Discrete 12/24-volt DC Input/Output	Control Circuit Conductor Common	Blue White with Blue Stripe
Conductors energized when the main disconnect is in the "off" position (e.g. foreign supply voltages)	Control Circuit Conductor AC Neutral DC Common Ground	Orange White White with Blue Stripe Green
Intrinsically Safe	Control Circuit Conductor DC Common	Light Blue White with Two Light Blue Stripes

- E. Circuit Identification:
1. Identify power, instrumentation, and control conductors at each termination and at accessible locations such as junction and pull boxes, panelboards, motor control centers, etc.
 2. Conductors for panelboard circuits shall identify circuit matching the circuit directory designations, including the neutral conductor.
 3. Control conductor identification shall match the associated terminal block label.
 4. Circuits Not Listed in Circuit Directories:
 - a. Assign circuit name based on unique device or equipment at load end of circuit.
 - b. Where unique device or equipment names are not available or apparent, add a unique number or letter modifier to each otherwise identical circuit name.

3.03 DATA CABLE AND COMMUNICATION EQUIPMENT IDENTIFICATION

- A. Individual labels shall be placed on all patch panels, 110-style punch down blocks, and both ends of all cables.
- B. Each component shall be clearly labeled using a code identifying each device's location throughout the sites along with a unique identifier. The record drawings shall identify the numbering at each SCC.

3.03 JUNCTION BOX IDENTIFICATION

- A. All junction boxes shall be labeled with permanent labels. Labels shall indicate circuit or load served, as well as the power source and highest voltage present on any conductor.

COPY OF BID SET

3.04 TERMINAL BLOCK IDENTIFICATION

- A. Terminal blocks shall be labeled on both sides of each terminal block. Terminal block numbering shall match the numbers shown on the project-specific wiring diagrams.
- B. Fused terminal blocks labels shall be located on top of the terminal blocks and include the fuse voltage and amperage rating.

3.05 LABELING FONT REQUIREMENTS

- A. The font for all conductor, cable, and device labels shall be Arial with black characters on white background, and minimum font size 12.
- B. The text for all conductor, cable, and device labels shall be machine printed. Handwritten labels are not acceptable.

END OF SECTION

COPY OF BID SET

SECTION 16230

STANDBY POWER SYSTEM

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Steel base assembly, diesel, engine, generator, engine-generator set controls, environmental systems.
- B. Related Sections and Divisions:
 - 1. Applicable provisions of Division 1 shall govern work in this section.
 - 2. The following listing of related sections is provided for the convenience of CONTRACTOR and is not necessarily all-inclusive. Other sections of the specifications not referenced below shall also apply to the extent required for proper performance of this work. All other sections of Division 16.

1.02 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300—Submittals.
- B. Shop drawings shall include the following:
 - 1. Detailed descriptions of equipment to be furnished, including all deviations from these specifications.
 - 2. Detailed layouts of all equipment and ancillary items.
 - 3. The manufacturer shall furnish schematic and wiring diagrams for the generator and an interconnection wiring diagram for the entire standby system. Test reports certified by the manufacturer shall be provided to ENGINEER for the entire system.
- C. Submit forms required in Section 3.01.G., to Hardin County Building Inspector, ENGINEER, and OWNER.

1.03 QUALITY ASSURANCE

- A. The generator shall be listed by Underwriters Laboratories, Inc., and be certified by the Canadian Standards Association.

1.04 OPERATING CONDITIONS

- A. Engine-generator set provided at Rose Run Pump Station shall be capable of continuous standby rating at 1,800 rpm, 0.8 PF, three-phase, 3-wire, 480 volts, at 60 hertz, and shall have a minimum capability of 112.5 kW, 141 kVA prime and 125 kW, 156 kVA standby. The unit shall be capable of 145 surge kW, 178 kVA for motor starting at a maximum sustained voltage dip of 10%.
- B. The generator set manufacturer shall verify the engine as capable of driving the generator with all accessories in place and operating, at the generator set kW rating after derating for the range of temperature expected in service, and the altitude of the installation. Site conditions are 100°F maximum ambient and 700 feet altitude.

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- C. Voltage regulation shall be $\pm 0.5\%$ of rated voltage for any constant load between no load and rated load.
- D. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed $\pm 0.5\%$.
- E. Random Voltage Variation: The cyclic variations in RMS voltage shall not exceed $\pm 0.5\%$ of rated voltage for constant loads from no load to rated load, with constant ambient and operating temperature.
- F. Total Harmonic Distortion: The sum of AC voltage wave-form harmonics from no load to full linear load shall not exceed 5% of rated voltage (L-N, L-L, L-L-L), and no single harmonic shall exceed 3% of rated voltage.
- G. Telephone Influence Factor: TIF shall be less than 50 per NEMA MG1-22.43.
- H. The engine-generator set shall accept a single step load of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
- I. Motor starting capability shall be a minimum of 178 kVA. The generator set shall be capable of recovering to a minimum of 90% of rated no load voltage following the application of the specified kVA load at near zero power factor applied to the generator set. Maximum voltage dip on application of this load, considering both alternator performance and engine speed changes shall not exceed 25%.

1.05 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from the earlier of either the date established for partial utilization in accordance with GC14.04 and 14.05, as modified in the Supplementary Conditions, or Substantial Completion of the project.

PART 2-PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The AC engine-generator set shall be as manufactured by Cummins Power Generation Model C125D6C, Kohler, or Caterpillar.
- B. The drawings and specifications were prepared based on Cummins Power Generation. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes to accommodate other equipment including, but not limited to, structural, mechanical, and electrical work. CONTRACTOR shall also pay additional costs necessary for revisions of drawings and/or specifications by ENGINEER.

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2.02 STEEL BASE ASSEMBLY

- A. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.
- B. The steel base assembly shall be provided with integral fuel tank with a capacity of 526 gallons. A fuel gauge shall be mounted within the tank. The fuel tank shall be furnished with a rust preventative coating. The fuel tank shall be pressure tested for a minimum of 2 hours to ensure its integrity. The fuel tank shall be UL-142 listed and labeled, and include secondary containment. Fuel tank shall be Kentucky-labeled and manufactured in accordance with the 2013 Kentucky Building Code. CONTRACTOR shall obtain tank installation plan review and written approval from the Hardin County Building Inspector or authorized agent per the Hardin County Building Inspector prior to tank installation. All costs associated with plan approval shall be included in the bid.
- C. Provide a low-level alarm activated at 30% for fuel tank with spare contacts for remote indication.
- D. Provide a float switch in the rupture basin for remote indication of fuel tank leak.

2.03 ENGINE

- A. The engine shall be stationary, liquid-cooled, diesel for use with No. 2 diesel fuel. The design shall be 4-cycle, 4-cylinder, minimum displacement of 272 cubic inches, turbo charged, after cooled as required by engine manufacturer. Engine shall be certified as capable of driving the generator of the rating indicated above on a continuous standby basis for the duration of normal source interruptions.
- B. Engine accessories shall include the following:
 - 1. A 24-volt DC electric starter as required by the engine manufacturer.
 - 2. Replaceable dry element air cleaner with restriction indicator.
 - 3. Positive displacement, mechanical, full-pressure lubrication oil pump, full-flow lubrication oil filters with replaceable elements, pressure relief valve, dipstick oil level indicator, and oil drain valve with hose extension. Provide all lubricants for proper operation of the unit.
 - 4. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, and accelerating to rated speed. The governing system shall include a programmable warm-up at idle and cool-down at idle function. While operating in idle state, the control system shall disable the alternator excitation system.
 - 5. Engine protective devices to indicate alarm and engine shutdown for the following:
 - a. Low coolant temperature alarm.
 - b. Low coolant level alarm.
 - c. Low lubrication oil pressure alarm and shutdown.
 - d. High coolant temperature alarm and shutdown.
 - e. Over-speed shutdown.
 - f. Over-crank shutdown.

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6. Battery charging alternator, 100 amp minimum, with solid-state voltage regulator.
7. Engine shall be radiator-cooled by engine-mounted radiator system including belt-driven pusher fan, coolant pump, and thermostat temperature control. Rotating parts shall be guarded against accidental contact. The cooling system shall be rated for full-rated load operation in a 104°F ambient condition. Radiator shall be provided with a duct adaptor flange permitting the attachment of air discharge duct directing the discharge of radiator air through the wall. Provide radiator drain extension to the side of the generator. Extension shall include shutoff valve.
8. The equipment supplier shall provide 50% ethylene glycol antifreeze solution to fill engine cooling system.
9. Engine-mounted thermostatically controlled coolant heater to aid in quick starting. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 104°F in a 40°F ambient, in compliance with NFPA 110 requirements. Heater shall be rated single-phase, 120 volts, 1,000 watts and be disconnected whenever the engine starts. Heater shall be UL 499 listed and labeled. The coolant heater(s) shall include provisions to isolate the heater for replacement of the heater element without draining the coolant from the generator set. CONTRACTOR shall provide proper circuit from normal utility power source.
10. Vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer.
11. An engine-driven, mechanical, positive displacement fuel pump and fuel filter with replaceable spin-on canister element.
12. Flexible supply and return fuel lines.
13. The engine shall be provided with all fuel system piping required for automatic operation of the system. All piping shall be black iron and be sized to provide proper fuel flow for the engine.

2.04 ENGINE EXHAUST SYSTEM

- A. Exhaust muffler shall be provided for the engine of size as recommended by manufacturer. Muffler shall be of the critical grade-type.
- B. Stainless steel flexible exhaust connections shall be provided as required for connection between engine exhaust manifold and exhaust line in compliance with applicable codes and regulations.
- C. Provide an exhaust condensation trap with manual drain valve to trap and drain off exhaust condensation to prevent condensation from entering the engine.

2.05 STARTING AND CONTROL BATTERIES

- A. A UL-listed/CSA-certified 10-ampere voltage regulated battery charger shall be provided for the engine-generator set.
- B. Charger shall be UL 1236-BBHH listed and CSA or CUL certified for use in emergency applications.
- C. The charger shall be compliant with UL 991 requirements for vibration resistance.
- D. The charger shall be capable of charging a fully discharged battery without damage to the charger. It shall be capable of returning a fully discharged battery to fully charged condition within 24 hours. The charger shall be UL labeled with the maximum battery amp-hour rating

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that can be recharged within 24 hours. The label shall indicate that the charger is suitable for charging of 200 AH batteries in accordance with NFPA requirements.

- E. The charger shall incorporate a 4-rate charging algorithm, to provide trickle charge rate to restore fully discharged batteries, a bulk charge rate to provide fastest possible recharge after normal discharge, an absorption state to return the battery to 100% of charge, and a float stage to maintain a fully charged battery and supply battery loads when the generator set is not operating. In addition, the charger shall include an equalization timer. Charge rates shall be temperature compensated based on the temperature directly sensed at the battery.
- F. The DC output voltage regulation shall be within $\pm 1\%$. The DC output ripple current shall not exceed 1 amp at rated output current level.
- G. The charger shall include the following features:
 - 1. Two-line alphanumeric display with programming keys to allow display of DC output ammeter and voltmeters (5% accuracy or better), display alarm messages, and perform programming.
 - 2. LED indicating lamps to indicate normal charging (green), equalize charge state (amber), and fault condition (red).
 - 3. AC input overcurrent, over voltage, and under voltage protection.
 - 4. DC output overcurrent protection.
 - 5. Alarm output relay.
 - 6. Corrosive-resistant aluminum enclosure.
- H. A calcium/lead antimony storage battery set of the heavy-duty starting-type shall be provided. Battery voltage shall be compatible with starting system. The battery set shall be rated no less than 850 CCA and shall be capable of a minimum of three 15-second cranking cycles. A battery rack constructed in conformance with NEC requirements and necessary cables and clamps shall be provided.

2.06 GENERATOR

- A. The generator shall be a single prelubricated regreasable bearing, self-aligning, 4-pole, two-thirds pitch, brushless, synchronous-type, revolving field with amortisseur windings, and with direct driven centrifugal blower fan for proper cooling and minimum noise. No brushes will be allowed. Generator shall be directly connected to engine fly wheel housing and driven through a flexible coupling to ensure permanent alignment. Generator design shall prevent potentially damaging shaft currents.
- B. Insulation shall meet NEMA standards for Class H and shall be UL 1446 listed. The maximum temperature rise shall not exceed 125°C at 40°C ambient.
- C. The generator shall be three-phase, broad-range, reconnectable and shall have 12 leads brought out to allow connection by user to obtain any of the available voltages for the unit.
- D. The generator set shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5% above or below rated voltage.
- E. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single-phase or three-phase fault at approximately 300% of rated current for not more than 10 seconds.

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- F. The subtransient reactance of the alternator shall not exceed 15%, based on the standby rating of the generator set.
- G. Provide a 225 amp mainline circuit breaker with the engine-generator set. Circuit breaker shall meet the requirements specified in Section 16475–Overcurrent Protection.

2.07 ENGINE-GENERATOR SET CONTROL

- A. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
- B. The generator set mounted controls shall include the following features and functions:
 - 1. Control Switches:
 - a. Mode Select Switch: The mode select switch shall initiate the following control modes. When in the RUN or MANUAL position the generator set shall start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
 - b. EMERGENCY STOP switch: Switch shall be Red “mushroom-head” pushbutton. Depressing the emergency stop switch shall cause the generator set to immediately shut down and be locked out from automatic restarting.
 - c. RESET switch: The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
 - d. PANEL LAMP switch: Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.
- C. Generator Set AC Output Metering: The generator set shall be provided with a metering set including the following features and functions:
 - 1. Digital metering set, 1% accuracy, to indicate generator RMS voltage and current (all three phases), frequency, output current, output kW, kWh, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three-phase voltages (line to neutral or line to line) simultaneously.
 - 2. The control system shall monitor the total load on the generator set, and maintain data logs of total operating hours at specific load levels ranging from 0 to 110% of rated load in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% of rated load.
 - 3. The control system shall log total number of operating hours and total kWh, as well as total values since reset.
- D. Generator Set Alarm and Status Display:
 - 1. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include:
 - a. The control shall include five configurable alarm-indicating lamps. The lamps shall be field-adjustable for any status, warning, or shutdown function monitored by the

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- genset. They shall also be configurable for color and control action (status, warning, or shutdown).
- b. The control shall include green lamps to indicate that the generator set is running at rated frequency and voltage, and that a remote start signal has been received at the generator set. The running signal shall be based on actual sensed voltage and frequency on the output terminals of the generator set.
 - c. The control shall include a flashing red lamp to indicate that the control is not in automatic state and red common shutdown lamp.
 - d. The control shall include an amber common warning indication lamp.
2. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. All conditions indicated below for warning shall be field-configurable for shutdown. Conditions required to be annunciated shall include:
 - a. Low oil pressure (warning).
 - b. Low oil pressure (shutdown).
 - c. Oil pressure sensor failure (warning).
 - d. Low coolant temperature (warning).
 - e. High coolant temperature (warning).
 - f. High coolant temperature (shutdown).
 - g. High oil temperature (warning).
 - h. Engine temperature sensor failure (warning).
 - i. Low coolant level (warning).
 - j. Fail to crank (shutdown).
 - k. Fail to start/overcrank (shutdown).
 - l. Overspeed (shutdown).
 - m. Low DC voltage (warning).
 - n. High DC voltage (warning).
 - o. Weak battery (warning).
 - p. Low fuel tank (warning).
 - q. High AC voltage (shutdown).
 - r. Low AC voltage (shutdown).
 - s. Under frequency (shutdown).
 - t. Overcurrent (warning).
 - u. Overcurrent (shutdown).
 - v. Short circuit (shutdown).
 - w. Overload (warning).
 - x. Emergency stop (shutdown).
 - y. (4) configurable conditions.
 3. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. All contacts shall be rated for 5 amps at 120 Vac. Relays shall be provided when necessary. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions. The nonautomatic indicating lamp shall be red and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.
- E. Engine Status Monitoring:
1. The following information shall be available from a digital status panel on the generator set control:
 - a. Engine oil pressure (psi or kPA).
 - b. Engine coolant temperature (degrees F or C).
 - c. Engine oil temperature (degrees F or C).
 - d. Engine speed (rpm).
 - e. Number of hours of operation (hours).

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- f. Number of start attempts.
 - g. Battery voltage (DC volts).
 - 2. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads as a percent of the standby rating of the generator set.
- F. Engine Control Functions:
- 1. The control system provided shall include a cycle cranking system which allows for user selected crank time, rest time, and number of cycles. Initial settings shall be for three cranking periods of 15 seconds each, with 15-second rest period between cranking periods.
 - 2. Manual Run/Stop Control Switch: When the mode control switch is in the MANUAL position and the MANUAL RUN/STOP switch is pressed, the Generator set shall start, bypassing time delay start. The control shall be configurable to include an idle period on manual start. If the generator set is running in the MANUAL mode, pressing the RUN/STOP switch shall cause the generator set to shut down after a cool-down at idle period.
 - 3. The control system shall include an engine governor control which functions to provide steady state frequency regulation, as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.
 - 4. The control system shall include time delay start (adjustable 0 to 300 seconds) and time delay stop (adjustable 0 to 600 seconds) functions.
 - 5. The control system shall include sensor failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sensor or wiring components, and an actual failure conditions.
- G. Alternator Control Functions:
- 1. The generator set shall include a full wave rectified automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll-off frequency and rate and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.
 - 2. A microprocessor-based protection device shall be provided to individually monitor all phases of the output current of the generator set and initiate an alarm (overcurrent warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The device shall shut down and lockout the generator set when output current level approaches the thermal damage point of the alternator (overcurrent shutdown). The protective functions provided shall be in compliance with the requirements of NFPA70 article 445.
 - 3. A microprocessor-based protection device shall be provided to monitor all phases of the output current for short-circuit conditions. The control/protection system shall monitor

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the current level and voltage. The controls shall shut down and lockout the generator set when output current level approaches the thermal damage point of the alternator (short-circuit shutdown). The protective functions provided shall be in compliance with the requirements of NFPA70 article 445.

4. Controls shall be provided to monitor the kW load on the generator set and initiate an alarm condition (overload) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
 5. A microprocessor-based AC over and undervoltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Undervoltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds. The system shall monitor individual phases and be connected line to neutral on three-phase 4-wire generator sets and for systems that are solidly grounded.
- H. A common fail contact for external connection to an audible alarm and remote alarm shall be provided. One auxiliary generator running contacts shall also be provided for remote indication at the SCADA System. All contacts shall be rated for 5 amps at 120 Vac.
- I. Generator control panel shall be mounted a maximum of 5 feet 6 inches above finished floor. CONTRACTOR shall be responsible for all required coordination.

2.08 WEATHER-PROTECTIVE GENERATOR ENCLOSURE

- A. Generator set weather-protective housing shall be provided factory-assembled to generator set base and radiator cowling. Housing shall provide ample airflow for generator set operation at rated load in the ambient conditions previously specified. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a two-step electrocoating paint process, or equal, meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:
1. Primer thickness 0.5 to 2.0 mils. Top coat thickness 0.8 to 1.2 mils.
 2. Gloss according to ASTM D523, 80% \pm 5%. Gloss retention after 1 year shall exceed 50%.
 3. Crosshatch adhesion according to ASTM D3359, 4B-5B.
 4. Impact resistance according to ASTM D2794, 120-inch pounds to 160-inch pounds.
 5. Salt spray according to ASTM B117, 1000+ hours.
 6. Humidity according to ASTM D2247, 1000+ hours.
 7. Water soak according to ASTM D2247, 1000+ hours.
- B. Painting of hoses, clamps, wiring harnesses, and other nonmetallic service parts shall not be acceptable. Fasteners used shall be corrosion-resistant and designed to minimize marring of the painted surface when removed for normal installation of service work.
- C. The enclosure shall include hinged doors for access to both sides of the engine and alternator and the control equipment. Key locking and padlockable door latches shall be provided for all doors. All hardware and door hinges shall be stainless steel. All doors shall be provided with door stops to hold them in the open position.

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- D. The enclosure shall include flexible coolant and lubricating oil drain lines that extend to the exterior of the enclosure, with internal drain valves and external radiator fill provision.
- E. The enclosure shall be provided with an exhaust silencer which is mounted inside of the enclosure. Silencer exhaust shall include a raincap and rainshield.
- F. The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load in an ambient temperature of up to 100°F. The enclosure shall reduce the sound level of the generator set while operating at full-rated load to a maximum of 73 dBA at any location, 7 meters from the generator set in a free-field environment.
- G. The enclosure shall be insulated with nonhydroscopic materials.

2.09 TOOLS AND SPARE PARTS

- A. The required spare parts for the generator shall be those as recommended by the manufacturer and shall include the following items as a minimum:
 - 1. All special tools required for normal operation and maintenance.
 - 2. One air cleaner element.
 - 3. One oil filter.
 - 4. One set of fan belts.
- B. All spare parts shall be packed in containers that are clearly identifiable with indelible markings on containers.

2.10 SCHEDULED OIL SAMPLING

- A. In order to minimize engine downtime, the supplier of the standby generator must provide an oil-sampling analysis kit that operating personnel shall use for scheduled oil sampling.
- B. Scheduled oil sampling shall be of the atomic absorption spectrophotometry method and shall be accurate within a fraction of one part per million for the following elements: iron, chromium, copper, aluminum, silicon, and lead. In addition, the sample shall be tested for the presence of water, fuel dilution, and antifreeze.
- C. All equipment needed to take oil samples shall be provided in a kit at the time of acceptance and shall include the following:
 - 1. Sample extraction gun (1).
 - 2. Bottles (10).
 - 3. Postage paid mailers (10).
 - 4. Written instructions (1).
- D. Immediate notification shall be provided to OWNER when analysis shows any critical reading. If readings are normal, a report showing that the equipment is operating within established parameters shall be provided.
- E. The scheduled oil-sampling kit shall be made available at additional cost to OWNER beyond the mandatory starter kit specified previously and shall be optional for OWNER to continue this service after the starter kit has been depleted.

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PART 3-EXECUTION

3.01 INSTALLATION

- A. The standby power system shall be installed as shown on the drawings and in accordance with the manufacturer's recommendations and all applicable codes.
- B. Installation of equipment shall include providing all interconnecting wiring between all major equipment provided for the on-site power system. CONTRACTOR shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.
- C. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site. All connections (e.g., fuel, water, electrical) to generator shall be made with flexible material/fitting to accommodate unit vibration.
- D. Equipment shall be initially started and operated by representatives of the manufacturer.
- E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.
- F. Generator fuel storage tank and system shall be installed by a certified installer in accordance with the 2013 Kentucky Building Code.
- G. CONTRACTOR shall furnish copies of an Aboveground Petroleum Product Tank Inventory Form, Flammable Liquid Tanks Installation Application Form, and Checklist for Aboveground Tank Installation Form to the Hardin County Building Inspector, ENGINEER, and OWNER.
- H. Maximum generator height, including subbase fuel tank, exhaust piping, silencer, etc., shall be 8 feet 10 inches. CONTRACTOR shall be responsible for all required coordination.

3.02 FIELD START-UP AND COMMISSIONING

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist CONTRACTOR in installation and start-up of the equipment specified in this section. The manufacturer's representative shall provide technical direction and assistance to CONTRACTOR in general operation of the equipment, connections and adjustments, and testing of the assembly and components contained therein.
- B. The manufacturer's representative shall provide inspection of the final installation. The manufacturer's representative shall perform site start-up and functional testing of the system. Upon completion of the manufacturer's start-up and testing, the manufacturer shall generate a site start-up and test report, documenting all systems checked, as well as any incomplete work remaining and operational deficiencies.
- C. CONTRACTOR shall provide a training session for up to three OWNER's representatives for one normal work day (not including start-up) at a job-site location determined by OWNER. The training session shall be conducted by a manufacturer's qualified representative. The

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training program shall consist of instruction on operation and testing of the assembly and major components within the assembly.

- D. CONTRACTOR shall provide three copies of the manufacturer's site start-up and test report to ENGINEER for review. Once ENGINEER has reviewed the report and all equipment is operating in accordance with the specifications, ENGINEER will make one site visit to check operation of the system. If the system is not ready or does not operate as specified, OWNER shall deduct payment to CONTRACTOR and make payment to ENGINEER for additional travel, expenses, and site visits until the equipment operates as specified. CONTRACTOR shall be responsible for all fuel, and electrical costs required to check operation of the system.

3.03 TESTING

- A. In addition to the load bank test above, after the unit is connected to the system, three simulated outages and a 4-hour run period on the actual facility shall also be provided.
- B. CONTRACTOR shall be responsible for all fuel costs for these tests.

END OF SECTION

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SECTION 16231

STANDBY POWER SYSTEM—PORTABLE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Steel base assembly, engine, generator, engine-generator set controls, environmental systems.
- B. Related Sections and Divisions:
 - 1. Applicable provisions of Division 1 shall govern work in this section.
 - 2. The following listing of related sections is provided for the convenience of CONTRACTOR and is not necessarily all-inclusive. Other sections of the specifications not referenced below shall also apply to the extent required for proper performance of this work. All other sections of Division 16.

1.02 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300-Submittals.
- B. Shop drawings shall include the following:
 - 1. Detailed descriptions of equipment to be furnished, including all deviations from these specifications.
 - 2. Detailed layouts of all equipment and ancillary items.
 - 3. The manufacturer shall furnish schematic and wiring diagrams for the generator and an interconnection wiring diagram for the entire standby system. Test reports certified by the manufacturer shall be provided to ENGINEER for the entire system.

1.03 QUALITY ASSURANCE

- A. The generator shall be listed by Underwriters Laboratories, Inc., and be certified by the Canadian Standards Association.

1.04 OPERATING CONDITIONS

- A. Engine generator set shall be capable of continuous standby rating at 1,800 rpm, 0.8 PF, 3-phase, 3-wire, 480 volts, at 60 hertz, and shall have a minimum capability of 117 kW, 146 kVA prime and 130 kW, 163 kVA standby.
- B. The generator set manufacturer shall verify the engine as capable of driving the generator with all accessories in place and operating, at the generator set kW rating after derating for the range of temperature expected in service and the altitude of the installation. Site conditions are 100°F maximum ambient and 725 feet altitude.
- C. Voltage regulation shall be $\pm 0.5\%$ of rated voltage for any constant load between no load and rated load.

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- D. Frequency regulation shall be isochronous from steady state no load to steady state-rated load. Random frequency variation with any steady load from no load to full load shall not exceed $\pm 0.5\%$.
- E. Random Voltage Variation: The cyclic variations in RMS voltage shall not exceed $\pm 0.5\%$ of rated voltage for constant loads from no load to rated load, with constant ambient and operating temperature.
- F. Total Harmonic Distortion: The sum of AC voltage wave-form harmonics from no load to full linear load shall not exceed 5% of rated voltage (L-N, L-L, L-L-L), and no single harmonic shall exceed 3% of rated voltage.
- G. Telephone Influence Factor: TIF shall be less than 50 per NEMA MG1-22.43.
- H. The engine generator set shall accept a single-step load of 100% nameplate kW and power factor, less applicable derating factors, with the engine generator set at operating temperature.
- I. Motor starting capability shall be a minimum of 540 kVA. The generator set shall be capable of recovering to a minimum of 90% of rated no-load voltage following the application of the specified kVA load at near zero power factor applied to the generator set. Maximum voltage dip on application of this load, considering both alternator performance and engine speed changes, shall not exceed 35%.

1.05 WARRANTY

- A. Manufacturer shall warrant the generator set system and components to be free from defects in material and workmanship for a period of three years, 3,000 hours, from date of delivery. Manufacturer shall warrant the trailer to be free from defects in material and workmanship for a period of one year from date of delivery.

PART 2--PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The AC engine generator set shall be as manufactured by Kohler or equal.
- B. The drawings and specifications were prepared based on Kohler. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes to accommodate other equipment including, but not limited to, structural, mechanical, and electrical work. CONTRACTOR shall also pay additional costs necessary for revisions of drawings and/or specifications by ENGINEER.

2.02 TRAILER AND WEATHER-PROTECTIVE GENERATOR ENCLOSURE

- A. Entire Standby Power System shall be mounted on manufacturer-provided, tandem-axle trailer, with the following minimum requirements:
 - 1. Weather-protective enclosure.
 - 2. 15-inch minimum wheels with radial construction trailer tires sized to exceed axle carrying capacity. Provide tongue-mounted spare tire.

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3. Fenders and running boards securely welded in place. Nonslip material shall be used on fenders and running boards required to access the generator set.
 4. Tongue weight shall be 10% to 15% of total trailer weight, and is not to be considered when sizing tires and axles. A jack for hitch, ball hitch, and safety chains shall also be provided.
 5. Electric braking system.
 6. Clearance, parking and directional lights with reflectors, and lighted license plate holder and accessories. Plug for trailer lights shall match OWNER's existing receptacle.
 7. Trailer shall include a fuel tank sized to operate genset for a minimum of 24 hours. The fuel tank shall be mounted to the trailer specified above. Fuel tank shall include a Rochester Series 6500 fuel gauge. Trailer shall be DOT rated.
 8. Electrical cable and plug holder.
- B. Where the top of the generator control panel is 6 feet or more aboveground, trailer shall include fold-up step(s) attached to the trailer.
- C. Generator set weather-protective housing shall be provided factory-assembled to generator set base and radiator cowling. Housing shall provide ample airflow for generator set operation at rated load in the ambient conditions previously specified. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a two-step electrocoating paint process, or equal, meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating which meets the following requirements:
1. Primer thickness 0.5 mils. Top coat thickness 0.8 mils to 1.2 mils.
 2. Gloss per ASTM D523-89, 80% \pm 5%. Gloss retention after 1 year shall exceed 50%.
 3. Crosshatch adhesion per ASTM D3359-93, 4B-5B.
 4. Impact resistance per ASTM D2794-93, 120-inch pounds to 160-inch pounds.
 5. Salt Spray per ASTM B117-90, 1000+ hours.
 6. Humidity per ASTM D2247-92, 1000+ hours.
 7. Water Soak per ASTM D2247-92, 1000+ hours.
- D. Painting of hoses, clamps, wiring harnesses, and other nonmetallic service parts shall not be acceptable. Fasteners used shall be corrosion-resistant, and designed to minimize marring of the painted surface when removed for normal installation of service work.
- E. The enclosure shall include hinged doors for access to both sides of the engine and alternator and the control equipment. Key-locking and padlockable door latches shall be provided for all doors. All hardware and door hinges shall be stainless steel. All doors shall be provided with door stops to hold them in the open position.
- F. The enclosure shall include flexible coolant and lubricating oil drain lines that extend to the exterior of the enclosure, with internal drain valves and external radiator fill provision.
- G. The enclosure shall be provided with an exhaust silencer which is mounted inside of the enclosure. Silencer exhaust shall include a rain cap and rain shield.

2.03 ENGINE

- A. The engine shall be stationary, liquid-cooled, diesel for use with No. 2 diesel fuel. The design shall be 4-cycle, 6-cylinder, minimum displacement of 415 cubic inches, turbocharged, aftercooled as required by engine manufacturer. Engine shall be certified as capable of

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driving the generator of the rating indicated above on a continuous standby basis for the duration of normal source interruptions.

- B. Engine accessories shall include the following:
1. A 24-volt DC electric starter, as required by the engine manufacturer.
 2. Replaceable dry element air cleaner with restriction indicator.
 3. Positive displacement, mechanical, full-pressure lubrication oil pump, full-flow lubrication oil filters with replaceable elements, pressure relief valve, dipstick oil level indicator, and oil drain valve with hose extension. Provide all lubricants for proper operation of the unit.
 4. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed. The governing system shall include a programmable warm-up at idle, and cooldown at idle function. While operating in idle state, the control system shall disable the alternator excitation system.
 5. Engine protective devices to indicate alarm and engine shutdown for the following:
 - a. Low coolant temperature alarm.
 - b. Low coolant level alarm.
 - c. Low lubrication oil pressure alarm and shutdown.
 - d. High coolant temperature alarm and shutdown.
 - e. Overspeed shutdown.
 - f. Over-crank shutdown.
 6. Battery charging alternator 60 amp minimum, with solid-state voltage regulator.
 7. Engine shall be radiator-cooled by engine-mounted radiator system, including belt-driven pusher fan, coolant pump, and thermostat temperature control. Rotating parts shall be guarded against accidental contact. The cooling system shall be rated for full-rated load operation in a 104°F ambient condition. Provide radiator drain extension to the side of the generator. Extension shall include shutoff valve.
 8. The equipment supplier shall provide 50% ethylene glycol antifreeze solution to fill engine cooling system.
 9. Engine-mounted thermostatically controlled coolant heater to aid in quick starting. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 104°F in a 40°F ambient, in compliance with NFPA 110 requirements. Heater shall be rated single-phase, 120 volts, 1,500 watts and be disconnected whenever the engine starts. Heater shall be UL 499 listed and labeled. The coolant heater(s) shall include cord and plug with provisions to isolate the heater for replacement of the heater element without draining the coolant from the generator set.
 10. Vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer.
 11. An engine-driven, mechanical, positive displacement fuel pump and fuel filter with replaceable spin-on canister element.
 12. Flexible supply and return fuel lines.
 13. Fuel filter with replaceable element.
 14. The engine shall be provided with all fuel system piping required for automatic operation of the system. All piping shall be black iron and be sized to provide proper fuel flow for the engine. The unit shall be provided with all supply, return, vent, and fill lines as required. Provide a check valve in the fuel supply line to prevent drain back of diesel

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fuel. Provide connections for connecting fuel system to the engine in compliance with applicable codes and regulations. All fuel piping shall be pressure tested for a minimum of 2 hours.

2.04 ENGINE EXHAUST SYSTEM

- A. Exhaust muffler shall be provided for the engine of size as recommended by manufacturer. Muffler shall be of the critical-grade type. Muffler shall be side inlet.
- B. Stainless steel flexible exhaust connections shall be provided as required for connection between engine exhaust manifold and exhaust line in compliance with applicable codes and regulations.
- C. Provide an exhaust condensation trap with manual drain valve to trap and drain off exhaust condensation and to prevent condensation from entering the engine.
- D. Provide a suitable rain cap at the stack outlet. Provide all necessary flanges and special fittings for proper installation.

2.05 STARTING AND CONTROL BATTERIES

- A. A UL-listed/CSA-certified 60-ampere voltage regulated battery charger shall be provided for the engine-generator set.
- B. The charger shall be capable of charging a fully discharged battery without damage to the charger. It shall be capable of returning a fully discharged battery to fully charged condition within 24 hours. The charger shall be UL labeled with the maximum battery amp/hour rating that can be recharged within 24 hours. The label shall indicate that the charger is suitable for charging of 200 AH batteries per NFPA requirements.
- C. The charger shall incorporate a 4-state charging algorithm to provide trickle charge rate to restore fully discharged batteries, a bulk charge rate to provide fastest possible recharge after normal discharge, an absorption state to return the battery to 100% of charge, and a float stage to maintain a fully-charged battery, and supply battery loads when the generator set is not operating. In addition, the charger shall include an equalization timer. Charge rates shall be temperature-compensated based on the temperature directly sensed at the battery.
- D. The DC output voltage regulation shall be within $\pm 1\%$. The DC output ripple current shall not exceed 1 amp at rated output current level.
- E. The charger shall include the following features:
 - 1. LED indicating lamps to indicate normal charging (green), equalize charge state (amber), and fault condition (red).
 - 2. AC input overcurrent, overvoltage, and undervoltage protection.
 - 3. DC output overcurrent protection.
 - 4. Corrosive-resistant aluminum enclosure.
- F. A calcium/lead antimony storage battery set of the heavy-duty starting type shall be provided. Battery voltage shall be compatible with starting system. The battery set shall be rated no less than 400 CCA, and shall be capable of a minimum of three 15-second cranking cycles. A battery rack constructed in conformance with NEC requirements and necessary cables and clamps shall be provided.

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2.06 GENERATOR

- A. The generator shall be a single prelubricated, regreasable bearing, self-aligning, 4-pole, two-thirds pitch, brushless, synchronous type, revolving field with amortisseur windings, and with direct-driven centrifugal blower fan for proper cooling and minimum noise. No brushes will be allowed. Generator shall be directly connected to engine flywheel housing, and driven through a flexible coupling to ensure permanent alignment. Generator design shall prevent potentially damaging shaft currents.
- B. Insulation shall meet NEMA standards for Class H and shall be UL 1446 listed. The maximum temperature rise shall not exceed 150°C at 40°C ambient.
- C. The generator shall be 3-phase, broad-range, reconnectable, and shall have 12 leads brought out to allow connection by user to obtain any of the available voltages for the unit.
- D. The generator set shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5% above or below rated voltage.
- E. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short-circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single-phase or three-phase fault, at approximately 300% of rated current for not more than 10 seconds.
- F. The subtransient reactance of the alternator shall not exceed 15%, based on the standby rating of the generator set.
- G. Provide a 200-amp mainline circuit breaker with engine generator set for 480-volt, 3-phase power. Circuit breaker shall be 100% rated. Circuit breakers shall meet the requirements specified in Section 16475—Overcurrent Protective Devices.

2.07 ENGINE-GENERATOR SET CONTROL

- A. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
- B. The generator set mounted-controls shall include the following features and functions:
 - 1. Control Switches:
 - a. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or MANUAL position, the generator set shall start and accelerate to rated speed and voltage. In the OFF position, the generator set shall immediately stop, bypassing all time delays. In the AUTO position, the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
 - b. EMERGENCY STOP switch. Switch shall be Red "mushroom-head," pushbutton. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
 - c. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.

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- d. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.
- C. Generator Set AC Output Metering. The generator set shall be provided with a metering set, including the following features and functions: Digital metering set, 1% accuracy, to indicate generator RMS voltage and current (all three phases), frequency, output current, output kW, kW hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three-phase voltages (line-to-neutral or line-to-line), simultaneously.
- D. Generator Set Alarm and Status Display:
1. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include:
 - a. The control shall include five configurable alarm-indicating lamps. The lamps shall be field-adjustable for any status, warning, or shutdown function monitored by the genset. They shall also be configurable for color and control action (status, warning, or shutdown).
 - b. The control shall include a flashing red lamp to indicate that the control is not in automatic state, and red common shutdown lamp.
 - c. The control shall include an amber common warning indication lamp.
 2. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. All conditions indicated below for warning shall be field-configurable for shutdown. Conditions required to be annunciated shall include:
 - a. Low oil pressure (warning).
 - b. Low oil pressure (shutdown).
 - c. Oil pressure sensor failure (warning).
 - d. Low coolant temperature (warning).
 - e. High coolant temperature (warning).
 - f. High coolant temperature (shutdown).
 - g. High oil temperature (warning).
 - h. Engine temperature sensor failure (warning).
 - i. Low coolant level (warning).
 - j. Fail to crank (shutdown).
 - k. Fail to start/overcrank (shutdown).
 - l. Overspeed (shutdown).
 - m. Low DC voltage (warning).
 - n. High DC voltage (warning).
 - o. Weak battery (warning).
 - p. Low fuel tank (warning).
 - q. High AC voltage (shutdown).
 - r. Low AC voltage (shutdown).
 - s. Under frequency (shutdown).
 - t. Overcurrent (warning).
 - u. Overcurrent (shutdown).
 - v. Short-circuit (shutdown).
 - w. Overload (warning).
 - x. Emergency stop (shutdown).
 - y. (Four) configurable conditions.

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- E. Engine Status Monitoring:
1. The following information shall be available from a digital status panel on the generator set control:
 - a. Engine oil pressure (psi or kPA).
 - b. Engine coolant temperature (degrees F or C).
 - c. Engine oil temperature (degrees F or C).
 - d. Engine speed (rpm).
 - e. Number of hours of operation (hours).
 - f. Number of start attempts.
 - g. Battery voltage (DC volts).
 2. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.
- F. Engine Control Functions:
1. The control system provided shall include a cycle-cranking system which allows for user-selected crank time, rest time, and number of cycles. Initial settings shall be for three cranking periods of 15 seconds each, with 15-second rest period between cranking periods.
 2. The control system shall include an engine governor control which functions to provide steady state frequency regulation, as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.
 3. The control system shall include sensor failure monitoring logic for speed sensing and loss of AC power.
- G. Alternator Control Functions:
1. The generator set shall include a full-wave rectified automatic digital voltage regulation system that is matched and prototype-tested by the engine manufacturer, with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion, and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing, and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque-matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Rotary potentiometers for system adjustments are not acceptable.
 2. A microprocessor-based protection device shall be provided to individually monitor all phases of the output current of the generator set and initiate an alarm (overcurrent warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The device shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (overcurrent shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.
 3. A microprocessor-based protection device shall be provided to monitor all phases of the output current for short-circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator

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(short-circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 Article 445.

4. Controls shall be provided to monitor the kW load on the generator set, and initiate an alarm condition (overload) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
5. A microprocessor-based AC over-under-voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Undervoltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds. The system shall monitor individual phases and be connected line-to-neutral on 3-phase, 4-wire generator sets, and for systems that are solidly-grounded.
6. The generator set control shall include a control heater.

2.08 MISCELLANEOUS EQUIPMENT

- A. Provide duplex 120-volt and simplex 208-volt, single-phase, 20-amp receptacles for plugin of miscellaneous equipment.
- B. Provide a 200-amp, 3-wire, 4-pole mating plug as manufactured by Crouse-Hinds, Catalog No. APL20467. Plug shall be installed on the 200-amp cable assembly, as manufactured by Crouse-Hinds, Catalog No. AREAL20426.
- C. Provide adequately-sized hangers or storage space on the generator set for storage of the cable assemblies specified above.

2.09 TOOLS AND SPARE PARTS

- A. The required spare parts for the generator shall be those as recommended by the manufacturer and shall include the following items as a minimum:
 1. All special tools required for normal operation and maintenance.
 2. One air cleaner element.
 3. One oil filter.
 4. One set of fan belts.
- B. All spare parts shall be packed in containers that are clearly identifiable with indelible markings on containers.

2.10 SCHEDULED OIL SAMPLING

- A. In order to minimize engine downtime, the supplier of the standby generator must provide an oil-sampling analysis kit that operating personnel shall use for scheduled oil sampling.
- B. Scheduled oil sampling shall be of the atomic absorption spectrophotometry method, and shall be accurate within a fraction of one part per million for the following elements: iron, chromium, copper, aluminum, silicon, and lead. In addition, the sample shall be tested for the presence of water, fuel dilution, and antifreeze.

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- C. All equipment needed to take oil samples shall be provided in a kit at the time of acceptance, and shall include the following:
 - 1. Sample Extraction Gun (1).
 - 2. Bottles (10).
 - 3. Postage-Paid Mailers (10).
 - 4. Written Instructions (1).
- D. Immediate notification shall be provided to OWNER when analysis shows any critical reading. If readings are normal, a report showing that the equipment is operating within established parameters shall be provided.
- E. The scheduled oil-sampling kit shall be made available at additional cost to OWNER beyond the mandatory starter kit specified previously and shall be optional for OWNER to continue this service after the starter kit has been depleted.

PART 3-EXECUTION

3.01 INSTALLATION

- A. The standby power system shall be built in accordance with the manufacturer's recommendations and all applicable codes.
- B. Equipment shall be initially started and operated by representatives of the manufacturer.
- C. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

3.02 START-UP, TESTING, AND TRAINING

- A. CONTRACTOR shall include 8 hours of start-up and testing by a certified, factory-trained engineer. Prior to making electrical connections, CONTRACTOR shall have a factory-trained service technician meet at the jobsite to go over the installation, to preclude any installation and start-up problems. Start-up services shall include, but not be limited to, inspection of CONTRACTOR installation and functional testing of the standby power system. On-site time shall be over and above the cost of travel and travel time to the site.
- B. CONTRACTOR shall provide a training session for up to three OWNER's representatives for one normal workday (not including start-up), at a jobsite location determined by OWNER. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of instruction on operation and testing of the assembly, circuit breakers, and major components within the assembly.

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3.03 TESTING

- A. The unit shall be connected to each station and a 2-hour run period on two actual facilities shall also be provided. All emergency warning and detection equipment shall be demonstrated to be operable by simulating failures. A signed test report shall be submitted to OWNER and ENGINEER with deficiencies noted, if any.
- B. CONTRACTOR shall be responsible for all fuel costs for these tests.

END OF SECTION

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SECTION 16250

AUTOMATIC TRANSFER SWITCHES

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Provide an automatic transfer switch control system where shown on the drawings.
 - 2. The system shall be a completely integrated assembly for automatic, unattended operation and control of the standby power system. System operation shall be as described in the following sections.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.
- B. Shop drawings shall include the following:
 - 1. Detailed descriptions of equipment to be furnished, including all deviations from these specifications.
 - 2. Detailed layouts of all cubicles and equipment.
 - 3. The manufacturer shall furnish schematic and wiring diagrams for the automatic transfer switch and an interconnection wiring diagram for the entire standby system. Test reports certified by the manufacturer shall be provided to ENGINEER for the entire system.

1.03 QUALITY ASSURANCE

- A. The transfer switch shall be listed by Underwriters Laboratories, Inc. (Std. 1008) and be approved by the Canadian Standards Association.

1.04 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from the earlier of either the date established for partial utilization in accordance with GC14.04 and 14.05, as modified in the Supplementary Conditions, or Substantial Completion of the project.

PART 2–PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The automatic transfer switch at Rose Run Pump Station shall be as manufactured by Cummins Power Generation OTPC Kohler KSP, 300-amp, 3-pole, or equal.

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- B. The drawings and specifications were prepared based on Cummins Power Generation. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes to accommodate other equipment. CONTRACTOR shall also pay additional costs necessary for revisions of drawings and/or specifications by ENGINEER.

2.02 AUTOMATIC TRANSFER SWITCHES

- A. Provide complete automatic transfer switch as shown on the Drawings. Interlocked molded case circuit breakers or contactors are not acceptable.
- B. The transfer switch shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a nonventilated enclosure constructed in accordance with Underwriters Laboratories, Inc., UL 1008. The transfer switch shall be installed in the motor control center.

2.03 CONSTRUCTION AND PERFORMANCE

- A. The transfer switch shall be double-throw, actuated by a single electrical operator momentarily energized and connected to the transfer mechanism by a simple overcenter linkage, with a minimum transfer time of 400 milliseconds.
- B. The transfer switch shall have the ability to detect under and over-voltage, under and over-frequency, voltage imbalance, incorrect phase rotation, and phase loss.
- C. The time delay between the opening of the closed contacts and the closing of the open contacts shall allow for voltage decay before transfer.
- D. The transfer switch shall allow the motor and transformer loads to be reenergized after transfer with normal inrush current. The transfer switch shall be capable of transferring successfully in either direction with 70% of rated voltage applied to the switch terminals.
- E. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and standby positions without the use of hooks, latches, magnets, or springs and shall be silver tungsten alloy. All contacts shall be 100% rated. Separate arcing contacts with magnetic blowouts shall be provided on all transfer switches.
- F. The transfer switch shall be equipped with a safe manual operator designed to prevent injury to operating personnel. The manual operator shall provide the same transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly.
- G. The transfer switch shall be equipped with a digital display that has the ability to monitor load power conditions, network status, review transfer switch events, and adjust transfer switch parameters. The display shall also include a bar graph display that indicates the level of power being supplied to the load as well as three-phase voltage, current, frequency, power factor, and kilowatts.

2.04 SEQUENCE OF OPERATION

- A. Engine starting contacts shall be provided to start the generating plant should the voltage of the normal source drop below 80% on any phase after an adjustable time delay to allow for momentary dips. The transfer switch shall transfer to standby when 90% of rated voltage

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and frequency has been reached. After restoration of normal power on all phases to 90% of rated voltage, an adjustable time delay period of zero to 31 minutes shall delay retransfer to allow stabilization of normal power. If the standby power source should fail during this time delay period, the switch shall automatically return to the normal source. After retransfer to normal, the engine-generator shall be allowed to operate at no-load for a period of 5 minutes. Two auxiliary contacts rated 25 amps, 120 volts shall be mounted on the main shaft; one closed on normal, the other closed on standby. All relays, timers, control wiring, and accessories shall be front accessible. In addition, one set of relay contacts shall be provided to open upon loss of the normal power supply. All control wire terminations are to be identified by tubular sleeve-type markers.

- B. The automatic transfer switch shall include the following functions. Adjustable time delays and features described below shall be operator-adjustable from the front of the transfer switch and shall not require the use of a laptop, software, or external programming device.
1. Time delay to override momentary normal source power outages to delay engine start signal and transfer switch operation. Adjustable 0.5 to 90 seconds.
 2. Time delay relays to control contact transition time on transfer to either source, adjustable 1 to 300 seconds (Programmed Transition).
 3. Time delay on retransfer to normal. Adjustable 0 to 31 minutes, with engine overrun to provide fixed 5-minute unloaded engine operation after retransfer to normal.
 4. Test with load-Auto-Test without load selector switch to simulate normal power failure. (Maintained Type).*
 5. Contact to close on failure of normal source to initiate engine starting or other customer functions.
 6. Contact to open on failure of normal source to initiate engine starting or other customer functions.
 7. Green pilot light to indicate switch in normal position.*
 8. Red pilot light to indicate switch in standby position.*
 9. Auxiliary contact closed in normal position.
 10. Auxiliary contact closed in standby position.
 11. Adjustable relay to prevent transfer to standby until voltage and frequency of generating plant have reached acceptable limits.
 12. Plant exerciser with 7-day time clock, multiple test schedules, and programmable exceptions for holidays, weekends, etc.

* Front cabinet door mounted.

- C. When coordinated with circuit breakers, the automatic transfer switch shall have the following short-circuit withstand capability:

Withstand Capability (RMS Amps, Symmetrical) Testing at 480 Vac	
Switch Ampere Rating	ATS Coordinated with Molded Case Circuit Breakers
300	42,000

- D. During the withstand tests, there shall be no contact welding or damage. The tests shall be performed on identical samples without the use of current limiting fuses. Oscillograph traces across the main contact shall verify that contact separation has not occurred. These procedures shall be in accordance with UL 1008 and testing shall be certified by Underwriters Laboratories or any nationally recognized independent testing laboratory.

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- E. When conducting temperature rise tests to UL 1008, the manufacturer shall include postendurance temperature rise tests to verify the ability of the transfer switch to carry full-rated current after completing the overload and endurance tests.
- F. As a precondition for approval, the manufacturer of the automatic transfer switch shall verify that his switches are listed by Underwriters Laboratories, Inc., UL 1008 with withstand and close-in values at least equal to the interrupting rating of the circuit breaker and/or fuse that is specified to protect the circuit.

PART 3-EXECUTION

3.01 INSTALLATION

- A. The installation of this system shall comply with the directions and recommendations of authorized factory representatives. These representatives shall offer the supervision necessary for proper installation.
- B. A final inspection and an initial start-up of the system shall be provided by the factory representatives.
- C. A letter of certification written by the authorized factory representatives which states that the system is properly installed and does properly function as recommended by the factory and as described herein shall be submitted to ENGINEER.
- D. A test run shall be performed by the authorized factory representatives in the presence of CONTRACTOR and ENGINEER or their representatives; the time of this test run shall be mutually agreed upon by all persons concerned.

3.02 START-UP AND TRAINING

- A. CONTRACTOR shall include 8 hours of start-up by a certified, factory-trained engineer. Start-up services shall include, but not be limited to, inspection of CONTRACTOR installation and functional testing of the ATS assembly. On-site time shall be over and above the cost of travel and travel time to the site.
- B. CONTRACTOR shall provide a training session for up to three OWNER's representatives for 1 normal workday (not including start-up) at a job site location determined by OWNER. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of instruction on operation and testing of the assembly, simulated outages, and review of major components within the assembly.

END OF SECTION

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SECTION 16412

SURGE PROTECTIVE DEVICES (SPD)

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Service entrance devices.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. ANSI/IEEE C62.41 and C62.45.
- B. NFPA 70, and 75.
- C. UL 1449, most recent issue.

1.03 QUALITY ASSURANCE

- A. Manufacturers of surge protective devices. Firms regularly engaged in the manufacture of these products of the types and ratings whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that in this project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide surge protective devices which have been listed and labeled by Underwriters Laboratories.
- E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300—Submittals.
- B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing, and construction diagram as described in ANSI/NEMA ICS 1. Test reports certified by the manufacturer shall be provided to ENGINEER upon request for each model submitted.

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1.05 WARRANTIES

- A. Manufacturer shall provide a minimum 20-year warranty from the date of substantial completion to cover repair or replacement of the device. This warranty shall include the field replaceable plug-in modules and coordinated fuses.

PART 2—PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The drawings and specifications were prepared based on MCG. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes to accommodate other equipment including, but not limited to, upsizing overcurrent protective devices to meet manufacturer recommendations. CONTRACTOR shall also pay additional costs necessary for revisions of drawings and/or specifications by ENGINEER.

2.02 GENERAL

- A. These specifications describe the electrical and mechanical requirements for high energy transient voltage (service entrance) surge suppressors. The specified surge protective device shall provide effective energy surge diversion for application in ANSI/IEEE C62.41-2002 location Category C3 (service entrance). Testing shall be per ANSI/IEEE C62.45-2002 using ANSI/IEEE C62.41 Category C3 waveforms and amplitudes.
- B. The system individual units shall be UL listed under UL1449, latest edition, Standard for Surge Protective Devices (SPD). Surge ratings shall be permanently affixed to the SPD.
- C. Operating Temperature: Operating temperature range shall be -40 to +55°C (-40 to 131°F).
- D. Storage Temperature: Storage temperature range shall be -40 to +85°C.
- E. Relative Humidity: Operation shall be reliable in an environment with 0% to 95% noncondensing relative humidity.
- F. Operating Altitude: The system shall be capable of operation up to an altitude of 13,000 feet above sea level.
- G. Design Life: >15 years.
- H. Operating Voltage: Maximum continuous operating voltage shall be no less than 115% of the nominal rated line voltage.
- I. Power Frequency: SPD power frequency shall be rated for use on 50 and 60 Hertz power systems.
- J. All SPDs shall be MOV type. Noise filtering capabilities shall be provided as an option for the devices specified herein.
- K. SPD shall be suitable for use in Type 2 locations.

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- L. Unit shall provide maximum ANSI/UL 1449 VPRs for 480Y/277-volt systems.
 - 1. L-N = 1500 V.
 - 2. L-G = 1500 V.
 - 3. N-G = 1200 V.
 - 4. L-L = 2500 V.

2.03 SERVICE ENTRANCE DEVICES

- A. The maximum surge current capacity of the specified system, based on the standard IEEE 8/20 microsecond waveform, shall be at least 160 kA per phase. The surge life (8/20) shall be at least 6 kA for 10,000 occurrences or 10 kA at 20 kV for 16,000 occurrences. The transient suppression capability shall be bidirectional and suppress both positive and negative impulses. SPD shall have a nominal discharge rating (I_n) of 10 kA.
- B. The SPD shall have a minimum Short Circuit Rating (SCCR) of 100 KAIC. The interrupt capability must be confirmed and documented by a recognized independent testing laboratory.
- C. The suppressor shall be designed so as to minimize the internal surge path impedance. Direct point-to-point internal wiring is inherently inductive and not acceptable. Connection to the power service shall be constructed as shown in the manufacturer's installation notes for best performance.
- D. The system shall be constructed using field replaceable plug-in modules. The module shall consist of multiple fuse protected metal oxide varistors. The status of each module shall be locally monitored with a red LED that will illuminate if the module protection is reduced. Protector shall provide redundant protection within each phase module with multiple surge rated fuses per module or one fuse per MOV.
- E. Red and green solid-state LED indicators shall be provided on the hinged front cover to indicate protection status. An illuminated green LED indicates power is present at the protector on all phases, and an illuminated red LED shall indicate that one or more of the modules have reduced protection. Both front panel and internal LEDs are required to provide power and fault indications. Relay operation shall be in a failsafe operating mode, i.e., continuously energized so that power failure, reduced protection, or a break in the remote monitoring line will cause a fault indication at the remote monitor. Neon indicators are not permitted.
- F. Relay alarm contacts shall be provided for remote alarm monitoring capability of unit status. Surge protected normally open and normally closed contacts shall be provided.
- G. The system shall be equipped with an audible alarm which shall be activated when any one or more of the modules has a reduced protection condition. A mute switch shall be provided for the audible alarm.
- H. A 14 gauge, NEMA Type 4, steel enclosure, with corrosion-resistant hardware shall be provided for the unit.
- I. Service entrance devices shall be as manufactured by MCG, 160M Series, Liebert 560 Series, or equal.

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PART 3-EXECUTION

3.01 INSTALLATION

- A. The installation and testing of the system shall be in full accordance with the manufacturer's installation and maintenance instructions and all national and local codes.
- B. Each installed device shall be fed by an appropriately sized circuit breaker, per the manufacturer's installation notes, in the protected panel. No SPD shall be installed without an upstream overcurrent device.
- C. Units shall be installed as close as practical to the electrical panel. Low impedance cabling furnished by the manufacturer shall be utilized for installations with lead lengths greater than, or equal to, 5 feet. Low impedance cabling furnished by the manufacturer or appropriately-sized standard cable, as approved by ENGINEER may be utilized for installations with lead lengths less than 5 feet. SPD leads shall be as short as possible for best performance.
- D. Manufacturer shall provide protection modules and coordinated fuses under a no-cost lifetime replacement warranty.

END OF SECTION

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SECTION 16420

ELECTRICAL AND TELEPHONE SERVICE SYSTEM

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Utility company.
 - 2. Secondary service characteristics.
 - 3. Definitions.
 - 4. Underground Overhead electrical service.
- B. Allowances: CONTRACTOR shall include in the Bid the cost of the following items specified in this Section. Refer to the individual sections listed below for a complete description of the Work required.
 - 1. Electric Utility Service Entrance, Section 1.07—Underground Electrical Service.
- C. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.
- D. See Division 1 for temporary service requirements. This section applies to permanent services only.

1.02 UTILITY COMPANY

- A. At the Industrial Park Pump Station No. 1 and No. 3, the Utility Company is the Nolin Rural Electric Cooperative Corporation. At the Industrial Park Pump Station No. 2 and Rose Run Pump Station, the Utility Company is the Kentucky Utilities Company.

1.03 SECONDARY SERVICE CHARACTERISTICS

- A. The secondary service will be 277/480-volt, 4-wire, three-phase for combined lighting and power.

1.04 DEFINITIONS

- A. Service: As defined in the NEC, Article 100.
- B. Primary Voltage: Above 600 volts.
- C. Secondary Voltage: 600 volts and below.

1.05 UNDERGROUND ELECTRICAL SERVICE

- A. Provide complete underground electrical service except for items provided by the Utility Company.

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- B. Provide electrical service system at the Industrial Park Pump Station No. 1 and No. 3, except the Utility Company will provide:
 - 1. Transformer (pad by CONTRACTOR).
 - 2. Metering (installed in CONTRACTOR-provided meter socket).
 - 3. Current transformers (installed in CONTRACTOR-provided CT cabinet).
 - 4. Primary cable as shown.

- C. Provide electrical service system at the Rose Run Pump Station and Industrial Park Pump Station No. 2, except the Utility Company will provide:
 - 1. Pole-mounted transformer.
 - 2. Meter (installed in CONTRACTOR-provided meter socket).
 - 3. Current transformers (installed in CONTRACTOR-provided CT cabinet).
 - 4. Secondary cable as shown.

- D. Coordinate the new electrical service with the Utility, and all Utility costs shall be paid directly by OWNER. All costs associated with temporary service of any type shall be included in CONTRACTOR's Bid.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 INSTALLATION

- A. Trench and backfill for duct lines and manholes in accordance with Division 2-Site Work.

END OF SECTION

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SECTION 16440

DISCONNECT SWITCHES

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Disconnect switches.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. NEMA KS 1–Enclosed Switches.

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.
- B. Include outline drawings with dimensions and equipment ratings for voltage, capacity, horsepower, and short-circuit.

PART 2–PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Disconnect Switches: Square D Class 3110 or Cutler Hammer Type DH.
- B. Substitutions: Under provisions of the General Conditions.

2.02 DISCONNECT SWITCHES

- A. Nonfusible Disconnect Switches: NEMA KS 1; heavy-duty, quick-make, quick-break, load interrupter enclosed knife switch with externally-operable handle interlocked to prevent opening front cover with switch in “On” position. A defeater shall be provided to bypass this interlock. Handle lockable in “Off” position. Provide auxiliary contacts to remove control power associated with field devices or instruments interlocked with equipment served. Auxiliary contacts shall be by the disconnect manufacturer.

2.03 SINGLE-PHASE MOTOR SWITCHES (2 HP OR LESS)

- A. Where noted on the drawings, motors rated 2 hp or less, for operation on 120 V or 240 V, single-phase, shall be provided with a specification-grade wall switch as disconnecting means. See Section 16141–Wiring Devices for additional information.

COPY OF BID SET

2.04 ENCLOSURES

- A. Provide disconnect switch enclosures as listed below, unless noted otherwise on the drawings:
 - 1. Indoor dry locations: NEMA 12, steel.
 - 2. Outdoor, corrosive, or wet locations: NEMA 4X, stainless steel.

PART 3—EXECUTION

3.01 INSTALLATION

- A. Provide disconnect switches where indicated on the drawings. Maximum mounting height shall be 42 inches above finished floor unless noted otherwise, or acceptable to ENGINEER based on field conditions.
- B. Provide wall switch for each single-phase fractional horsepower motor where indicated on the drawings.
- C. Disconnect enclosures that house wiring powered from a source separate from the motor power wiring (e.g., MAS units, space heaters) shall have a nameplate installed on the front of the disconnect indicating that power may be present at the motor when the disconnect is in the "Off" position.
- D. Wiring within disconnects shall only be for loads or equipment served by that disconnect. Foreign wiring within disconnect enclosures is not allowed. All wiring within disconnect enclosures shall be landed on lugs or terminals provided by the disconnect manufacturer, or on dedicated terminal strips for instrumentation equipment or field devices. Splices and spring wire connectors are not allowed within disconnect enclosures.

END OF SECTION

COPY OF BID SET

SECTION 16450

SECONDARY GROUNDING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Power system grounding.
 - 2. Electrical equipment and raceway grounding and bonding.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 SUBMITTALS

- A. Indicate location of system grounding electrode connections and routing of grounding electrode conductor.
- B. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.

PART 2–PRODUCTS

2.01 MATERIALS

- A. Ground Rods: Copper-bonded, 5/8-inch diameter; minimum length 10 feet.
- B. Ground Connections Below Grade: Exothermic type by Cadweld, compression type by Thomas & Betts, or equal. Compression connectors shall be prefilled with an oxide inhibitor.
- C. Ground Fittings: O-Z/Gedney, Type ABG, CG, TG, KG, GBL, or equal.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Compression-type connectors shall be installed with the manufacturer recommended tools. Compression dies shall emboss index on the connector when installed correctly. An indenter crimp shall be made on ground rods prior to connection of grounding conductor.
- B. Provide a separate insulated equipment grounding conductor for each feeder and branch circuit. Provide a dedicated neutral conductor sized to match the circuit or feeder conductors for each feeder or branch circuit requiring a neutral. Terminate each end on a grounding lug, bus, or bushing.

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- C. Bond together system neutrals, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and cold water plumbing systems.
- D. Connect grounding electrode conductors to metal water piping, metal frame of building or structure, and structural reinforcing bars using suitable ground clamps. Make connections to flanged piping at a point ahead of meter or service shutoff valve. Provide jumper connection across meter or service shutoff valve.
- E. Ground system, transformer neutrals, and equipment as required by code and local ordinances.
- F. All feeder neutrals shall be connected to neutral at only one point in the MCC.
- G. All bare copper conductors installed outdoors shall be buried a minimum of 2 feet below grade.
- H. Water system grounds and a minimum of three ground rods at 15-foot separations near service or feeder entrance of each building shall be provided and ground wires must attach to point ahead of meter or service shutoff valve. These shall be connected to ground bus by conductors sized to code requirements. The above are minimum requirements.
- I. All grounding electrode conductors shall be installed in PVC conduit. All conduit bends shall be made using sweep elbows. Conduit bodies and 90-degree bends are not allowed.
- J. Include ground for grounded receptacles, light fixtures, motors, and equipment items shown on the drawings.
- K. Flexible connections do not qualify for ground. All flexible connections must have separate green ground wire from motor base, lighting fixture, or equipment frame to conduit system.
- L. Provide a separate grounding conductor system for the grounding of all lighting fixtures and devices installed in the same conduit as the branch circuit conductors. Ground conductors shall be individually connected at each fixture or device.
- M. All equipment in NEMA 4X areas that are fed from circuits in PVC conduit shall be provided with a separate green ground wire that is terminated at the metallic conduit system and the equipment.
- N. Separately derived systems as defined by the National Electrical Code shall be grounded as such. This shall include, but not be limited to, 4-wire transformers and 4-wire standby generators.
- O. Refer to Section 16930—Instrument and Communication Wire and Cable for additional grounding requirements.

3.02 TESTING

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

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- B. Provide ground system resistance test report for each ground grid. Test reports shall document ground system resistance following the three-point "Fall-of-Potential" test. The test results shall include a graph of the results plus a diagram of the testing layout. The remote current probe (C2) shall be placed a minimum of 100 feet from the ground system potential/current probe (P1/C1) or as required to provide sufficient spacing to demonstrate a resistance plateau on the graph. The ground resistance shall be tested with the potential probe (P2) between the P1/C1 probe and the C2 probe at 10% intervals starting at 0% and ending at 100% of the distance between P1/C1 and C2, 11 points total. A single point of measurement is not acceptable, and the two-point method of ground system testing shall only be used where there is no or insufficient "open earth" area to use the three-point Fall-of-Potential method. Resistance at any point in the grounding system shall not exceed 5 ohms. All ground system tests shall be witnessed by ENGINEER or OWNER. ENGINEER shall be notified a minimum of 72 hours in advance of all ground system testing.
- C. The test meter shall be Associated Research Vibroground test set with null balance, James A. Biddle Megger Earth-Tester-Null Balance, or equal. All ground system tests shall be performed in accordance with the procedures outlined in the instruction manuals of the ground system test report.
- D. Ground resistance testing shall be performed with all rods connected and shall be isolated from all metallic connections, such as from the ground rod to other grounded structures and electrical system neutrals.
- E. Multiple ground rod grids shall be isolated from all metallic connections such as from grid under test to other grounded structures and electrical system neutrals.
- F. Provide test report using the attached Form 16450. Each ground grid, including service entrance transformers, etc., shall have a form submitted.

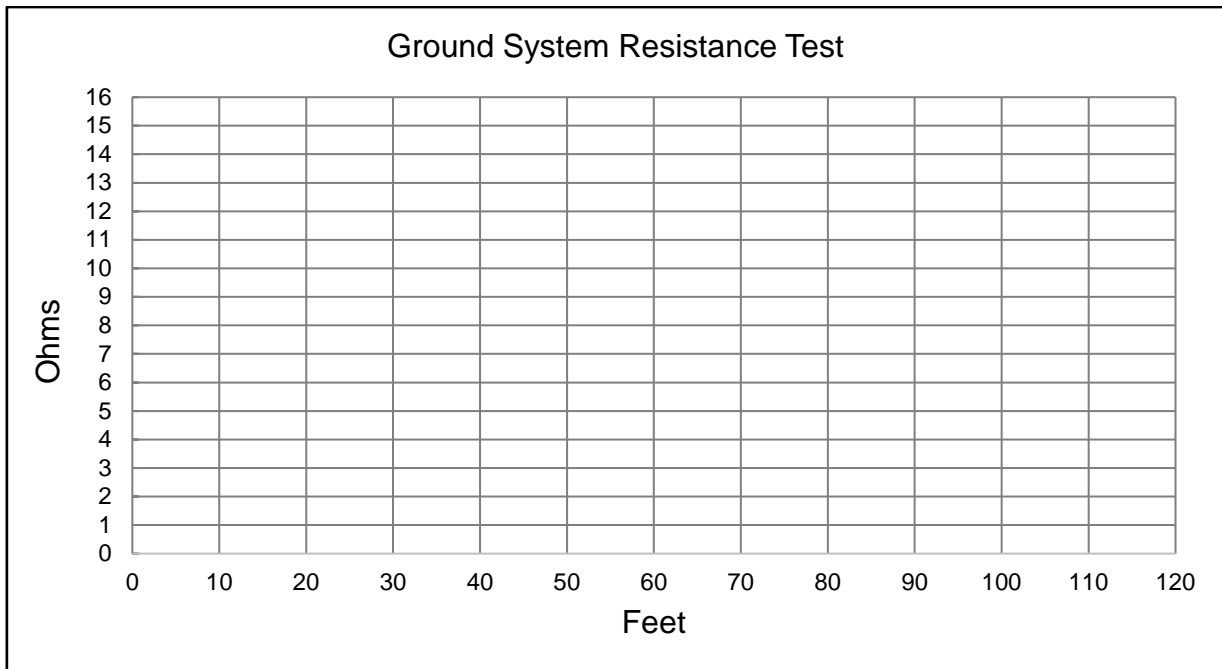
END OF SECTION

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FORM 16450

GROUND ROD RESISTANCE TO EARTH TEST RECORD

1. DATE _____
2. PROJECT NAME _____
3. LOCATION OF TEST _____
4. GROUND ROD TYPE _____
DIAMETER _____ LENGTH _____
5. TEST METHOD _____
INSTRUMENT TYPE _____
SERIAL NO. _____
6. REQUIRED MAXIMUM RESISTANCE TO EARTH _____
7. MEASURED RESISTANCE TO EARTH _____
GROUND ROD SYSTEM _____



TEST PERFORMED BY: _____
Signature

TEST WITNESSED BY: _____
Signature

COPY OF BID SET

SECTION 16475

OVERCURRENT PROTECTIVE DEVICES

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Provide overcurrent protective devices as shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit shop Drawings and product data in accordance with provisions of Section 01300–Submittals, including electrical ratings, physical size, interrupt ratings, trip curves, I²t curves, and manufacturer's detailed specifications.

1.03 QUALITY ASSURANCE

- A. Comply with the following requirements:
 - 1. NFPA 70 National Electrical Code (NEC).
 - 2. Local codes and ordinances.
 - 3. Provide overcurrent protective devices by same manufacturer for each type of device.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Section 01600–Materials and Equipment.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

PART 2–PRODUCTS

2.01 CIRCUIT BREAKERS

- A. General:
 - 1. Comply with UL 489 and NEMA AB1 requirements.
 - 2. Provide thermal and magnetic protection unless noted otherwise.
- B. Main Breakers:
 - 1. Circuit breakers shall have a short-circuit interrupting rating as indicated on the Drawings.
 - 2. Provide solid-state circuit breakers with electronic sensing, timing, and tripping circuits for adjustable current settings. Provide ground fault trip with integral adjustable ground fault pickup and delay settings, adjustable long-time pickup, long-time delay, short-time pickup, short-time delay, and instantaneous pickup settings.

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3. Circuit breakers shall be UL listed for 100% continuous current where indicated on the Drawings.

C. Feeder Breakers:

1. Circuit breakers shall have a short-circuit interrupting rating as indicated on the Drawings.
2. Solid-state Circuit Breakers: Circuit breakers with frame sizes 400 amperes and larger shall be provided with electronic sensing, timing, and tripping circuits for adjustable current settings. Provide adjustable long-time pickup, long-time delay, short-time pickup, short-time delay, and instantaneous pickup settings.
3. Field-Adjustable Thermal-Magnetic Trip Circuit Breaker: NEMA AB1. Provide circuit breakers with frame sizes less than 400 amperes with mechanism for adjusting instantaneous pickup setting for automatic operation. Range of adjustment shall be three to ten times the trip rating.
4. Field-Changeable Magnetic-Only Ampere Rating Circuit Breakers/Motor Circuit Protectors: NEMA AB1. Provide circuit breakers with frame sizes 200 amperes and larger with changeable trip units.

- D. All lugs shall be rated to accept copper conductors.

2.02 ENCLOSURES

- A. Circuit breakers shall be installed within MCC, panelboard, etc. as shown on the Drawings.

2.03 ACCESSORIES

- A. Provide accessories as scheduled as listed below:
1. Handle lock: Include provisions for padlocking.
 2. Provide mechanical trip device.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install overcurrent protective devices in accordance with manufacturer's recommendations.

3.02 ADJUSTMENT

- A. Set and record adjustable settings on circuit breakers to provide selective coordination and proper operation.

END OF SECTION

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SECTION 16480

MOTOR CONTROL

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Motor control devices, accessories, and general requirements.
 - 2. Manual motor starters.
 - 3. Magnetic motor starters.
 - 4. Solid-state starters.
 - 5. Motor control centers.
 - 6. Motor control panels.

- B. Allowances: An allowance of \$15,000 shall be included in the Lump Sum Base Bid to be adjusted at final payment in accordance with actual Section 16940 System Supplier charges for CONTRACTOR to install antenna towers furnished by Section 16940 System Supplier as a result of the radio path analysis.

- C. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

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1.02 REFERENCES

- A. ANSI/NEMA ICS 6–Enclosures for Industrial Controls and Systems.

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- B. NEMA AB 1–Molded Case Circuit Breakers.
- C. NEMA ICS 2–Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA ICS-18–Motor Control Centers.
- E. NEMA KS 1–Enclosed Switches.
- F. NEMA PB 1–Panelboards.
- G. NEMA PB 1.1–Instruction for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

1.03 QUALITY ASSURANCE

- A. Manufacturers of Motor Control Equipment: Firms regularly engage in the manufacture of motor control equipment of the types and capacities required whose products have been in satisfactory use in similar service for not less than 10 years.
- B. UL Labels: Provide motor control devices, manual motor controllers, magnetic motor starters, solid-state starters, variable frequency drives, combination motor starters, motor control centers, etc., which have been listed and labeled by Underwriters Laboratories.

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.
- B. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01300–Submittals.
- B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.06 DELIVERY, STORAGE, AND HOLDING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer’s written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.07 SPARE PARTS

- A. Furnish spare parts for equipment specified herein as listed in Section 16951–Spare Parts.

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1.08 COORDINATION

- A. Section 16480–System Supplier shall coordinate all equipment specified herein with Section 16940–Controls and Instrumentation System Supplier. This shall include, but not be limited to, equipment such as MCCs, stand-alone motor controllers, combination starters, and control stations. Drawings for MCCs, combination starters, motor controllers, and motor control equipment shall be provided by the Section 16940 System Supplier. Drawings from equipment manufacturers will not be accepted as shop drawings or O&M documents.

1.09 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from the earlier of either the date established for partial utilization in accordance with GC14.04 and 14.05, as modified in the Supplementary Conditions, or Substantial Completion of the project.

PART 2–PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Motor control devices, motor starters, and motor control centers shall be as manufactured by Allen-Bradley, or equal, as approved by ENGINEER and in accordance with substitutions under provisions of the General Conditions. All equipment specified in this section and provided by CONTRACTOR shall be by the same manufacturer.
- B. The drawings and specifications were prepared based on Allen-Bradley. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes to accommodate other equipment including, but not limited to, structural, mechanical, and electrical work. CONTRACTOR shall also pay additional costs necessary for revisions of drawings and/or specifications by ENGINEER.

2.02 MOTOR CONTROL DEVICES, ACCESSORIES, AND GENERAL REQUIREMENTS

- A. Auxiliary Contacts: NEMA ICS 2; two field convertible contacts minimum, in addition to seal-in contact, or as necessary.
- B. Push buttons: NEMA ICS 2; heavy-duty, oiltight (30 mm) as shown on the drawings.
- C. Indicating Lights: NEMA ICS 2; heavy-duty, oiltight (30 mm), LED, push-to-test type as shown on the drawings.
- D. Selector Switches: NEMA ICS 2; heavy-duty, oiltight, (30 mm) as shown on the drawings.
- E. Timing Relays: UL listed with On and Timing-Out LEDs.
- F. Contactors: NEMA ICS 2. All contactors for starters specified herein shall be NEMA rated. IEC contactors are not allowed. Contactors shall be Allen-Bradley, Bulletin 509, or equal.

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- G. Control Power Transformers: 240/120-volt secondary. Each motor starter shall have a dedicated control power transformer.
- H. Elapsed Time Meters: Redington/Engler 722 series, or equal, 3 inches round, flush door mounted, capable of reading up to 99,999.9 hours, nonreset type.
- I. Relays for motor control circuits, hard-wired control logic, and for loads less than 10 amps shall be general purpose, industrial, square base relays. Relays for lighting circuits and small motor loads shall be industrial, electrically-held power relays. Relays shall meet the following requirements:
 - 1. General purpose relays:
 - a. Configuration: DPDT or 3 PDT as required by system supplier.
 - b. Mounting: DIN rail with screw terminal base socket.
 - c. Voltage: 120 Vac.
 - d. Contact rating: 15 A, minimum; 3/4 hp.
 - e. Operating life: 10 million cycles.
 - f. Status: On-Off flag type or LED indicator.
 - g. UL listed.
 - h. Manufacturer: Allen-Bradley, 700-HB, or equal.
 - 2. Power relays.
 - a. Configuration: Electrically-held, 2-12 poles.
 - b. Mounting: DIN rail, square base.
 - c. Voltage: 120 Vac.
 - d. Contact rating: 20 A continuous; 1 hp.
 - e. Operating life: 10 million cycles.
 - f. UL listed.
 - g. NEMA rated.
 - h. Manufacturer: Allen-Bradley, 700-PK, or equal.
- J. All starters shall be equipped with the auxiliary devices to meet the requirements of the Drawings and Specifications. Each starter operating at other than 120-volt, single-phase shall be equipped with a control transformer providing 120-volt secondary for control power. Transformer shall have fused primary and secondary connections and shall be sized per manufacturer's recommendations. Coils and pilot lights in all starters shall be 120 volts.
- K. Enclosures for Stand-Alone Controllers, Starters, and Control Devices:
 - 1. Enclosures in indoor dry locations shall be NEMA 1 gasketed.
 - 2. Enclosures in indoor damp or wet locations, outdoor locations, or locations below grade shall be NEMA 4X, stainless steel.
 - 3. Enclosures in hazardous locations shall be NEMA 7, cast iron.
 - 4. Starters and disconnect devices for motors shall be installed in common enclosures, combination type, with all accessories such as terminal blocks, push-to-test pilot lights, and H-O-A switches.
 - 5. All wiring within starter enclosures shall be landed on terminal blocks. This shall include internal control wiring, field wiring, and any spare or unused wiring.
 - 6. Control stations shall include devices as shown on the Drawings and specified in Section 16940—Controls and Instrumentation.

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- L. Hardwired Motor Controls:
 - 1. Equipment and wiring specified to be hardwired shall be physically wired independent of controllers, programmable relays, and communication systems to allow manual operation in the event of an emergency.
 - 2. Motor control wiring and logic shall be set up such that in the event of a power failure, equipment shall automatically restart if previously running, or remain off if previously off. A manual reset shall not be required to restart equipment following a power failure.

2.03 MANUAL MOTOR CONTROLLERS

- A. Where noted on the drawings, controllers for motors rated 2 hp or less, for operation at 120 V or 240 V single-phase, shall be specification grade wall switches as specified in Section 16141–Wiring Devices.

2.04 MAGNETIC MOTOR STARTERS

- A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower. Each magnetic starter shall be equipped with a solid-state overload relay, Allen-Bradley E1 Plus, Bulletin 592-EE, or equal. Starters for submersible pumps and motors installed outdoors shall include ground fault protection.
- B. Full-Voltage Starting: Nonreversing type as shown on the drawings.
- C. Coil Operating Voltage: 120 volts, 60 Hz.
- D. Size: NEMA ICS 2; size as shown on the drawings. Contactors shall be Allen-Bradley, Bulletin 509 (Nonreversing), or equal.
- E. Overload relays shall have the following features:
 - 1. Self-powered, solid-state.
 - 2. Up to 5:1 adjustment range.
 - 3. DIP switch settings for trip class and reset mode.
 - 4. Current transformers (no heaters).
 - 5. Thermal memory.
 - 6. Ambient temperature compensation.
 - 7. Visible trip indicators.
 - 8. Phase loss protection.
 - 9. Low energy consumption.
 - 10. Ground fault protection as specified herein.
- F. Magnetic motor starters in motor control centers shall be combined with magnetic only molded case circuit breakers.
- G. Through-the-door overload reset pushbuttons shall be provided for all magnetic starters installed in motor control centers.

2.05 SOLID-STATE STARTERS

- A. Starters where called for shall be reduced voltage solid-state starters. These starters shall be constructed with NEMA-rated (as previously specified) motor control center type construction and located in the specified MCCs, or motor control panel as shown on the drawings. The starters shall be furnished with the following features:

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1. Output Stage: 6 SCRs; full-wave inline control.
 2. Ambient Temperature: Operating range, 0 to 50°C at rated current.
 3. Transportation and Storage Range: 35° to 65°C (-30° to 149°F).
 4. Input Adjustments:
 - a. Initial step and voltage: 0 to 50%.
 - b. Current limit: 75% to 350%.
 - c. Acceleration time: 0 to 30 seconds.
 - d. Deceleration time: 2 to 60 seconds.
 - e. Trip running current: 75% to 150%.
 5. SCR Peak Inverse Voltage (PIV Rating):
 - a. Line voltage 208 to 480 V: Continuous.
 - b. SCR rating 1400 V.
 6. Transient Voltage Suppressor: Provide accessory protective module to protect against high-potential transient voltage spikes, model 150-F84, sized based on motor horsepower.
 7. RC Snubber Network: To prevent false firing due to dv/dt characteristics.
 8. Hard Firing Gate Pulse: A combination of high potential gate pulse and a rapid rise time to prevent SCR damage because of di/dt stress.
 9. Overload Capacity:
 - a. Continuous: 115% full load capacity.
 - b. One minute: 250%.
 - c. Thirty seconds: 450%.
 - d. Five seconds: 650%.
 10. Electronic Fuse: Overload trip capacity acts as an electronic fuse which replaces the I²T fuses. Should a fault occur, the unit will trip out in one cycle or less.
 11. Modularity: For ratings/amps to 1200 amps, the power structure shall consist of three power poles with integral heat sinks.
 12. Communications: A DPI serial communication port shall be provided as standard. Optional communications protocol interface modules shall be available for connection to Remote I/O, DH485, ControlNet, DeviceNet and RS232/422/485.
 13. Interface to the starter shall be via a removable Human Interface Module (HIM) with integral display. This unit shall be a 7-line by 21-character backlit LCD display with graphics capability. HIM shall be used to display starter-operating conditions, fault/alarm indications, and programming information with full text support in multiple languages. The LCD HIM shall be rated IP20/Type 1 and may also be used as a handheld terminal by connecting via a separate cable. The HIM keypads shall include programming keys, starter operating keys (Start, Stop, and Jog), numeric keys for direct entry and an ALT (alternate function) key to allow starter programming or operating functions to be accessed directly without knowledge of programming structure. The HIM unit shall be mounted on the front of the enclosure door so the operator does not have to open the enclosure to access the HIM.
- B. Provide the following trip features:
1. Overcurrent trip.
 2. Phase fail trip.
 3. Current imbalance trip.
 4. Excessive starts per hour.
 5. Stall and jam detection.
 6. Underload protection.
 7. Undervoltage protection.
 8. Overvoltage protection.
 9. Voltage unbalance.

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- C. Provide an isolation contactor on the input of each starter.
- D. Solid-state starters shall be Allen-Bradley heavy-duty, Bulletin 150, SMC Flex, or equal. All nonpositive displacement equipment shall be furnished with Allen-Bradley pump control option.
- E. Solid-state motor starters shall be combined with thermal-magnetic molded case circuit breakers.

2.06 MOTOR CONTROL CENTERS

- A. Starters and disconnect devices for motors shall be installed in MCCs except where shown to be remote-mounted at the motor location. Starters and disconnect devices shall be NEMA rated, sized according to application as specified. The MCC and NEMA Class IIB drawings shall be supplied as part of the Controls and Instrumentation package described in Section 16940–Controls and Instrumentation. MCC drawings provided by the MCC manufacturer or through any contractor will not be accepted as shop drawing submittals or O&M documents. CONTRACTOR shall wire and test all MCCs for the functions described herein in its shop prior to shipment to the site. Provide one copy of the test report to ENGINEER. CONTRACTOR shall coordinate MCC functions with Section 16940–Controls and Instrumentation Supplier.
- B. It shall be assumed that colors will be selected by OWNER and shall be nonstandard. Color shall match that specified for control enclosures specified in Section 16940–Controls and Instrumentation.
- C. Auxiliary contacts shall be of quantity necessary for equipment functions.
- D. MCC design shall be in accordance with latest applicable NEMA standards, shall have been tested to prove adequate mechanical and electrical capabilities, and all major components shall have been individually tested.
- E. Structures shall be totally enclosed, dead front, free-standing vertical sections, 90 inches high and not less than 20 inches deep for front-mounted units and not more than 40 inches deep for units mounted back-to-back. Each vertical section shall have side panels extending the full height of the section to minimize fault-propagation to adjacent sections.
- F. Each structure shall contain a main horizontal bus continuously braced within each section, with rating as specified, and vertical bus feeding unit compartments with a minimum rating of 300 amperes, or as necessary for load and feeder breakers. All horizontal and vertical bus of all MCC sections shall be powered regardless of location of transfer switch, unless otherwise noted. All motor control centers shall include a 1/4-inch by 2-inch ground bus. All bus shall be tin-plated copper and braced to withstand short-circuit currents as indicated.
- G. Structures shall contain a horizontal wireway at the top, isolated from the horizontal bus, and shall be readily accessible by removal of its cover plate. Adequate space for conduit and wiring to enter the top or bottom shall be provided without structural interference and accessible without disrupting service.
- H. A vertical wireway with a minimum of 28 square inches of cross-sectional area shall be adjacent to each vertical unit compartment and shall be covered by its own door. These

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vertical wireways shall be free of all live parts and shall contain vertical wireway tie bars. Exceptions to this are as shown on the drawings.

- I. All units shall be provided with a mechanical interlock with the unit door to prevent access unless the disconnect is in the off position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect.
- J. Padlocking facilities shall be provided to positively lock the disconnect in either the on or off position with from one to three padlocks whether the door is open or closed.
- K. All disconnect operating handles located higher than 6 feet 7 inches above finished floor in the on position (including the MCC pad height) shall be provided with handle extensions. All disconnect operating handles above this height must operate in the vertical direction.
- L. All unit heights shall be of modular dimensions to allow for unit layout, in any combination, without structural interference. Drawout units shall have a tin-plated stab assembly for connection to the vertical bus; no wiring to these stabs shall extend into the bus compartments. All bus access openings shall be provided with automatic shutters that close when the unit (e.g., starter, breaker) is withdrawn.
- M. Terminal blocks for NEMA Type B assemblies shall be mounted within the unit and shall be factory-wired. Provide a minimum of 25% spare terminals for all terminal blocks furnished.
- N. Control centers shall be NEMA Class II.
- O. Wiring in control centers shall be Type B. All conductors supplying power from the MCC bus to frame-mounted equipment shall have the phases identified as specified in Section 16195–Electrical Identification.
- P. Provide neutral landing lugs for all MCCs accepting utility service-entrance conductors. Neutral landing lugs shall be bonded to the ground bus at the utility service entrance, unless otherwise noted.
- Q. Control centers shall include NEMA 1 gasketed enclosures, unless otherwise noted.
- R. Remote-mounted controls shall be heavy-duty, oiltight (30 mm) of same quality and type furnished in starters and as shown on the drawings. Equipment controls that require a manual reset shall be accomplished through a reset push button on the enclosure or MCC bucket for the associated piece of equipment. All reset buttons shall be appropriately labeled, including mechanical type.
- S. MCC enclosures must be in accordance with area designations shown on the drawings.
- T. All lighting and small power transformers shall be dry type, Class H insulation, DOE 2016 Efficiency rated, 115°C rise (kVA as indicated on drawings). Coil windings shall be copper, glass-taped, dipped in silicone varnish, with two taps 2 1/2% above and below, 480-volt primary, Delta with 120/208-volt, three-phase, 4-wire secondary, unless indicated otherwise.
- U. All lighting panelboards shall be Cutler Hammer Pow R-Line 1a, or equal, with 10,000 amps interrupting capacity, at 120/208-volt, three-phase, 4-wire with branch

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breakers as shown on the drawings, unless indicated otherwise. Branch-mounted main circuit breakers will not be allowed. Minimum size shall be 20 inches wide by 5 3/4 inches deep. All bus shall be aluminum. Provide laminated, typewritten panel schedule for all panelboards at project final completion.

- V. All motor control centers shall be factory-assembled, wired, and tested. All internal wiring shall be numbered, and each wire shall be terminated on terminal strips, including internal spares, field wiring, and spare field wires. Schematic and wiring layout drawings following JIC Standards which show all connections to external devices, a complete bill of materials, and a detailed description of operation, shall be submitted for each piece of equipment.
- W. Arrangement and physical locations of all equipment within each motor control center shall be subject to shop drawing approval.
- X. All components shall be properly identified with laminated engraved nameplates with 3/8-inch-high letters (white or black). Nameplates located outdoors shall be stainless steel screw on type. Nameplates located indoors shall be adhesive type.
- Y. Unless otherwise indicated, all conduit entrances shall be through the bottom only.
- Z. MCC interrupting rating shall be as shown on the drawings, minimum 42,000 A.
- AA. The main breaker or main lugs of each MCC shall be provided with a surge protection device and a three-phase monitor. This surge protection device shall be on the load side of the main and be as specified in Section 16412–Surge Protective Devices. The three-phase monitor shall be on the load side of the main and be Timemark *269, or equal. CONTRACTOR shall select voltage to match electrical service. The three-phase monitor shall be hard-wired to a red, push-to-test indicating light on the MCC bucket door for indication of “Three-Phase Fail.” This shall be in addition to PLC I/O or hard-wired interlocks.
- BB. Each MCC shall be provided with a power meter and appropriately sized metering-class current transformers (CTs) installed on the load side of the MCC main breaker. Power meter shall be Allen-Bradley PowerMonitor 500, Bulletin 1420-V2-ENT, or equal. CTs shall be Allen-Bradley Bulletin 1411-8SHT-XXX, or equal, and shall be rated for ANSI/IEEE C57.13 Accuracy Class 0.3. Provide twisted CT wiring sized as required for the specified CT accuracy class, minimum 14 AWG. Power meter shall be provided with an Ethernet/IP communications module matching the SCADA System communication protocol so that all readings can be monitored at the SCADA System HMI. Power meter shall be mounted on the door of a dedicated MCC bucket, where shown on the Drawings. The MCC bucket shall be provided with a control power transformer, fused disconnects for the control power circuit and voltage sensing lines, and CT shorting blocks as specified in Section 16120–Wire.
- CC. Main Breaker: Molded case circuit breaker, three-pole, amperes as shown on the drawings with lugs for 480-volt, three-phase, 4-wire, 60-cycle entrance. Breakers noted on the drawings shall be GFI and 100% rated. When main breaker is the disconnecting means for a structure, breaker shall be service entrance rated.
- DD. Main and feeder circuit breakers shall be provided in accordance with the requirements specified in Section 16475–Overcurrent Protective Devices.

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2.07 MOTOR CONTROL PANELS

- A. Arrangement and physical location of all equipment within control station panel shall be subject to shop drawing approval.
- B. Starters and disconnect devices for motors shall be provided in the motor control panels. Starters and disconnect devices shall be NEMA-rated, sized according to application as specified.
- C. Motor control panel design shall be in accordance with latest applicable NEMA standards and shall have been tested to prove adequate mechanical and electrical capabilities, and all major components shall have been individually tested. Control panel shall bear a serialized UL label indicating that it is UL-approved as an assembled unit. Panels which have individual components that are UL-labeled but do not have UL approval as an assembled unit are not acceptable.
- D. Enclosures shall be wall mount, front access only, minimum No. 12 gauge steel, have hinged doors, and have rotating lockable handle 3-point latch on each compartment door (not screws or bolts), with top and bottom bolts actuated by one rotating handle on large doors. All indicating lights, selector switches, operator interfaces, etc., shall be installed on an inner front door. Panels shall include door stop kit, data pockets for panel wiring diagrams, and minimum 18-inch LED light and switch. Panels shall include main breaker with padlock hasp to prevent opening the panel with switch in "On" position. A defeater shall be provided to bypass this interlock, with handle lockable in "On" position. All doors and panels shall be gasketed, and panels installed outdoors or nonconditioned spaces shall be insulated. All louvers shall be filtered with forced-air cooling as necessary by the supplier for conditions where installed. Enclosures shall be as manufactured by Hoffman or Saginaw. Enclosure rating shall be as follows, unless noted otherwise on the drawings or in the associated specification section: Indoor and/or dry locations: NEMA 12. Enclosure shall be sized as required to accommodate all equipment specified herein and specified in Section 16940–Controls and Instrumentation.
- E. The equipment mounted within the enclosures shall be mounted on the enclosure back panel, neatly organized, and in accordance with the manufacturer's recommendations:
 - 1. All wiring within control panels shall be insulation type MTW, minimum size 16 AWG. Wiring within the enclosure shall be routed through plastic wiring troughs with removable covers. Maximum fill for wiring troughs shall be 60%. Terminal strips located adjacent to wiring troughs shall have a minimum of 1 1/2 inches between terminal strip and trough. All wiring in control panels not in wiring troughs shall be bound with continuous-type spiral windings.
 - 2. All I/O devices shall be wired to rail-mounted terminal blocks. Plastic wiring duct shall be Electrovert "Electro-duct," Panduit, or equal. Terminal blocks shall be Electrovert 9700 Series, Square D, Class 9080 Type G, or equal.
 - 3. Field wiring in dry locations shall be insulation type THHN, minimum size 14 AWG. Field wiring in damp or wet locations shall be insulation type XHHW-2, minimum size 14 AWG. All field wiring shall terminate at the rail-mounted terminal blocks. Splices are not allowed within enclosures or wireways. Field-wiring terminals shall be clearly identified as to which I/O terminals they are wired. Wire markers shall be permanently attached wraparound adhesive, or heat shrink-type markers. Wire numbering preprinted on the conductor and individual wraparound numbers are not acceptable.
 - 4. Jumpers between adjacent terminal blocks shall be copper jumper bars supplied by the terminal block manufacturer.

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5. All panels with DIN rail mounted equipment shall include a minimum of 25% spare DIN rail space.
 6. In addition to spare I/O specified herein, provide a minimum of 25% spare hot and neutral terminals, wired to terminal strips. Spare terminals shall be provided for all voltage sources within the panel (e.g., 120 V, 24 V).
- F. Fuse holders shall be provided with integral LEDs to indicate when the fuse is blown.
- G. All starters shall be equipped with auxiliary devices to meet the requirements of the drawings and specifications. Each starter operating at other than 120-volt single phase shall be equipped with a control transformer providing 120-volt secondary for control power. The use of one common control power transformer for all starters is allowed but may only be used for associated motor controls, alarm relays, timers, controllers (where applicable), etc. Pump monitoring relays (e.g., MiniCAS, temperature, and seal fail relays) shall be wired such that all power to the motor is disconnected with the pump disconnect in the open position. The common transformer may not be used for loads external to the control panel or for devices unrelated to the above-noted items. Transformer shall have fused primary and secondary connections and shall be sized in accordance with manufacturer's recommendations. Coils and pilot lights for all starters shall be 120 volts.
- H. Motor control panels shall be factory-assembled, wired, and tested. All internal wiring shall be color-coded, numbered Class II, Type C, and each wire shall be terminated on terminal strips, including internal spares, field wiring, and spare field wires. Terminal blocks shall be located at the bottom or side of the enclosure, depending where the I/O conduits penetrate the enclosure. Provide a minimum of 25% spare terminals for all terminal blocks furnished. Schematic and wiring layout drawings following JIC Standards that show all connections to external devices, a complete bill of materials, and a detailed description of operation shall be submitted.
- I. Power supplies shall be protected against short-circuits and contain their own overcurrent and overvoltage protection. 12- and 24-volt DC power supplies shall be provided and installed in the enclosures for powering all analog input signals where required.
- J. All door-mounted devices shall be furnished flush-mounted, and an exterior-engraved phenolic nameplate worded by the manufacturer and reviewed by OWNER (upon receipt of shop drawings) shall be provided for each compartment, device, light, etc. All components within the enclosures shall be identified with interior-mounted engraved labels. Labels shall be installed on the enclosure backpanel and not on the device or wireway. Devices shall be grouped for each device or unit being controlled.
- K. Each panel shall have a specification grade, GFI duplex, 20-ampere, 120-volt receptacle fed from a dedicated 20-ampere single-pole circuit breaker.
- L. Control panels shall be provided with a 24 Vdc battery controller for an uninterruptible power supply (UPS) system sufficient to power the control panel for 60 minutes. Control power for all alarms, the alarm light, and alarm horn as specified herein shall be through the UPS. UPS shall be provided with a dry contact output to the alarm circuit in the event the UPS battery needs replacement. UPS shall have a rated current of 40 A, battery charging current of 2 A, and dry contacts rated for 30 Vdc, 1 A for DC Bus OK, Battery Fail, and Battery Discharged. UPS shall be Mean Well DR-UPS40, or equal. Provide a stand or shelf so that the UPS batteries do not sit on the bottom of the enclosure.

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- M. Where PLCs or Operator Interface Panels (OIPs) are installed in control panels, two copies of all programs with associated passwords shall be turned over to OWNER at final completion. Copies shall be a bound hard copy and electronic compact disk.
- N. Provide enclosure and panel space for future installation of devices, PLC, radio, lights, etc., the enclosure and panel shall be constructed for such installation. Supports shall be provided for future equipment, and panel openings shall be made and covered with neat cover plates matching the panel.
- O. Electrical service and motor control equipment in the control station panels shall be in accordance with the following, and shall have minimum 42,000 A rating for interrupting capacity. Provide fusing for individual motor branch circuits where necessary to limit the available current to the rating of the branch circuit.
- P. The main service breaker for the station control panel shall be service entrance rated, and provided with a surge protection device and three-phase monitor. This surge protection device shall be fed with a 30/3 breaker fed from the load side of the main and be an MCG Electronics, Inc., Model SF160M, or equal. The three-phase monitor shall be as manufactured by Timemark, Model *269, or equal, for power/phase failure indication as well as to shut down the pumps. CONTRACTOR shall select voltage to match electrical service.
- Q. Main Breaker: Molded-case circuit breaker, 3-pole, amperes as shown on the drawings, rated for service entrance. Breaker shall be Cutler Hammer HLD, or equal, with walking beam interlock for generator breaker.
- R. Mini CAS MAS units shall be furnished to the control panel supplier by the pump manufacturer for each pump. The MAS unit is a 24 Vac module. Provide control power transformer or power supply as required. The pump motor overtemperature motor/bearing overtemp alarm shall be wired to this panel so that when an overtemperature condition is detected, the pump shall be shut down and locked out (Hand and Auto modes). Manual reset shall be required to restart motor. Seal failure Motor/J-box moisture detection shall be for indication only and shall not shut down pump. MAS units shall be powered from the control panel UPS.
- S. Each analog signal entering or leaving the control panel shall be provided with a DIN rail mounted surge protection device as manufactured by Citel, Model DLA-2403, or equal. Each transmitter shall be provided with a surge protection device as manufactured by Citel, Model TSP-10, or equal, on the output and Citel Model DS4xS, or equal on the power supply. Surge protection shall be provided for all phases and neutral.
- T. Instrumentation equipment located in hazardous areas as noted on the drawings shall be wired to intrinsic safety barriers. Safety barriers for discrete devices shall include indicating LED and be DIN rail mounted, as manufactured by Phoenix, Model PI-EX-ME-2NAM/COC, or equal. Safety barriers for analog devices shall be DIN rail mounted, as manufactured by Phoenix, Model PI-EX-ME-RPS-I/I, or equal.
- U. CONTRACTOR shall provide new floats in the wet well. Floats shall be mounted on a stainless steel cable with a PVC-covered weight. Float switches, when specified herein, shown on the drawings, or required to complete an operating system, shall have the following minimum requirements:

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1. The float switches shall consist of a 316 stainless steel housing 5 1/2 inches in diameter, mounting clamp, and a flexible two-conductor cable with a CPE jacket and a potted SPST magnetic reed switch. Provide switch configuration (NO or NC) as required. The electrical load for the switch contacts shall be 100 VA at up to 250 volts. The two-conductor cable shall be 16 AWG with fine strands made for heavy flexing service and underwater use. Cable length shall be 100 feet minimum for a continuous run to the terminating control panel. A green grounding wire shall connect internally to the float housing. Floats shall be Siemens Model 9G-EF, or equal.
 2. Weight and buoyancy shall be such that contaminants will not result in the float switch changing operating level more than 1 inch.
 3. Operating temperature range shall be -31°F to 194°F.
 4. Floats shall be mounted in accordance with manufacturer's instructions. All mounting hardware shall be stainless steel and furnished with floats.
 5. All floats shall be intrinsically safe in design. Intrinsically-safe barriers shall be as specified herein.
 6. Provide stainless steel kellum grips for each float cable.
- V. Motor Control Panel Requirements:
1. Number of Pumps: 2.
 2. Pump Disconnect: 15\3 MCP.
 3. Pump Starter: 4 hp, size 1.
 4. Voltage, Phase, Amps: 480-volt, three-phase, 4-wire, 100 A Main Breaker.
 5. Float Controls:
 - a. Both Pumps "Off."
 - b. Lead Pump "On."
 - c. Lag Pump "On."
 - d. High Water.
 - e. Low Water.
 6. Automatic Alternator.
 7. Provide interface relays and contacts for the following points in the control panel. All points shall be wired and labeled at terminal strips in the panel for connection to SCADA system.
 - a. WET WELL HIGH WATER LEVEL (Local indication Red).*
 - b. WET WELL LOW WATER LEVEL (Local indication Red).*
 - c. PUMP NO. 1 "IN AUTO."
 - d. PUMP NO. 2 "IN AUTO."
 - e. PUMP NO. 1 "RUN" (Local indication Green).
 - f. PUMP NO. 2 "RUN" (Local indication Green).
 - g. PUMP NO. 1 "SEAL FAIL" (Local indication Amber).
 - h. PUMP NO. 2 "SEAL FAIL" (Local indication Amber).
 - i. PUMP NO. 1 "CALL-TO-RUN FAIL".**
 - j. PUMP NO. 2 "CALL-TO-RUN FAIL".**
 - k. PUMP NO. 1 "STARTER OVERLOAD" (Local indication Red).**
 - l. PUMP NO. 2 "STARTER OVERLOAD" (Local indication Red).**
 - m. PUMP NO. 1 "OVERTEMPERATURE" (Local indication Red).**
 - n. PUMP NO. 2 "OVERTEMPERATURE" (Local indication Red).**
 - o. POWER/PHASE FAIL (Local Indication Red).*
 - p. BATTERY FAIL.
- * These alarms shall activate the common alarm light, alarm horn, and SCADA system. Provide a "Silence" push button in the control panel for the alarm horn. Alarm light shall remain activated until the alarm condition clears.

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- + Alarm signal to the SCADA system for each pump shall be a common alarm from the call-to-run fail logic, starter overload, and the motor thermostats (overtemperature).

- W. Provide eight, 20/1 breakers for the site and control building lighting, HVAC equipment, level transmitter, and control building receptacles. Provide 20A, 3-pole, 480-volt breaker for Control Building unit heater. Circuit breakers shall be operable with the inner door closed.
- X. Provide space for SCADA and telemetry equipment as described in Section 16940-Controls and Instrumentation for installation by Section 16940 System Supplier.

2.08 MOTOR CONTROL PANEL–CONTROL PHILOSOPHY

- A. Duplex Pump Station: Provide a H-O-A switch for each pump located on the inner front door of the control panel. In the “Hand” position, the pump shall start, bypassing all controls (unless otherwise noted). The pump shall be allowed to pump down below the “Low Water” float switch in the “Hand” position. In the “Off” position, the pump shall be inoperable. In the “Auto” position, the pump shall be controlled from the PLC/float controls as specified in Section 16940–Controls and Instrumentation.
- B. Each pump shall be provided with a current switch and dedicated call-to-run relay. When the pump is called to run (Hand and Auto modes), the call-to-run relay shall be energized and if a run signal is not received from the current switch after an adjustable hard-wired time delay (0 seconds to 30 seconds), a call-to-run fail alarm shall be generated. Current switch shall be Veris Industries, Hawkeye H800HV, or equal, and include DIN rail mounting hardware. Elapsed time meter, run light on control panel inner door, and run input to the PLC shall be from the current switch.
- C. Pump failure, as indicated above, shall be monitored by an auxiliary motor overload contact on the motor starter, the GFI unit tripped, by internal thermostats in the motor, and by call-to-run fail logic. Upon shutdown from the GFI unit or motor thermostats, a manual reset from a dedicated reset push button shall be required to restart the motor. Provide a separate starter overload reset push button for each motor starter on the inner front door of the control panel.
- D. Provide an auxiliary contact from the phase fail relay, as specified herein, to shut down the pumps (Hand and Auto modes) in the event of undervoltage or single-phase condition. A time delay shall be provided for each pump so that after a power failure, the pumps will not restart simultaneously.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Provide motor control equipment in accordance with manufacturer’s instructions and drawings.
- B. Motor Starter Panelboard Installation: In conformance with NEMA PB 1.1.

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- C. Provide fuses in fusible switches.
- D. Overloads shall be selected on the basis of nameplate horsepower and service factor. Selection of overloads based on horsepower shown on the drawings is not acceptable. Where power factor correction capacitors are provided, overload protection shall be compensated for the lower motor running current because of improved power factor.
- E. All motor control wiring shall be installed in accordance with control wiring diagrams furnished.
- F. Wireways in MCCs shall be used only for routing of conductors. Splices are not allowed within wireways.
- G. All wiring within MCCs shall be landed on terminals inside buckets or equipment compartments and not left unterminated within wireways. This shall include all internal MCC wiring and external field wiring, including spare wires.
- H. Motor Data: Provide neatly typed label inside each motor starter enclosure identifying motor served, nameplate horsepower, full-load amperes, code letter, service factor, and voltage/phase rating.
- I. Control wiring and field wiring (120 V and below) within MCCs shall be separated from power wiring (277 V and above). Where possible, route control and field wiring in separate raceways or wireways. Provide a minimum of 2 inches separation between control wiring, field wiring, and power wiring.
- J. All motors will be provided by other divisions, ready for connections. CONTRACTOR shall be responsible for electrical connections for power and control circuit wiring, proper phase relationships, and correct motor rotation.
- K. Provide motor circuit wiring for each motor from the source of supply to the terminal box on the motor including all intermediate connections at devices such as motor starters, disconnect switches, etc.
- L. All feeder cable connections to motor leads up to 600 volts shall be insulated and sealed with factory-engineered kits, as specified in Section 16120–Wire.
- M. Provide motor starters as specified for all motors, unless shown or specified that starters or control equipment will be furnished by others.
- N. Provide motor circuit disconnect devices for all motors, unless shown or specified that disconnect devices or starters are furnished with other equipment.

END OF SECTION

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SECTION 16500

LIGHTING

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes a complete functional lighting system.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 REFERENCES

- A. Underwriters Laboratories: Lighting fixtures shall be manufactured in accordance with the standards of the Underwriters Testing Laboratories and shall bear the UL label where practicable. In all cases the lighting fixtures shall be constructed with UL listed components.
- B. Applicable Codes: Fixtures shall be made and installed in accordance with the current version of the National Electrical Code, the Uniform Building Code, the Federal Occupational Safety & Health Act, and other applicable regulations.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical equipment, cable, wire, and connectors.
- D. NEMA/ANSI Compliance: Comply with National Electrical Manufacturers Association, American National Standards Institute, and other standards pertaining to material and construction and testing where applicable.

1.03 SYSTEM DESCRIPTION

- A. Intent: It is the intent of these specifications to obtain a completed lighting fixture installation by CONTRACTOR. Completed means lamped, cleaned, adjusted, tested, and ready for occupancy and operation in accordance with the above-indexed paragraphs and in accordance with the other sections of these Contract Documents. It is the responsibility of CONTRACTOR to point out discrepancies, errors, and other problems.
- B. All lighting fixtures are to be provided complete with all necessary accessories for a proper installation. Catalog numbers shown are basic fixture types, and additional features, accessories, and options specified, scheduled or required, are to be included for all fixtures provided.

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300—Submittals. Shop drawings shall include, but not be limited to, the following:
 - 1. Manufacturer's dimensioned scale drawings showing in complete detail the fabrication of all lighting fixtures including overall and detail dimensions, finishes, prefinishes, metal thickness, fabrication methods, support method, ballasts, sockets, type of shielding, reflectors, wiring sizes and insulation types, lenses, provisions for relamping, and all

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other information to show compliance with the Contract Documents. Manufacturers' catalog cut sheets will not be acceptable.

2. Installation instructions.
 3. Certified test data and reports.
 4. Shop drawings shall not only clearly indicate the assigned fixture type, but also the equipment location.
 5. Provide a submittal on all lamp types used. Submittal should include, but not be limited to, lumen output, lamp color temperature, and CRI value.
- B. Submit for review samples requested by ENGINEER. The fixtures or components are to be tagged with the project name and the fixture type. Samples will be held by CONTRACTOR available for reference throughout the construction period. Fixtures or components under the Contract shall be identical with the accepted samples. No sample (fixture or component) is to be installed on the Project.
1. In the event the submissions are not approved, the materials will be returned to CONTRACTOR to immediately make a new submission responding to the notations (corrections/revisions) of ENGINEER regarding compliance with the Contract Documents.
 2. All charges for these shipments shall be paid by CONTRACTOR.
 3. The fixture schedule shows the style of the fixture only. CONTRACTOR shall verify the types of ceiling and mounting construction prior to releasing fixtures for fabrication and delivery, and provide fixtures adapted to the ceiling construction used.

1.05 QUALITY ASSURANCE

- A. Standards: Materials, equipment, and parts, as well as workmanship provided under this section, shall conform to the highest commercial standard as specified and as indicated on drawings. Fixture parts and components not specifically identified or indicated shall use materials most appropriate to their intended use or function and as such be resistant to corrosion and thermal mechanical stresses encountered in the normal application and function of the fixtures.
- B. Measuring and Testing Equipment: CONTRACTOR shall have available at all times, instruments for the measurement of voltage, luminaire temperature, lighting level, and fixture brightness level.
- C. Photometric Testing: Samples may be necessary to be subjected to photometric testing at the request of ENGINEER. Luminaire efficiency shall be determined in an integrating sphere not less than 100 inches in diameter. Testing will be at CONTRACTOR's expense.
- D. Manufacturers: Firms regularly engaged in the manufacture of lighting fixtures of the types and ratings for the project, whose products have been in satisfactory use in similar service for not less than 5 years.
- E. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that in this project.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Luminaires and lighting equipment shall be delivered to the project complete, including mounting devices, lamps, and components necessary for the proper operation of the equipment.

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- B. Marking: All equipment must be clearly and boldly identified as to the fixture type and, where practicable, the fixture location.
- C. Timely Purchasing: Luminaires and associated lamps and other appurtenances shall be ordered in a timely fashion and securely stored to be available to meet the project schedule.

1.07 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from the earlier of either the date established for partial utilization in accordance with GC14.04 and 14.05, as modified in the Supplementary Conditions, or Substantial Completion of the project.

PART 2-PRODUCTS

2.01 FABRICATION

- A. Materials: Provide dimensional thickness of metal, plastic, and composite materials so that all fixtures are rigid, stable, and will resist deflection, twisting, and warping under normal installation and relamping procedures.
 - 1. All luminaire housings shall be minimum 22 gauge, cold-rolled steel, unless a heavier gauge is specified.
 - 2. All aluminum extrusion housings shall be minimum 3/16 inches thick.
 - 3. All spun, hydroformed, or sheet aluminum reflectors shall be fabricated from No. 12 aluminum sheets minimum, 15 gauge (0.57 inches), or heavier.
 - 4. All acrylic and polycarbonate lenses and/or diffusers shall be minimum 1/8-inch nominal thickness.
- B. Joints: Provide positive, durable, means of connection at all joints. No hollow rivets shall be used.
- C. Gaskets: Provide neoprene, silicone, rubber, or other appropriate gasketing, stops, and barriers where required, to prevent light leak, control sound and vibration, prevent water leaks, and if pertinent, water vapor penetration.
- D. Edges: Provide finished product with the following minimum qualities:
 - 1. Ground and/or burr-free metal edges.
 - 2. Tight-fitting connections, hinges, and closures.
 - 3. Clean, neat corners, edges, trims, and frames.
- E. Castings: All cast parts, including die-cast members, shall be of uniform quality; free from blow holes, pores, hard spots, shrinkage defects, cracks, or other imperfections that affect strength and appearance or are indicative of inferior metals or alloys.

2.02 FINISHES

- A. Application: Fixture finishes shall be applied in a manner that will provide a durable wear-resistant surface:

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1. Prior to finishing, all surfaces must be free from foreign materials such as dirt, rust, oil, polishing compounds, and mold-release agents.
2. All castings and extrusions shall be machined, sanded, or similarly treated and given minimum one coat of baked-on clear methacrylate lacquer, unless a painted finish is specified.
3. Aluminum surfaces exposed to weather (other than anodized reflectors covered elsewhere) shall receive a duronodic or polyester powder paint finish as specified for corrosion resistance.
4. Sheet steel fixture housings, iron and steel parts, which have not received phosphating treatment ("Bonderizing," or similar process) or are to be utilized in exterior applications, are to be made corrosion-resistant by zinc or cadmium plating or hot-dip galvanizing.
5. Unless specified to the contrary, all fluorescent fixture housings shall have a complete coverage of white alkyd reflecting enamel, 85% minimum reflectivity, applied by either a spray or dip process, then baked in a temperature-controlled oven until paint is thoroughly cured. Prior to applying the enamel, each metallic surface shall be prepared for painting by using a five-stage hot zinc phosphatizing process.
6. Plastic refractors diffusers material shall be light stable 100% virgin acrylic, translucent (98% minimum transmission), unless specified otherwise, conforming to minimum standards of IES-NEMA-SPI. Material shall perform as applied in a normal interior environment for a period of 20 years without noticeable deformation, and with a transmission loss not exceeding 5%. Nominal thickness of material shall be 0.125 inches for either extrusions or injections.

2.03 LAMPS

A. LED Linear:

1. All downlight LED lamps shall be of the same manufacturer.
2. All downlight LED lamps shall be 3500 K color temperature.
3. All downlight LED sources shall have a minimum CRI rating of 80.
4. All downlight LED lamps shall be of the wattage specified on the drawings.
5. Initial downlight LED source lumen output shall be minimum 5,000.

B. LED Site Lighting:

1. All bollard LED sources shall be of the same manufacturer.
2. All bollard LED sources shall be 4000 K color temperature.
3. All bollard LED sources shall have a minimum CRI rating of 70.
4. All bollard LED sources shall be of the wattage specified on the drawings.
5. Initial bollard LED source lumens shall be minimum 7033.

C. LED Building Exterior Lighting:

1. All site lighting LED sources shall be of the same manufacturer.
2. All site lighting LED sources shall be 4000 K color temperature.
3. All site lighting LED sources shall have a minimum CRI rating of 70.
4. All site lighting LED sources shall be of the wattage specified on the drawings.
5. Initial site lighting LED source lumens shall be minimum 5,400.

2.04 WIRING

A. Minimum Standards: All wiring shall comply with the following standards:

1. All wiring within lighting fixtures or from the splice with the building wiring shall be as specified in Section 16120–Wire.

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2. Wiring between LED modules and associated operating and starting equipment shall be of similar or heavier gauge than the leads furnished with the ballasts.
3. Wiring within fixture construction is to be concealed, except where the fixture design or mounting dictates otherwise.
4. Wiring channels and wireways shall be free from projections and rough or sharp edges throughout and all points or edges over which conductors must pass and may be subject to injury or wear.
5. Insulated bushings shall be installed at points of entrance and exit of flexible wiring.

2.05 MARKING OF FIXTURES

- A. Voltage Identification: Fixtures designed for voltages other than 110- to 125-volt circuits shall be clearly marked.

2.06 FIXTURE TRIMS

- A. Trim Details: Provide trim details as shown on the drawings or as specified. The trim finish and dimensions are subject to the shop drawing approval of ENGINEER.
 1. Mitered corners shall be smoothed before shop finish is applied. No lapping of trim metal for all flush-mounted ceiling trims for rectangular or square recessed fixtures.
 2. All exposed ceiling trim and inside reveals on all fixtures shall be painted in a color to match ENGINEER's sample.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install fixtures, lamps, lenses, etc., after building is enclosed, weathertight, and environmental conditions are nominally the same as expected for the complete spaces. All lamps, glassware, reflectors, and refractors shall be clean and free of chips, cracks, and scratches.
- B. All wall-mounted fixtures and all ceiling-mounted surface fixtures shall be fed through a fixture Stud/Hickey/Nipple assembly and with provisions to prevent fixture turning.
- C. All fixtures shall be securely and adequately supported and installed.
- D. Surface- or pendant-mounted fixtures shall be attached to and supported from structural part of the building in a manner acceptable to ENGINEER. Fixtures shall be supported by not less than two supports for each fixture. Where fixtures are to be suspended, they shall be mounted on steel channel with the channel supported directly to the structure by a minimum of 3/8-inch rod inside rigid conduit stems. Any fixture which has an individual fixture weight of greater than 25 pounds shall have safety cable installed, in addition to other support means. Cable shall be 3/16-inch airplane cable. All fittings and connectors shall be compression type. Cables must be secured to the building structure and to a point or points on the fixture to protect against falling parts.
- E. Industrial-type fixtures in unfinished areas which are near obstructions such as ducts and pipes shall be suspended so that the bottom of the fixture is no higher than the bottom of the obstruction. All fixtures in each room should be located at the height of the lowest fixture, but not lower than 8 feet 0 inches A.F.F. Fixtures shall not be located until the locations of these

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obstructions are determined, and fixtures shall be accessible after installation of other equipment.

- F. All fixture whips shall be constructed of minimum No. 12 AWG conductors.

3.02 SUPPORTS

- A. Mounting Frames: Provide mounting frames (plaster frames for example), as necessary, for installation and as called for under other sections. Frames are to be finished matte white baked enamel unless otherwise noted.
- B. Mounting Accessories: Provide bars, angles, or other attachment devices for all recessed fixtures. Fixtures shall be securely attached so there is minimum possible movement up, down, or sideways. Fixtures shall be mounted to permit access to wiring. Fastening devices shall be of a positive, locking type, and shall not require the use of special tools to apply or remove. Tie wires shall not be used in place of fastening devices.
- C. Fire Codes: Where necessary to meet Code requirements, enclosure housings shall be constructed to provide a 1-hour fire rating.
- D. CONTRACTOR Responsibility: CONTRACTOR shall verify all ceiling conditions from the drawings and furnish appropriate mounting details for each lighting fixture.
- E. Pendant Mounting: Provide pendant- or surface-mounted fixtures with required mounting devices and accessories, including hickeys, stud extensions, ball aligners, canopies, and stems. Coordinate locations of fixtures in mechanical areas. Provide mounting stems on pendant fixtures of the correct length to uniformly maintain the fixture heights shown on the drawings, or established in the field.
- F. Adequate rigid, sturdy support shall be provided to prevent possibility of fixture falling. Surface and pendant fixtures must be supported with two supports per 4-foot section. All pendants must have swivel aligners located at the top ends; pendants shall be minimum 3/8-inch threaded rod inside 3/4-inch rigid steel conduit, unless specifically indicated otherwise on the drawings, painted on jobsite. Support surface-mounted fixtures from structural members other than ceiling tees by providing Unistrut members laid across main ceiling tees or by attachment directly to structure.

3.03 ADJUSTMENT

- A. Focusing/Adjustment: After the installation of lighting fixtures is completed, fixtures so requiring (both interior and exterior units), shall be adjusted after dark under the observation of OWNER.

3.04 CLEANING

- A. Installation Sequence: Lighting fixture mounting frames, plaster rings, etc., are required to be installed prior to the finishing assembly which shall not be installed until the Project is "broom clean." When the fixture location or construction cannot permit sequential installation, CONTRACTOR shall carefully protect all reflectors, lenses, flanges, and other visible surfaces.

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- B. Cleaning: Before final acceptance by OWNER, all protective (strippable) coatings, dust, finger marks, paint spots, and any other materials deleterious to the appearance or functioning of the lighting fixtures must be removed. Abrasive cleaners are not permitted.

3.05 FINAL INSPECTION

- A. Upon completion of the installation, lighting equipment must be in first-class operating order and free from defects in condition and finish:
 - 1. At time of final inspection, all fixtures and equipment must be installed and lamped with new lamps, and be complete with all lenses, diffusers, reflectors, side panels, louvers, or other necessary components.
 - 2. Fixtures shall be completely clean and free from finger marks, dust, plaster, or paint spots.
 - 3. Any reflectors, lenses, diffusers, side panels, or other parts damaged prior to the final inspection, shall be replaced at no expense to OWNER.
 - 4. Housing shall be rigidly installed and adjusted to a neat flush fit with the ceiling.

END OF SECTION

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SECTION 16930

INSTRUMENT AND COMMUNICATION WIRE AND CABLE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: This specification contains the requirements for instrument wire and cable as opposed to electrical power wire and cable.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 QUALITY ASSURANCE

- A. Standards: Comply with standards specified in this section as listed in Division 1.
- B. Qualifications of Installers: Skilled workers who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work.

1.03 PRODUCT HANDLING

- A. Instrument cable shall be furnished in lengths as necessary.
- B. Reels, coils, or package rolls of instrument cable shall be identified with the project name and other tagging identification as called for.

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01300—Submittals.

1.05 QUALIFICATIONS

- A. CONTRACTOR shall have at least four years of experience in the installation of similar systems. CONTRACTOR shall provide documentation upon request to certify that all assigned staff have attended training courses corresponding to the type of cabling and equipment specified herein.
- B. CONTRACTOR shall currently be licensed to install low voltage electronic cabling systems in the state of the project.
- C. CONTRACTOR shall currently meet all manufacturer's requirements for the provision and installation of all equipment specified herein.

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PART 2–PRODUCTS

2.01 SHIELDED PAIR CABLING FOR ELECTRONIC INSTRUMENTS

- A. Shielded pair cabling shall have stranded, tinned-copper conductors twisted with 2-inch lay.
- B. Insulation of conductors shall be 15 mil, 90°C minimum PVC, rated for 300 volts. Materials shall equal or exceed UL 13 requirements for physical properties.
- C. Color coding shall be manufacturer's standard or as stated.
- D. The outer jacket shall be flame-retardant and weather- and ultraviolet-resistant PVC, 35 mils thick, and 80°C minimum rating. The outer jacket shall contain a ripcord and shall equal or exceed the requirements of UL 1277. Cable shall be UL labeled as power-limited circuit cable.
- E. A 100% coverage shield shall be applied over the insulated conductors. The shield shall consist of a 0.85 mil minimum thickness aluminum mylar tape. A stranded, tinned-copper drain wire shall be furnished in continuous electrical contact with the shield.
- F. Single-pair shielded cables shall be Belden 9316, or equal.

2.02 INDUSTRIAL ETHERNET CABLE

- A. Patch cables shall be provided premanufactured by the cable manufacturer or connector manufacturer in sufficient length to connect the associated equipment to any port on the equipment, patch panel, or switch. Field-attached plugs shall be insulation displacement type and shall be by the same manufacturer as the cable.

PART 3–EXECUTION

3.01 INSTALLATION REQUIREMENTS AND SPECIAL CONSIDERATIONS

- A. Shielded pair and industrial Ethernet specified in this section shall be installed in conduit, and may not be run free-air or in nonmetallic tubing such as innerduct.

3.02 GROUNDING

- A. The shielded connection for shielded network cabling shall be connected at the network switch or patch panel and not at the field device connection. Ground patch panels and network switches accepting shielded network cables.
- B. Shielded cabling shall be installed in accordance with manufacturer's instructions and to minimize electrical noise and interference to associated instruments. Refer to instrument manufacturer's instructions for additional requirements.
- C. Ends of signal wires shall be sealed to prevent the migration of moisture into the cable and to prevent unintentional grounding of the shield at the open end. Seal signal wires using a minimum 1-inch piece of heat-shrink tubing installed over PVC jacket and individual wires, and heat-shrink to a watertight fit.

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- D. All shields must be grounded.
- E. Cable shield grounds shall be isolated from control system signal grounds, except at instrument system grounding electrodes.
- F. The control room instrument ground shall be separate and isolated from the electrical power grounding system.

END OF SECTION

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SECTION 16940

CONTROLS AND INSTRUMENTATION

PART 1–GENERAL

1.01 SUMMARY

- A. Related Sections and Divisions:
1. Applicable provisions of Division 1 shall govern work in this section.
 2. Section 16941–Controls and Instrumentation Drawings.

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1.02 SYSTEM DESCRIPTION

- A. The work includes furnishing, delivering, installing all items furnished, and placing in operation the Supervisory Control and Data Acquisition (SCADA) System for the Industrial Park Pump Stations No. 1, No. 2, and No. 3 and Rose Run Pump Station.

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- B. System Supplier shall be defined as the fabricator, assembler, and supplier of all system components. This shall include, but not be limited to, all instrumentation as specified, all PLC cabinets and required interface hardware and internal wiring, the SCADA System computers, hardware, system drawings, and system software. See paragraph 1.08 for other System Supplier requirements.
- C. CONTRACTOR shall inspect all work. The Bid shall include everything necessary to obtain a complete installation operating in accordance with these specifications and the Bidder's proposal, whether necessary items and equipment are contained in, or are remote from the enclosures furnished under this Contract. All responsibility for this system ultimately lies with CONTRACTOR.
- D. CONTRACTOR shall be responsible for the placing of circuits and making of electrical and hydraulic connections in accordance with System Supplier-furnished drawings, instructions, and field supervision to provide proper connection. CONTRACTOR shall include the services of a System Supplier factory engineer to supervise making of connections to power supplies, motor leads, communication circuits, existing control equipment, and any other connections external to the new control equipment; adjust the equipment; initiate and check operation; instruct OWNER's electrician on operation and maintenance of the equipment; and place the equipment in operation in an acceptable manner. This shall include on-site review of software/hardware controls from the central control point.
- E. Any auxiliary interface relays and controls needed for completion of this project, if not specifically called for, shall be by System Supplier. All switches and control and indicating lights associated with the control panels shall be new and installed in the starter panels. All new telemetry equipment and controls shall be installed in new supervisory control panels as necessary by System Supplier at locations where space allows.

1.03 QUALITY ASSURANCE

- A. System Suppliers: Firms regularly engaged in the design and manufacture of SCADA systems of the size and complexity specified herein, and whose systems have been in satisfactory use in similar service for not less than 10 years.
- B. Installer: A firm with at least 10 years of successful installation experience on projects with SCADA System design and installation work similar to that required for the project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide control panels, power supplies, controllers, relays, wire, and connectors that have been listed and labeled by Underwriters Laboratories.
- E. NECA Standards: Comply with applicable portions of National Electrical Contractor's Association's Standard of Installation.

1.04 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's data, specifications, and installation recommendations for each item specified herein.

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- B. Submit shop drawings and product data in accordance with provisions of Section 01300–Submittals.
- C. Provide product data on all equipment and devices specified herein as well as wiring schematics for all systems.
- D. Shop drawing submittals shall be assembled in two phases; in the first submittal, the following information shall be provided in booklet form:
 - 1. Detailed catalog information, descriptive literature, and specifications of hardware. All items being provided must be specifically noted on this literature.
 - 2. All field devices and instruments.
 - 3. Project implementation plan, including information on project organization, project management, engineering, programming, configuration, training, startup, and maintenance services. Plan shall include key personnel on project, point of contact, and communication protocol.
 - 4. Overall network schematic showing all controllers, radio, and hardware addresses applicable to the system.
 - 5. A complete set of system P & IDs.
 - 6. Wiring diagrams for all SCCs and MCCs.
 - 7. PLC I/O Listing.
- E. The second submittal shall include:
 - 1. Software.
 - 2. PLC programs and software.
 - 3. Control narratives.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provision of Section 01300–Submittals.
- B. Include spare parts data listing, source and current prices of replacement parts and supplies, and recommended maintenance procedures and intervals.
- C. Submit Operation and Maintenance Manuals in accordance with Division 1. The following additional information shall apply:
 - 1. Manuals shall contain, but not be limited to, the following:
 - a. System Hardware.
 - b. System Software.
 - 2. Hardware section shall include:
 - a. Safety precautions, physical description, functional description, operating procedures, theory of operation, maintenance instructions, checkout procedures, troubleshooting procedures, servicing, and removal and replacement procedures.
 - b. Wiring schematic and logic diagrams, parts list, and point-to-point wiring.
 - c. Listing of all hardware timers installed in MCCs and SCCs, as well as the ranges set on each timer. Listing shall also include actual timer setting after completion of startup.
 - 3. Software section shall include:
 - a. Software manual shall describe system techniques, general philosophies, list, and description of all standard software.
 - b. Program documentation (i.e., PLCs, radios, OIPs) shall include programs, documentation files, database and configuration as installed. Provide two copies of backup disks of this information. Passwords for all programmable devices

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(i.e., PLCs, radios, OIPs) shall be turned over to OWNER at the time of final completion.

1.06 DELIVERY, STORAGE, AND HOLDING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to SCC components, enclosure, and finish.

1.07 DESCRIPTION OF THE NOLIN RIVER SEWER INFRASTRUCTURE

- A. This project includes providing new sewer infrastructure in the Nolin River Watershed and providing four pumping stations.
- B. System Supplier shall be responsible for the development of all process control functions based on the algorithms described in this specification. Many systems encompass several algorithms for system components.
- C. Included as part of the project shall be the monitoring of three sewage lift stations and a parshall flume via radio telemetry as specified herein. CONTRACTOR shall be responsible for reviewing each site and include in price bid all services, equipment, and devices required to provide the monitoring and control functions described herein and shown in Section 16990–SCADA System I/O Listing.
- D. All process equipment shall be monitored and alarmed as described herein and listed in the I/O tables shown in Section 16990–SCADA System I/O Listing. All analog and process equipment shall be monitored, totalized, indicated, recorded, and stored for reports and historical data.
- E. The individual station SCCs and the listing of control and monitoring functions are shown in the I/O Listing in Section 16990–SCADA System I/O Listing. With the exception of the items listed as existing, all equipment shall be provided in this Contract.

1.08 CONTRACTOR AND SYSTEM SUPPLIER GENERAL REQUIREMENTS

- A. This specification, along with the Contract drawings, defines the requirements of a PLC-based process monitoring and control system. System Supplier shall construct a process monitoring and control system specifically for the demanding requirements of a real-time municipal wastewater pump station.
- B. It is the intent of this specification to define a fully integrated open-type process monitoring and control system, factory-tested, delivered to the site, ready to function upon connection of power source and field instrument wiring. Components, peripherals, interconnections, cabling, power supplies, software, and services necessary to form a complete, integrated system shall be identified and provided by CONTRACTOR. CONTRACTOR shall be responsible for reviewing the wiring diagrams and control sequences for equipment provided under other divisions of these specifications and coordinating all interface requirements. CONTRACTOR shall submit to ENGINEER, in writing, any deficiencies noted during this

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review. Any changes required by CONTRACTOR because of failure to complete this review shall be the responsibility of CONTRACTOR, at no increase in cost to OWNER.

- C. CONTRACTOR shall be responsible for complete coordination in providing all equipment, sensors, and meters supplied with input and output signals, and contacts that are compatible with the systems as specified herein. CONTRACTOR shall also be responsible for complete coordination with manufacturers of other systems specified in other divisions of these specifications with which an interface is required. The Contract drawings and I/O Listing are symbolic representatives of the required work. It is not intended that the drawings show all appurtenances. CONTRACTOR shall provide a complete and working system according to the true intent and meaning of the drawings, specifications, and standard industry practices.
- D. To promote a complete and totally integrated system, a single manufacturer who has experience in furnishing similar networked PLC-based monitoring and control systems of the same complexity and size for municipal wastewater facilities shall provide specified equipment and services. The system proposed to meet this specification shall be of field-proven design, incorporating manufacturer's standard equipment and software. Service of all peripheral devices shall be provided by the manufacturer of the process monitoring and control system.
- E. Section 16940 System Supplier shall coordinate all equipment specified within Specification Section 16480–Motor Control. Drawings for MCCs, combination starters, motor controllers, motor control equipment, and motor control panel, shall be provided by the Section 16940 System Supplier. Drawings from equipment manufacturer will not be accepted as shop drawings or O&M documents.
- F. Design and specification of devices and completed system shall conform to applicable portions of the latest edition of the National Electrical Code (NEC).
- G. Control panels shall bear a serialized UL label indicating that it is UL approved as an assembled unit. Panels that have individual components that are UL labeled, but do not have UL approval as an assembled unit are not acceptable.
- H. Training Program:
 - 1. Submit training plan including course syllabus, personnel who will be conducting the training, and schedule.
 - 2. Provide materials, instructors, and workbooks to complete the training.
 - 3. Training courses shall include:
 - a. Operator training. Course length minimum 8 hours. Training shall utilize equipment specified herein following installation and field testing. (Two 4-hour sessions shall be provided at the WWTP. Training sessions shall occur at a minimum of 2-week intervals.)
 - b. Maintenance training. Course length minimum 8 hours. Two 4-hour sessions shall be provided at the WWTP. Training sessions shall occur at a minimum of 2-week intervals.
 - 4. Manufacturer's training shall be directed to system and equipment operation, maintenance, troubleshooting, and equipment and system-related areas other than the process itself.
- I. System Supplier shall meet the following minimum requirements:

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1. System Supplier shall have a full-time staff of qualified programmers who are knowledgeable in the configuration of networked computer systems and the PLCs being provided.
 2. System Supplier shall have a minimum of one Microsoft-certified engineer.
 3. System Supplier shall have training capabilities and shall have conducted training courses in programming and maintenance.
 4. System Supplier shall have an adequate inventory of spare parts.
 5. System Supplier shall have a full-time staff of qualified service technicians.
 6. System Supplier shall be responsible for the programming and documentation of the system.
 7. System Supplier shall be responsible for all details that may be necessary to properly install, wire, adjust, and place in operation a complete and working system.
 8. System Supplier shall be responsible for all coordination between the system and the field devices, instrumentation equipment, motor control centers, and equipment furnished with other divisions of this specification. This shall include interface with existing equipment.
 9. System Supplier shall have a UL panel shop located inside the System Supplier's own facilities.
- J. All components shall be standard make acceptable to OWNER, with one manufacturer to provide all similar components. The Base Bid System Supplier shall be Delaney & Associates, Inc. (859) 342-4944, no equal.

1.09 FACTORY ACCEPTANCE TESTING, SYSTEM STARTUP, AND SUPPORT SERVICES

- A. Permit ENGINEER and OWNER to observe vendor's staging records or other quality assurance records relating to system(s) supplied. System Supplier shall assemble the system components as a complete process monitoring and control system and demonstrate that the system is operational before shipment from System Supplier factory to the job site. This testing shall be as an integrated assembly by simulating each of the specified I/O points and all specified algorithms. This test shall be witnessed by OWNER and ENGINEER (two personnel). System Supplier shall provide lodging, meals, and transportation for 1 day and 1 night as a minimum for this witness test in the Bid. All problems, errors, insufficiencies, and failures identified during testing shall be resolved before shipment. In the event the equipment does not operate in accordance with the specifications, programming of controllers/computers is incomplete, or setup of equipment is incomplete, there shall be deducted from payments due CONTRACTOR the amount of \$1,500 per day for ENGINEER's time plus travel and expenses, for all additional factory acceptance testing and office time spent by ENGINEER.
- B. On-Site Functional Acceptance Testing:
1. After all equipment has been installed and is placed in full-time operation or after all equipment associated with the group of equipment scheduled for on-site functional acceptance testing has been installed and placed in full-time operation, CONTRACTOR and System Supplier shall demonstrate that all equipment and controls operate in compliance with the Contract Documents. For each piece of equipment being tested, all systems associated with the operation of the equipment (e.g., controls, supply/discharge piping, etc.) shall be installed and be in full operating condition so that all equipment functions are able to be completely tested without delay using real-time process I/O.
 2. All control wiring, hardwired interlocks, control programming, etc., shall be checked out and functionally tested by System Supplier prior to ENGINEER's on-site functional

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- acceptance testing. All functional errors shall be corrected prior to ENGINEER's on-site functional acceptance testing.
3. Coordination Teleconferences:
 - a. CONTRACTOR shall schedule and conduct an initial functional acceptance testing coordination teleconference at least two months prior to the anticipated functional acceptance testing. Meeting shall include CONTRACTOR, System Supplier, Division 16 contractor, OWNER, and ENGINEER, and all other parties responsible for the equipment and controls scheduled for functional acceptance testing.
 - b. CONTRACTOR shall schedule and conduct additional functional acceptance testing coordination teleconferences one month prior to the date for functional acceptance testing of each group of equipment to confirm status of equipment installation and System Supplier checkouts, and updates to the functional acceptance testing schedule, after which ENGINEER will finalize reservations for travel and accommodations. All parties shall agree on a date for functional acceptance testing of the next group of equipment at this teleconference, or schedule an additional teleconference to establish a testing date one month prior to the delayed testing date. If the functional acceptance testing is rescheduled within one month of the agreed upon date, there will be deducted from payments due to CONTRACTOR the amount of penalties paid by ENGINEER for travel and accommodation cancellations. OWNER will deduct the amount of these charges from payments made to CONTRACTOR.
 - c. CONTRACTOR shall provide the following information in written form at each meeting and teleconference. All information shall be updated prior to each meeting and teleconference.
 - (1) Equipment installation and manufacturer's startup schedule.
 - (2) Status of all power and control system wiring for the equipment scheduled for functional acceptance testing.
 - (3) Schedule and status of System Supplier's on-site checkout and functional testing.
 - (4) Anticipated delays and the cause of each delay.
 - (5) Conflicts with OWNER's operation of the facility.
 - (6) Proposed dates for acceptance testing of all equipment and controls.
 - (7) Proposed dates for future acceptance testing coordination teleconferences.
 4. After being notified by CONTRACTOR that the equipment has been installed and is in full operating condition and ready for ENGINEER's functional acceptance testing, ENGINEER will make one 3-day trip to check operation. CONTRACTOR and System Supplier shall be on-site during testing to adjust equipment, correct erroneous wiring, and make modifications to control system, as necessary. If the equipment and controls do not operate according to the Contract Documents, or if CONTRACTOR and System Supplier are not present during the scheduled testing, there will be deducted from payments due to CONTRACTOR the amount of \$1,500 a day for ENGINEER's time plus travel and expenses, and for all additional field and office time spent by ENGINEER checking equipment. OWNER will deduct the amount of these charges from payments made to CONTRACTOR.
 5. System Supplier shall provide functional acceptance testing support through one or more on-site field service engineers and the project control system programmer. Time for the on-site field service engineers and programmer scheduled for functional acceptance testing shall be dedicated to the functional acceptance testing process and shall not be interrupted for other construction-related activities.
- C. Final acceptance and payment will not be made until the system has operated satisfactorily for a minimum of 30 consecutive days. CONTRACTOR shall include in Bid field follow-up to

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ensure proper adjustments and operation during the first year following project final completion. Prior to beginning the 30-day test, the following criteria shall be met:

1. Satisfactory operation of I/O control loops.
2. Satisfactory operation of software.
3. Satisfactory operation of control program.
4. Satisfactory operation of peripheral equipment.
5. The necessary debugging programs have been performed.
6. Data output is reliable.
7. Control loops are operational.
8. Checking and calibrating of systems have been completed.
9. Reports are operational and give correct data.

- D. CONTRACTOR, through System Supplier, shall provide the following support services:
1. Field Service Engineer: Field service engineer shall be responsible for programming of system PLCs in the factory and at the site. Field service engineer shall be present at the factory acceptance test and be present for startup of all systems and available throughout the entire construction process until final completion. Service technicians sent for system startup will not be acceptable. Support shall include on-site time. Services shall include, but not be limited to:
 - a. Commissioning, installation, startup, and testing of equipment.
 - b. Revising or rewriting manuals to incorporate an installed and accepted system.
 - c. On-site training.
 - d. Software modifications.
 2. In-factory support shall include consultation following the acceptance testing and shipment. Services shall include, but not be limited to:
 - a. Researching and answering questions related to the system operation, documentation, and system use and functions.
 - b. Program modifications.
 - c. Revising or rewriting manuals.
 3. Post-startup support shall include follow-up services during the 1-year period following final acceptance. Service shall include follow-up recalibration and replacement of defective equipment, as well as additional training, software modifications, and control configurations as requested by OWNER. This shall include 40 hours for work on-site other than warranty repair or replacement of defective equipment. This time shall be used for software enhancements and modifications to improve the operation of the system. It shall be assumed that these 40 hours include two trips to the site.

1.10 EQUIPMENT ENCLOSURES

- A. New enclosures shall be front access only, minimum No. 12 gauge steel, and hinged doors, rotating lockable handle, 3-point latch on each supervisory equipment compartment door (not screws or bolts), with top and bottom bolts actuated by one rotating handle on large doors. Provide door stop kit for all panel doors, data pockets for wiring diagrams, and minimum 18-inch, bolt-on, LED light and door switch. Panels over 48 inches wide shall have two lights. Painting shall include phosphate treatment, zinc chromate iron oxide primer, baked rust-inhibiting enamel, gray interior, and OWNER-selected exterior color. All doors and panels shall be gasketed. All louvers shall be filtered with forced-air cooling as necessary by the supplier for conditions where installed. New enclosures shall be a minimum of 24 inches wide, 20 inches deep, and 90 inches high and shall be as manufactured by Hoffman or Saginaw. MCC structures are not acceptable. Where installed next to motor control centers, enclosure painting shall match that of the MCC.

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- B. Indicating devices shall be at eye level, minimum 48 inches, maximum 60 inches, from floor to bottom of device.
- C. Plastic wiring troughs shall have removable covers. Maximum fill for wiring troughs shall be 60%. All wiring in supervisory enclosures and control panels not in wiring troughs shall be bound with continuous-type spiral windings. Terminal strips located adjacent to wiring troughs shall have a minimum of 1 1/2 inches between terminal strip and wiring trough. All wiring labels shall be able to be read without removing wiring trough covers.
- D. Tubing and instruments containing water shall be in separate compartments located and constructed so that leakage or spray at 100 psi pressure cannot touch electrical conductors or devices. Leakage shall be conducted to the floor in duct or pipe.
- E. All wiring for new panels shall be done in the factory, Class II, Type C with master terminal strips for exterior connections. Terminal strips shall be located either at the bottom or on the side of the enclosure, depending on where the I/O conduits penetrate the enclosure. Wiring troughs shall be provided for all field wiring. Splices are not allowed within enclosures or wireways. All enclosures must pass through doors to point of installation, and if enclosures are shipped in sections, all wiring and connections between sections shall be done by CONTRACTOR. All wiring shall be labeled at each end with corresponding numbers. This numbering shall be shown on the shop and record drawings.
- F. All door-mounted devices shall be furnished flush-mounted, and an exterior-engraved phenolic nameplate worded by OWNER (upon receipt of shop drawings) shall be provided for each compartment, device, and light. All components within the enclosures shall be identified with interior-mounted engraved labels. Labels shall be installed on the enclosure back panel and not on the device or wireway. Devices shall be grouped for each device or unit being controlled.
- G. All panels with DIN rail-mounted equipment shall include a minimum of 25% spare DIN rail space.
- H. In addition to spare I/O specified herein, provide a minimum of 25% spare hot and neutral terminals wired to terminal strips. Spares shall be provided for all voltage sources within the panel (e.g., 120 V, 24 V).
- I. Enclosures that include motor controllers shall have a main disconnect for the enclosure.

1.11 COMMON REQUIREMENTS ALL EQUIPMENT

- A. All indicating and recording devices shall be electric or electronic.
- B. All indicating and control devices mounted on control panel and MCC enclosure doors (e.g., meters, gauges, electronic indicators, pilot lights, selector switches, OIPs, etc.) shall be located at eye level, minimum 48 inches, maximum 60 inches, from floor to bottom of device. Indicating devices on MCC enclosure doors located in the bottom half of an MCC section shall be mounted as high as possible.
- C. All motor control power shall be 120 volts with suitable circuit protection (fuses or breakers). Fuse holders shall be provided with integral LEDs to indicate when the fuse is blown.

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- D. Devices powered at 120 volts from supervisory control panels shall be fused. This shall include, but not be limited to transducers.
- E. Provide lightning protection, isolation transformers, and fused disconnects at each end of each power circuit, supervisory circuit, and local supervisory circuit with transformers and relays, if necessary, to obtain supervisory power. 120-volt power shall be available at all control points. Lightning protection shall be completely solid-state and self-healing and shall not require the use of fuses. Provide a single switch with an indicating light to deenergize the control power for each location. Each panel shall have a GFI, duplex, 20 ampere, 120-volt receptacle.
- F. If enclosure and panel space is needed for future installation of devices and lights, the enclosure and panel shall be constructed for such installation. Supports shall be provided for future equipment, and panel openings shall be made and covered with neat cover plates matching the panel.
- G. Where equipment is necessary to perform a function as called for in one part of this specification, it shall be provided, even though the detailed enumeration at various control points may omit listing that equipment.
- H. Where a certain accuracy of sensing and transmitting levels or flows and controlling operations are called for, means must be provided to read or determine that the levels or flows are within the limits or accuracy specified of the sensing, transmitting, and controlling devices. Where no accuracy is specified, but a knowledge of levels is necessary to set operating points, an indicating device of accuracy consistent with the operation of the system is required.
- I. All control and auxiliary relays shall have indicating LEDs. All timing relays shall have On and timing Out LEDs.

1.12 GENERAL CONTROL ALGORITHMS

- A. In general, the following is a definition of I/O at each MCC:
 - 1. Run from MCC or auxiliary starter contact (dry contact).
 - 2. Fail from MCC or starter auxiliary O.L. contact (dry contact).
 - 3. Command Run Maintained start or as required (dry contact).
 - 4. Hand-Auto from MCC or Controller Selector Switch (dry contact), feedback to SCADA.
 - 5. Any command to operate shall be acted upon within 5 seconds, and any status feedback signals shall be received within 5 seconds.
- B. Programming algorithms described herein and in Part 3–Execution shall reside within the PLC associated with that equipment and not in the master PLC. Polling sequences shall be set-up to poll remote data based on the data type (e.g., alarms, historical) so that data transmission rates are not adversely affected.
- C. All alarm contacts or system changes following a command must exist or not change for 0 to 5 seconds to activate the SCADA to the alarm state.
- D. All analog and digital inputs shall be monitored and totalized in the PLC. This shall include, but not be limited to levels. The following analog signals shall have minimum, maximum, and running average calculated values: levels. Instantaneous values, totals, maximum, minimum, and average values shall be read by the OIP and master SCADA system and be

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reset on a daily basis as described below. Minimum, maximum, and average values shall be stored in the PLC for the current day and previous day.

- E. PLCs shall calculate equipment runtimes and number of starts for all equipment where run signals are monitored. Runtimes and number of starts shall be read by the OIP and master SCADA system and be reset on a daily basis as described below.
- F. Equipment runtimes as described above shall be stored in the PLC for a period of 7 days. This data shall be available for use by the master SCADA system for importing into a reporting software package for purposes of daily, weekly, and monthly reporting. The PLC shall indicate the specific date for each of the 7 previous days.
- G. Runtimes, number of starts, and number of cycles as described above shall be reset on a daily basis. This reset shall occur based on a time (hour and minute) setpoint stored in the PLC through the master SCADA system. The operator shall set the time when the daily reset will occur. Once this time setpoint matches the current time of the processor clock, the Master PLC shall send a reset signal to all remote PLCs to clear any totals that have accumulated locally.
- H. In addition to the totalizers described above, the PLC shall also calculate cumulative totals for all runtimes and number of starts. Maximum, minimum, and running average for all analog inputs shall also be included as part of the cumulative total algorithm. Cumulative totals shall totalize until manually reset by the operator. There shall be a manual reset for each signal. The PLC shall display the date of the last cumulative totalizer reset for each signal.
- I. System Supplier shall provide addressing for all hardcoded time delays and PLC settings that are not operator adjustable. This shall include, but not be limited to, time delays for float switches, call-to-run fails, level alarms, and data fail alarms. Indication of time remaining for all timers (hardcoded and operator adjustable) within PLCs shall be made available for indication at the OIP and master SCADA System.
- J. Float switches shall include time delays to prevent intermittent starting and stopping and/or alarming because of bouncing floats.
- K. System Supplier shall provide addressing for all PLC fault codes so that the error number and associated description can be displayed at the SCADA System.
- L. All analog signals shall be scaled to engineering units in the PLC with implied decimal to allow storage in integer registers. System Supplier shall provide all analog ranges, PLC register values, and associated scaling factors to ENGINEER for use with the master SCADA system. This shall include upper and lower limits of PLC registers (i.e., -32768 to 32767 or 0 to 65535), as well as upper and lower limits for the associated device (i.e., 0 to 150 psi). Analog values specified to be displayed with decimal points shall be scaled by the master SCADA system.
- M. For all level sensing devices, provide a Transducer Fail alarm at the SCADA System for each transducer. Transducer fail shall be defined as the signal from the transducer being out of range.
- N. Provide "Out of Service" indication for each piece of equipment when that equipment's MCC H-O-A is not in the Auto position.

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- O. All analog signals shall have associated high and low setpoints and alarms.
- P. PLCs shall be set up so that the ranges of all analog input signals to the PLC I/O cards can be configured from the OIP and master SCADA system. Provide two operator-adjustable setpoints for each analog input, one corresponding to 4 mA and the other corresponding to 20 mA. These setpoints are applicable to devices attached to the master and remote PLCs. This feature is intended to be used for startup and calibration purposes.
- Q. All equipment controlled automatically from the SCADA System shall have “Call-to-Run” signals generated from their associated PLCs. These signals shall be displayed at the SCADA System. Each associated PLC shall also generate a Call-to-Run Fail if the equipment is called-to-run but does not start within a specific time period. Call-to-run signals may be generated by the master or remote PLC as determined by System Supplier. The Call-to-Run signal shall be generated within the PLC software and may not be combined with other fail signals such as hardwired motor fails, and overtemperature.
- R. In cases where the automatic alternation of equipment is provided by the PLC, indication of the lead, lag, and lag-lag pumps (where applicable) shall be provided and displayed at the SCADA System.
- S. All controlled equipment as described herein shall have the capability of manual control from the OIP and master SCADA system through the manipulation of analog or digital variables. This shall be through the use of a “SCADA H-O-A” switch or by forcing a single I/O point as a manual start command. All analog and digital outputs shall be capable of being manually set from the OIP and master SCADA system.
- T. Where a manual reset is required at the SCADA System (i.e., level lockout, pressure lockout), the OIP and master SCADA system shall be configured to set a discrete reset bit. Once the PLC receives the bit and the alarm condition has cleared, the PLC shall clear the alarm and place the associated equipment back in service.
- U. The SCADA System shall allow the operator to change all setpoints and operating parameters within the PLCs as described herein. All control algorithms and alarms for equipment shall be programmed in the associated PLC and not in the master. There shall be no control algorithms or alarms in the computers. Control of each piece of equipment shall be accomplished as described herein and in Part 3–Execution of this section.
- V. The master PLC shall monitor the status of each remote PLC and remote I/O rack, and an alarm shall be generated at the SCADA System if communication is not received from the remote PLC within an operator-adjustable time period.
- W. Radios installed in telemetry panels (master and remote) shall be powered through a normally closed control power relay contact. If the PLC detects a communication fail, the PLC shall energize the control power relay that will deenergize power to the radio. The relay shall be energized for 5 seconds and then deenergized. Communication fail time delays shall be adjusted during startup based on the quantity of telemetry panels.
- X. Battery status of each master and remote PLC shall be monitored by the SCADA System. In the event of a low battery condition, an alarm shall be generated at the SCADA System.

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- Y. The SCADA System shall provide logged data of both alarm and utilization functions for the system. This data shall be capable of being printed out based on demand, hourly use, or 24-hour periods as desired by the operator. The system shall store this 24-hour data for periods of up to 1 year giving on-demand or as-required monthly reports.

1.13 SPARE PARTS

- A. System Supplier shall furnish spare parts for equipment specified herein as listed in Section 16951–Spare Parts.

1.14 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from the earlier of either the date established for partial utilization in accordance with GC14.04 and 14.05, as modified in the Supplementary Conditions, or Substantial Completion of the project.

PART 2–PRODUCTS

2.01 INDUSTRIAL CONTROL AND POWER RELAYS

- A. Industrial control and power relays shall be installed in supervisory control centers, motor control centers, industrial control panels, and where required by System Supplier. Relays used to interface with PLC I/O shall be terminal style, interposing/isolation relays. Relays for motor control circuits, hardwired control logic, and for loads less than 10 amps shall be general purpose, industrial, square base relays. Relays for lighting circuits and small motor loads shall be industrial, electrically held power relays.
- B. Relays shall meet the following requirements:
 - 1. Interposing/isolation relays:
 - a. Configuration: SPDT or DPDT as required by System Supplier.
 - b. Mounting: DIN rail with screw terminal base socket.
 - c. Voltage: 120 Vac, or as required by System Supplier.
 - d. Contact rating: 8 A (DPDT), 16 A (SPDT).
 - e. Operating life: 10 million cycles.
 - f. Status: On-Off flag-type or LED indicator.
 - g. UL listed.
 - h. Manufacturer: Allen-Bradley, 700-HK, or equal.
 - 2. General purpose relays:
 - a. Configuration: DPDT or 3PDT as required by System Supplier.
 - b. Mounting: DIN rail with screw terminal base socket.
 - c. Voltage: 120 Vac.
 - d. Contact rating: 15 A, minimum; 3/4 hp.
 - e. Operating life: 10 million cycles.
 - f. Status: On-Off flag-type or LED indicator.
 - g. UL listed.
 - h. Manufacturer: Allen-Bradley, 700-HB, or equal.
 - 3. Power relays:
 - a. Configuration: Electrically held, 2-12 poles.
 - b. Mounting: DIN rail, square base.
 - c. Voltage: 120 Vac.

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- d. Contact rating: 20 A continuous; 1 hp.
 - e. Operating life: 10 million cycles.
 - f. UL listed.
 - g. NEMA rated.
 - h. Manufacturer: Allen-Bradley, 700-PK, or equal.
4. Duplex Alternation Relay.
- a. Configuration: DPDT or DPDT cross wired.
 - b. Mounting: DIN rail with screw terminal base socket.
 - c. Voltage: 120 Vac.
 - d. Contact Rating: 10 A, minimum; 1/8 hp.
 - e. Operating Life: 10 million mechanical operations and 100,000 electrical operations.
 - f. Status: Output position indicating LEDs.
 - g. Control: Three-position toggle switch permitting selection of normal duplexing action, locking in the A-B sequence, or locking in the B-A sequence. Alternation shall be able to be toggled every time a 120 Vac control signal is removed.
 - h. Manufacturer: Diversified Electronics, ARA, or equal.

2.02 PLC TELEMETRY SYSTEMS

- A. PLCs, Operator Interface Panel (OIP), network switches, radios, and antennas shall be provided by System Supplier to match OWNER's existing equipment. Provide expansion I/O modules as required to accommodate all signals listed in Section 16990-SCADA System I/O Listing.
- B. Provide a 120-volt AC true on-line UPS backup in each SCC that will provide continuous communication between all SCCs for at least 30 minutes following a power failure.
 - 1. UPS power shall be provided, at a minimum, to the following equipment:
 - a. PLCs and I/O cards, controllers, and OIPs.
 - b. Radios, network switches, signal converters, and other communication devices.
 - c. Power fail and communication indicating lights and alarm devices.
 - d. Power supplies for loop-powered instruments.
 - e. Intrinsic safety barriers.
 - 2. The UPS shall be plug connected inside the SCC with a dedicated receptacle and overcurrent protection device. All UPS-powered devices shall be continuously powered through the UPS under normal operating conditions. Provide relays to automatically bypass the UPS when the UPS output rises 110% above or falls 80% below the normal supply voltage, or when the UPS is deenergized (e.g., line-side plug disconnected, upstream overcurrent device opened, etc.).
 - 3. Each UPS shall be provided with a relay card that provides a dry contact output to the SCADA system in the event that the UPS batteries need replacement.
 - 4. UPS shall be APC with relay I/O module, Liebert GXT4 with relay card, or Eaton 9130. Provide a stand or shelf within each SCC panel for the UPS so that the UPS does not sit on the bottom of the enclosure.

2.03 FLOAT SWITCHES

- A. Float switches when specified herein, shown on the drawings, or necessary to complete an operating system shall be as follows:
 - 1. The float switches shall be mercury free and consist of a 304 stainless steel housing 5 1/2-inch diameter, stainless steel mounting clamp, a flexible two-conductor cable with a CPE jacket, and a potted SPST magnetic reed switch. Provide switch configuration (NO or NC) as required. The electrical load for the switch contacts shall be 100 VA at

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up to 250 volts. Float switches shall include a two-conductor cable 16 AWG with fine strands made for heavy flexing service and underwater use. Cable length shall be 50 feet minimum for a continuous run to the terminating control panel. A green grounding wire shall connect internally to the float housing. Floats shall be Siemens Model 9G-EF, Anchor Scientific Model SSTNM, or equal.

2. Weight and buoyancy shall be such that contaminants will not result in the float switch changing operating level more than 1-inch.
3. Operating temperature range shall be -31° to 194°F.

B. Floats shall be mounted on a stainless steel cable with PVC-covered anchor according to manufacturer's instructions. All mounting hardware shall be stainless steel and provided with the floats.

C. Provide stainless steel kellum grips for each float cable.

D. All floats indicated on the drawings or specified herein to be intrinsically safe in design shall be as such. Provide intrinsically safe barriers as specified herein.

2.04 THERMOSTATS

A. Thermostats associated with the SCADA System as specified in Section 16990–SCADA System I/O Listing shall be provided by System Supplier as specified in Section 16141–Wiring Devices. Thermostats not specified in Section 16990–SCADA System I/O Listing shall be provided as part of Section 16141–Wiring Devices.

2.05 TVSS DEVICES FOR CONTROL PANELS AND INSTRUMENTATION EQUIPMENT

A. The incoming power supply of each supervisory control center shall be protected with a transient voltage surge suppression (TVSS) device. TVSS unit shall be as manufactured by Citel Model DS4xS, or equal. Surge protection shall be provided for all phases and neutral.

B. Each analog signal entering or leaving a supervisory control panel and leaving a building shall be provided with a DIN-rail mounted surge protection device as manufactured by Citel, Model DLA-24D3, or equal. Each transmitter shall be provided with a surge protection device as manufactured by Citel Model TSP15M, or equal, on the output and Citel Model DS4xS, or equal, on the power supply. Surge protection shall be provided for all phases and neutral.

2.06 INTRINSIC SAFETY BARRIERS

A. Instrumentation equipment located in hazardous areas as noted on the drawings shall be wired to intrinsic safety barriers. Safety barriers for discrete devices shall include indicating LED and be DIN-rail mounted, as manufactured by Phoenix Contact, Model MACX MCR-EX-SL-2NAM, (voltage as required), PR Electronics, Model 5202B2, or equal. Safety barriers for analog devices shall be DIN-rail mounted, as manufactured by Phoenix, Model MACX MCR-EX-SL-RPSSI, PR Electronics, Model 5104B, or equal.

2.07 SUBMERSIBLE LEVEL TRANSMITTERS

A. Where indicated on the drawings, levels shall be sensed by a submersible pressure transmitter. The transmitter shall be a Siemens Bulletin A1000i, KPSI Model 750, or equal, loop powered submersible pressure transmitter, with an intrinsically safe wiring barrier. The transmitter shall be of the head-pressure sensing type, suitable for continuous submergence

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and operation and shall be installed in accordance with manufacturer's instructions. The bottom diaphragm face of the sensor shall be installed 6 inches above the floor. The sensor shall be mounted using a self supporting cable system; location shall be determined in the field. Cable shall be vented, reinforced, and rated for full weight of transmitter. A separate support cable or anchor shall not be required. Provide stainless steel Kellum grip at suspension point, Hubbel, or equal.

- B. If necessary for the installation/application, transmitter shall include a terminal connection box Siemens part no. 6012910002, or KPSI part no. 845. Moisture protection shall be provided for all units through an aneroid bellows.
- C. The transducer shall sense water level (pressure) variations and transform these variations directly into a standard process signal of 4-20 mA over the desired level range (span). The transducer shall be completely solid-state, with no mechanical linkages or moving parts. Supply voltage shall be as required by CONTRACTOR. Accuracy shall be $\pm 0.25\%$ of full scale. Transmitter shall be backed by a minimum 2 year warranty.
- D. The transducer shall incorporate a variable-capacitance transducer element to convert the sensed pressure to a corresponding electrical value. The sensed media shall exert its pressure against a Teflon coated Buna-N or elastomeric diaphragm that flexes minutely so as to vary its proximity to a ceramic substrate to vary the capacitance of an electrical field created between the two surfaces. A stable, hybrid, operational amplifier assembly shall be incorporated in the transducer to excite and demodulate the sensing mechanism. The transducer shall incorporate laser-trimmed, temperature compensation and high quality components and construction to provide a precise, reliable, stable output signal directly proportional to the sensed pressure over a factory-calibrated range. Operating pressure range of the transducer shall be approximately 0 to 15 psig.

2.08 ALARM DEVICES

- A. Provide LED, red, UL listed, NEMA 4X, 120 Vac beacon light, model 105XBRMR 120A, as manufactured by Edwards Signaling, or equal. Provide model 105BX outlet box attachment and 105BM mounting bracket as manufactured by Edwards Signaling, or equal, for wall mounting light.
- B. Provide minimum 100dB at 10 feet, cast aluminum/epoxy-counted corrosion-resistant housing, stainless steel diaphragm horn, model 876-N5, as manufactured by Edwards Signaling, or equal.

2.09 OPEN CHANNEL FLOW TRANSMITTERS

- A. Open channel flow transmitters shall utilize an ultrasonic, noncontacting method to measure flow through the flume with an accuracy of $\pm 0.25\%$ of measurement. Flow calculation shall be selectable from a "standard" exponent for the given open channel type, but it shall allow field entry of user-selected exponents. A 4-digit local display shall allow operator-selected display of flow rate, level, and 8-digit totalized flow. Flow rate shall be field-programmed for units of flow, gpm, mgd, etc. All adjustments shall be by digital values in EEPROM, providing memory storage through power failures without requiring battery backup. Totalized flow shall be stored to EEPROM to minimize lost data during a power outage. Field adjustments shall include zero, span, blanking, dampening, low flow totalization suppression, and sampler or totalizer pulse output. Programming shall be performed by a removable, portable keypad module maintaining NEMA 4 enclosure integrity during programming or when removed from

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the enclosure. Output shall be isolated 4-20 mAdc into a 750-ohm load and a pulse output proportional to totalized flow.

- B. Transducers in Class I locations shall be FM approved as being suitable for Class I, Division 1, Groups A, B, C, and D locations and shall have an operating range of -4°F to 200°F.
- C. The transducer radiating surface shall be self-cleaning and shall operate without problems in moisture, dust, and frost. It shall be suited for continuous submergence, with the interconnecting cable splice made above flood level. The transducer shall be designed to amplify acoustic output 54 times over normal outputs. Transducer beam angle shall be 6 degrees. CONTRACTOR shall coordinate transducer mounting height with maximum water level to be monitored.
- D. The interconnecting cable between transducer and the amplifier shall be provided with the instrument, limited to 1,200 feet, and be run in a conduit separate from other wires or cables. The transducers shall be temperature compensated through an integral temperature sensor. Provide a 120 Vac power source for the amplifier.
- E. The amplifier enclosure shall house the amplifier and digital indicator in a NEMA 4 enclosure suitable for indoor or outdoor installation. For all transmitters located outdoors, transmitter shall be installed in a fiberglass hinged-cover NEMA 4X enclosure with window and quick-opening hasps. Enclosure shall include TVSS devices specified herein, anti-condensation heater, Hoffman DAH Series, or equal, with temperature control switch model ATEM. Provide sun shield for all transmitters located outdoors.
- F. The open channel flow transmitter shall be Siemens, Hydro Ranger, or equal.

PART 3-EXECUTION

3.01 MOTOR CONTROL CENTERS - INDUSTRIAL PARK PUMP STATION NO. 1 (MCC-1) & ROSE RUN PUMP STATION (MCC-4)

- A. Raw Wastewater Pumps (P-01 and P-02):
 - 1. H-O-A Selector Switch:
 - a. With the H-O-A selector switch in the "Hand" position, the motor shall start and run continuously, bypassing all controls unless otherwise noted. Hand position shall be hardwired and not through the PLC. The pump shall be allowed to pump down below the "Low Water Level" float switch in the "Hand" position.
 - b. With the H-O-A selector switch in the "Off" position, the motor shall be inoperable.
 - c. With the H-O-A selector switch in the "Auto" position, the motor shall be controlled as described under SCC-General below.
 - 2. Motor has internal thermal overloads that shall shut down the motor in the event of overtemperature (Hand and Auto modes). Manual reset at the unit shall be required to restart motor. Internal thermal overloads shall be wired such that momentary power interruptions do not shut down the motor. Motor also has internal moisture detection that shall be for indication at the MCC and SCADA system. This shall not shutdown the motor. There is a 120VAC control module (Mini-CAS) furnished as specified in Division 11 for thermal and moisture detection which shall be installed in the MCC starter bucket by CONTRACTOR.

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3. Float switches (5 total) shall be hardwired to the motor control circuit via an intrinsic safety barrier in control panel.
4. Motor disconnect has an auxiliary contact that shall be wired to the MCC such that control power is disconnected when the disconnect is in the "Off" position.
5. All of the above controls shall be hardwired and not through the PLC. CONTRACTOR shall provide the equipment manufacturer with a copy of the wiring diagrams for control of this unit for their review and approval.

3.02 MASTER SITE

- A. The existing SCADA software at the master site is Micro-Comm SCADAview CSX. This software includes a web server to remotely access system information and an alarm dialer feature for existing lift station sites. Provide all necessary I/O expansion modules at the master PLC (Micro-Comm Model 1650) and polling modifications, HMI modifications, and programming as required to integrate the new sites into the existing master site SCADA software and alarm dialer.

3.03 SUPERVISORY CONTROL CENTER-GENERAL

- A. All control algorithms and alarms described herein shall be programmed into the PLC. Refer to the I/O listing for all required I/O that shall interface with the SCC. Provide space in new control panels for I/O expansion modules as required to accommodate all signals noted as "future" in the I/O listing.
- B. UPS's installed in all control panels shall be provided as specified herein with a relay I/O module that provides a dry contact output to the PLC in the event that the UPS batteries need replacement. Indication of "Replace UPS Battery" shall be provided at the SCADA system.
- C. Control descriptions described herein are specific in nature to equipment associated with the SCCs. CONTRACTOR shall refer to Section 1.12-General Control Algorithms for additional programming requirements. Control descriptions herein shall reside in the local PLC and not in the master.
- D. In the event of a power failure, when power is restored the PLC shall automatically stagger the restart of any controlled equipment that is being called to run by the PLC. The stagger time shall be HMI adjustable from 0 to 600 seconds.
- E. Provide a new power fail relay in each SCC that shall be used for control power fail alarm as well as indication that operation is from the UPS. Provide a white, 30 mm, push-to-test indicating light on the front of the enclosure to indicate that power is being supplied by the UPS. Control power fail wiring shall be hard-wired and not through the PLC.
- F. Provide new Supervisory Control Centers (SCCs) at Industrial Park Pump Station No. 1, Rose Run Pump Station, and Elizabethtown WWTP Parshall Flume. Control panels shall include PLCs, radios, antennas, power supplies, and all required cabling between control panel components and SCADA equipment in the SCCs. The new SCCs shall be located in the Control Building of each pump station or where shown on the drawings. The new SCCs enclosures shall be sized as required by the System Supplier for the equipment being furnished. Refer to the I/O listing for all required I/O that shall interface with the SCC.
- G. At Industrial Park Pump Station No. 3, provide PLCs, radios, antennas, power supplies, and all required cabling between control panel components and SCADA in the new motor control

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panel as specified in Section 16480–Motor Control. Coordinate with 16480–Motor Control Supplier.

- H. System Supplier shall design the radio telemetry system for at least 99.9% reliability. System Supplier shall include in their bid an on-site radio path survey for all four sites. Radio path survey results shall include acceptable fade margins for all communication paths. Submit two copies of survey to ENGINEER for approval.
- I. A HMI shall be provided on the front of each control panel to interface with the PLC. The HMI shall allow the operator to enter all control and alarm setpoints in the PLC and provide indication of all analog signals.
- J. The “Station Common Alarm” signals noted in the I/O list shall consist of the following alarm points at each lift station: Pump Failed, Motor Overtemp, Seal Fail from Wetwell Pump No. 1 and Wetwell Pump No. 2, Wetwell High Level, Wetwell Low Level, and Three Phase Power Fail. Provide relay logic within SCC for a hardwired “Station Common Alarm” digital input. Input shall not be generated via PLC logic.
- K. The SCADA system station common alarm light and alarm horn at the entrance to the pump station Control Building shall be controlled from the SCC as follows:
 - 1. The common alarm light and horn shall be energized when the “Station Common Alarm” signal from the PLC is active.
 - 2. The common alarm light and horn shall be powered from the SCC. Power to the common alarm light and horn shall be fused.
 - 3. Provide a “Silence” pushbutton on the door of the SCC for the alarm horn. Alarm light shall remain activated until the alarm condition clears.
 - 4. All of the above controls shall be hardwired for fail-safe operation and not through the PLC.
- L. The Raw Wastewater Pumps (P-01 and P-02) shall each be controlled from the associated PLC with a SCADA Hand-Off-Auto selector switch as follows:
 - 1. In SCADA “Hand”, the pump shall start and run continuously bypassing all controls unless noted otherwise.
 - 2. In SCADA “Auto”, the pumps shall be controlled based on the level in the associated wet well (LIT-01/LIT-02) and from the backup floats as described below.
 - a. The operator shall be able to select either a fixed pump sequence or auto alternation of the two pumps. In the fixed mode, the operator shall be able to select one of the two pumps to be the lead pump with the unselected pump automatically becoming the lag pump. In the automatic alternation mode, the pump sequence selected in the fixed mode shall be used for the first run cycle, but the pumps shall alternate after each run cycle of the lead pump thereafter. In the event that a pump has failed or is out of service (H-O-A switch at MCC or SCADA not in Auto) the lag pump shall be rotated into lead position.
 - b. There shall be operator-adjustable “Lead Pump Start”, “Lag Pump Start”, and “Common Pumps Off” level setpoints for control of the pumps.
 - c. As the level in the wet well rises above the “Lead Pump Start” setpoint, the lead pump shall start and run. If the level in the wet well continues to rise above the “Lag Pump Start” setpoint, the lag pump shall start and run. Both pumps shall be shut down when the wet well level falls below the “Common Pumps Off” setpoint.
 - d. Provide operator-adjustable high and low level alarm setpoints within this PLC based on the signal from the level transducer.

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3. There shall be a three-position selector switch (Transducer - (blank center position) - Backup Floats) on the front door of this SCC to allow the operator to select either the level transducer or the backup floats for control of the pumps. Both the "Transducer" and "Backup Floats" positions shall be spring-return to the center position. In the "Transducer" mode, the pumps shall be controlled as described above. In the "Backup Floats" mode, the pumps shall be controlled as described below. Provide an amber pilot light on the front of this SCC to indicate that the system is in the "Backup Floats" mode. The selector switch and amber pilot light shall be hardwired and not through the PLC. In addition to using the selector switch, the "Transducer" and "Backup Floats" level control modes shall both be able to be manually set at the SCADA System.
 - a. The backup floats shall be enabled from the selector switch described above, when the level transducer fails, when the low water level float is activated, or when the high level float is activated. A "Backup Floats Mode Active" pilot light on the front of this SCC shall be energized and an alarm shall be activated at the SCADA System to indicate that the system is in the "backup floats" mode. Once the Backup Floats system has been activated, the pumps shall continue to be operated from the backup floats until the system is manually reset by the operator using a reset pushbutton on the front door of this SCC. The system shall also be able to be reset from the SCADA System.
 - b. The five backup floats in the wet well shall control the pumps as follows. This control shall be hardwired and not through the PLC.
 - (1) Provide a three-position selector switch on the door of this SCC to allow the operator to select the pump sequence or automatic alternation of the two pumps (i.e. 1-2, 2-1, automatic alternation). Provide an automatic alternator within this SCC to alternate the lead pump after each run cycle of the lead pump while operating under the automatic alternation mode.
 - (2) In the event the level in the wet well rises above the high level float, the lead and lag pumps shall both start and control of the pumps shall be automatically switched to the "backup floats" mode. Provide a time delay for each pump so that the pumps do not start simultaneously. Once started, the pumps shall continue to run until the wet well level falls below the common pumps off float. The pumps shall then be controlled from the lead start float, lag start float, and common pumps off float.
 - c. In the event the wet well level falls below the low level float switch, the pumps shall be shut down. If not already in the "backup floats" mode, the pumps shall be automatically switched to the backup floats mode and operate as described above.

END SECTION

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SECTION 16941

CONTROLS AND INSTRUMENTATION DRAWINGS

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included: Applicable provisions of Division 1 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit drawings in accordance with provisions of Section 01300–Submittals.

1.03 COORDINATION

- A. The requirements set forth in this section are intended to apply to the drawings provided as specified in Section 16480–Motor Control, and Section 16940–Controls and Instrumentation.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 GENERAL REQUIREMENTS

- A. All drawings shall have the following information:
 1. Project information, including name of OWNER and specific project name.
 2. Drawing title, accurately representing what is on the drawing.
 3. Unique drawing identifier, consisting of a unique drawing number or drawing number with individual sheet number. If sheet numbers are used, total number of sheets must be identified on each sheet.
 4. System Supplier company name, address, and phone number.
 5. Original design information, including person responsible for design, date of original design, person responsible for checking of design, and date of design check.
 6. Revision block indicating revision number, date, description of revision, and person responsible for revision.
- B. All drawings shall have line numbers that can be uniquely referenced from other drawings.
- C. All drawings showing wiring shall include unique wire numbers assigned to wiring that is installed between devices in the panel. The wire number shall be shown on the drawings.
- D. All drawings showing relays shall include reference to the drawings where the relay contacts are shown. Spare relay contacts that are not used shall be identified.

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3.02 DRAWINGS REQUIRED

- A. Index of Drawings: Index of Drawings shall list drawing number, sheet number (if applicable), and drawing title for each drawing in drawing package.
- B. Symbol Sheet: Symbol Sheet shall include:
1. Explanation of all symbols used on the drawings, including, but not limited to, normally open/normally closed contacts, flow switches, limit switches, pressure switches, selector switches, pushbuttons, timers, control relays, solenoids, fuses, circuit breakers, terminal blocks, and contactors. Symbol sheet does not need to be specific to project, but must contain explanation of all symbols used on the drawings (i.e., special symbols used for a particular project must be added to standard symbol sheets).
 2. List of abbreviations used on the drawings.
 3. Explanation of continuation method for circuits that cannot be shown on a single sheet.
- C. Exterior Enclosure Layout Drawing: Exterior layout drawing shall show location of all externally-mounted equipment. Exterior layout drawing shall include:
1. Enclosure dimensions, enclosure NEMA rating (i.e., NEMA 1, NEMA 4X stainless steel, NEMA 4X nonmetallic, etc.), and enclosure color or finish.
 2. Location and actual depiction of panel latches, hinges, mounting holes and lifting eyes.
 3. Location and accurate representation of equipment mounted on enclosure (i.e., switches should look like actual switches being installed; indicating lights should look like actual lights being installed).
 4. Equipment nameplate location.
 5. Description for each piece of equipment or unique identifier and parts list, or bill of materials.
 6. Nameplate list including nameplate wording, size, construction (i.e., lamicoid with Black background and White letters), and mounting method (i.e., stainless steel screws). Label size must include size in inches or reference to standard sizes included on symbol sheet, or elsewhere in drawing package.
 7. Identification of area reserved for equipment located inside enclosure, but not actually mounted on enclosure back panel, such as UPSs, fiber optic patch panels, and lighting packages.
- D. Interior Enclosure Layout Drawing: Interior layout drawing shall show location of all internally-mounted equipment. Interior layout drawing shall include:
1. Back panel dimensions and finish.
 2. Location and accurate representation of equipment (i.e., terminal blocks should look like actual terminal blocks; receptacle should look like actual receptacle, etc.).
 3. Dimensions of internally-mounted equipment are not necessary, but equipment should be drawn to scale such that an accurate representation of the way equipment will be mounted is shown on the drawing.
 4. Description for each piece of equipment or unique identifier and parts list, or bill of materials.
- E. Interconnection Diagram, Network Diagram or Block Diagram: Interconnection Diagram, Network Diagram or Block Diagram shall show all cabling between system components and identify any station addressing or node numbers that are assigned to equipment. All cables shall be identified by cable type, including specific manufacturer and model/part number. Party responsible for furnishing and installing cable shall also be included. Some examples of cables that must be shown are:
1. Antenna cables.

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2. Communications cables between system components (fiber and/or copper). This includes fiber optic jumpers between fiber patch panels and equipment, and Ethernet patch cables between switches and devices.
 3. Communications cables (fiber and/or copper) between PLCs, controllers, operator interface equipment and security devices (e.g., card readers, electric strikes, and motion detectors) that are not shown on the elementary schematics.
- F. Elementary Schematic: Elementary schematics shall be developed for each motor or supplied equipment and shall include:
1. Nominal voltage, AC or DC designation, number of phases (if AC), and frequency in hertz (if AC) for each source of electrical supply to the enclosure.
 2. Prospective short-circuit current available at the point of electrical supply to the enclosure.
 3. Type of power supply system grounding (e.g., wye phase midpoint grounded, delta phases corner grounded, wye phases midpoint grounded, delta phases ungrounded, etc.).
 4. Complete documentation of electrical circuit from supply to motor or supplied equipment. Documentation shall include disconnecting means, main overcurrent protection (when supplied), branch overcurrent protection (when supplied), control circuit and special purpose control protection, motor control, overload protection, local disconnect (when supplied) and motor horsepower, and full load amps from nameplate or supplied equipment full load amps.
 5. Documentation of PLC or controller inputs and outputs.
 6. Documentation of all circuit breaker/motor protector ratings, fuse sizes, control power transformer VA ratings, dip switch settings, etc.
- G. Wiring Diagram: Wiring diagrams shall show all terminations for all cables external to the enclosure. Terminations may be shown on the elementary schematics as long as the termination information is concise and easily understood by the personnel installing the field wiring. Termination information shall be shown for all devices, including devices that are not part of System Supplier's scope of supply. A box with two dots or continuation arrows indicating continuation to a piece of equipment are not acceptable.
- H. Calculations Summary: Calculations summary shall include calculations performed to:
1. Determine size of UPS.
 2. Determine air conditioning equipment requirement.
 3. Determine control power transformer sizing. Control power transformer sizing calculations may be generic based on typical circuits.
- I. Functional Testing Recommendations: Testing recommendations shall include description of functional tests that must be performed by operators. Functional test description shall be included for UPS, indicating lights, and other devices whose condition can only be determined by testing.

3.03 SAMPLE DRAWINGS

- A. Sample Drawings showing an acceptable format are included in the appendix. The samples included in the appendix do not represent the only acceptable method of showing the required information.

END OF SECTION

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SECTION 16951

SPARE PARTS

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included: Spare parts for applicable sections of Division 16 as noted below.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.

1.02 QUALITY ASSURANCE

- A. UL Labels: All electrical equipment and material shall be listed and labeled by Underwriters Laboratories, except where UL does not include the equipment in their listing procedures.
- B. NEMA/ANSI Compliance: Comply with National Electrical Manufacturer's Association, American National Standards Institute, and other standards pertaining to material, construction, and testing where applicable.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All electrical equipment and material shall be received and stored with the factory winter-proof wrapping intact. Provide factory-wrapped waterproof flexible barrier metal for factory packaging of equipment and material to protect against physical damage in transit. When applicable, equipment stored shall be in factory coverings in a clean, dry, indoor space which provides protection against the weather.
- B. All spare parts shall be suitably boxed or wrapped to prevent deterioration and shall be completely identified on the outside.

PART 2–PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Spare parts specified herein shall be provided by the same manufacturer as the equipment provided on the project.

2.02 PANELBOARDS

- A. Furnish four 20/1 branch circuit breakers.

2.03 MOTOR CONTROL CENTERS

- A. The following shall be furnished:
 - 1. Two spare fuses for each type of control and current-limiting fuse provided.
 - 2. One set of fuses for each Reduced Voltage Solid-State Starter size (horsepower) provided.

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3. One replacement relay for each type of relay provided, including time-delay relays.

2.04 CONTROLS AND INSTRUMENTATION

- A. The following shall be furnished.
 1. 10% of PLC communication cards, minimum of one each. This shall include remote I/O scanner and adapter cards, and PC cards as required.
 2. One radio and antenna for each type provided.
 3. One PLC processor for each type provided.
 4. 10% of PLC input/output cards for each type provided (analog and discrete), minimum one each.
 5. Two transient/spike suppressors.
 6. One network switch.

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

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SCADA SYSTEM I/O LISTING

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STRAND ASSOCIATES, INC.
 NOLIN RIVER PUMP STATIONS, HARDIN COUNTY WATER DISTRICT NO. 2 - GLENDALE, KY
 CONTRACT 1-2017
 SCADA SYSTEM I/O LISTING - SCC - INDUSTRIAL PARK PUMP STATION NO. 1

SCC	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS
1	STATION COMMON ALARM		1	0	0	0	2~#14	FROM STATION COMMON ALARM LOGIC IN SCC
1	MCC-1 POWER FAIL		1	0	0	0	2~#14	FROM PHASE MONITOR IN MCC-1
1	CONTROL POWER FAIL		1	0	0	0	2~#14	FROM CONTROL POWER RELAY IN THIS SCC
1	REPLACE UPS BATTERY		1	0	0	0	2~#14	FROM UPS IN THIS SCC
1	WETWELL PUMP NO. 1	P-01						
1	IN AUTO		1	0	0	0	2~#14	FROM H-O-A SWITCH ON MCC
1	RUNNING		1	0	0	0	2~#14	FROM STARTER IN MCC
1	FAILED		1	0	0	0	2~#14	FROM STARTER IN MCC
1	START/STOP		0	1	0	0	2~#14	TO STARTER IN MCC
1	MOTOR OVERTEMP		1	0	0	0	2~#14	FROM MINI-CAS UNIT IN MCC
1	SEAL FAIL		1	0	0	0	2~#14	FROM MINI-CAS UNIT IN MCC
1	WETWELL PUMP NO. 2	P-02	5	1	0	0		SAME AS WETWELL PUMP NO. 1
1	(FUTURE) WETWELL PUMP NO. 3		5	1	0	0		SAME AS WETWELL PUMP NO. 1
1	(FUTURE) WETWELL PUMP NO. 4		5	1	0	0		SAME AS WETWELL PUMP NO. 1
1	NORTH WETWELL							
1	LEVEL	LIT-01	0	0	1	0	SH. PR.	FROM ULTRASONIC LEVEL TRANSMITTER IN WETWELL
1	HIGH LEVEL		1	0	0	0	2~#14	FROM HIGH LEVEL FLOAT SWITCH IN NORTH WETWELL
1	LAG START		1	0	0	0	2~#14	FROM LAG START FLOAT SWITCH IN NORTH WETWELL
1	LEAD START		1	0	0	0	2~#14	FROM LEAD START FLOAT SWITCH IN NORTH WETWELL
1	COMMON PUMPS OFF		1	0	0	0	2~#14	FROM COMMON PUMPS OFF FLOAT SWITCH IN NORTH WETWELL
1	LOW LEVEL		1	0	0	0	2~#14	FROM LOW LEVEL FLOAT SWITCH IN NORTH WETWELL
1	IN BACKUP FLOATS MODE		1	0	0	0	2~#14	FROM BACKUP FLOAT SYSTEM LOGIC IN SCC
1	BACKUP FLOATS MODE RESET		0	1	0	0	2~#14	TO BACKUP FLOAT SYSTEM LOGIC IN THIS SCC
1	SOUTH WETWELL		6	1	1	0		SAME AS NORTH WETWELL
1	(FUTURE) AUTOMATIC TRANSFER SWITCH							
1	IN NORMAL POSITION		1	0	0	0	2~#14	FROM AUTOMATIC TRANSFER SWITCH
1	IN EMERGENCY POSITION		1	0	0	0	2~#14	FROM AUTOMATIC TRANSFER SWITCH
1	(FUTURE) STANDBY GENERATOR							
1	RUNNING		1	0	0	0	2~#14	FROM GENERATOR CONTROL PANEL
1	GENERATOR COMMON WARNING		1	0	0	0	2~#14	FROM GENERATOR CONTROL PANEL
1	GENERATOR COMMON SHUTDOWN		1	0	0	0	2~#14	FROM GENERATOR CONTROL PANEL
1	COMMON FAIL		1	0	0	0	2~#14	FROM GENERATOR CONTROL PANEL
1	BATTERY CHARGER COMMON ALARM		1	0	0	0	2~#14	FROM GENERATOR BATTERY CHARGER
	TOTALS		43	6	2	0		

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STRAND ASSOCIATES, INC.
 NOLIN RIVER PUMP STATIONS, HARDIN COUNTY WATER DISTRICT NO. 2 - GLENDALE, KY
 CONTRACT 1-2017
 SCADA SYSTEM I/O LISTING - SCC - INDUSTRIAL PARK PUMP STATION NO. 3

SCC	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS
3	STATION COMMON ALARM		1	0	0	0	2-#14	FROM STATION COMMON ALARM LOGIC IN SCC
3	MCP POWER FAIL		1	0	0	0	2-#14	FROM PHASE MONITOR IN MCP
3	CONTROL POWER FAIL		1	0	0	0	2-#14	FROM CONTROL POWER RELAY IN THIS SCC
3	REPLACE UPS BATTERY		1	0	0	0	2-#14	FROM UPS IN THIS SCC
3	WETWELL PUMP NO. 1	P-01						
3	IN AUTO		1	0	0	0	2-#14	FROM H-O-A SWITCH ON MCP
3	RUNNING		1	0	0	0	2-#14	FROM STARTER IN MCP
3	FAILED		1	0	0	0	2-#14	FROM STARTER IN MCP
3	START/STOP		0	1	0	0	2-#14	TO STARTER IN MCP
3	MOTOR OVERTEMP		1	0	0	0	2-#14	FROM MINI-CAS UNIT IN MCP
3	SEAL FAIL		1	0	0	0	2-#14	FROM MINI-CAS UNIT IN MCP
3	WETWELL PUMP NO. 2	P-02	5	1	0	0		SAME AS WETWELL PUMP NO. 1
3	WETWELL							
3	LEVEL	LIT-01	0	0	1	0	SH PR	FROM ULTRASONIC LEVEL TRANSMITTER IN WETWELL
3	HIGH LEVEL		1	0	0	0	2-#14	FROM HIGH LEVEL FLOAT SWITCH IN WETWELL
3	LAG START		1	0	0	0	2-#14	FROM LAG START FLOAT SWITCH IN WETWELL
3	LEAD START		1	0	0	0	2-#14	FROM LEAD START FLOAT SWITCH IN WETWELL
3	COMMON PUMPS OFF		1	0	0	0	2-#14	FROM COMMON PUMPS OFF FLOAT SWITCH IN WETWELL
3	LOW LEVEL		1	0	0	0	2-#14	FROM LOW LEVEL FLOAT SWITCH IN WETWELL
3	IN BACKUP FLOATS MODE		1	0	0	0	2-#14	FROM BACKUP FLOAT SYSTEM LOGIC IN SCC
3	BACKUP FLOATS MODE RESET		0	1	0	0	2-#14	TO BACKUP FLOAT SYSTEM LOGIC IN THIS SCC
	TOTALS		20	3	1	0		

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STRAND ASSOCIATES, INC.
 NOLIN RIVER PUMP STATIONS, HARDIN COUNTY WATER DISTRICT NO. 2 - GLENDALE, KY
 CONTRACT 1-2017
 SCADA SYSTEM I/O LISTING - SCC - ROSE RUN PUMP STATION

SCC	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS
4	STATION COMMON ALARM		1	0	0	0	2~#14	FROM STATION COMMON ALARM LOGIC IN SCC
4	MCC-4 POWER FAIL		1	0	0	0	2~#14	FROM PHASE MONITOR IN MCC-4
4	CONTROL POWER FAIL		1	0	0	0	2~#14	FROM CONTROL POWER RELAY IN THIS SCC
4	REPLACE UPS BATTERY		1	0	0	0	2~#14	FROM UPS IN THIS SCC
4	WETWELL PUMP NO. 1	P-01						
4	IN AUTO		1	0	0	0	2~#14	FROM H-O-A SWITCH ON MCC
4	RUNNING		1	0	0	0	2~#14	FROM STARTER IN MCC
4	FAILED		1	0	0	0	2~#14	FROM STARTER IN MCC
4	START/STOP		0	1	0	0	2~#14	TO STARTER IN MCC
4	MOTOR OVERTEMP		1	0	0	0	2~#14	FROM MINI-CAS UNIT IN MCC
4	SEAL FAIL		1	0	0	0	2~#14	FROM MINI-CAS UNIT IN MCC
4	WETWELL PUMP NO. 2	P-02	5	1	0	0		SAME AS WETWELL PUMP NO. 1
4	(FUTURE) WETWELL PUMP NO. 3		5	1	0	0		SAME AS WETWELL PUMP NO. 1
4	(FUTURE) WETWELL PUMP NO. 4		5	1	0	0		SAME AS WETWELL PUMP NO. 1
4	NORTH WETWELL							
4	LEVEL	LIT-01	0	0	1	0	SH. PR.	FROM ULTRASONIC LEVEL TRANSMITTER IN WETWELL
4	HIGH LEVEL		1	0	0	0	2~#14	FROM HIGH LEVEL FLOAT SWITCH IN NORTH WETWELL
4	LAG START		1	0	0	0	2~#14	FROM LAG START FLOAT SWITCH IN NORTH WETWELL
4	LEAD START		1	0	0	0	2~#14	FROM LEAD START FLOAT SWITCH IN NORTH WETWELL
4	COMMON PUMPS OFF		1	0	0	0	2~#14	FROM COMMON PUMPS OFF FLOAT SWITCH IN NORTH WETWELL
4	LOW LEVEL		1	0	0	0	2~#14	FROM LOW LEVEL FLOAT SWITCH IN NORTH WETWELL
4	IN BACKUP FLOATS MODE		1	0	0	0	2~#14	FROM BACKUP FLOAT SYSTEM LOGIC IN SCC
4	BACKUP FLOATS MODE RESET		0	1	0	0	2~#14	TO BACKUP FLOAT SYSTEM LOGIC IN THIS SCC
4	(FUTURE) SOUTH WETWELL		7	1	1	0		SAME AS NORTH WETWELL
4	AUTOMATIC TRANSFER SWITCH							
4	IN NORMAL POSITION		1	0	0	0	2~#14	FROM AUTOMATIC TRANSFER SWITCH
4	IN EMERGENCY POSITION		1	0	0	0	2~#14	FROM AUTOMATIC TRANSFER SWITCH
4	STANDBY GENERATOR							
4	RUNNING		1	0	0	0	2~#14	FROM GENERATOR CONTROL PANEL
4	GENERATOR COMMON WARNING		1	0	0	0	2~#14	FROM GENERATOR CONTROL PANEL
4	GENERATOR COMMON SHUTDOWN		1	0	0	0	2~#14	FROM GENERATOR CONTROL PANEL
4	COMMON FAIL		1	0	0	0	2~#14	FROM GENERATOR CONTROL PANEL
4	BATTERY CHARGER COMMON ALARM		1	0	0	0	2~#14	FROM GENERATOR BATTERY CHARGER
	TOTALS		44	6	2	0		

COPY OF BID SET

STRAND ASSOCIATES, INC.
 NOLIN RIVER PUMP STATIONS, HARDIN COUNTY WATER DISTRICT NO. 2 - GLENDALE, KY
 CONTRACT 1-2017
 SCADA SYSTEM I/O LISTING - SCC - PARSHAL FLUME

SCC	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS
5	CONTROL POWER FAIL		1	0	0	0	2~#14	FROM CONTROL POWER RELAY IN THIS SCC
5	REPLACE UPS BATTERY		1	0	0	0	2~#14	FROM UPS IN THIS SCC
5	INDUSTRIAL PARK FLOW	FIT-01						
5	INSTANTANEOUS FLOW		0	0	1	0	SH. PR.	FROM OPEN CHANNEL FLOW METER ON EAST PARSHALL FLUME CHANNEL
5	TOTAL FLOW		1	0	0	0	2~#14	FROM OPEN CHANNEL FLOW METER ON EAST PARSHALL FLUME CHANNEL
5	ROSE RUN FLOW	FIT-02	1	0	1	0		SAME AS FIT-01
	TOTALS		4	0	2	0		

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DIVISION 20

STANDARD SPECIFICATIONS FOR UTILITY AND STREET CONSTRUCTION IN KENTUCKY

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SECTION 1–MATERIALS AND EQUIPMENT

1.1 GENERAL

Materials provided shall be suitable for the conditions in which they are being installed and used. CONTRACTOR shall review installation requirements of the Contract with material suppliers and incorporate any additional installation requirements necessary to meet the required use within the price bid for the Work.

All material shall conform to the type, size, and shape shown on the Drawings and as specified.

All material in contact with potable water shall meet NSF Standards 60 and 61.

All pipe and materials used in performance of the Work shall be clearly marked as to strength, class, or grade. Pipe and materials not so marked shall be subject to rejection.

When requested by ENGINEER, material suppliers shall furnish certificates of compliance indicating that all tests required by the various Standards have been conducted and that the test results comply with the Standards.

1.1.1 REFERENCED SPECIFICATIONS

Unless the text indicates otherwise (e.g., see Materials Standards), Standard Specifications shall refer to Division 20 Standard Specifications for Utility and Street Construction in Kentucky.

KYDOH Specifications in the Standard Specifications shall refer to the *State of Kentucky Transportation Cabinet, Department of Highways, Standard Specifications for Road and Bridge Construction, Latest Edition*.

Best Management Practices in the Standard Specifications shall refer to *Kentucky's Best Management Practices for Construction Activities*.

1.1.2 MATERIAL STANDARDS

This listing of Material Standards is provided for convenience only and may not be all inclusive.

AASHTO	M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.
	M148	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
	M167	Standard Specifications for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches.
	M252	Standard Specifications for Corrugated Polyethylene Drainage Pipe.
	M294	Standard Specifications for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in) Diameter.
ACI	211.1	Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

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	305.1	Specification for Hot Weather Concreting.
	306.1	Standard Specification for Cold Weather Concreting.
ANSI	Z60.1	American Standard for Nursery Stock.
ASME	B16.1	Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250.
ASTM	A48	Standard Specification for Gray Iron Castings.
	A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
	A240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
	A479	Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
	A536	Standard Specification for Ductile Iron Castings
	A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
	B62	Standard Specification for Composition Bronze or Ounce Metal Castings.
	B88	Standard Specification for Seamless Copper Water Tube.
	C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
	C32	Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale).
	C33	Standard Specification for Concrete Aggregates.
	C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
	C90	Standard Specification for Loadbearing Concrete Masonry Units.
	C139	Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
	C140	Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
	C150	Standard Specification for Portland Cement.
	C270	Standard Specification for Mortar for Unit Masonry.
	C301	Standard Test Methods for Vitrified Clay Pipe.

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C425	Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
C470	Standard Specification for Molds for Forming Concrete Test Cylinder Vertically.
C478	Standard Specification for Precast Reinforced Concrete Manhole Sections.
C497	Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.
C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe.
C700	Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
C828	Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines.
C913	Standard Specification for Precast Concrete Water and Wastewater Structures.
C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
C969	Standard Practice for Infiltration and Exfiltration Testing of Installed Precast Concrete Pipe Sewer Lines.
C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
C1103	Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
C1214	Standard Test Method for Concrete Pipe Sewerlines by Negative Air Pressure (Vacuum) Test Method.
C1244	Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
C1433	Standard Specifications for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.
C1628	Standard Specification for Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets.
C1677	Standard Specification for Joints for Concrete Box, Using Rubber Gaskets.
D698	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft ³ (600 kN-m/m ³)).
D1557	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³ (2,700 kN-m/m ³)).
D1784	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

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D1785	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
D2152	Standard Test Method for Adequacy of Fusion of Extruded Poly (Vinyl Chloride) (PVC) Pipe and Molded Fittings by Acetone Immersion.
D2240	Standard Test Method for Rubber Property—Durometer Hardness.
D2241	Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
D2321	Standard Practice for Underground Installation of Flexible Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
D2339	Standard Test Method for Strength Properties of Adhesives in Two-Ply Wood Construction in Shear by Tension Loading.
D2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
D2464	Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
D2466	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
D2467	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
D2564	Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
D2672	Standard Specification for Joints for IBS PVC Pipe Using Solvent Cement.
D2680	Standard Specification for Acrylonitrile Butadiene Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
D2855	Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
D3965	Standard Classification System and Basis for Specifications for Rigid Acrylonitrile Butadiene Styrene (ABS) Materials for Pipe and Fittings.
D4101	Standard Specification for Polypropylene Injection and Extrusion Materials.
D4475	Standard Test Method for Apparent Horizontal Shear Strength of Pultruded Reinforced Plastic Rods By The Short-Beam Method.
F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

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	F593	Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
	F594	Standard Specification for Stainless Steel Nuts.
	F679	Standard Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings.
	F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
	F1417	Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air.
AWWA	C104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
	C105	Polyethylene Encasement for Ductile-Iron Pipe Systems.
	C110	Ductile-Iron and Gray-Iron Fittings.
	C111	Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
	C115	Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges.
	C150	Thickness Design of Ductile-Iron Pipe.
	C151	Ductile-Iron Pipe, Centrifugally Cast, for Water.
	C153	Ductile-Iron Compact Fittings.
	C300	Reinforced Concrete Pressure Pipe, Steel Cylinder Type.
	C301	Prestressed Reinforced Concrete Pressure Pipe, Steel Cylinder Type.
	C302	Reinforced Concrete Pressure Pipe, Noncylinder Type.
	C500	Metal-Seated Gate Valves for Water Supply Service.
	C502	Dry-Barrel Fire Hydrants.
	C504	Rubber-Seated Butterfly Valves.
	C507	Ball Valves, 6 Inches Through 48 Inches (150 mm Through 1,200 mm).
	C508	Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS
	C509	Resilient-Seated Gate Valves for Water Supply Service.

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	C600	Installation of Ductile-Iron Water Mains and Their Appurtenances.
	C605	Underground Installation of PVC Pressure Pipe and Fittings for Water.
	C651	Disinfecting Water Mains.
	C800	Underground Service Line Valves and Fittings.
	C900	PVC Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm through 1500 mm).
	C901	Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. (13 mm) Through 3 in. (76 mm), for Water Service.
	C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1575 mm) for Water Distribution and Transmission.
	C907	Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 IN. through 12 IN. (100 mm through 300 mm), for Water, Wastewater, and Reclaimed Water Service.
	M55	PE Pipe-Design and Installation.

1.2 PIPE

The type of pipe to be used in the Project shall be as specified in the Standard Applications table in the **SPECIAL PROVISIONS** or as shown on the Drawings.

Rigid pipes are defined as pipe manufactured of such materials as concrete or clay.

Thermoplastic pipe shall be defined as pipe manufactured of such materials as PVC or other plastics.

1.2.1 REINFORCED CONCRETE PIPE

Reinforced concrete pipe shall meet ASTM C76 for circular pipe, ASTM C507 for elliptical pipe, ASTM C655 for D-load pipe, or ASTM C1433 for box culvert pipe.

Not more than one lift hole per length of pipe shall be used in storm sewer. Lift holes will not be permitted in sanitary sewers.

Reinforced concrete pipe shall be of the class as shown on the Drawings or in the **SPECIAL PROVISIONS**, but shall be at least Class III minimum and shall have a minimum "B" wall construction. All reinforced concrete pipe used in the Work shall be of adequate strength to support the construction and trench loads applied. All reinforcing cages shall be circular; elliptical reinforcement will not be permitted. Reinforcing cage shall extend to the full width into the bell end of the pipe and to within 1 inch of the spigot end of the pipe.

All reinforced concrete pipe and fittings shall be provided with joints and gaskets which meet ASTM C1628 for sanitary sewer and ASTM C443 for storm sewer. Joints for sanitary sewer shall be sealed with rubber gaskets of either continuous O-ring or profile cross section. Joints for storm sewer shall be sealed with rubber gaskets having a continuous O-ring cross section. Joints for elliptical pipe shall be sealed with an application of a trowelable bitumastic joint sealant on the inside of the joint. All pipe shall be specifically built to fit the gasket used.

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Nonstandard pipe lengths may be used at manholes and structures as necessary to allow them to be located at the locations identified on the Drawings. Reinforced concrete bends, tees, and reducers shall be manufactured to provide for the required transitions as shown on the Drawings. Sufficient additional reinforcement shall be added at the spring lines and top and bottom of the pipe to prevent shearing after installation. Repairs to complete fabricated pipe fittings shall be such that the completed unit shall have the same strength as that of the remainder of the pipe barrel and the concrete used to complete the section shall not spall or separate.

All pipe shall have smooth interior wall. Sanitary sewer pipe shall be provided with either a smooth exterior wall (i.e., no bell), or with an R-4 big bell joint.

Joints for all smooth exterior wall reinforced concrete sanitary sewer pipe (except where open cut is not allowed) shall be provided with an external bitumastic wrap, Mac Wrap, or equal. Wrap shall be minimum 12 inches wide and shall be secured on the pipe with a minimum of one stainless steel band seal connector on each side of the joint.

Acceptance of reinforced concrete pipe shall be on the basis of plant load-bearing tests, material tests, and inspection of manufactured pipe for visual defects and imperfections.

All reinforced concrete pipe used for sanitary sewer shall be vacuum tested from end to end at the factory in accordance with ASTM C1214. Test result, date, pipe class, date of manufacture, and individualized pipe i.d. shall be clearly marked on each pipe. Written vacuum test results for each pipe i.d. shall be kept and submitted to ENGINEER. ENGINEER shall be provided an opportunity to observe all tests.

Cement used in the manufacture of reinforced concrete pipe shall meet the requirements of ASTM C150 Standard Specification for Portland Cement for Type II cement.

A three-edge bearing test shall be conducted by the manufacturer according to ASTM C497 as proof of design by determining the ultimate load capacity of the pipe. One segment of pipe from each pipe class must pass the three-edge bearing test such that the load required to produce the ultimate load exceeds the load rating of the pipe. The test results shall be maintained in a log and provided to OWNER. Manufacturer shall also maintain concrete cylinder testing data and quality control records to verify that pipe meets the required ASTM standards.

An alkalinity test shall be conducted on the concrete mixture used for each type and class of reinforced concrete pipe used in the project. The alkalinity test shall be conducted according to ASTM C497 and the alkalinity of all concrete mixtures shall be equal to or greater than 0.2 grams of CaCO_3 equivalent reactivity per gram of concrete. The manufacturer shall complete the alkalinity tests.

The costs of the tests shall be incidental to the pipe cost. CONTRACTOR shall include all such costs in the price bid for the Work. CONTRACTOR shall submit a signed, dated, and certified copy of the test data to OWNER (in a format acceptable to OWNER) for review prior to delivering any pipe to the project site. No additional compensation will be made to CONTRACTOR for the required testing.

The pipe leakage shall not exceed 150 gallons/day/inch inside diameter/mile of pipe. The manufacturer shall provide a written and signed statement indicating the pipe meets this criterion.

CONTRACTOR shall provide written certification that pipe meets the standards herein.

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1.2.2 CLAY PIPE

Vitrified clay pipe and fittings shall conform to ASTM C700. Pipe and fittings shall be extra strength. Joints shall be compression type joints conforming to ASTM C425.

1.2.3 COMPOSITE PIPE (PVC AND ABS)

Composite pipe shall meet the requirements of ASTM D2680. Resin used in the manufacture of PVC composite sewer pipe and fittings shall have cell classification 12454 as defined in ASTM D1784. Resin used in the manufacturer of ABS composite pipe and fittings shall have cell classification of 1-0-2-2-3 of ASTM D3965.

Acceptance of piping shall be subject to tests conducted by an approved testing agency.

Attachment of couplings and saddle fittings and field joining of pipe sections and fittings shall be accomplished by solvent welding or rubber gaskets in accordance with the recommendations of the pipe manufacturer. All exposed filler material shall be field-coated with ABS or PVC Solvent Cement. Approved adapters shall be provided for transitions to other types of pipe.

Pipe shall be subject to rejection for failure to conform to material requirements of ASTM D2680 or for any of the following reasons:

- a. Distortion or puncture of the inner plastic shell. Distortion or punctures of the outer shell shall not be reasons for rejection if the inner shell is unaffected and such exterior distortion or puncture is suitably repaired with a solvent-welded patch.
- b. Voids in the concrete filler at pipe ends, exceeding 1 inch in depth as measured from the pipe end and exceeding 10% of the pipe circumference. However, this pipe may be used if the faulty pipe end is sawed off and field-coated.
- c. Through cracks in coupling.

1.2.4 SOLID WALL PVC

Polyvinyl Chloride (PVC) pipe shall meet the requirements of ASTM D3034 for pipe sizes 4 inches through 15 inches and ASTM F679 for pipe sizes 18 inches through 60 inches.

PVC material for ASTM D3034 pipe shall have cell classification 12454 or 12364 as defined in ASTM D1784 with a modulus of elasticity of 400,000 psi or 440,000 psi respectively. Pipe stiffness shall be minimum 46 psi when tested in accordance with ASTM D2412. Pipe shall have a maximum standard dimension ratio (SDR) of 35.

PVC material for ASTM F679 pipe shall have cell classification 12454 or 12364 as defined in ASTM D1784. Pipe stiffness shall be a minimum 115 psi when tested in accordance with ASTM D2412.

Pipe and fittings shall be the product of one manufacturer and the manufacturer shall have experience records substantiating acceptable performance of the pipe and fittings to be furnished. The minimum wall thickness of fittings shall be the same as the pipe to which it connects.

Acceptance of piping and fittings shall be subject to tests conducted by an approved testing agency in accordance with ASTM D3034 and/or ASTM F679.

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Fittings such as saddles, elbows, tees, wyes, and others shall be of material and construction corresponding to and have a joint design compatible with the adjacent pipe. Approved adapters shall be provided for transitions to other types of pipe.

Joints shall be of the elastomeric type for pipes 4 inches or larger and elastomeric or solvent cement for pipes less than 4 inches.

Elastomeric joints shall be a bell and spigot joint conforming to ASTM D3212 sealed by a rubber gasket conforming to ASTM F477 so that the assembly will remain watertight under all conditions of service, including the movements resulting from the expansion, contraction, settlement, and deformation of the pipe. Bells shall be formed integrally with the pipe and shall contain a factory-installed positively restrained gasket.

Solvent cement joints shall be assembled using solvent cement obtained from the pipe manufacturer, which conforms to the requirements of ASTM D2564.

The assembled joint shall pass the performance tests as required in ASTM D3212.

1.2.5 OPEN PROFILE WALL PVC (18 INCHES AND LARGER PIPE ONLY)

Open profile PVC pipe and fittings shall meet the requirements of ASTM F794. Fittings shall also conform to ASTM D3034 SDR 35. Pipe shall have smooth interior with a ribbed exterior. Exterior ribs shall be perpendicular to the axis of the pipe to allow placement of gaskets without additional cutting or matching. Pipe shall have solid wall cross-section; no voids between inner and outer surfaces of pipe wall.

PVC materials shall have cell classification 12454 as defined in ASTM D1784 with minimum modulus of elasticity of 400,000 psi. Pipe stiffness shall be minimum 46 psi when tested in accordance with ASTM D2412. Impact strength shall equal or exceed values given in ASTM D3034 or F679.

Pipe and fittings shall be the product of one manufacturer and the manufacturer shall have an experience record substantiating acceptable performance of the pipe to be furnished. Fittings shall be injection molded.

All joints shall be of the flexible elastomeric type with bells and spigots conforming to ASTM D3212. Gaskets shall conform to ASTM F477. All bells shall be formed integrally with the pipe. Elastomeric gasket shall be positively restrained in ribs on spigot of pipe.

Acceptance of piping shall be subject to tests conducted by an approved testing agency in accordance with ASTM F794.

Fittings such as saddles, elbows, tees, wyes, and others shall be of material and construction corresponding to, and have a joint design compatible with the adjacent pipe. Approved adapters shall be provided for transitions to other types of pipe. Fittings shall be molded.

Joints shall be sealed with elastomeric gaskets meeting the requirements of ASTM F477. Solvent cement shall not be used to join pipe lengths or fittings to pipe lengths. The assembled joint shall pass the performance tests as required in ASTM D3212.

The pipe wall will be homogeneous and contain no seams. Minimum pipe stiffness per ASTM D2412 shall be 60 psi for 18 inches and 46 psi for 21 inches and larger pipe sizes. Pipe shall withstand impact of 210-foot-pounds for 8 inches and 220-foot-pounds on larger sizes. Standard lengths shall be 13-foot or 20-foot lengths. Pipe shall withstand flattening up to 60% without cracking, splitting, or breaking and pass acetone immersion in accordance with ASTM D2152.

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1.2.6 GRAVITY SANITARY SEWER SERVICE BRANCHES AND LATERALS

Branches (tees and wyes) shall be of the same material as the main except for reinforced concrete pipe used for sanitary sewer. For reinforced concrete pipe, special branches shall be furnished and installed to accept the lateral. Such special branches are subject to review by ENGINEER.

If a different thermoplastic material is specified in the **SPECIAL PROVISIONS** for laterals than for the main line, appropriate solvent welds, fittings, transition couplings, and other appurtenances shall be provided to effect a watertight seal.

Fittings for laterals shall be of the same material as the lateral pipe unless special fittings are needed for transition between material types or sizes or standard fittings are not manufactured.

Where the wye or tee branches and laterals are of dissimilar materials, CONTRACTOR shall provide a transition coupling for the connection.

All fittings used, including type of jointing, are subject to review by ENGINEER. See **SPECIAL PROVISIONS** for any additional requirements.

1.2.7 STEEL OR ALUMINUM CORRUGATED PIPE

Corrugated pipe composed of corrosion-protected steel or of aluminum shall meet the requirements of AASHTO M36 and of structural steel plate shall meet the requirements of M167. Pipe provided shall be new and free of defects and scale. Pipe and fittings that are dented, deformed, or have damaged coatings shall be removed from the site at CONTRACTOR's expense.

The average inside diameter of circular pipe shall not vary more than 1/2 inch or 1%, whichever is greater, from the nominal diameter.

The span and rise dimensions shall not vary more than 1 inch or 2% of the equivalent circular diameter, whichever is greater.

Coupling bands shall conform to AASHTO M36 and shall be made of the same base metal as the pipe. The bands shall not be less than 7 inches wide for diameters of 8 inches to 30 inches, inclusive; not less than 12 inches wide for pipe with diameters 36 inches to 60 inches, inclusive; and not less than 24 inches wide for pipe with diameters greater than 60 inches. Such bands shall be so constructed as to lap on an equal portion of each of the pipe sections to be connected and preferably shall be connected at the ends by galvanized angles having minimum dimensions of 2 by 2 by 3/16 inches.

All connections shall be shop fabricated where possible.

All cuts in corrugated pipe and pipe arch shall be saw cut. Connections cut in the field shall be saw cut with a saddle connection of 16-gauge material bolted on the corrugated pipe with 1/2-inch diameter galvanized bolts.

1.2.8 HIGH DENSITY POLYETHYLENE (HDPE) CORRUGATED PIPE

Corrugated pipe composed of high density polyethylene shall meet the requirements of AASHTO M252 and M294. Pipe and fittings shall be made from virgin polyethylene compounds conforming to ASTM D3350.

Pipe shall have interior smooth inner wall of full circular cross section with an integrally formed outer corrugated wall AASHTO Type S designation.

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Fittings may be molded or fabricated and shall not impair the integrity or function of the pipe. Only fittings supplied or recommended by pipe manufacturer shall be used. Where elastomeric gaskets are required they shall conform to ASTM F477.

1.2.9 IRON PIPE AND FITTINGS

General: Iron pipe shall be ductile iron conforming to AWWA C151. Fittings shall be ductile or cast iron conforming to the standards herein. Iron pipe and fittings shall be American-made: American, Clow, Griffin, Tyler, U.S. Pipe, or equal.

Ductile iron pipe shall consist of pipe centrifugally cast in metal or sand-lined molds. Pipe wall shall be homogeneous from inside to outside and shall be completely free of laminations, blisters, or other imperfections. Defects may be removed at the factory only.

Each pipe and fitting shall have the weight, class or nominal thickness, country where cast, casting period, manufacturer's mark, the year in which the pipe was produced, and the letters DI or DUCTILE cast or stamped thereon. Improper or incomplete marking will be cause for rejection of the pipe or fitting.

CONTRACTOR shall furnish certification data representing each class of pipe or fitting furnished. The certification report shall clearly state that all pipe and fittings furnished meet the appropriate AWWA specification.

Exterior Pipe: Ductile iron pipe shall be provided with mechanical joints or push-on joints where buried. Provide flanged joints inside manholes, wet wells or other such structures, and elsewhere exterior as shown on the Drawings or as specified.

Unless otherwise shown on the Drawings or specified in the **SPECIAL PROVISIONS**, buried pipe shall be minimum Pressure Class 350 with a water hammer allowance of 100 psi. Additional pipe wall thickness shall be furnished as required by AWWA C150 for the depth of cover as shown on the Drawings when using Laying Condition 4 of AWWA C600 or the Class C Bedding Detail as shown on Drawing 01-975-43A.

Flange jointed pipe to be used elsewhere as shown on the Drawings or as specified, shall be minimum Special Thickness Class 53 conforming to AWWA C115 with a minimum rated working pressure of 250 psi and with a water hammer allowance of 100 psi. All flanged pipe shall be made up in strict accordance with AWWA C115 specifications. No field make-up flanges will be allowed unless strictly conforming to AWWA C115 with facing done after turning pipe through flange. Manufacturers of flanged pipe and fittings shall be certified to NSF 61 by an ANSI-accredited third-party certification organization.

Linings and Coatings: Buried pipe and pipe in manholes, wet wells, and other structures shall be cement-mortar lined and asphaltic coated inside and asphaltic coated outside. Inside lining and coating shall comply with AWWA C104. Outside coating shall comply with AWWA C151. Lining and coatings shall be suitable for use with potable water systems. The asphaltic coating shall be applied over the cement lining on the inside of the pipe and directly on the outside of the pipe. The coatings shall be smooth and impervious to water without any tendency to scale off.

Exterior aboveground pipe and pipe in manholes, wet wells, and other structures shall comply with the above unless specified otherwise in the **SPECIAL PROVISIONS**.

Polyethylene Encasement: Where required on the Drawings or specified in the **SPECIAL PROVISIONS**, CONTRACTOR shall provide polyethylene encasement conforming to AWWA C105. Film shall be Class C—Carbon Black, with a minimum thickness of 0.008 inches (8 mils). Tape for securing the film shall be

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a thermoplastic material with a pressure sensitive adhesive face capable of bonding to metal, asphaltic coating, and polyethylene. Tape shall have a minimum thickness of 8 mils and a minimum width of 1 inch.

The polyethylene film envelope shall be as free as is commercially possible of gels, streaks, pinholes, particles of foreign matter, and undispersed raw materials. There shall be no other visible defect such as holes, tears, blisters, or thinning out at folds.

Tapping and Bonding: In cases where corporation stops are to be tapped into mains, pipe wall thickness shall be furnished as specified in AWWA C151 to provide four threads or pipe saddles shall be furnished as approved by manufacturer.

Cable bond conductor or electrobond conductivity straps shall be installed on all ductile iron piping to maintain electrical continuity across joints. Continuity across valves and fittings shall be made with multiple conductivity straps connected in series. Lead-tipped gaskets or bronze wedges will not be allowed.

Cutting-in and Repair Tees and Sleeves and Tapping Tees: Cutting-in and repair tees and sleeves and tapping tees shall be of ductile or cast iron with the same rated working pressure of the pipe in which they are installed but no less than 150 psi.

Exterior Joints, Fittings, and Gaskets: Joints, fittings, and gaskets shall have the same rated working pressure of the pipe in which they are installed but no less than a minimum rated working pressure of 150 psi. Fittings shall be cement-mortar lined and asphaltic coated inside and shall be shop primed or asphaltic coated outside as specified above for the piping in which they are being installed.

Joints, fittings, and gaskets for buried piping shall be mechanical joint or push-on joint conforming to AWWA C110 and AWWA C111, as well as AWWA C153 (compact), with vulcanized styrene butadiene rubber gaskets conforming to AWWA C111.

Bolts on mechanical joints shall be high-strength low-alloy steel (Corten, or equal) conforming to AWWA C111; a certificate to that effect shall be provided.

Flange joints, fittings, and gaskets to be used elsewhere as shown on the Drawings or as specified shall conform to AWWA C110, AWWA C111, and to ANSI B16.1. Gaskets for flanged piping shall be full face, minimum 1/8-inch-thick, synthetic rubber gaskets with factory-made holes for flange bolts. Thicker gaskets shall be provided as needed to accommodate allowed tolerances in flange manufacturing.

Gaskets shall be furnished in sufficient number for all joints. Sufficient joint lubricant shall be furnished by the manufacturer with the gaskets.

1.2.10 PVC PIPE (AWWA)

AWWA PVC pressure rated pipe shall conform to the requirements of AWWA C900 for pipe from 4 inches through 60 inches. Pipe shall be furnished with integral elastomeric bell and spigot joints.

PVC pipe outside diameter shall conform to ductile iron pipe sizes (DIPS). The type of PVC material, nominal pipe size, standard dimension ratio, and pressure rating shall be not less than pressure class 235 and not greater than dimension ratio 18.

Markings on the pipe shall include the following: Nominal pipe size, type of plastic pipe material, DR number, AWWA Designation with which the pipe complies, manufacturer's name, and the seal or mark of the laboratory making the evaluation of the suitability of the pipe for the transport of potable water.

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1.2.11 PVC PIPE (SDR-PR)

Standard dimension ratio PVC pressure rated pipe shall conform to the requirements of ASTM D2241 (SDR-PR) for pipe from 4 inches through 12 inches. Pipe shall be furnished with integral elastomeric bell and spigot joints. Spigot end shall conform to ASTM D2241. Bell end shall conform to ASTM D3139. Gaskets shall meet ASTM F477.

PVC pipe outside diameter shall conform to galvanized iron or steel pipe sizes (IPS). The type of PVC material, nominal pipe size, standard dimension ratio, and pressure rating shall be not less than pressure class 200 and not greater than standard dimension ratio (SDR) 21.

Markings on the pipe shall include the following: Nominal pipe size, type of plastic pipe material, SDR number, pressure class rating, manufacturer's name, and the seal or mark of the laboratory making the evaluation of the suitability of the pipe for the transport of potable water.

1.2.12 PVC PIPE (SCHEDULE PIPE)—4 INCHES OR LESS

PVC Schedule pipe 4 inches or less shall conform to the requirements of ASTM D1785 for Schedules 40, 80, or 120. Pipe shall be solvent weld type conforming to ASTM D2855 with bell conforming to ASTM D2672. Pressure rating for pipe supplied shall be minimum 150 psi. PVC pipe diameter shall conform to galvanized iron or steel pipe sizes (IPS).

1.2.13 HIGH DENSITY POLYETHYLENE PRESSURE (HDPE) PIPE AND FITTINGS

HDPE pressure rated pipe shall conform to the requirements of AWWA C906 for pipe from 4 inches through 65 inches. HDPE pipe shall be manufactured from material conforming to PE Code PE4710.

HDPE pipe outside diameter shall conform to ductile iron pipe sizes (DIPS). The type of HDPE material, nominal pipe size, standard dimension ratio, and pressure rating shall be not less than pressure class 250 and not greater than a dimension ratio (DR) 9.

Markings on the pipe shall include the following: Nominal pipe size, type of plastic pipe material, DR number, pressure class rating, manufacturer's name, and the seal or mark of the laboratory making the evaluation of the suitability of the pipe for the transport of potable water.

Fittings for HDPE pipe shall conform to AWWA C906 and shall have the same pressure rating as the pipe in which they are installed.

1.2.14 PVC PRESSURE PIPE FITTINGS (4 INCHES AND LARGER)

Unless otherwise specified in the **SPECIAL PROVISIONS** or shown on the Drawings, fittings for PVC pressure pipe shall be iron pipe fittings as specified herein.

1.2.15 GRINDER PUMP PRESSURE SEWER PIPE AND FITTINGS (LESS THAN 4 INCHES)

Grinder pump pressure sewer pipe and laterals, shall be constructed of PVC conforming to ASTM D1785 for Schedules 40, 80, or 120 or to ASTM D2241, Class 250, SDR 17 with solvent weld joints.

All fittings shall be solvent weld, 1120 PVC, Schedule 40 conforming to ASTM D2466 or Schedule 80 in accordance with ASTM D2467. Threaded fittings shall be Schedule 80 minimum conforming to ASTM D2464.

All fittings and joints shall have a working pressure rating at least equal to the pipe to which they are attached. Fittings shall be compatible with the above-specified SDR-PR or Schedule Pipe. All PVC fittings

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outside of manholes shall have socket or bell ends. Transitions to curb stops shall be socket type on the PVC side and threaded on the curb stop side. Fittings inside manholes shall be as shown on the Drawings. All PVC pipe and fittings shall be approved by the National Sanitation Foundation and shall bear their mark of approval.

1.2.16 PIPE RESTRAINT

Pipe restraint fittings shall be provided as follows:

- a. For ductile iron pipe with ductile iron mechanical joints MEGALUG® Series 1100 or 1100SD by EBAA Iron Sales, Inc.; Series D-SLDE or SSLD by Sigma; Series 3000 or 3000S by Star Pipe Products; or equal.
- b. For ductile iron pipe with ductile iron push-on joints MEGALUG® Series 1100HD or 1700 by EBAA Iron Sales, Inc.; Series SLDEH or SSLDH by Sigma; Series 3100P or 3100S by Star Pipe Products; Flex-Ring or Lok-Ring by American Cast Iron Pipe Company; TR Flex by U.S. Pipe Company; or equal.
- c. For PVC pipe with ductile iron mechanical joint fittings—MEGALUG® Series 2000 PV, 1100SV, or 2000SV by EBAA Iron Sales, Inc.; Series D-SLCE or PVM by Sigma; Series 1000C or 4000 by Star Pipe Products; or equal.
- d. For PVC pipe with PVC push-on joints (not solvent welded)—MEGALUG® Series 1100HV, 1900, or 2800 by EBAA Iron Sales, Inc.; Series SLCEH, PWP, or D-PWP by Sigma; Series 4100P by Star Pipe Products; or equal.

Gland body, wedges, and wedge actuating components shall be ductile iron conforming to ASTM A536 Grade 65-45-12. Bolts and tie rods shall be high-strength low-alloy steel conforming to AWWA C111.

Gaskets that include metal locking segments vulcanized into the gasket to grip the pipe to provide joint restraint are not acceptable.

1.2.17 COPPER WATER TUBING

Copper tubing installed within trenches shall be Type K soft annealed seamless copper tubing and shall conform to the Specifications of ASTM B88. All other copper shall be Type K hard copper conforming to ASTM B88.

The name or trademark of the manufacturer and a mark indicating the type shall be permanently and plainly marked on tubing.

Fittings for copper tubing shall be copper alloy meeting the requirements of AWWA C800-14. The maximum lead content shall be 0.25%. They shall have uniformity in wall thickness and strength and shall be free from any defect that may affect their serviceability.

Fittings shall be of the flared or compression-type. Unions shall be extra heavy 3-part unions only.

Each fitting shall be permanently and plainly marked with the name or trademark of the manufacturer.

1.2.18 SURFACE WATER CROSSINGS

Unless indicated otherwise on the Drawings or in the **SPECIAL PROVISIONS**, pipe for water crossings shall be ductile iron, Flex-Ring, or Lok-Ring by American Cast Iron Pipe Company, TR Flex by U.S. Pipe

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Company, or equal. Type of joint is subject to the review of ENGINEER and approval of OWNER. Mechanical joints with retainer glands will not be allowed.

1.2.19 TRANSITION COUPLINGS FOR GRAVITY SEWER SERVICE

Transition couplings shall be provided to join dissimilar pipe materials or to connect pipe where a standard pipe joint cannot be provided. Couplings shall be designed to join the pipe materials matching flow line elevations. Transition couplings for gravity sewer service shall be Fernco 5000 RC Strongback, Mission Flex-Seal ARC Shielded, or equal. Shear rings shall be provided to minimize differential settlement. All bands, clamps, shear rings and other metal components shall be stainless steel. Bushings or transitions shall be provided to accommodate pipe size differences.

1.2.20 MISCELLANEOUS PIPE

Piping needed for repair or reconstruction of existing utilities and appurtenances shall be of the same type and strength as the existing. The type of jointing used in repair and reconstruction shall be reviewed by ENGINEER. Special fittings shall be furnished and installed as necessary for repair, reconstruction, or connection of existing facilities.

All special fittings on or for connection to utilities shall be specifically built for the type of gasket used. Special fittings shall have joints of the same type as the utility to which the connection is being made.

When sanitary sewer construction is within 50 feet of a potable well, 200 feet of a municipal well, or as requested by ENGINEER, a water main equivalent pipe shall be used. To transition from water main equivalent pipe to pipe normally supplied, a transition pipe with suitable joints to mate the two different pipes shall be supplied. No field-constructed transitions will be allowed unless reviewed by ENGINEER and approved by OWNER. Construction shall not proceed until proper transition pipe is supplied.

1.3 VALVES

The type of valves to be used in the Project shall be as specified in the Standard Applications table in the **SPECIAL PROVISIONS** or as shown on the Drawings.

1.3.1 GATE VALVES

Solid wedge and double disk gate valves and resilient wedge gate valves shall conform to AWWA C500 and C509, respectively. Double disk valves shall not be used for wastewater applications. Valves shall close clockwise.

Valve stem seals shall be O-rings. The compound shall be of Buna-N or NBR rubber and have a durometer hardness of 70 degrees when tested in accordance with ASTM D2240.

Markings shall be cast on the bonnet or body of each valve and shall show the manufacturer's name or mark, the year and location valve casting was made, the size of the valve, and the designation of working water pressure.

Valves on water distribution systems and force main shall be suitable for direct burial, be provided with nonrising stems, and be equipped with a standard 2-inch-square operating nut with cast-on directional arrow.

Valves in structures as shown on the Drawings or as specified in the **SPECIAL PROVISIONS** shall be provided with nonrising stems and handwheels.

Buried or submerged valves shall be fusion bonded epoxy coated.

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1.3.2 BUTTERFLY VALVES

Butterfly valves shall conform to AWWA C504.

Valves shall be Class 150B with ductile iron valve body.

Shaft seals shall be the self-adjusting split-V type or standard O-ring seals.

Valves shall be suitable for direct burial-type installation on water distribution mains. Valves shall close in a clockwise direction.

All valves 30 inches and larger shall be furnished with a seat, adjustable, removable, and replaceable from the interior of the pipeline. The seat shall be removable and replaceable without removing the body from the pipeline.

Valves shall be furnished with a standard AWWA 2-inch-square nut for manual wrench operation which shall be positively secured to the operator input shaft (in conformance with AWWA C500).

A self-draining, self-aligning base 4 3/4-inch- to 5-inch-diameter concentric with the input shaft shall be provided to accept a circular valve box base.

The operator shall be self-locking with a permanent factory set stop at each end of its travel. The disc shall not creep or flutter under service conditions. The valve shall seat closed at an angle of 90 degrees from full open.

The operator shall be designed for the output torque according to AWWA C504. Maximum input torque required to develop the rated output torque shall not exceed 150-foot pounds for any size valve.

The operator case shall be completely watertight, sealed by means of approved gaskets, gasket compounds, O-rings, or threaded plugs. Operators shall be filled with a suitable oil lubricant or thoroughly coated with an approved grease at the factory. If the operator lubricant is oil, suitable fill and drain plugs shall be provided.

Buried or submerged valves shall be fusion bonded epoxy coated.

1.3.3 PLUG VALVES

Plug valves shall be DeZURIK Series PEC, ValMatic, or equal.

Valves shall be of the nonlubricated eccentric type with resilient faced plugs and end connections as shown on the Drawings or as needed to mate with main. Plugs and upper and lower shafts shall be cast in one piece. The plug profile shall be of a cylindrical eccentric shape so that the vertical face of the plug is straight and the horizontal face is eccentrically curved in relation to the plug shafts. Segmented ball valves with spherical plugs shall not be acceptable. Port areas shall be at least 80% of full pipe area. Valve bodies shall be of ASTM A126, Class B cast iron. Resilient plug facings shall be of chloroprene, suitable for use with wastewater.

Valves shall be furnished with corrosion-resistant seats and replaceable oil-impregnated permanently lubricated stainless steel sleeve-type bearings, which comply with the latest edition of AWWA Standards C507 and C504. Valves shall be furnished with a 1/8-inch machined smooth welded overlay seat of not less than 90% nickel. Seat area shall be raised surface completely covered with weld to ensure that the plug face contacts only nickel. Screwed-in seats are not acceptable. Valve shaft seals shall be of the type utilizing a stuffing box and pulldown packing gland. Shaft seals shall be designed for

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replacement with the line pressurized at design pressure with the plug in both the open and closed position. Standard Alemite No. 1610-BL grease fittings shall be installed in the upper and lower journals of the plug valves.

The design of the valve and stuffing box assembly shall be such that the packing can be adjusted or completely replaced without disturbing any part of the valve or operator assembly except the packing gland follower. Stuffing boxes shall have a depth sufficient to accept at least four rings of v-type packing. Valve seating adjustment shall be accomplished without removing the valve from the pipe line and with pressure in the line.

Valve pressure ratings shall be 175 psi for valves through 12 inches and 150 psi for valves in sizes 14 inches through 24 inches. Valves shall provide driptight shutoff up to the full pressure rating in both seating and unseating head conditions. Valves and all accessories shall be suitable for buried and submerged water service.

All underground valves shall be equipped with cast iron telescopic adjustable valve boxes and covers. Provide 4- and 6-inch valves with valve key and stainless steel extended stems.

Plug valves 8 inches and larger shall be mounted in the horizontal, and when open, valve plugs shall be at top of valve out of flow stream. Plug valves installed in the horizontal shall have worm gear actuators. Provide same full pressure rating for gearbox as for valve. All gearing shall be enclosed in a cast iron housing of same quality as plug valve and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall indicate valve position. Buried and submerged actuators shall be suitable for direct burial or submergence and shall be mounted on a gasketed and totally enclosed actuator mounting bracket and shall have a totally enclosed and gasketed cover. Actuator shall be filled with grease. Provide OWNER with number of revolutions to open and close valves.

Extension stems shall be provided. Extension stems for submerged gear-operated valves shall be fabricated from stainless steel rod. Stems shall be provided with 2-inch operating nut.

Buried or submerged valves shall be fusion-bonded epoxy-coated.

Valves shall be equipped with open/close rotation indicator at top of extended stem. All valves shall open when the operating shaft is rotated counterclockwise.

See **SPECIAL PROVISIONS** for any additional valve requirements.

1.3.4 CHECK VALVES

Swing Check Valves: Swing check valves in lines carrying liquid shall be M&H Style 259, Pratt, DeZURIK, American, Dresser, (lever and weight) for sizes 2 inches to 30 inches, or equal, conforming to AWWA C508, minimum 150 psi, iron body with disk to be bronze trimmed and neoprene rubber faced. Additional weights shall be used if necessary to stop slamming.

Air Cushion Swing Check Valves: Air cushion swing check valves in lines carrying liquid shall be GA Industries 250D, or equal. The swing check valves shall be constructed with a heavy cast iron or cast steel body, a bronze or stainless steel seat ring, an extra heavy noncorrosive shaft for attachment of lever and necessary weights to close valve, and a complete noncorrosive air cushion chamber. The valve shall be tight seating and shockless in operation. The seal ring shall be renewable and shall be securely held in place by a threaded joint. The air cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be operated without any hammering action. Shock absorption shall be by air, and the chamber shall be

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so arranged that the closing speed can be adjusted to meet the service requirements. The valve disk shall be of cast iron or cast steel and shall be suspended from a noncorrosive shaft that shall pass through a stuffing box to be connected to the chamber on the outside of the valve.

1.3.5 GRINDER PUMP PRESSURE SEWER SHUTOFF VALVES

All shutoff valves in valve and air release manholes for low pressure grinder pump sewers shall be PVC ball valves, ASAH1, True Union, 150 psi, Plastic Systems, Cartridge Type 342, or equal.

Ball valves shall be 1120 PVC body, union nuts, stem, handle, and end connectors. Balls shall be made of either CPVC or PVC. Valves shall be equipped with replaceable Teflon seats and EPDM O-ring seals. Ball valves shall be compatible with pipe and fittings as specified herein.

1.3.6 CORPORATION STOPS, CURB STOPS, AND TAPPING SADDLES

Corporation stops from 1/2 inch to 1 1/2 inches and curb stops from 1/2 inch to 2 inches shall be copper alloy and shall be manufactured in accordance with AWWA C800-14 and ASTM B62. The maximum lead content shall be 0.25%. Unless otherwise specified in the **SPECIAL PROVISIONS**, manufacturer shall be Mueller, Ford, or equal, minimum 150 psi working pressure.

With PVC main and for ductile iron main with 2-inch taps, tapping saddles shall be provided for all corporation stops. Tapping saddles shall be Mueller, Ford, or equal, brass or bronze, minimum 150 psi working pressure with stainless steel bands, nuts, and bolts.

1.3.7 FIRE HYDRANTS

Fire hydrants provided under these Specifications shall conform to AWWA C502 for Dry-Barrel Fire Hydrants. Hydrants shall have the following features:

Bury Length	Approximately 3 feet to traffic flange.
Nozzle Size	One 4 1/2-inch- and two 2 1/2-inch-diameter openings.
Nozzle Threads	National standard fire hose coupling screw threads.
Drain Port	Drain port at base of hydrant barrel. Plug drain port when hydrant installed in area where ground water level may rise above drain port.
Size of Main Valve Opening	5 1/4-inch diameter minimum. The hydrant lead connection shall be minimum 6 inches diameter mechanical joint.
Torque Requirements	Hydrant shall comply with AWWA C502 even if greater than 5-foot bury.
Lubrication	Nontoxic and providing proper lubrication for a temperature range of -30° to +120° Fahrenheit.

Hydrants shall have permanent markings identifying the manufacturer by name, initials, insignia, or abbreviations in common usage, and designating the size of the main valve opening and the year of manufacture. Markings shall be so placed as to be readily discernible and legible after hydrants have been installed.

CONTRACTOR shall furnish certification to ENGINEER that the hydrant and all material used in its construction conform to the applicable requirements of AWWA C502 and the supplementary requirements thereto.

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All joints on fire hydrant leads shall be made using pipe restraint specified herein. Approximately 1/2 cubic yard of clear stone shall be placed from the bottom of the trench around the hydrant elbow and up the hydrant barrel. Clear stone shall be wrapped completely in filter fabric to prevent the in-migration of fine materials.

CONTRACTOR shall furnish all necessary fittings in the fire hydrant lead to install the fire hydrant in a plumb condition at locations shown on the Drawings and at the specified depth of bury. The pumper nozzle of all fire hydrants shall be installed with the nozzle pointing toward the street. ENGINEER reserves the right to alter the location of fire hydrants from that shown on the Drawings.

1.3.8 VALVE BOXES

A valve box shall be provided for fire hydrant auxiliary valves and for valves in the main. The valve box shall be centered and plumb over the wrench nut of the valve with the box cover flush with the finished ground elevation. Solid 4-inch concrete blocks shall be placed under the base of valve boxes so that the bottom of the base is about 2 inches away from contact with the valve bonnet. Unless otherwise indicated in the **SPECIAL PROVISIONS**, a Gate Valve Adaptor by Adapter, Inc., or equal, may be used in lieu of blocks. The valve box shall not transmit shock or stress to the valve.

Valve boxes shall be made of cast iron conforming to ASTM A48, Class 20. The castings shall be free from blowholes, porosity, hard spots, shrinkage defects or cracks, or other injurious defects and shall have a normal smooth casting finish. The castings shall be thoroughly coated with a 1 mil minimum thickness bituminous coating. Valve boxes shall be 5 1/4 inches in diameter. Valve boxes shall have a maximum length of 5 feet when extended without extension sections. Extensions shall be provided for deeper mains.

Valve boxes shall consist of a base section, tubular mid and top sections, both with cast threads by which one can be telescoped on the other, extension sections if required, and a circular drop cover.

1.3.9 CURB BOXES

Curb boxes shall be of the *Arch or Minneapolis Pattern*, Ford, Mueller, or equal made with cast iron conforming to ASTM A48, Class 20. The castings shall be free from blowholes, porosity, hard spots, shrinkage defects or cracks, or other injurious defects and shall have a normal smooth casting finish. The pentagon head bolt shall be brass.

The castings shall be thoroughly coated with a 1 mil thickness bituminous coating.

A 2 1/2-inch-diameter box shall be provided for 3/4-inch and 1-inch service stops.

A 3-inch-diameter box with the enlarged base shall be provided for 1 1/4, 1 1/2, and 2-inch service stops.

All curb boxes shall have a maximum length of 5 feet when extended without the use of extension section. Extensions shall be provided for deeper mains.

1.3.10 MISCELLANEOUS VALVES

Shutoff valves in pipe taps and potable and nonpotable water lines smaller than 1 inch shall be Milwaukee 1131T (threaded), Milwaukee 1169 (solder joint), Nibco T-134 (threaded), Nibco S-134 (solder joint), or equal, bronze 300 psi gate valves. Provide unions for ease of valve removal

Shutoff valves in pipe taps and potable and nonpotable lines, pump vent, and drain lines 1 inch through 2 1/2 inches shall be gate valves, 150 psi, bronze or iron body bronze mounted, solid wedge disk, threaded, rising stem Nibco T-131, Milwaukee 1150, or equal. Provide unions for ease of valve removal.

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1.4 PRECAST REINFORCED CONCRETE MANHOLES

Unless otherwise required in the **SPECIAL PROVISIONS**, all manhole sections including risers, flat slab tops, conical tops, base sections, steps, and adjusting rings shall be precast reinforced concrete. Reinforced concrete manhole sections shall conform to ASTM C478. Manhole construction shall conform to Drawing 01-975-43A.

Lengths of manhole riser (barrel) shall be furnished in such combinations as to conveniently make up the depth of the manhole. A maximum of two handling holes per length of riser will be permitted.

Standard sewer and water manholes shall be constructed with eccentric cone top section and water main valve manholes shall be constructed with a concentric cone top section for 48-inch-diameter barrel sections. For other diameters the top section shall be a cone section, if available, or flat slab. Concrete adjusting rings shall be furnished to set the manhole casting to established grade. Valves and cleanout piping connections shall be centered below the casting.

Drop entrances to sanitary sewer manholes shall be installed where indicated on the Drawings and as shown on Drawing 01-975-43A. Drop entrances shall be of the same diameter as the sewer main from sizes 8 inches through 18 inches. For larger diameters, the drop shall be 18 inches unless otherwise specified in the **SPECIAL PROVISIONS** or shown on the Drawings. Drop entrances for storm sewer manholes are not required.

The interior bottom of sanitary sewer and storm sewer manholes shall be constructed of concrete benches which shall be precast or poured-in-place in the field. Benches shall extend to the top of each pipe to a maximum height of 42 inches. Flow lines shall be made smooth with uniform curves to promote flow through the manhole.

All joints between manhole pipe sections and top shall be tongue-and-groove conforming to ASTM C443. Manhole joints shall be sealed with circular O-ring or preformed flexible joint sealant as specified herein.

Manhole connections for sanitary sewer mains shall be made using flexible, watertight connections, PSX Press Seal, Kor-N-Seal, or equal, for sewers up through 18-inch diameter. All other sanitary sewer manhole connections shall be made with A-Lok, PSX Press Seal, Kor-N-Seal, or equal. Manhole connections for all other piping shall be made with A-Lok, PSX Press Seal, Kor-N-Seal, or concrete grout.

Manhole bottoms for sanitary sewer shall be monolithically precast with the bottom section for manholes up through 6-foot diameter. Bottoms for larger diameter manholes shall be precast but need not be monolithically cast with the bottom section. All other manhole bottoms shall be either poured-in-place or precast concrete.

Manhole bottoms for air release manholes, force main cleanout manholes and water system valve manholes shall have an 18-inch-diameter sump hole. Sump hole shall have a solid concrete bottom where groundwater is above the bottom of the manhole.

Manholes shall be furnished of minimum diameters as shown on Drawing 01-975-43A. Manholes shall be furnished large enough to provide a minimum distance, between adjacent pipe, measured tangentially along the inside face of the manhole, equal to one-half the outside diameter of the intersecting sewer pipe. In any event, manholes shall be furnished in the diameter necessary to accommodate intersecting sewer pipe and the pipe to manhole connection as proposed for use.

Steps shall be installed in all sewer manholes by the manufacturer as shown on Drawing 01-975-43A and shall be cast iron conforming to ASTM A48, Class 30B or steel reinforced plastic conforming to ASTM A615, Grade 60 and ASTM D4101, Type II, Grade 49108 as shown on the Drawings. Manhole steps

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shall be spaced at 16 inches on center with an allowable tolerance of ± 1 inch. Steps shall be embedded into the riser or conical top section wall a minimum of 3 inches.

Precast reinforced concrete manhole risers and tops shall be tested in accordance with ASTM C497. Precast reinforced concrete manhole risers and tops meeting the strength requirements will be considered acceptable and shall be stamped with an appropriate monogram. When requested, copies of test reports shall be submitted to ENGINEER before the manhole sections are installed in the Project. Final acceptance will be made after field inspection upon delivery to the jobsite.

Precast reinforced concrete manhole sections shall be subject to rejection for failure to conform to any of the Specification requirements. In addition, individual sections of manhole risers and tops may be rejected because of any of the following reasons:

- a. Fracture or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
- b. Defects that indicate imperfect proportioning, mixing, and molding.
- c. Surface defects indicating honey-combed or open texture.
- d. Damaged ends, where such damage would prevent making a satisfactory joint.
- e. Manhole steps out of line, or not properly spaced.
- f. Noticeable infiltration into manhole.
- g. Variation in diameter of the manhole section of more than 1% from the nominal diameter.
- h. Any continuous crack having a surface width of 0.01 inch or more and extending for a length of 12 inches or more regardless of position in the section wall.

Each precast reinforced concrete manhole riser and top section shall be clearly marked with the name or trademark of the manufacturer and the date of manufacture. This marking shall be indented into the manhole section or shall be painted thereon with waterproof paint.

Precast concrete adjusting rings for standard manholes shall have an inside diameter of 26 inches, be not less than 2 inches nor more than 6 inches high, and shall have a wall thickness of 6 inches unless otherwise specified. The rings shall contain a minimum of one No. 2 reinforcing rod centered within the ring. The joints between rings and between rings and castings shall be sealed with preformed flexible joint sealant as specified herein.

1.5 STORM SEWER INLETS

All inlets shall meet the requirements of ASTM C913. Construction shall conform to Drawing 01-975-41A. Inlets, in general, shall be rectangular in shape and shall be constructed of precast or poured-in-place concrete.

1.6 MASONRY

Concrete block shall meet the requirements of ASTM C139.

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The face size of stretcher units shall be 7 5/8 inches by 15 5/8 inches. Variations in the face size shall be within the limits permitted by the above standards. Special shapes and sizes shall be furnished and installed as necessary.

Sewer brick shall conform to ASTM C32. All sewer brick shall be grade SS and manhole brick shall be grade MS. Sewer brick shall be installed as shown on the Drawings furnished by ENGINEER and as required in the construction of sewer appurtenances.

1.7 MANHOLE AND INLET CASTINGS

All manhole and inlet castings shall be gray iron and meet the requirements of ASTM A48. Unless otherwise shown on the Drawings or specified in the **SPECIAL PROVISIONS**, standard manhole castings shall be Neenah R1550 with machined frame, Type B solid lid, concealed pick holes and self-sealing gaskets, East Jordan Iron Works, or equal. Floodproof castings shall be Neenah R1916 C with machined frame, type B solid lid, concealed pick holes and self-sealing gaskets, East Jordan Iron Works, or equal.

Inlet castings for locations with curb and gutter shall be Neenah R3067 with type L grates on slopes and type R grates at low points, East Jordan Iron Works, or equal. For driveway areas, inlet castings shall be Neenah R3290 with Type A grates, East Jordan Iron Works, or equal.

1.8 FRAME/CHIMNEY SEAL

Where required by the **SPECIAL PROVISIONS** or shown on the Drawings, CONTRACTOR shall provide internal manhole frame chimney seal. The seal shall be made of a rubber type product, with a minimum thickness of 3/16 inches, a minimum unstretched width of 8 inches and be extruded or molded from a high grade rubber compound conforming to the applicable requirements of ASTM C923. The bands used for compressing the sleeve against the manhole shall be fabricated from stainless steel conforming to ASTM A240, Type 304, for sheet and ASTM A479, Type 304, for rods. Any screws, bolts, or nuts used on these bands shall be stainless steel conforming to ASTM F593 and F594, Type 304. The internal seal or its appurtenances shall not extend far enough into the manhole opening to restrict entry into or exit from the manhole.

Manhole frame-chimney seals shall be designed to prevent the leakage of water into the manhole at the area of the joint between the manhole frame and chimney continuously throughout a 20-year design life. The seal shall remain flexible, allowing repeated vertical movements of the frame because of frost lift, ground movement, or other causes of up to 2 inches and/or repeated horizontal movements of the frame because of thermal movement of the pavement or other causes of up to 1/2 inch, both rates of movement occurring at rates not less than 0.10 inch per minute. If the seal is an internal seal, it and its appurtenances shall not extend far enough into the manhole opening to restrict entry or exit from the manhole.

The seal shall be made of only materials that have been successfully used in sanitary sewer construction for at least ten years and have proven to be resistant to sanitary sewage; corrosion or rotting under wet or dry conditions; the gaseous environment in sanitary sewers and at road surfaces including common levels of ozone, carbon monoxide and other trace gases at the sites of installations; the biological environment in soils and sanitary sewers; chemical attacks by road salts, road oil and common street spillages or solvents used in street construction or maintenance; the temperature ranges, variations and gradients in and between manhole frames and chimneys in the climate of the location of construction; variations in moisture conditions and humidity; fatigue failure caused by a minimum of 30 freeze-thaw cycles per year; or vibrations because of traffic loadings; fatigue failure because of repeated variations of tensile, compressive and shear stresses and repeated elongation and compression; and any combination of the foregoing. The materials used shall be compatible with each other and the manhole materials.

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1.9 JOINT SEALING FOR MANHOLES AND APPURTENANCES

Unless modified by the **SPECIAL PROVISIONS**, the type of material to be used to seal joints between manhole barrels, cone sections, tops, adjusting rings, castings, and other appurtenances shall be as specified in the Standard Specifications or as shown on the Drawings.

1.9.1 MORTAR

Mortar shall meet the requirements of ASTM C270. Mortar shall be one part Portland cement and 2 1/4 parts washed mortar sand.

1.9.2 PREFORMED FLEXIBLE JOINT SEALANT

Prefomed flexible joint sealant shall be EZ Stik, Kent Seal, Ram Nek, or equal, meeting the requirements of ASTM C990.

1.9.3 O-RINGS

O-rings shall meet the requirements of ASTM C443.

1.10 AGGREGATE SLURRY (FLOWABLE) BACKFILL

Aggregate slurry (flowable) backfill shall consist of fine and coarse aggregate conforming to ASTM C33. Coarse aggregate shall be size number 67 and fine aggregate shall be size number 4. The material shall be mixed with water to provide an approximate 3-inch slump. The mix shall be deposited in the trench from ready mix concrete transit mix trucks and shall be consolidated using concrete vibrators or vibratory plate compactors.

1.11 EROSION CONTROL

Erosion and pollution control components such as silt fences, rock bags, straw bales, trash receptors, etc. shall meet the requirements of Best Management Practices and the Stormwater Pollution Prevention Plan established for this Project.

1.12 BEDDING DIKE

Where shown on the Drawings or requested by ENGINEER in the field, CONTRACTOR shall install clay bedding dikes to prevent groundwater from flowing continuously through the bedding material installed for the sanitary sewer. Bedding dikes shall be 4 feet long and shall extend from the bottom of the trench excavation to within 2 feet of the ground surface and 1 foot beyond the trench width on both sides of the trench.

1.13 SPECIAL MATERIALS AND EQUIPMENT

See **SPECIAL PROVISIONS** for items of material and equipment specific to the Project.

SECTION 2—ALIGNMENT AND GRADE

2.1 GENERAL

Utility lines shall be laid and installed to the lines and grades specified with valves, fittings, manholes, and other appurtenances at the specified locations; spigots centered in bells; and all manholes and riser pipes plumb.

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Water main and force main shall maintain a minimum of 36 inches of cover. Gravity sewer mains and laterals shall maintain a minimum 36 inches of cover but shall be deep enough to provide service to buildings.

Water main, force main, and other pressure mains shall be installed to within ± 0.1 feet of designed grades. Sanitary and storm sewer and laterals shall be installed to within ± 0.03 feet of designed grades.

Unless otherwise noted in the **SPECIAL PROVISIONS** or on the Drawings, service lines shown on the Drawings are approximate. ENGINEER will assist CONTRACTOR in staking the actual locations in the field.

Staking shall be completed in conformance with Division 1 of the Specifications.

2.2 DEVIATIONS OCCASIONED BY UNDERGROUND FACILITIES

Wherever significant obstructions not shown on the Drawings are encountered during the progress of the Work, CONTRACTOR shall proceed in accordance with the General Conditions to notify owners and protect the facilities. Existing items unnecessarily damaged during the performance of the Work shall be repaired and replaced at the expense of CONTRACTOR.

2.3 CAUTION IN EXCAVATION

CONTRACTOR shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures may be determined and shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on its part.

2.4 SUBSURFACE EXPLORATION

Whenever, in the opinion of ENGINEER, it is necessary to explore and excavate to determine the location of existing underground facilities, CONTRACTOR shall make explorations and excavations for such purposes. If CONTRACTOR is asked to perform additional Work in making the explorations and excavations, extra compensation will be allowed as specified in the General Conditions.

SECTION 3—EXCAVATION AND PREPARATION OF TRENCH

3.1 GENERAL EXCAVATION

The trench shall be dug so that the utilities can be laid to the alignment and depth specified. Unless otherwise allowed by ENGINEER, trenches shall not be excavated more than 100 feet in advance of pipe laying. Earth excavation shall include all excavation except rock as hereinafter defined. Included in earth excavation shall be removal of street paving of all types, existing structures, existing improvements and trees smaller than 4 inches in diameter measured 4 feet above the ground, all as necessary to complete the pipe installation.

3.2 EXCAVATION TO GRADE

The trench shall be finished to the depth necessary to provide a uniform and continuous bearing and support for the pipe on the bedding material provided at every point between bell holes. Any part of the bottom of trench excavated below the specified grade shall be corrected with bedding material, thoroughly compacted in place. The bedding shall be shaped and finished with hand tools to fit the bottom quadrant to the pipe.

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If, in the opinion of ENGINEER, unstable soil conditions are encountered at subgrade, CONTRACTOR shall replace the unstable soil with special bedding. CONTRACTOR shall be allowed extra compensation for the special bedding, unless the unstable soil conditions are caused by CONTRACTOR's failure to adequately dewater the trench, in which case CONTRACTOR shall bear the entire cost.

All excavated material shall be piled in a manner that will not endanger the Work. Stockpiles not for immediate backfilling shall have silt fences placed around their perimeter for erosion control. The Work shall be conducted in such a manner that pedestrian and motor traffic is not unnecessarily disrupted. Fire hydrants, valve boxes and manholes shall be left unobstructed. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed.

Excavated material designated by ENGINEER as being undesirable for backfilling and all surplus excavated material shall be immediately removed as excavation progresses. All such material shall be disposed of in an environmentally safe manner in accordance with local, state, and federal regulations. No such materials shall be disposed of in wetlands, floodplains, or other environmentally sensitive areas. Disposal sites are also subject to approval of OWNER. All undesirable and surplus material disposed of must be leveled off and graded to rough elevations as determined by OWNER. Appropriate erosion control measures shall be provided and maintained at disposal sites until disposal is complete and the disposal site is permanently stabilized.

CONTRACTOR shall remove bituminous pavement and road surface as a part of the trench excavation. The width of pavement removed shall be the minimum possible, and acceptable, for convenient and safe installation of utilities and appurtenances.

All bituminous pavement shall be cut on neat, straight lines and shall not be damaged beyond the limits of the trench.

Where it is necessary to trench through concrete pavement, a strip shall be sawed and removed in such a manner as not to disturb the remainder of the pavement. Paving and undermining of existing concrete pavement shall be prevented by CONTRACTOR. If CONTRACTOR unnecessarily removes or damages pavement or surfaces beyond limits acceptable to ENGINEER, such pavement and surfaces shall be replaced or repaired at the expense of CONTRACTOR.

3.3 DEWATERING

CONTRACTOR shall, at its own expense, keep the excavation clear of water while structures and appurtenances are being built, utilities are being installed, and fill and backfill is being compacted. CONTRACTOR shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outages, and shall have available at all times competent workers for the operation of the pumping equipment. The dewatering systems shall not be shut down between shifts, on holidays or weekends, or during Work stoppages.

All dewatering shall be done in accordance with applicable federal, state, and local code requirements.

Under no conditions shall the Work be laid in or under water. No water shall flow over the Work until the joints are complete or the concrete has set. Wherever necessary, CONTRACTOR shall excavate in advance of the completed Work, lead the water into sumps or pump wells, and provide erosion control measures to prevent water or sediment damage.

The expense for making all extra excavations necessary to prevent water from interfering with the proper construction of the Work and for forming of all dams, digging sumps or pump wells, bailing and pumping, and erosion control shall be borne by CONTRACTOR. Any permits necessary for the dewatering operations shall be obtained and paid for by CONTRACTOR. No extra payment will be made for

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dewatering of the trench whether accomplished by the use of sumps and pumps, well point systems, or deep wells.

CONTRACTOR's dewatering system shall ensure that soils within the trench will not be destabilized by hydrostatic uplift pressures from adjacent groundwater. If conditions warrant, CONTRACTOR shall furnish and install well point systems or deep wells. Spacing and depth of well points or wells shall be adequate to lower the piezometric level to at least 2 feet below the bottom of the excavation. Additional lowering shall be provided as necessary to create a stable subgrade. The control of groundwater shall be such that softening or heaving of the bottom of excavations or formation of quick conditions or boils shall be prevented. Dewatering systems shall be designed and operated to prevent the migration or removal of soils. In areas where rock is encountered, the water level shall be kept at or below top of rock but at least 6 inches below bottom of concrete. Additional rock shall be removed as needed to provide clearances.

CONTRACTOR shall take all necessary precautions during the dewatering operation to protect adjacent structures against subsidence, flooding, or other damage. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property. Any such facilities and structures damaged shall be repaired or replaced to the satisfaction of their owner.

Prior to dewatering, CONTRACTOR shall take into account the effect of its proposed dewatering operation on existing private water supply systems and shall make arrangements with property owners for protecting their supplies or providing alternative supply. If CONTRACTOR's dewatering operation adversely affects private water supply systems, CONTRACTOR shall provide property owners with alternative potable and nonpotable supplies until dewatering operations are ceased and groundwater levels return to normal. If the water in private water supply wells is contaminated through no fault of CONTRACTOR after restoration of original groundwater levels, OWNER will provide measures to restore water potability. CONTRACTOR is responsible for restoration of the water supply, not its potability after restoration.

In areas where continuous operation of dewatering pumps is necessary, CONTRACTOR shall avoid noise disturbance to nearby residences and businesses to the greatest extent possible by using electric driven pumps, intake and exhaust silencers, or housing to minimize noise.

The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted fill or backfill, and prevent floatation or movement of all structures and pipelines.

3.4 WIDTH OF TRENCH

CONTRACTOR shall be responsible for determining and providing the minimum width necessary to provide a safe trench in accordance with current OSHA standards and all other applicable standards. The top width of trench excavation shall be kept as narrow as is reasonably possible and acceptable to minimize pavement damage. Pay items related to maximum trench widths shall not limit CONTRACTOR's responsibility to provide safe trench conditions.

Width of Trench—Rigid Pipe: The width of trench below the outside top of the pipe shall be as shown in the following table for the sizes listed. A minimum clearance of 8 inches between the outside of the pipe barrel and the trench wall at the pipe spring line shall be maintained to allow for bedding and haunching. If sheeting is used and is going to remain in place, the trench width shall be measured as the clear distance between inside faces of the sheeting. Otherwise, the trench width shall be based on the width between stable trench walls after sheeting is removed.

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MAXIMUM WIDTH OF TRENCH BELOW TOP OF PIPE

Nominal Pipe Diameter (Inches)	Trench Width (Inches)
4	30
6	30
8	36
10	36
12	36
15	36
18 and larger	SEE SPECIAL PROVISIONS

Where the width of trench below the outside top of the pipe barrel cannot be otherwise maintained within the limits shown above, CONTRACTOR, at its own expense, shall furnish an adequate pipe installation for the actual trench width which will meet design conditions. This may be accomplished by furnishing higher class bedding, a stronger pipe, concrete cradle, cap or envelope or by driving sheeting prior to excavation to subgrade. Removal of sheeting below the top of the pipe, if allowed by ENGINEER, shall be gradual during backfilling.

If the maximum trench width is exceeded for any reason other than by request of ENGINEER, the concrete cradle, cap, sheeting, bedding or the stronger pipe shall be placed by CONTRACTOR at its own expense. Where the maximum trench width is exceeded at the written request of ENGINEER, the concrete cradle, cap, sheeting, bedding or stronger pipe will be paid for on the basis of the price bid.

Width of Trench—Thermoplastic and Ductile Iron Pipe: The trench width for flexible pipe shall be minimum three times the pipe outside diameter or the maximum trench width specified for rigid pipe, whichever is greater. A minimum clearance of 8 inches between the outside of the pipe barrel and the trench wall at the pipe spring line shall be maintained to allow for bedding and haunching.

3.5 ROCK EXCAVATION, UTILITIES

Rock excavation for utilities shall include all hard, solid rock ledges, bedded deposits and unstratified masses and all conglomerate deposits or any other material so firmly cemented that in the opinion of ENGINEER it is not practical to excavate and remove same with a 225-net flywheel horsepower trench backhoe or equal, except after continuous drilling and blasting. Soft or disintegrated rock which can be removed with a pick, loose, shaken or previously broken rock, or rock which may fall into the excavation from outside the limits of excavation will not be classified as rock excavation. Rock excavation shall also include all rock boulders necessary to be removed having a volume of 2 cubic yards or more.

When rock is encountered, it shall be stripped of earth and ENGINEER or OWNER's representative notified and given proper time to evaluate same before removal. Any rock removed which has not been measured by ENGINEER or OWNER's representative will not be classified as rock excavation.

The depth of trench in rock shall be 6 inches below the lowest outside bottom of the pipe.

All rock excavated from the trench shall be classified as undesirable backfill material and shall be disposed of as specified in the Excavation to Grade section. All trenches in rock shall be backfilled with bedding, cover, and backfill material furnished by CONTRACTOR.

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3.6 BLASTING

Blasting for rock excavation will be permitted only after securing the written approval of OWNER and only after proper precautions are taken for the protection of persons or property. The hours of blasting will be fixed by OWNER. Any damage caused by blasting shall be repaired by CONTRACTOR at its expense. CONTRACTOR's method and procedure of blasting shall conform to state laws and municipal ordinances.

CONTRACTOR shall provide a copy of Blaster License as required by the licensing agencies to OWNER prior to commencement of blasting.

3.7 SPECIAL BEDDING

Special bedding shall consist of stone material and filter fabric as described herein. Where the bottom of the trench at subgrade is found to be unstable or of unsuitable material, which in the opinion of ENGINEER should be removed, CONTRACTOR shall excavate and remove such unstable or unsuitable material to the trench width and to a depth of 2 feet. The excavated area shall be lined with filter fabric, Mirafi 140 N, US Fabrics US 120NW, Propex Geotex 401, or equal, and backfilled with bedding material in maximum 12-inch layers. At subgrade the filter fabric shall be wrapped over the special bedding with an 18-inch overlap. Bedding material shall then be placed over the special bedding to support the piping. See Dewatering and Excavation to Subgrade sections for additional conditions.

3.8 CONCRETE CRADLE

If soil conditions require it, concrete cradle or encasement shall be placed around the pipe as shown on Drawing 01-975-43A. Excavation shall be carried below the grade line to a depth requested by ENGINEER and concrete cradle or encasement placed. Before the concrete is placed, the pipe shall be laid to line and grade, blocked and braced, and the joint made. The cradle shall then be placed, taking care not to disturb the pipe. Concrete shall have a minimum 28-day compressive strength of 4,000 psi. Concrete cradle shall not be used for thermoplastic piping. See Trench Width section for additional conditions.

3.9 BRACED AND SHEETED TRENCHES

Open-cut trenches shall be sheeted and braced as required by any governing federal regulations including OSHA, state laws, and municipal ordinances; and as may be necessary to protect life, property, improvements or the Work. Underground or aboveground improvements to be left in place shall be protected and, if damaged, shall be repaired or replaced at the expense of CONTRACTOR.

Sheeting and bracing which is to be left in place must be removed for a distance of 4 feet below the present or proposed final grade of the street, road, or land, whichever is lower. Trench bracing, except that which shall be left in place, may be removed after backfilling has been completed or has been brought up to such an elevation as to permit its safe removal.

3.10 TUNNELING, BORING, JACKING, OR BORING AND JACKING

Where shown on the Drawings or specified in the **SPECIAL PROVISIONS**, the sewer, water main or force main (carrier pipe) shall be placed inside a casing pipe that is installed by tunneling, boring, jacking, or boring and jacking or other acceptable methods not using open-cut construction techniques. Installation shall be accomplished in accordance with State Laws, municipal ordinances, and any permit requirements. Casing pipe used shall be of adequate diameter and thickness to support all loads imposed and to permit installation of the carrier pipe to plan line and grade. Type and minimum size of casing pipe

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shall be as called for on the Drawings or as specified. Steel casing pipe joints shall be continuous circumferential welds of strength equal to pipe walls.

Casing pipe shall be installed using equipment and material that cases the hole as earth is removed to eliminate cavities at the lead end of the casing pipe. Grouting between casing pipe and soil opening shall be performed when needed to secure casing pipe, to prevent soil collapse, and to fill voids between the casing pipe and native soil.

Installation of casing and carrier pipe shall proceed in such a manner as to minimize disruption of traffic and to avoid damage to adjacent streets. No equipment shall work off the pavement or shoulder of the street being crossed during the course of construction. Signs, barricades, flagmen and lighting shall be provided to strictly comply with the Traffic Control section of the Standard Specifications as may be modified by any permit requirements. Stricter requirements shall govern in case of differences.

The carrier pipe shall be placed inside the casing pipe using hardwood blocks or stainless steel casing spacers, which are shaped to fit both the casing pipe and carrier pipe. At least three blocks or spacers shall be provided for each length of carrier pipe. They shall be banded or fixed to the barrel of the carrier pipe so they are parallel to the longitudinal centerline. The annular space between the casing pipe and carrier pipe shall be filled with sand or concrete grout. Sand fill shall be thoroughly tamped and rammed in place.

All carrier pipe within the limits of jacking pits shall be installed at CONTRACTOR's expense to resist all loads imposed including, if necessary, the use of special pipe.

Other tunneling methods shall be as specified in the **SPECIAL PROVISIONS**.

SECTION 4—PIPE AND MANHOLE INSTALLATION

4.1 GENERAL

Prior to commencing pipe laying, CONTRACTOR shall notify ENGINEER of the intended date for starting Work. ENGINEER may request at CONTRACTOR's expense the removal and relaying of pipe which was installed prior to notification of ENGINEER.

Proper implements, tools, and facilities shall be provided and used by CONTRACTOR for the safe and convenient prosecution of the Work. All pipe, fittings, and appurtenances shall be carefully lowered into the trench, piece by piece, with a crane, rope or other suitable tools or equipment, in such manner as to prevent damage to materials. Under no circumstance shall pipe be dropped or rolled into the trench.

Materials shall be as shown on the Drawings or as specified herein.

4.2 MATERIAL INSPECTION

CONTRACTOR shall inspect the pipe, fittings, and appurtenances for defects when delivered to the jobsite and prior to lowering into the trench. Defective material shall be removed from the jobsite. All material shall be clean and free of deleterious substances prior to use in the Work.

4.3 BEDDING AND COVER

Immediately prior to placing the pipe, the trench bottom shall be shaped by hand to fit the entire bottom quadrant of the pipe. If pipe is of the bell and spigot type, bell holes shall be provided to prevent the bell from supporting the backfill load. Bell holes shall be large enough to permit proper making of the joint but not larger than necessary to make the joint. All adjustments to line and grade must be done by scraping away or filling in bedding material under the body of the pipe. Any fill used must be bedding material. If

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necessary to obtain uniform contact of the pipe with the subgrade, a template shall be used to shape the bedding material. All pipe shall be bedded in bedding material at least 4 inches thick. CONTRACTOR shall perform all necessary excavation and shall furnish all necessary material to provide this bedding.

Bedding material shall be hard and durable and shall be made by crushing sound limestone or dolomite ledge rock, or crushed gravel aggregate. Bedding material shall conform to the requirements of ASTM C33.

PERCENTAGE BY WEIGHT PASSING INDICATED SIEVE

Size	2 1/2 IN	2 IN	1 1/2 IN	1 IN	3/4 IN	1/2 IN	3/8 IN	No. 4	No. 8	No. 16	No. 30	No. 100	No. 200
57			100	95-100		25-60		0-10	0-5				
8						100	85-100	10-30	0-10	0-5			
9						100	75-100	0-25	0-5				
10							100	85-100				10-30	

All rigid sanitary sewer pipe and related appurtenances shall be bedded and covered in accordance with the Class B bedding detail as shown on Drawing 01-975-43A. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.

Concrete and other rigid pipe used in non-sanitary sewer applications (sanitary sewer applications, if allowed by the **SPECIAL PROVISIONS**) may be bedded using the Class C bedding detail as shown on Drawing 01-975-43A. Bedding material shall conform to the above for rigid sanitary sewer pipe.

Ductile and cast iron pipe shall be bedded in accordance with Class C bedding detail as shown on Drawing 01-975-43A or the Type 3 laying condition of AWWA C600. Bedding material shall conform to Size No. 8, or No. 9. Where ductile iron pipe is polyethylene encased, bedding material shall conform to Size No. 10 or cover material as specified below.

Thermoplastic sanitary sewer pipe and related appurtenances shall be bedded and covered in accordance with the Thermoplastic Pipe Bedding Detail on Drawing 01-975-43A. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.

All other sanitary sewer pipe and related appurtenances shall be bedded and covered in accordance with the Class B bedding detail as shown on Drawing 01-975-43A. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.

PVC and HDPE water main or force main shall be bedded and covered in accordance with the Thermoplastic Pipe Bedding Detail on Drawing 01-975-43A. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used.

Bedding material for copper water services shall conform to Size No. 9 or No. 10.

No material native to the trench shall be used for bedding material.

CONTRACTOR shall provide ENGINEER with a sieve analysis of the bedding material for review prior to starting construction.

Material which is to be placed from the bedding material to 1 foot above the top of the pipe shall be termed cover material. All trenches shall be backfilled by hand to 1 foot above the top of the pipe with cover material. Cover material shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously in 6-inch layers and shall be compacted using hand tamping bars and/or mechanical tampers. CONTRACTOR shall use special care in placing cover material to avoid injury to or movement of the pipe. Cover material shall consist of durable granular particles ranging in size from fine to a maximum size of 3/4 inches. Unwashed bank run sand and crushed bank run gravel

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will be considered generally acceptable cover material. Cover material shall generally conform to the following gradation specifications:

COVER MATERIAL GRADATION

Sieve Size	Percentage by Weight Passing
1 inch	100
3/4 inches	85 to 100
3/8 inches	50 to 80
No. 4	35 to 65
No. 30	--
No. 40	15 to 30
No. 200	5 to 15

Native trench materials may be used for cover material if they substantially conform to the above gradation specifications and a suitable credit is extended to OWNER.

All bedding materials may be substituted for cover material when requested by CONTRACTOR except where polyethylene encasement is used. In such case, only those bedding materials specifically noted for polyethylene encasement may be used.

4.4 PIPE LAYING

All pipe shall be laid accurately to the line and grade as designated. Preparatory to making pipe joints, all surfaces of the portions of the pipe to be joined or of the factory-made jointing material shall be clean and dry. Lubricants, primers, adhesives, and other joint material shall be used and installed as recommended by the pipe or joint manufacturer's specifications. The jointing materials or factory fabricated joints shall then be placed, fitted, joined, and adjusted in such a workmanlike manner as to obtain the degree of watertightness specified. Pertinent specifications from the joint and pipe manufacturer which outline procedures to be followed in making the joint shall be furnished to ENGINEER.

Wyes, tees, and special fittings shall be installed as called for on the Drawings or as requested by ENGINEER. Wyes, tees, and special fittings shall, in general, be jointed with the same type of joint as used in the pipe.

In joining two dissimilar types of pipe, manufactured adapters and fittings shall be used. Adapters and fittings shall be configured to maintain invert elevations at same level.

Joint deflections shall not exceed the limits established by the pipe manufacturer for the pipe and joint being used.

Joints that are damaged because of carelessness, improper handling, or failure to prevent imperfections in manufacture shall be subject to rejection and gaskets shall be subject to rejection whenever they show surface cracking, tears, or splice separation.

At times when pipe laying is not in progress, the open ends of pipe shall be closed with plugs to prevent the entry of foreign material. All foreign material shall be removed from the pipe prior to acceptance.

After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with specified backfill material tamped around it except at the bells. Trenches shall be kept water-free during bedding, laying, and jointing and for as long a period as necessary to permit proper execution of the Work.

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Pipe shall be brought home by using a cross member and levers or jacks. It will not be permissible to push pipe home with motor-powered excavation equipment.

Force main and water main shall be installed in accordance with AWWA C600 for iron pipe, AWWA C605 for PVC pipe, and AWWA M55 for HDPE pipe. All plugs, caps, tees, hydrants, bends, and other fittings for water mains and force mains shall be provided with restrained joints.

The minimum length of pipe to be restrained shall be as shown in the following table:

REQUIRED LENGTH OF RESTRAINED PIPE BEYOND FITTING IN FEET

Fitting	Minimum Length—Ft
90 Degree Bend (4 inches)	36
90 Degree Bend (6 inches to 8 inches)	54
90 Degree Bend (10 inches to 12 inches)	72
90 Degree Bend (14 inches)	84
45 Degree Bend (\leq 6 inches)	18
45 Degree Bend (8 inches to 14 inches)	36
22 1/2 Degree Bend \leq 14 inches	18
11 1/4 Degree Bend \leq 14 inches	9
Fire Hydrant Leads	All Joints
End of Line Tees (4 inches)*	18 (Along Branch)
End of Line Tees (6 inches to 8 inches)*	36 (Along Branch)
End of Line Tees (10 inches to 12 inches)	54 (Along Branch)
End of Line Tees (14 inches)*	66 (Along Branch)

*Restrained run length on tees assumed 18 feet on each side of fitting

This table assumes horizontal orientation of fittings, 150 psi test pressure plus a 100 psi water hammer allowance, ductile iron pipe, and a 3-foot bury. Lengths shall be adjusted for other conditions and fittings. For other fittings and for more specific requirements, see the Drawings or **SPECIAL PROVISIONS**.

4.5 SEWER SERVICE BRANCH AND LATERAL INSTALLATION

General: CONTRACTOR shall furnish and install sanitary sewer and storm sewer branches, laterals, and leads as shown on the Drawings or requested by ENGINEER. Under normal circumstances, service laterals will be installed within the right-of-way or easement to serve all existing buildings and all platted lots. In certain cases, only wye or tee branches will be installed to vacant lots. Service laterals shall consist of a branch fitting at the main and extension of the specified lateral pipe to the end of lateral as called for and requested. All necessary fittings shall be furnished and installed to complete the installation as shown on Drawing 01-975-75A. All necessary fittings shall be furnished and installed to complete installation of for storm sewer leads as shown on Drawing 01-975-41A.

Wye or Tee Branches: Wherever shown on the Drawings or requested by ENGINEER, wye or tee branches shall be provided for use in making sanitary sewer service and storm sewer inlet connections. Unless specified otherwise in the **SPECIAL PROVISIONS** or as shown on the Drawings, wye or tee branches for sanitary sewer service lateral connections to single-family residences shall be 4-inch diameter. All other sanitary sewer service lateral connections shall be 6 inches. Wye or tee branches for storm sewer inlet connections shall be of the size called for on the Drawings, 12 inch minimum.

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Sanitary sewer service branches shall be turned so that the branch is at an angle of 30 degrees or 45 degrees with the horizontal.

Sanitary Sewer Service Laterals: Under normal conditions and unless otherwise specified in the **SPECIAL PROVISIONS**, shown on the Drawings, or requested by ENGINEER, all service laterals shall be Standard Laterals, Type 1, as shown on Drawing 01-975-75A. Service laterals of Types 2 through 6 may be requested by ENGINEER to meet field conditions.

It is the general intent to install Modified Laterals, Type 2, 4, or 5 for service to homes that presently have shallow or no basements or where the depth to groundwater at the end of lateral is shallow. Type 3 and 6 risers are only to be provided where shown on the Drawings or specified in the **SPECIAL PROVISIONS**.

Installation and Testing Requirements: Except for those branches that are to be used on storm sewers or for extending sanitary sewer service laterals, wye and tee branches shall be closed with airtight stoppers blocked to withstand air test pressures.

The ends of all laterals shall be plugged and blocked to resist air test pressures. All plugs shall be manufactured to fit the pipe used and shall be watertight. The ends of all laterals shall be marked as shown on Drawing 01-975-75A using flagging tape and 2 by 4 markers.

A complete and accurate tabulation of length, depth, and location of all branches, risers, and laterals shall be kept by CONTRACTOR on cards available from ENGINEER. Measurements shall be made from the nearest downstream manhole. Lateral installation to meet these Specifications and field conditions are the responsibility of CONTRACTOR. Problems occurring because of failure to provide proper installation or proper records shall be corrected by CONTRACTOR at its expense.

No installed lateral shall be backfilled until ENGINEER has been notified that the lateral is complete and reasonable time is allowed for observation of the Work.

4.6 WATER SERVICE LATERAL INSTALLATION

Water service laterals requiring reconstruction and new service laterals shall be installed in accordance with AWWA C600. CONTRACTOR shall perform all excavation, backfill, and other Work necessary for a complete installation. The service tubing shall be continuous and shall be placed at a minimum depth of 30 inches. Each service shall include a corporation stop at the main, copper service tubing, curb stop, curb box, couplings, and all other appurtenances necessary for a complete installation. Where existing services in the street are being reconstructed, the new service shall be connected to the existing service at the property line unless otherwise shown or specified. Taps in the main shall be at an angle of 45 degrees above the horizontal.

OWNER reserves the right to make taps and connections to the new mains prior to backfilling by CONTRACTOR. CONTRACTOR shall delay backfilling until OWNER has completed its Work.

All curb boxes on new services shall be marked by placing a 4-foot-long 2 by 4 adjacent to it. The 2 by 4 shall project 1 foot above existing ground and shall be painted blue. All services shall be extended to the street property line, unless otherwise shown or specified.

4.7 PORTABLE TRENCH BOX

Whenever a portable trench box or shield is used, special precautions shall be taken so as not to pull already jointed pipe apart or leave voids around the pipe wall. Whenever possible, the bottom edge of the box shall be kept at a level approximately even with the top of pipe. Cover material shall be placed to at least the top of pipe before moving the box ahead.

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4.8 MANHOLES

Manholes shall be installed in accordance with Drawing 01-975-41A for storm sewer, Drawing 01-975-42A for water main, and Drawing 01-975-43A for sanitary sewer. Manholes shall be plumb with any steps aligned and openings located over steps. For sanitary sewers, openings shall be located over the bench and not the sewer flow line itself.

All manholes shall be made watertight and shall show no visible signs of leakage at the time of final review and within the correction period. Any leakage shall be sealed from the exterior of the manhole.

4.9 STORM SEWER INLETS

Storm sewer inlets shall be installed in accordance with Drawing 01-975-41A. Inlets shall be set to the line and grade as furnished by ENGINEER. The outside end of the lift hole shall be covered with filter fabric to prevent the entrance of fines into the inlet.

Inlets shall be connected to the storm sewer main either at manholes, at wye branches in the main, or to other inlets, all as shown on the Drawings. Minimum size of inlet lead pipe shall be 12 inches.

Storm inlets shall be backfilled to undisturbed soil and at least 2 feet along connecting piping with bedding material.

4.10 MASONRY

No masonry shall be laid when the temperature of the outside air is below 40°F unless all masonry materials are heated and protected against freezing.

Only enough mortar shall be mixed that can be conveniently used before it reaches initial set. Retempering of mortar will not be permitted.

4.11 ABANDONING UTILITIES

Utilities to be abandoned shall, unless otherwise noted on the Drawings or in the **SPECIAL PROVISIONS**, be abandoned in place. Open ends of pipes shall be plugged with 12 inches of concrete. Manhole barrels, valve boxes and other such structures shall be removed to a point 3 feet below existing or final ground surface, whichever is lower, and shall then be filled with backfill material compacted to that of the trench backfill. An approximate 9-inch-diameter opening shall be made in the bottom of the structure to allow for groundwater movement.

4.12 CONNECTIONS TO AND MODIFICATIONS OF STRUCTURES AND MAINS

Unless otherwise noted on the Drawings or in the **SPECIAL PROVISIONS**, openings in existing structures to allow for connection of mains shall be core drilled, and the mains themselves shall be connected by use of watertight connections as specified in the Standard Specifications. Flow channels in the bottoms of existing structures shall be modified as necessary to provide smooth transition for incoming flow and/or orientation of mains. These modifications may include breaking out and reforming flow channels. See **SPECIAL PROVISIONS** for any additional requirements.

Where mains, new and existing, are to intersect, dog house manholes shall be provided to facilitate connection and to gain access to the intersecting mains. Manholes shall be provided at the manufacturing plant with arched openings in lower barrel section to span each of the intersecting mains. Reinforcing shall be cut and bent back. In the field, manhole shall be set on concrete blocks, with reinforcing provided according to Drawing 01-975-41A, 42A, or 43A for the bottom slab. Concrete shall be poured under and around the manhole to seal all openings, cover and adhere to the slab and bent reinforcement, and

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provide for benches or fillets in the manhole. Sanitary and storm sewer mains shall be kept intact until the bench or fillet is poured. Then the top of pipe to springline shall be removed to provide access. See **SPECIAL PROVISIONS** for any additional requirements.

SECTION 5—BACKFILLING

5.1 BACKFILL MATERIAL

Backfill shall be that material placed between the top of cover material to the subgrade for placement of restoration materials. Backfill for storm inlets shall be bedding material.

When the type of backfill material is not otherwise specified or shown on the Drawings, CONTRACTOR may backfill with the excavated material, provided that such material consists of loam clay, sand, gravel, or other materials which in the opinion of ENGINEER are suitable for backfilling.

All backfill material shall exceed 35°F and be free from frost, cinders, ashes, refuse, vegetable or organic matter, boulders, rocks, or stone, frozen lumps, or other material which in the opinion of ENGINEER is unsuitable. From 1 foot above the top of the pipe to the trench subgrade, well-graded material containing stones up to 8 inches in their greatest dimension may be used, unless otherwise specified in the **SPECIAL PROVISIONS**. Care should be taken in backfilling so as not to damage the installed pipe.

In refilling the trench, if there is not sufficient material excavated therefrom suitable for refilling, CONTRACTOR shall, without extra compensation, furnish the deficiency. Where indicated on the Drawings, fill shall be provided over projecting conduits. Such fill shall be free of large boulders, and the top 6 inches shall be of suitable material to fit the adjoining ground.

5.2 GRANULAR BACKFILL

When called for on the Drawings, in the **SPECIAL PROVISIONS**, or requested by ENGINEER, backfill material shall be granular and shall consist of durable particles ranging in size from fine to coarse in a substantially uniform combination. Sufficient fine material shall be present to fill all the voids in the coarse material. No stones over 3 inches or clay lumps shall be present. Unless otherwise allowed by ENGINEER, granular backfill shall generally conform to the following gradation specification:

GRANULAR BACKFILL

Sieve Size	Percentage by Weight Passing
3 inches	100
2 inches	95 to 100
No. 4	35 to 60
No. 200	5 to 10

5.3 PLACEMENT

All trenches shall be backfilled using specified material so that excessive lengths of trench are not left open. In general, the backfilling operation shall proceed so that no more than 100 feet of trench is open behind the pipe laying operation.

Backfill shall be left below the original surface to allow for placement of restoration materials including pavement, base course, concrete, topsoil, sod, plus any pavement replacement specified in accordance with the Asphaltic Paving section herein. When settlement occurs, CONTRACTOR shall restore the surface improvements at its expense, to maintain the finished surface.

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5.4 BACKFILL CONSOLIDATION

Unless specifically deleted in the **SPECIAL PROVISIONS**, all trenches shall be consolidated as specified in this section for the entire depth and width of the trench.

Consolidation shall be achieved by use of smooth surface vibratory compactors or backhoe-operated hydraulic compactors for granular materials and rotating sheepsfoot type mechanisms for loam/clay soils. The lift height shall not exceed 8 inches for walk-behind hand-operated vibratory compactors and sheepsfoot. Lift height shall not exceed 24 inches for self-propelled vibratory drum or backhoe-operated hydraulic compactors. Smaller lift heights shall be provided as necessary to achieve the degree of compaction specified.

Unless specified otherwise in the **SPECIAL PROVISIONS**, backfill material beneath paved areas or future paved areas and within 5 feet of paved areas or future paved areas shall be consolidated as follows: Within 3 feet of the surface 95% of maximum dry density, below 3 feet from the surface to 1 foot above the pipe 90% of maximum dry density, as determined by the modified Proctor Test (ASTM D1557).

Unless otherwise specified in the **SPECIAL PROVISIONS**, backfill material placed in all other areas shall be compacted to the point where no additional consolidation can be observed from the compaction and backfill equipment being used.

Backfill material not meeting the compaction specification shall be recompacted by CONTRACTOR at no cost to OWNER. Cost for additional testing on recompacted material shall be at CONTRACTOR's expense.

5.5 MAINTENANCE OF SURFACE

CONTRACTOR shall maintain all backfilling, resurfacing, repaving, and other surface improvements constructed under this Contract. CONTRACTOR shall, upon proper notice from OWNER, make all repairs in surfaces of trenches and excavations. All expenses incurred by OWNER and/or CONTRACTOR in making repairs and all expenses in maintaining trench and excavation surfaces shall be at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. OWNER reserves the right to make all emergency repairs necessary to make safe all streets and walks at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. A maintenance guarantee fund, if specified in the **SPECIAL PROVISIONS**, will be withheld from the final amount due CONTRACTOR for a period of six months after acceptance of the Work to assure such maintenance.

CONTRACTOR shall be responsible for controlling dust dispersion during utility and street construction. Remedial actions required as a result of inadequate dust control shall be CONTRACTOR's responsibility. To control dust, CONTRACTOR shall apply calcium chloride or ammonium lignin sulfonate in 12 to 14% solution or other dust control palliative acceptable to OWNER. Prior to application of dust palliative, the street shall be graded smooth.

SECTION 6—ROADWAY AND DRAINAGE EXCAVATION, GRADING AND BASE COURSE

6.1 GENERAL

The Work under this section includes all clearing, grubbing, excavation, grading, base course, and other miscellaneous items of Work required for restoration of utility construction Work and for street construction as shown on the Drawings and included in the Specifications.

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Unless otherwise specified, all street construction Work shall conform to the KYDOH Specifications as amended herein. Street construction shall mean street, roadway, parking lot, driveway, and similar type construction.

See **SPECIAL PROVISIONS** for availability of water for use in street construction.

6.2 CLEARING AND GRUBBING

In general, allowable tree removals shall be those trees which are necessary to remove for utility and street construction within the right-of-way or easement areas. Actual allowable tree removals will be determined in the field by ENGINEER. All trees and brush outside the right-of-way or easement areas shall be protected by CONTRACTOR, unless otherwise allowed by ENGINEER.

For utility construction, trees and brush to be removed outside the immediate trench area shall be cut flush with the ground surface or pushed over for all brush and for all trees 12-inch Diameter Breast Height (DBH) or less measured 4.5 feet aboveground. Trees in excess of 12-inch DBH shall be cut to within 6 inches of the ground surface. A basal application of herbicide shall be applied to all remaining stumps to prevent the development of suckers. Trees that are pushed over shall have their stumps removed and disposed of off-site.

Trees and brush, including stumps, within the trench area and within areas of street, sidewalk, bike path, and driveway construction shall be removed from the site and disposed of.

6.3 COMMON EXCAVATION

All street excavation shall be performed as called for in Section 204 of the KYDOH Specifications and as herein modified.

The following items of Work shall be included in common excavation:

- a. The excavation to subgrade elevations as detailed in the Drawings including road bed areas, terraces, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.
- b. Removal (and stockpiling, if the use of salvaged topsoil is required) of topsoil from all cut areas and fill areas within a 1:1 slope of finished street, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.
- c. The preparation, grading, compaction, and proof-rolling of subgrade areas for roadbed, sidewalks, bike paths, driveways, and other miscellaneous surface improvements to the elevations detailed on the Drawings.
- d. Excavation and grading required to realign and/or create ditch lines and drainage ways to route drainage to or from storm facilities as shown on the Drawings, or as necessary to maintain positive drainage.
- e. Removal of temporary backfill placed in new utility trenches above the subgrade.
- f. The removal and disposal of all undesirable and surplus materials.

Common excavation may be completed as part of utility construction prior to initiating general street excavation activities.

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All subgrade areas in streets and parking lots, including utility trench restoration areas, shall be proof-rolled with a heavily loaded triaxle dump truck or other similar equipment requested by ENGINEER prior to the placement of any fill materials or base course. ENGINEER must be present during proof-rolling to review the Work necessary for the stabilization of any unstable areas identified.

Saw cuts shall be made in existing pavement, driveways, curb and gutter, and sidewalks to allow restoration to neat straight lines. Saw cuts damaged during construction shall be recut prior to beginning restoration.

6.4 ROCK EXCAVATION, STREETS

Rock excavation for streets shall include removal of rock to subgrade elevations. Rock for excavation purposes shall be as defined in the Rock Excavation, Utilities section. Such rock shall be classified as undesirable backfill and disposed of in accordance with the Excavation to Grade section.

6.5 BORROW EXCAVATION

CONTRACTOR shall salvage suitable materials from utility and street construction activities to provide fill for street construction. Where sufficient quantities of materials suitable for street construction are not available from areas of the site, CONTRACTOR shall perform borrow excavation to make up the deficit in accordance with Section 205 of the KYDOH Specifications.

6.6 EXCAVATION BELOW SUBGRADE

ENGINEER may request the excavation of unsuitable materials in areas of unstable subgrade. The excavation of such materials, except in areas where CONTRACTOR has completed utility construction or placed street fill, shall be measured by ENGINEER for payment.

The excavation and replacement of unstable utility trench backfill and/or street fill placed by CONTRACTOR shall be at CONTRACTOR's expense.

Base course placed on unstable foundation shall be removed and replaced at CONTRACTOR's cost following excavation of the affected area.

Where requested by ENGINEER in the field, excavation below subgrade areas shall be lined with geotextile material and backfilled with Size No. 2 crushed stone base course as specified herein.

6.7 GEOTEXTILES

Geotextile shall be placed as requested by ENGINEER to stabilize street subgrade areas. Construction fabric shall be Mirafi 600X, Propex 2006, or equal. Any alternate fabric must have ENGINEER's approval prior to use. Construction fabric shall be installed in accordance with the manufacturer's recommendations. Vibratory compaction shall not be used in the compaction of base course in areas where construction fabrics are used.

6.8 PREPARATION OF FOUNDATION

The subgrade shall be graded and rolled to provide uniform density and shall comply with the profile and cross sections contained in the Drawings. All Work shall comply with Section 207 of the KYDOH Specifications.

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6.9 CRUSHED AGGREGATE BASE COURSE

Crushed aggregate base course shall consist of crushed stone or crushed gravel and be furnished in accordance with Section 302 of the KYDOH Specifications. Crushed aggregate base course shall be placed directly on subgrade areas or on top of salvaged asphaltic millings. CONTRACTOR shall supply ENGINEER with a current sieve analysis of the material prior to use. The material furnished shall be uniformly graded and shall conform to ASTM C33.

For street construction, base course shall be placed to the thickness shown on the standard sections. Where standard sections are not provided, a minimum of 9 inches of base course shall be provided. Base course thickness for utility trench patches in street areas shall match existing base course thickness with 12 inch minimum. The top 3 inches of base course shall be DGA. The remaining base course shall be Size No. 2. Base course shall be wetted and rolled with a self-propelled hydrostatic-drive vibratory roller. Unless otherwise requested by ENGINEER in the field, excavation below subgrade backfill shall be Size No. 2.

The finished new base course shall be fine-graded, rolled, and compacted in preparation for placement of new pavement. CONTRACTOR shall maintain the finished surface until pavement is placed.

6.10 SALVAGED ASPHALT PAVEMENT BASE

Where required on the Drawings or in the **SPECIAL PROVISIONS**, CONTRACTOR shall salvage existing asphaltic pavement for use as base course for street construction and/or restoration. Work shall be completed in accordance with Section 408 and 409 of the KYDOH Specifications as amended herein.

Pulverized asphalt millings shall consist of asphalt pavement that has been pulverized in place to the full depth of existing pavement. Pulverized millings shall be graded and compacted to the grades established by ENGINEER prior to placement of new asphaltic pavement. Ninety-five percent (95%) of pulverized millings shall pass a 1 1/4-inch screen with all material less than 4 inches in its longest dimension.

Salvaged asphalt millings shall consist of asphalt pavement that has been milled and transported for use as base course for street construction and/or restoration. Ninety-five percent (95%) of salvaged millings shall pass a 1 1/4-inch screen with all material less than 4 inches in its longest dimension.

SECTION 7—CONCRETE CURB AND GUTTER, SIDEWALK, AND PAVEMENT

7.1 GENERAL

The Work under this division includes the construction or reconstruction of all concrete improvements required for utility or street construction as shown on the Drawings and as specified. CONTRACTOR shall schedule its Work to comply with the Traffic Control section of Division 1.

Unless otherwise specified, all street construction Work shall conform to the KYDOH Specifications as amended herein.

7.2 CONCRETE

All concrete shall conform to the requirements as called for in Section 601 of the KYDOH Specifications, unless otherwise specified. All concrete shall be normal set air-entrained concrete with water reducing agent, Grade A-WR with Type IA cement capable of producing a minimum compressive strength of 3,000 psi in 10 days.

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As soon after finishing operations as the free water has disappeared, the concrete surface shall be sealed by spraying on it a uniform coating of curing material to provide a continuous water impermeable film on the entire concrete surface.

Liquid curing compounds shall conform to the requirements of AASHTO Designation M148, Type 2, White Pigmented.

The material shall be applied to form a uniform coverage at the rate of not less than 1/2 gallon per 100 square feet of surface area.

Within 30 minutes after the forms have been removed, the edges of the concrete shall be coated with the curing compound, applied at the same rate as on the finished surface.

CONTRACTOR shall erect and maintain suitable barricades to protect the new concrete. Where it is necessary to provide for pedestrian traffic, CONTRACTOR shall construct adequate crossings. Crossing construction shall be such that no load is transmitted to the new concrete.

Any part of the Work damaged or vandalized prior to final acceptance shall be repaired or replaced at the expense of CONTRACTOR.

Pedestrian traffic shall not be permitted over new concrete prior to 72 hours after application of curing material. Vehicular traffic shall not be permitted over newly placed concrete until a minimum compressive strength of 3,000 psi has been achieved.

When the atmospheric temperature exceeds 80°F during concrete placement, ACI 305.1 shall apply in addition to all other sections of the Specifications.

Cold weather concreting shall conform to the requirements of ACI 306.1 and all other sections of the Specifications. Cold weather is defined as a period when, for more than 3 successive days, the average daily temperature drops below 40°F. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50°F occur during more than half of any 24-hour period, the period will no longer be regarded as cold weather.

The temperature of the delivered concrete shall not exceed 85°F.

Care shall be exercised to keep mixing time and elapse time between mixing and placement at a minimum. Ready-mix trucks shall be dispatched in a timely manner to avoid delay in concrete placement, and the Work shall be organized to use the concrete promptly after arrival at the jobsite.

The subgrade, forms, and reinforcing shall be sprinkled with cool water just prior to placement of concrete. Prior to placing concrete, there shall be no standing water or puddles on the subgrade.

If approved by ENGINEER, an admixture for retarding the setting of the concrete may be used.

Concrete shall be thoroughly tamped to remove all voids. The exposed surface shall be thoroughly troweled and finished with a brush at right angles to vehicular or pedestrian traffic. All edges shall be rounded with a 1/4-inch-radius edger. Honeycombed areas shall be pointed and rubbed with mortar to provide a void-free surface.

Before final finishing, a 10-foot straight edge shall be used to check the surface. Any areas showing a variation of more than 1/4 inch from the straight edge shall be corrected. Final finishing shall be delayed a sufficient time so that excess water and grout will not be brought to the surface.

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7.3 CURB AND GUTTER

Curb and gutter where required for street construction, site Work construction, or for restoration of utility construction shall be placed using forms or a machine to the dimensions and shape shown. Where curb and gutter details are not provided, curb and gutter shape and dimensions shall match existing adjacent curb and gutter. The base course beneath the curb and gutter shall be trimmed or filled as necessary to provide a full depth of curb and gutter as shown on the Detail Drawings. In the absence of Detail Drawings, depth shall be to the adjacent street subgrade with a minimum 4 inches. Prior to placement of concrete, the base shall be thoroughly compacted and moistened.

Where forms are used, they shall be of metal and of sufficient strength to resist distortion or displacement. Forms shall be full depth of the Work. Facing boards, if used, shall be built to obtain the cross section called for on the Detail Drawings. Forms shall be securely staked and held firmly to line and grade. Forms shall be cleaned thoroughly and oiled before reuse.

All curved curb and gutter shall form smooth curves and shall not be a series of chords. Radius forms shall be used for all curved curb and gutter where the radius of curvature is 100 linear feet or less.

Driveway openings in the curb line will be staked by ENGINEER in the field. The details for concrete gutter sections through a driveway are shown on the Detail Drawings.

A 3/4-inch expansion joint filler shall be placed through the curb and gutter at the radius points of all intersection curbs at storm inlets and at a maximum interval of 100 feet. This expansion joint filler shall extend through the entire thickness of concrete and shall be perpendicular to the surface and at right angles to the line of the curb and gutter.

At intervals of not more than 10 feet, a contraction joint shall be tooled to a depth of one-fifth of the total concrete thickness with a 1/4-inch-radius jointer. The contraction joint shall be at right angles to the line of the curb and gutter.

If machine-formed curb and gutter is placed by CONTRACTOR, CONTRACTOR shall create a plane of weakness at all joints that is sufficient to cause contraction cracking at the joints.

CONTRACTOR may saw contraction joints. The depth of cut shall be a minimum of one-fifth of the total concrete thickness. Sawing shall be done as soon as practicable after the concrete has set sufficiently to preclude raveling during the sawing and before any shrinkage cracking takes place in the concrete. If this results in random cracking, CONTRACTOR will be required to tool the contraction joints as specified above.

Steel separator plates of a section conforming to the curb and gutter as shown on the Detail Drawings shall be placed directly opposite all contraction joints in abutting street pavement. After separator plates have been removed, the edges of the joints shall be rounded with a 1/4-inch-radius edge. The use of steel separator plates at other locations will not be allowed.

7.4 CONCRETE SIDEWALK AND DRIVEWAYS

Concrete sidewalk and driveway construction required for a street or site work construction or for restoration of utility construction shall be placed using forms or machines to the dimensions and thicknesses shown. Where details are not provided match existing, but sidewalks shall be no less than 5 inches thick and driveways shall be no less than 7 inches thick.

The subgrade shall be thoroughly compacted and finished to a trim, firm surface. All soft or unsuitable material shall be removed and replaced with suitable material.

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A minimum 4-inch-thick layer of sand, sand and gravel, or base course shall be placed under all sidewalks and driveways. This material shall be thoroughly moistened and compacted before the concrete is placed.

Where forms are used, they shall be of metal or wood and shall be of sufficient strength to resist distortion or displacement. They shall be full depth of the Work and shall be securely staked to hold the required line and grade. Where machines are used, concrete mixture shall be controlled to prevent distortion from sloughing.

Concrete sidewalk shall be segmented into 5-foot-long rectangular blocks with tooled joints. Concrete driveways shall be segmented into uniform rectangular blocks with tooled joints at a maximum spacing of 10 feet in each direction. The joint must extend at least one-fifth of the total thickness of concrete. The edges of the sidewalk along forms and joints shall be rounded with an edging tool of 1/4-inch radius. All joints shall be at right angles to the centerline of the sidewalk.

A 1/2-inch-thick asphaltic expansion joint filler shall be placed at sidewalk-driveway intersections, at sidewalk-sidewalk intersections, at the intersection with new or existing curb and gutter, around all castings, and at maximum 40-foot intervals in sidewalks.

Sidewalk cross slope shall be 1.5 percent unless otherwise noted in the Drawings or requested by ENGINEER. Handicap ramps shall have a maximum slope of 7 percent, with maximum grade changes of 11% at curb to ramp transitions, and be provided with a truncated dome patterned surface meeting ADA requirements.

SECTION 8--ASPHALTIC PAVING

8.1 GENERAL

The Work under this division includes asphaltic concrete pavement and other miscellaneous items and Work required for utility or street construction as shown on the Drawings and included in the Specifications for paving.

Unless otherwise specified, all paving shall conform to the KYDOH Specifications as amended by these Specifications and by the **SPECIAL PROVISIONS**.

ENGINEER may request samples of asphaltic concrete for testing. CONTRACTOR shall cut samples from the finished pavement where requested by ENGINEER and patch the sample area. Samples for sieve analysis and asphalt content will be taken by ENGINEER prior to placement.

8.2 ADJUSTING CASTINGS

Where surface course paving is completed in the following construction season, castings shall initially be set to the finished lower course grade before lower course is placed. Where upper course paving and lower course paving are completed in the same construction season, castings shall be adjusted to final grade prior to paving.

Where adjustments are required, they shall not be made more than 48 hours prior to the anticipated time of paving. CONTRACTOR shall furnish Class 1 barricades with flashers on all adjusted castings until paving has been completed.

Internal chimney seals, where required, shall be installed after castings have been adjusted to finished grade.

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Valve boxes shall be adjusted by turning the box. The valve box shall be seated on the adjusting threads to prevent future settlement. The box shall be adjusted to conform to the finished pavement and shall be plumb to allow valve operation. OWNER shall be contacted by CONTRACTOR to check operation of valve after box adjustment and prior to paving.

8.3 ASPHALTIC CONCRETE PAVING

This Work shall include the construction of asphaltic concrete surface course for areas to be paved including utility trench restoration and new street construction. All Work shall be performed in accordance with Section 403 of the KYDOH Specifications and as modified by **SPECIAL PROVISIONS**.

Asphaltic concrete pavement shall be ESAL Class 2.

Asphaltic binder for intermediate course and surface course shall be PG 64-22 per Section 806 unless specified otherwise in the **SPECIAL PROVISIONS**.

Aggregate shall comply with Sections 804 and 805.

Prior to the commencement of paving, mix designs and aggregate sieve analysis shall be submitted to ENGINEER.

The pavement structure for street areas and driveways shall be in accordance with the standard sections. Where standard sections are not provided, the minimum pavement structure shall consist of 2 1/4 inches of asphaltic concrete intermediate course material and 1 3/4 inches of asphaltic concrete surface course for street and parking lot construction and 2 1/2 inches of surface course material for bike paths, sidewalks, and asphalt driveways. Pavement thickness for trench restoration shall match adjacent pavement thickness or minimum thickness as specified for street construction, whichever is greater.

8.4 TACK COAT

Unless otherwise specified in the **SPECIAL PROVISIONS** or shown on the Drawings, CONTRACTOR shall provide tack coat between all layers of new asphalt and on existing pavement to be overlaid with new asphalt. Tack coat shall meet the requirements of Section 406 of the KYDOH Specifications.

8.5 PAVEMENT STRIPING

Where required on the Drawings or in the **SPECIAL PROVISIONS**, CONTRACTOR shall provide painted pavement markings.

Two-way traffic shall be maintained at all times.

Centerline marking shall be double 4-inch solid yellow line, placed at the marked centerline.

Traffic lane marking shall be single 4-inch broken white line, placed 12 feet from median curb flange or as shown or requested by ENGINEER. Turning lane markings and crosswalk markings shall be 8 inches and 6 inches solid white, respectively. Stop bars shall be 18 inches solid white.

All markings shall be applied in accordance with Sections 713 and 842 of the KYDOH Specifications and the Manual on Uniform Traffic Control Devices.

Markings shall be placed at locations noted within 1-inch tolerance.

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SECTION 9—RESTORATION AND SITE WORK

9.1 SCOPE

The Work under this portion of the Contract includes finished grading, seeding, sodding, miscellaneous restoration, and other miscellaneous items of Work outside of the areas to be paved.

CONTRACTOR shall proceed with restoration of property and cleanup of all disturbed areas concurrently with the installation of utilities and street construction.

Where restoration is included as a portion of a Bid item, the estimated cost of restoration and cleanup, up to a maximum of 15% of each Bid item, may be withheld until final cleanup of the Work in each Bid item.

Unless otherwise specified, all restoration Work shall conform to the KYDOH Specifications and the **SPECIAL PROVISIONS**.

See **SPECIAL PROVISIONS** for availability of water for use in restoration and site Work.

9.2 SEEDING AND SODDING

Seeding and sodding shall be completed in all areas disturbed by construction other than areas with finished gravel, brick, asphalt, concrete, or decorative landscape treatments.

9.2.1 SEED RESTORATION

Unless otherwise shown on the Drawings or specified in the **SPECIAL PROVISIONS**, all areas disturbed by construction shall be restored with seed restoration. Prior to seeding, disturbed areas shall be graded to subgrade for placement of topsoil.

Topsoil shall consist of salvaged topsoil or hauled-in topsoil provided and placed in accordance with Sections 212 and 827 of the KYDOH Specifications. Topsoil shall be placed to a uniform depth of 6 inches in place.

All areas requiring terrace restoration that do not require sod restoration shall be restored by seed restoration. Seed restoration shall consist of placing and grading topsoil, seeding, fertilizing, and mulching.

Seed materials and placement shall conform to Sections 212 and 827 of the KYDOH Specifications unless otherwise requested by ENGINEER. CONTRACTOR shall not be responsible for watering. Fertilizer shall conform to Sections 212 and 827. Mulching shall conform to Sections 213 and 827 for straw mulch.

9.2.2 SOD RESTORATION

Specific areas to be restored with sod shall be shown on the Drawings or specified in the **SPECIAL PROVISIONS**. Sod restoration shall be completed in accordance with the following: Prior to placement of sod, finish grading shall be completed. Finish grading shall consist of placing topsoil to the edge of hard-surfaced areas or to limits established by ENGINEER.

Topsoil shall be of humus-bearing soil, adapted to the sustenance of plant life and commonly known as black dirt, and shall be free of stones, debris, vegetable material, and excesses of peat, sand, or clay. Unless otherwise specified, topsoil shall be placed 4 inches thick and shall be graded and raked. Finished topsoiled areas shall be free of stones, road material, or lumps of dirt. The soil in the area to be sodded

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shall be loosened and brought to a reasonably fine granular texture to a depth of not less than about 1 inch.

A 15-30-15 fertilizer shall be spread uniformly over the areas at the rate of 17 pounds per 1,000 square feet of area unless otherwise specified in the Contract. Fertilizer shall be worked into the soil prior to placing sod.

Sod shall consist of a dense, well-rooted growth of permanent and desirable grasses, indigenous to the general locality where it is to be used, and shall be practically free from weeds or undesirable grasses. At the time the sod is cut, the grass on the sod shall have a length of approximately 2 inches (if longer, the grass shall be cut to approximately this length), and the sod shall have been raked free from debris.

The sod shall be cut in uniform strips approximately 18 inches by 36 inches but no longer than is convenient for handling and transporting.

The thickness of the sod shall be as uniform as possible, approximately 1 1/2 inches or more, depending on the nature of the sod, so that almost all of the dense root system of the grasses will be retained, but exposed, in the sod strip and so that the sod can be handled without undue tearing or breaking.

Sod shall be laid so that the joints caused by abutting ends of sod strips are not continuous. Each sod strip shall be so laid as to abut snugly against the strip previously laid.

As the sod is being laid, it shall be rolled or firmly but lightly tamped with suitable wooden or metal tampers to set or press the sod into the underlying soil.

At points where water will flow over a sodded area, the upper edges of the sod strips shall be turned into the soil below the adjacent area and a layer of earth placed over this juncture, which earth shall be thoroughly compacted to conduct the surface water over the upper edge of the sod.

At the limits of sodded areas, wherever practical or feasible, the end strips shall be placed to effect a broken line, and ends of the strips shall be turned in and treated as above described.

All sodded areas shall be kept thoroughly moist until the sod is established. Sod that dies during correction period shall be replaced at no cost to OWNER.

9.3 MISCELLANEOUS RESTORATION

CONTRACTOR shall be responsible for the proper replacement of all damaged street and highway signs and markers at all times during construction. Repair or replacement of signs shall be subject to review of ENGINEER and applicable local, state, and federal highway departments before final acceptance of the Work.

CONTRACTOR shall restore all culverts removed, damaged, or disturbed during construction to their original condition or they shall be replaced. Mailboxes shall be restored to their original locations and height. Light poles and power poles shall be restored to their original location. Underground improvements, such as water main, gas main, telephone or electric lines or drain tiles shall be restored to original condition. At all locations where utilities cross, compacted backfill shall be used from the bottom of the excavation to the top of the highest conduit. All street improvements, fences, walkways, and home and yard improvements, if destroyed, damaged, or removed shall be replaced to original condition or better.

Where construction interrupts existing private or public sewer and water systems, it shall be CONTRACTOR's responsibility to maintain these systems or provide alternative means until the new

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system is placed in operation or until final acceptance of the Work, whichever occurs first. No bypassing of untreated wastewater will be allowed.

9.4 RETAINING WALLS

9.4.1 BOULDER WALLS

In areas as generally shown on the Drawings and as specifically noted in the field by ENGINEER, CONTRACTOR shall construct boulder walls.

The boulders shall be round field stone. The stone shall consist of varying sizes and weights. The minimum weight shall be 250 pounds.

The stone shall be placed randomly. The larger stone shall be placed at the bottom; minimum 12 inches deep into the soil. The minimum batter shall be 3 inches in one vertical foot unless otherwise allowed by ENGINEER. Geotextile fabric shall be installed behind the wall to prevent the backfill from eroding through the joints and courses. Backfill shall meet the requirements of the Backfilling section. The layout of the wall shall be reviewed by ENGINEER prior to construction of the wall. A suitable foundation shall be provided to preclude settlement. The wall may be constructed in conjunction with the new embankment. Chinking shall be provided to secure stability of the stones.

9.4.2 CUT BLOCK MODULAR RETAINING WALL

This Work includes construction of interlocking modular concrete retaining wall units and accessories at locations shown on the Drawings and as requested by ENGINEER in the field.

Modular wall units shall be constructed in accordance with ASTM C90, ASTM C140, ASTM D2339, and ASTM D4475.

Masonry units, when delivered to the site, shall be thoroughly cured and shall be dry. When stored on the site, they shall not be in contact with the ground and shall be kept clean.

CONTRACTOR shall submit gradation of base leveling pad material and unit fill material as well as color samples for OWNER's selection.

CONTRACTOR shall provide design calculations verifying the proposed design satisfies the design parameters as shown on the Drawings and as required herein.

Masonry units shall be Keystone Retaining Units, or equal, as manufactured in accordance with ASTM C90 and ASTM C140.

Masonry units shall have a minimum 28-day compressive strength of 3,000 psi. The concrete shall have a maximum moisture absorption of 8%.

Standard units shall be classic straight split face, 8 inches high by 18 inches wide. Top row of units shall have a smooth face. Color of units will be selected by OWNER from manufacturer's standard color selections. A concrete wall cap/sidewalk will be constructed on top of the wall.

Units shall be interlocked with noncorrosive fiberglass pins.

Connecting pins shall be 1/2-inch-diameter thermoset isophthalic polyester resin-pultruded fiberglass reinforcement rods.

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Pins shall have a minimum flexural strength of 128,000 psi and short beam shear of 6,400 pounds per ASTM D4475.

Construction adhesive shall be Keystone Kapseal, or equal, and shall meet requirements of ASTM D2339.

Base leveling pad material shall be 6 inches of compacted crushed stone, 3/8 inches to 3/4 inches. Pea gravel shall not be allowed.

Unit fill shall be free-draining, well-graded crushed stone, 3/8 inches to 3/4 inches, with no more than 5% passing the No. 200 sieve. Masonry unit voids shall be capable of accepting a railing post diameter of up to 3 inches. Nonshrink grout shall be used in voids accepting railing posts.

All walls shall be designed for a surcharge of 250 psf and a railing load of 50 plf in addition to the loads imposed by the retained material. The engineered design shall be in accordance with the AASHTO Standard Specifications for Highway Bridges, Section 5.8.

Foundation soil shall be excavated as required for leveling pad dimensions shown on the Drawings.

Subgrade shall be approved by the Project Soils Engineer to confirm that the actual foundation soil conditions meet or exceed assumed design strength. Soils not meeting required strength shall be removed and replaced with acceptable material.

Leveling pad materials shall be placed as shown on the Drawings to a minimum thickness of 6 inches and shall extend laterally a minimum of 6 inches in front of and behind the modular wall.

Materials shall be compacted to provide a level surface on which to place the first course of units. Compaction shall be to 95% of standard proctor for sand or gravel type materials. For crushed rock, material shall be densely compacted.

Leveling pad shall be prepared to ensure complete contact of retaining wall unit with base.

Units shall be installed to conform to elevations shown on the Drawings or as staked in the field to match existing grade.

The first course of concrete wall units shall be placed on the base leveling pad. The units shall be checked for level and alignment. Bottom of wall shall be minimum 12 inches below finished grade.

Units shall be placed side by side for full length of wall alignment. Alignment may be done by a string line or offset from base line.

Units shall be interlocked with fiberglass pins. Pins shall protrude into adjoining courses above a minimum of 1 inch. Two pins required per unit.

All voids inside and between units and drainage zone behind units shall be filled with tamped unit fill material. Automated compaction equipment shall not be used directly over the units. Walk-behind mechanical compaction equipment may be used to compact soils that are placed beyond the drainage zone behind the unit. Mobile mechanical compaction equipment shall not be used within 5 feet of the wall face.

While placing material behind first course of units, the passive soil wedge at the front of these units shall be placed.

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All excess material from top of units shall be cleaned prior to installing the next course. Each course is to be completely filled, backfilled, and compacted prior to proceeding to next course.

A permanent mechanical connection of cap units to wall units shall be provided with construction adhesive.

9.4.3 STRUCTURAL GEOGRID

Geogrid shall be a product with a regular grid structure of a select high density polyethylene or polypropylene resin, UX1500MSE, as manufactured by Tensar Corporation, or equal.

Minimum allowable junction strength of the geogrid, per G.R.I.–GG2, shall be equal to or greater than 90% of the ultimate strength of the geogrid, as per G.R.I.–GG1.

The geogrid soil reinforcement shall be laid horizontally on compacted backfill. Place the next course of modular concrete facing units over geogrid. The geogrid shall be pulled taut and anchored prior to backfill placement on the geogrid.

Geogrid reinforcement shall be continuous throughout their embedment length(s). Spliced connections between shorter pieces of geogrid will not be allowed.

9.5 PLANTINGS

Plantings shall be provided as shown on the Drawings or as otherwise specified in the **SPECIAL PROVISIONS**. Plants should be planted on the day of delivery. If this is not possible, protect the stock not planted. Plant material shall be kept in the shade, well-protected with soil, wet moss or other acceptable material and shall be well-watered. Plants shall not be bound with wire or rope at any time to avoid damaging the bark or breaking branches.

Plants shall be lifted and handled from the bottom of the ball only. Plants moved with a ball will not be accepted if the ball is cracked, loose, or broken before or during the planting operations.

Fertilizer shall be delivered to site in original, unopened containers, each bearing manufacturer's guaranteed analysis. Packaged materials shall be stored off ground and protected from moisture.

CONTRACTOR shall coordinate planting Work with installation of sod and the construction of other site features.

CONTRACTOR shall take precautions to ensure that equipment and vehicles do not disturb or damage existing site grading, walks, drives, utilities, plants, etc., and shall replace and/or return to original condition any damage caused by CONTRACTOR's negligence at no cost to OWNER.

CONTRACTOR shall maintain plantings immediately upon installation of plants and continue until acceptance, including watering, weeding, removal of dead material, resetting of plants to proper grade and plumb position, and other necessary operations.

Plants shall be alive and in good, healthy, and flourishing condition of growth at the end of the correction period.

Any plant installed under this Contract that is dead or not in a vigorous, thriving condition shall be removed from the site and replaced at CONTRACTOR's cost as soon as conditions permit during the normal planting season. In case of any questions regarding the condition of a rejected plant, CONTRACTOR may elect to allow such plant to remain through another complete growing season. If at that time, the rejected plant is found to be dead or in an unhealthy or badly impaired condition, it shall be replaced.

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One replacement after acceptance shall constitute fulfillment of CONTRACTOR's guarantee for the particular plant replaced. All replacements shall be plants of the same kind and size as specified originally. CONTRACTOR shall make all necessary repairs required because of plant replacements. Such repairs shall be done at no extra cost to OWNER. Plants shall be replaced, mulched, wrapped, fertilized, pruned, and restored to original condition at no extra cost to OWNER.

Plant names shall conform to those given in *Standardized Plant Names*, 1942 Edition, American Joint Committee on Horticultural Nomenclature. All plants shall be true to name and legibly tagged as to name and size. Federal or other governmental certificates of inspection shall accompany all shipments as required.

Plant materials, methods, etc. shall conform to the latest edition of ANSI Z60.1.

CONTRACTOR shall have investigated the sources of supply and shall be satisfied that CONTRACTOR can supply the listed plants in the size, variety and quality specified before submitting a Bid. Failure to do so will not relieve CONTRACTOR of the responsibility for furnishing and installing all plant materials in strict accordance with the Contract Documents.

All material shall be the highest quality. Plants shall have typical growth habit for their species. Plants shall be sound, healthy, vigorous, and free from insect pests, plant diseases, and injury. One-sided plants and plants taken from tightly planted nursery rows will be rejected.

All plants shall equal or exceed measurements specified, measured before pruning with branches in normal position. Height and spread refers to main body of plant and not from tip to tip of branches and roots. Trees shall have a well-defined central leader.

Soil excavated from plant pits that is similar in nature to topsoil and is determined to be suitable for planting soil shall be thoroughly mixed with one part of peat to five parts of existing soil. Very poor soils of clay, gumbo, gravel, hard-pan, or other soils injurious to plants shall not be used.

If quantity of soil excavated from planting pits is not adequate for planting, CONTRACTOR shall furnish imported planting soil consisting of partially decomposed vegetable matter of natural occurrence. Such soil shall be black, clean, low in content of mineral or woody material, mildly acidic, fertile and friable. This soil shall be mixed with one part of peat to five parts of soil. Peat shall be a domestic product consisting of partially decomposed vegetable matter of natural occurrence-black, clean, granulated, or shredded.

Fertilizer shall be equal to Milorganite (6-2-0), Louisville Green (5-3-0), or equal uniform in composition and free-flowing. Fertilizer which becomes caked or otherwise damaged making it unsuitable for use will not be accepted. Rate of application shall be as recommended by nursery.

Wood mulch shall be shredded hardwood bark of local origin, similar in physical composition to shredded mulches sold under the brand names of Montaho, Pay-Gro, or equal.

Mulches shall be a minimum of 4 inches thick.

Deciduous trees and shrubs shall be planted from November 1 to April 1. All trees and shrubs shall be planted so as to provide the maximum growing time allowable under the Contract Times. At the option and on full responsibility of CONTRACTOR, planting operations may be conducted under unseasonable conditions without additional compensation or change to warranty.

CONTRACTOR shall stake out on the ground the location of all plants before excavation is begun, and review layout with OWNER. Plants installed at incorrect locations shall be relocated by CONTRACTOR at no expense to OWNER.

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CONTRACTOR shall excavate the plant pit, centered at the location stake, cylindrical in shape with vertical sides and flat or saucer-shaped bottom. Planting soil for backfilling shall be kept separate from excavated subsoil. Pit shall be large enough to provide at least 12 inches of planting soil backfill around and beneath the root system. Where surface or subsurface conditions prevent digging a plant pit to specified dimensions, obtain approval from landscape architect to modify location or pit dimensions.

The root ball shall be centered in the plant pit resting on 12 inches of planting soil well-tamped. The plant hole shall be backfilled with planting soil placed in layers around the root ball. Each layer shall be hand-tamped in place in a manner to avoid injury to roots and ball. When approximately two thirds of the plant hole has been backfilled, the hole shall be filled with water to allow the soil to settle around the roots. Top of root ball shall be 1 inch above surrounding grade. The cord or wire securing burlap at base of tree shall be cut, with the burlap folded back.

Just prior to inspection for acceptance, CONTRACTOR shall prune all plantings. The amount of pruning will be limited to the minimum necessary to remove dead or injured twigs and branches to compensate for loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as not to change the natural habit or shape of the plant.

CONTRACTOR shall promptly remove any soil, peat or similar material that has been brought onto paved areas by planting operations, keeping those areas clean at all times, and shall remove all debris resulting from planting operations from the site.

Replacement plantings shall match existing plant type, with minimum 4-year nursery growth.

SECTION 10–MISCELLANEOUS REQUIREMENTS

10.1 GRADE STAKES AND PROPERTY STAKES

CONTRACTOR shall furnish and place in position all items necessary to control the horizontal and vertical accuracy of the Work including lasers, batterboards, string lines, plummets and graduated poles.

Where lasers are used, CONTRACTOR shall check the Work against intermediate grade stakes. Prior to initial use of the laser, CONTRACTOR shall set up laser on ground surface and check line and gradient controls. Lasers not functioning properly shall be immediately removed.

If existing property stakes, not within the limits of the trench or street slope limits, are removed or damaged by CONTRACTOR, CONTRACTOR shall bear the cost of replacement. Replacement shall be made by a legal survey performed by a licensed Land Surveyor hired by OWNER. Cost for survey shall be deducted from the Contract Price.

10.2 TESTING PIPELINES

10.2.1 GENERAL

CONTRACTOR shall conduct testing on all new pipe lines as specified below.

Utility installations which fail to meet the test limits shall be repaired in a manner acceptable to ENGINEER. In general, defective pipe installations should be uncovered and relaid, with new pipe if necessary, to repair the defect. Under no circumstances shall defects be sealed from the interior of the pipe, and only where specifically allowed by ENGINEER, shall defects be sealed from the exterior of the pipe.

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10.2.2 SANITARY SEWER LEAKAGE TESTING

All sanitary sewer gravity mains shall be tested for leakage after installation of laterals and placement of backfill. Leakage testing of thermoplastic sanitary sewer gravity mains shall be conducted in accordance with ASTM F1417. Testing of rigid sanitary sewer mains shall be in accordance with ASTM C828 for clay pipe and ASTM C1214 for concrete pipe. CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results.

Sewers 18 inches and larger may be tested for leakage by infiltration or exfiltration in lieu of vacuum testing. Concrete pipe shall be tested per ASTM C969 except as modified herein. If groundwater is 2 feet or more above the sewer, measurements will be taken to determine the rate of infiltration into the sewer. If groundwater is below 2 feet above the sewer, the stretch of sewer shall be plugged at its downstream end and water shall be placed inside the sewer to provide a minimum of 4 feet of head above the upstream end.

Measurements will then be taken to determine the rate of leakage out of the sewer. CONTRACTOR shall furnish all labor and materials necessary for making the tests. The allowable leakage shall be as indicated below for final acceptance.

At the conclusion of construction and before final acceptance of the Work, the downstream end of all sanitary sewer will be measured for infiltration. Allowable infiltration shall not exceed 100 gallons/inch of pipe diameter/mile/day for that portion of the Work under groundwater. If infiltration is exceeded, the leak or leaks shall be located and repaired.

CONTRACTOR shall prepare all pipeline for testing and shall furnish all equipment, materials, tools, and labor necessary for performance of the tests. Equipment for the low pressure air test of gravity mains shall be equal in all operational aspects to that as furnished by Cherne Industrial, Inc., or United Survey, Inc.

Air and leakage testing of storm sewers will not be required.

10.2.3 MANHOLE TESTING

If required on the Drawings or in the **SPECIAL PROVISIONS**, sanitary sewer manholes shall be vacuum tested in accordance with ASTM C1244. Pipes entering the manhole shall be plugged and the seal inflated in accordance with manufacturer's recommendations.

Vacuum testing of storm sewer and other manholes will not be required.

10.2.4 TELEVISED INSPECTION

Where specified in the **SPECIAL PROVISIONS**, a color televised survey of installed sanitary sewer shall be provided after air testing to confirm branch locations, verify cleanliness of sewer, and confirm presence or absence of sags or deviations in sewer alignment. Sewers shall be cleaned immediately prior to the survey. The survey shall conform to NASCO PACP standards.

Televised inspection of storm sewers will not be required.

10.2.5 DEFLECTION TESTING

All PVC pipe used for sanitary sewer shall be tested for vertical deflection. Maximum deflection after completion of backfilling shall be 5% of the inside pipe diameter. Testing shall not be started until trench backfill has been in place for 30 days. CONTRACTOR shall keep a record of all tests performed. These

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records shall show the individual lengths of main tested and test results. Deflection shall be measured by pulling a mandrel with a vertical diameter equal to 95% of the pipe inside diameter through the line, after thoroughly flushing the lines to be tested. The testing device shall be controlled using cables at both the upstream and downstream manholes. The testing device must pass freely through the sewer without the use of unreasonable force on the control cables. Any line that will not pass the test cylinder will not be accepted until the faulty sections have been removed and replaced and the line retested.

Deflection testing of thermoplastic storm sewer shall be provided in accordance with the above requirements.

10.2.6 WATER MAIN DISINFECTION

CONTRACTOR shall furnish all water and other materials, equipment, and labor necessary to disinfect all new water mains and all existing water mains disturbed by construction. Sampling and testing shall conform to AWWA C651 and Section 4 of 401 KAR 8:150. CONTRACTOR shall coordinate and bear cost for necessary testing by a certified laboratory and shall submit the results to the Environmental and Public Protection Cabinet. Sampling and testing shall be scheduled to complete the Work within the Contract Times. A water main shall not be placed in service until satisfactory test results are obtained. Items of material for testing shall be furnished in the size and quantity necessary to properly complete the test. Interruption or delay of CONTRACTOR's Work progress caused by testing and sampling shall not be cause for extra payment under the Contract nor shall they be cause for extension of Contract Time.

10.2.7 WATER MAIN AND FORCE MAIN TESTING

CONTRACTOR shall conduct hydrostatic pressure tests and leakage tests of all joints in accordance with the requirements of AWWA C600 for iron pipe and AWWA C605 for PVC pipe. During performance of the hydrostatic pressure test, water main shall be subjected to a minimum pressure of at least 50% above normal working pressure with a minimum pressure 125 psi. Force main shall be tested to 200% of normal operating pressure in the main, but to no more than the pressure rating of the pipe. All air shall be removed from the main during testing. This shall be done by flushing, by installing corporations at high points, or by releasing air at valves at high points. Test pumping equipment used shall be centrifugal pumps or other pumping equipment that will not place shock pressures on the main. Power plunger pumps will not be permitted for use on closed pipe systems. Pumps shall be disconnected during test periods.

Prior to conducting the pressure and leakage test, CONTRACTOR shall backfill the trench for its full depth. All bends and special connections to the main shall be adequately blocked and tied prior to the test. Any damage caused to the main or its appurtenances during performance of these tests shall be corrected by CONTRACTOR at its expense.

CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results.

Where connections are made to existing mains, it shall be the responsibility of CONTRACTOR to provide the necessary hydrostatic tests on all new mains installed. This may necessitate, but is not limited to, the installation of temporary valves to isolate the new system from the existing system. All materials, Work, and equipment necessary for this Work shall be furnished by CONTRACTOR at its expense.

All testing of pipelines shall proceed concurrently with installation. CONTRACTOR is advised that it may be advantageous to conduct daily preliminary testing of its Work.

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Water from disinfection testing shall not be discharged to a stream, creek, river, storm sewer tributary thereto, or to a navigable water without first neutralizing the chlorine residual in the water and complying with local, state, and federal laws thereto.

10.3 TRAFFIC CONTROL

CONTRACTOR shall conduct its Work to minimize disruption of traffic on the jobsite and on adjacent streets and alleys. Where construction is in an area having only one vehicular access, CONTRACTOR shall conduct its Work to avoid or minimize blockage of such access. Blocking of streets or providing detours shall only be done if allowed in the **SPECIAL PROVISIONS**. Safe access shall be provided at all times for local traffic when CONTRACTOR is not working. CONTRACTOR shall keep local police and fire departments informed as to traffic access status as the Work proceeds.

CONTRACTOR shall furnish and install all necessary flagmen, barricades, signs, warning lights, and appurtenances to provide for safe and convenient control of traffic throughout the Project site. Barricading, signing and flagging shall be accomplished in strict accordance with the Manual on Uniform Traffic Control Devices and the KYDOH Specifications.

10.4 EROSION CONTROL

Where land disturbance activities do not exceed one acre, CONTRACTOR shall maintain site conditions where erosion and pollution are controlled.

Unless otherwise specified in the **SPECIAL PROVISIONS**, CONTRACTOR shall, for land disturbance activities exceeding one acre, develop and implement a Storm Water Erosion and Pollution Control Plan in accordance with conditions of federal and state permits, local ordinances, Best Management Practices, and as required by the Notice of Intent (NOI).

The following certification shall be included in the Storm Water Erosion and Pollution Control Plan, which CONTRACTOR and all subcontractors shall sign:

"I certify under penalty of law that I understand the terms and conditions of the General Pollutant Discharge Elimination System (NPDES) Permit that authorizes the storm water discharges associated with industrial activities from the construction site and as may be detailed in the Contract Documents. I agree to indemnify and hold OWNER harmless from any claims, demands, suits, causes of action, settlements, fines, or judgments and the costs of litigation, including, but not limited to, reasonable attorney's fees and costs of investigation and arising from a condition, obligation or requirement assumed or to be performed by CONTRACTOR for storm water pollution and erosion control."

Where land disturbances exceed one acre, CONTRACTOR shall execute a Notice of Intent (NOI) and send to OWNER and the Kentucky Division of Water, KPDES Branch.

Such controls as identified in the Storm Water Erosion and Pollution Control Plan shall be installed prior to disturbing any soil on the site. CONTRACTOR shall construct, maintain, and remove the erosion and pollution controls in accordance with the plan.

CONTRACTOR shall provide a "qualified" inspector to inspect erosion control and pollution controls. Inspector shall have prior experience with erosion and pollution controls and have knowledge of installation and maintenance of erosion and pollution controls as described by the Best Management Practices. Inspector shall be identified in the erosion and pollution control plan. In accordance with the General Pollution Elimination Systems General Permit conditions, the Project site erosion control inspection shall be every seven days and after each 1/2 inch rainfall or greater. CONTRACTOR shall

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maintain hard copies of the inspection report with Storm Water Erosion and Pollution Control Plan for the duration of the Project.

CONTRACTOR shall respond within 24 hours to all corrective measures noted on the inspection report to address pollution issues. CONTRACTOR shall submit to OWNER a written notice stating the times, dates and actions taken to rectify the defective pollution and erosion controls.

CONTRACTOR shall pay any fines or other fees resulting from failure of CONTRACTOR to comply with the permit requirements or failure to provide a permit.

CONTRACTOR shall submit a "Notice of Termination" (NOT) to KDOW at end of the Project.

10.5 MISCELLANEOUS WORK

CONTRACTOR shall provide miscellaneous Work as specified in the **SPECIAL PROVISIONS**.

SECTION 11—MEASUREMENT AND PAYMENT

11.1 GENERAL

Payment for changes in quantities, as shown in the Bid and Contract, shall be made in accordance with the prices bid. No change of grade, alignment or location shall annul or impair the Contract made and entered into relative to said Work. Payment shall be made for the quantities of each Bid item as actually installed. If a price is not provided in the Bid for an item of Work, the Work shall be considered incidental and included in adjacent items of Work.

11.2 UTILITY CONSTRUCTION

Payment for utility construction including water main, storm sewer, sanitary sewer, and force main will be made as listed in the Bid for furnishing all materials, labor, and equipment for the complete installation of the sewers, mains, and appurtenances as shown and specified.

The prices bid shall include the pipe, excavation, dewatering, bedding, laying, jointing, backfilling, paving, restoration, testing, and maintenance of surface, and all other labor and material necessary for complete compliance with these Specifications. Wye and tee branches shall be included in the prices bid for sewer main unless otherwise listed in the Bid proposal form. The cost of all special connections to existing mains and appurtenances shall be included in the prices bid. Unless otherwise shown on the Drawings or specified in the **SPECIAL PROVISIONS**, the prices bid for utility construction shall include the cost of backfilling with existing materials.

11.3 SERVICES, LATERALS, AND RISERS

Water services, standard sewer laterals, and modified sewer laterals, as listed in the Bid, will be paid for in addition to the prices bid for water main and sanitary sewer. The prices bid for services and laterals shall include the entire cost for all labor, tools, bends, couplings and incidentals to install the services and laterals beyond the tap or wye or tee branches as shown and specified. Lengths of services and laterals for payment will be measured along the centerline of the pipe from the center of the main to the end of service. The cost of tunneling under or removing and replacing existing sidewalk and curb and gutter or other existing improvements shall be included in the prices bid. The cost of connecting existing water services to new water services shall be considered incidental to the Work

Risers will be paid for in addition to the prices bid for sanitary sewer main. The prices bid for risers shall be for the installation of risers constructed of ductile iron complete in place as shown on Drawing 01-975-75A. If included in the Bid, lengths of risers for payment will be measured along the

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centerline of the riser from the center of the main to the top 90° bend. In the prices bid, CONTRACTOR shall include all labor, equipment, and material necessary to install and support the riser column and to also provide ductile iron pipe from the riser column to the end of the service. If not included in the Bid, risers shall be paid for the same as for sanitary sewer laterals above.

11.4 INLET LEADS

The prices bid for inlet leads shall include the entire cost of all labor, excavations, backfilling, and material necessary for installation of the pipe from the center of the sewer main to the inlet box. The costs of special pipe fittings necessary to make the connections at the sewer main and at the inlet box shall be included in the prices bid.

The depth of service laterals and inlet leads will vary. The prices bid shall be for pipe installed at depths as shown on the Drawings or as requested by ENGINEER.

11.5 MANHOLES

Where manholes are not included in other Bid items, they will be paid for according to the prices bid. The prices bid for manholes shall include the cost of all material, Work, excavation, and backfilling necessary for construction of manholes as shown on the Drawings. Special bedding or pipe adjacent to manholes to standard trench width shall be included in the manhole price. The prices bid shall include the furnishing and installation of casting, steps, adjusting rings, and eccentric cone or flat slab as shown on the Drawings.

Special manholes will be paid for as shown on the Drawings and as listed in the Bid.

11.6 DROP ENTRANCES

Drop entrances to manholes shall be furnished and installed as shown on the Drawings and as specified. No additional payment will be made for drop entrances to manholes. Drop entrances will vary in depth from a minimum of 2 feet to the maximum as indicated on the Drawings.

11.7 STORM SEWER INLETS

The prices bid for inlets shall include the entire cost of all materials, labor, excavation, and backfilling necessary for complete construction of the inlets as shown and as specified. The cost of inlet lead pipe will be paid for under a separate Bid item. The depth of inlet will vary from the minimum shown on Drawing 01-975-41A to the amount specified. The prices bid shall apply for all inlet depths as actually installed. The cost of concrete encasement at the sewer main, where necessary, shall be included in the prices bid for inlets.

11.8 ROCK EXCAVATION, UTILITIES

Rock excavation for utility trenches shall be paid at the price bid. Such price bid may either be per linear foot regardless of trench depth or on a cubic yard basis as measured in place.

Rock excavation shall include the cost of hauling and disposal of excavated rock and furnishing and placing backfill material and will be in addition to the prices bid for utility or street installations and appurtenances thereto.

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11.9 SPECIAL BEDDING AND CONCRETE CRADLE

Where ENGINEER determines that unstable soils are present and are not CONTRACTOR's fault, payment for special bedding will be made. The price bid for special bedding shall include excavation for the bedding and furnishing and placing the bedding material.

The price bid for concrete cradle shall include forming, sheeting, excavation, and all materials for installation as shown on the Drawings. Measurement of concrete cradle will be made within the trench width for the depth as shown on the Drawings or requested by ENGINEER.

Special bedding and concrete cradle, where requested, will be paid for in addition to the prices bid for utility installations.

11.10 GRANULAR BACKFILL

The cost of granular backfill shall be included in the prices bid for utility installations and appurtenances where shown on the Drawings or specified. Where requested in the field by ENGINEER, payment will be made based on the prices bid measured in place following compaction. Costs shall include hauling away and disposing of material replaced by the granular backfill. Volume allowed for payment on a unit price basis shall not exceed an average trench width of 8 feet for the depth of fill placed.

Cover material and material placed within the zone of the trench where restoration materials are to be placed, such as topsoil and base course, shall not be included in the quantity measured for hauled-in granular backfill.

11.11 TRENCH SHEETING

Payment will be made only for sheeting required on the Drawings or **SPECIAL PROVISIONS**. The prices bid shall include the entire cost of furnishing all materials and labor for installation of the sheeting.

11.12 DEWATERING

The cost of removal of ground water and surface water shall be included in the prices bid for utility and street construction. No separate payment will be made for dewatering.

11.13 TUNNELING, BORING, JACKING, OR BORING AND JACKING

Payment for placement of casing pipe and carrier pipe inside the casing pipe shall be for the limits as shown on the Drawings and as listed in the Bid. The prices bid shall include the cost for furnishing the casing and carrier pipes, equipment, and labor necessary for installation including jacking pits, sheeting, special Work to install the casing and carrier pipe, backfilling, and restoration of surface improvements. Placement of the carrier pipe inside the casing pipe, including blocking and filling of the annular space, shall also be included in the prices bid.

11.14 EROSION CONTROL

Erosion control shall be paid at the various prices bid, if listed individually, or shall be included in the price bid for erosion control. If not included in the Bid, erosion control shall be considered incidental and included in the price bid for adjacent Work.

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11.15 BEDDING DIKE

Bedding dike shall be paid at the prices bid, if listed separately. If not included in the Bid, it shall be considered incidental and included in the price bid for adjacent Work.

11.16 AGGREGATE SLURRY (FLOWABLE) BACKFILL

Aggregate slurry (flowable) backfill shall be paid at the prices bid, if listed separately. If individual Bid items are not provided in the Bid, it shall be considered incidental and included in the price bid for adjacent Work.

11.17 CLEARING AND GRUBBING

Cost for clearing and grubbing as described shall be paid for according to the Bid items included in the Bid. If individual Bid items are not provided in the Bid, the cost of this Work shall be considered incidental to adjacent utility and street construction Work.

11.18 COMMON EXCAVATION

Common excavation shall be included in the price bid for the Work, if listed separately. If individual Bid items are not provided in the Bid, the cost of this Work shall be considered incidental to adjacent utility and street construction Work.

The cost for utility installations within areas where common excavation is to be performed shall not include the cost for common excavation required in this Contract for street construction.

If listed separately, the price bid shall include excavation of materials and placement and compaction of excavated materials, except topsoil, to subgrade elevations. For lump sum bids, CONTRACTOR shall be responsible to make its own computations for common excavation in compiling the price bid. No changes in payment for common excavation will be allowed unless changes in the Work to be completed have been reviewed by ENGINEER. If not on a unit price basis, payment for any such changes shall be determined by calculating the common excavation quantity related to the change in Work and applying a unit price cost based on the lump sum bid and ENGINEER's original estimated common excavation quantity. For CONTRACTOR's information, ENGINEER's estimated quantity for common excavation will be noted in the Bid.

Saw cutting will be paid for according to the price bid, if listed separately. If individual Bid items are not provided, the cost of this Work shall be considered incidental.

11.19 ROCK EXCAVATION, STREETS

Rock excavation for grading of streets or for site work shall be paid at the price bid, and shall include the hauling and disposal of the excavated rock. Such price bid will be on a cubic yard basis as measured in place by cross sectioning the rock before and after its removal.

11.20 BORROW EXCAVATION

Cost for borrow excavation shall be paid for according to the items included in the Bid. If individual Bid items are not provided in the Bid, the cost of this Work shall be considered incidental to adjacent utility and street construction Work.

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11.21 EXCAVATION BELOW SUBGRADE

Payment for excavation below subgrade will only be made if excavation below subgrade is reviewed by ENGINEER and only within the limits as requested. Excavation below subgrade shall be measured in place. The price bid for excavation below subgrade shall include all costs to excavate, remove, and dispose of undesirable material.

Cost for providing geotextile beneath excavation below subgrade shall be paid for in accordance with the price bid, if listed separately. If individual Bid items are not provided in the Bid, it shall be considered incidental and included in the price bid for adjacent Work.

11.22 GEOTEXTILES

Geotextile fabrics shall be paid at the prices bid, if listed separately. If individual Bid items are not provided in the Bid, they shall be considered incidental and included in the price bid for adjacent Work.

11.23 BASE COURSE

Payment for crushed aggregate base course shall be made at the price bid and shall include all labor, materials, and Work necessary for complete installation. Payment will be made based on weight tickets provided to ENGINEER within one week of delivery for each truckload of base course.

Fine grading shall be included in the price bid for fine grading, if listed separately. If a Bid price for fine grading is not provided in the Bid, the cost of this Work shall be considered incidental to adjacent utility and street construction Work.

Placement of base course for driveways, sidewalks, and outside the limits of a 1:1 slope from the bottom pavement or curb edge or top of shoulder edge shall not be eligible for payment unless the limits are extended on the typical section.

11.24 SALVAGED ASPHALT PAVEMENT

Cost for placement of salvaged asphalt pavement as base course shall be included in the price bid, if listed separately. This price shall include grading and compaction. Cost for salvaged asphalt milling shall include the cost of milling and transport. If a Bid price is not provided in the Bid, the cost of this Work shall be considered incidental to adjacent utility and street construction Work.

11.25 CONCRETE

The cost for removal of existing concrete pavement, curb and gutter, sidewalk, driveway, and pavement shall be paid for according to the price bid for these items. If a Bid price is not provided in the Bid, the cost for these removals shall be included in the price bid for adjacent utility and street construction Work.

The costs for meeting both cold and hot weather concrete requirements shall be included in the price bid for the Work, if listed separately. If a Bid price is not provided in the Bid, the cost of this Work shall be considered incidental to adjacent utility and street construction Work.

The cost for protecting newly placed concrete from damage will be considered incidental to the Work.

Concrete pavement shall be included in the price bid for the Work, if listed separately. If a Bid price is not provided in the Bid, the cost of this Work shall be considered incidental to adjacent utility and street construction Work.

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11.26 CURB AND GUTTER

The prices bid for concrete curb and gutter, if listed separately, shall apply to both straight and curved curb and gutter (outside of median nose areas), to standard and reject curb and gutter, and to driveway sections at driveways and curb ramps (outside of median nose areas). Curb and gutter will be paid for through all inlets. The cost of base preparation, placing and finishing, jointing, tie bars, and utility markings, shall be included in the price bid for curb and gutter. The cost of curb and gutter placed in median nose areas shall be included in the price bid for median nose, if listed separately. If Bid prices are not provided in the Bid, the cost for these items shall be included in the cost for adjacent utility and street construction Work.

11.27 CONCRETE SIDEWALK AND DRIVEWAYS

Cost for new or replacement concrete sidewalk and driveway, if listed separately, shall be paid for according to the price bid. Price shall include grading, subgrade preparation, base material, placement, finish, and all other items necessary to complete the Work. If a Bid price is not provided in the Bid, the cost for these items shall be included in the price bid for adjacent utility and street construction Work.

11.28 ASPHALTIC CONCRETE PAVING

The cost for adjusting castings for new utility construction shall be considered incidental to the Work.

If existing castings are being replaced as part of the Work, the cost for adjusting the replacement castings shall be included in the price bid for the replacement castings.

Payment for adjusting new manhole castings from the finished intermediate course surface to finished grade and for adjusting existing castings to intermediate course and/or surface course grades shall be in accordance with the prices bid, if listed separately. If a Bid price is not provided in the Bid, the cost for these adjustments shall be included in the price bid for adjacent utility and street construction Work.

Providing and placing asphaltic tack coat material, if listed separately in the Bid shall include all labor, materials, and equipment necessary to provide the tack coat as specified herein. If not included in the Bid, it shall be considered incidental to the Work.

The price bid for new asphaltic concrete intermediate and surface course pavement, if listed separately, will be based on the price bid for the Work. Payment will only be made for the quantities where weight tickets for each truckload have been delivered to ENGINEER within one week of placement. Price bid shall include all materials, labor, and Work necessary for complete, in-place, asphaltic concrete pavement including fine grading and ramps. Asphaltic material will not be paid for as a separate item. The price bid for asphaltic pavement shall include CONTRACTOR's costs for labor, tools, and materials to cut, excavate, and match the new Work to the existing pavement. Where a unit price is not provided, the cost for paving shall be considered incidental to the Work.

11.29 PAVEMENT STRIPING

Pavement striping, if listed separately in the Bid, shall include all labor, materials, and equipment necessary to provide the markings as specified herein, including traffic control. If not included in the Bid, it shall be considered incidental and included in the price bid for adjacent Work.

11.30 SEEDING AND SODDING

Seeding and sodding (including topsoil), if listed separately, shall be paid for in accordance with the prices bid, which price shall be full compensation for preparing the earth bed including providing, grading, and

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rolling topsoil; furnishing and placing seed or sod, watering; and for all labor, equipment, tools, and incidentals necessary to complete the Work. Where prices are not provided, the cost for this Work shall be considered incidental to the Work and included in the costs for adjacent utility and street construction Work.

11.31 MISCELLANEOUS RESTORATION

Cost for miscellaneous restoration items shall be paid for according to the prices bid, if listed separately. Where prices are not provided in the Bid, the costs shall be included in the price bid for adjacent utility and street construction Work.

11.32 BOULDER WALLS

Boulder wall will be paid for at the price bid, which price shall be full compensation for furnishing and installing the stone, for selecting the stone, preparation of the foundation, including excavation, backfilling, disposing excess materials, for all labor, tools, and equipment, and transportation necessary to complete the Work. Payment shall include the stone wall face that is buried 12 inches.

11.33 CUT BLOCK MODULAR RETAINING WALLS

Modular retaining wall will be paid for at the price bid, which price shall be full compensation for furnishing and installing the wall; preparation of the foundation, including excavation, backfilling, and disposing excess materials; and for all labor, tools, equipment, and transportation necessary to complete the Work.

11.34 PLANTINGS

Plantings, if listed separately, shall be paid for in accordance with the prices bid. The price bid for plantings shall include all items as specified herein and as shown on the Drawings. Where unit prices are not provided for, they shall be included in the cost for adjacent utility and street construction Work.

11.35 DUST CONTROL

Unless, provided for in the Bid, dust control shall be considered incidental to the Work and included in adjacent or related items of Work.

11.36 SPECIAL ITEMS OF WORK, MATERIAL, AND EQUIPMENT

Payment for special items of Work, material, and equipment will be paid for as specified in the **SPECIAL PROVISIONS**.

11.37 MISCELLANEOUS WORK

Payment for miscellaneous Work will be paid for as specified in the **SPECIAL PROVISIONS**.

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SECTION 12–SPECIAL PROVISIONS

The following modifies, expands, or clarifies the Standard Specifications for Utility and Street Construction. Reference is made in this Section 12 to the specific provision of the Standard Specifications being clarified, modified, or expanded. These **SPECIAL PROVISIONS** shall govern whenever there is conflict or discrepancy with the Standard Specifications and the KYDOH Specifications.

12.1 1.1 GENERAL

See Section 01010 for description of Work.

12.2 1.2 PIPE

The following pipe materials shall be used on the Project:

Pipe Application	Material
Sanitary Sewer	Solid Wall PVC SDR 35
Sanitary Sewer Laterals (Types 1,2,4, and 5)	Solid Wall PVC SDR 35
Piping for Miscellaneous Connections such as to Pressure Gauges	Copper
Force Main	For Contract 1-2017: Ductile Iron Pressure Class 350 ≤ 12 inches and Ductile Iron Pressure Class 250 ≤ 16 inches For all other contracts: PVC (AWWA) Pressure Class 235
Fittings for PVC and DI Pipe Used in Water Main or Force Main	Ductile or Cast Iron

12.3 1.2.6 GRAVITY SANITARY SEWER SERVICE BRANCHES AND LATERALS

CONTRACTOR shall use Sanitary Sewer Laterals Types 1, 2, 4, and 5 in accordance with the Lateral Details on Drawings 01-975-75A.

CONTRACTOR shall install a stopper at the end of the lateral and place two 2'x4' markers in accordance with the lateral details on Drawing 01-975-75A.

CONTRACTOR shall contact property owner prior to installing sanitary sewer line or sanitary sewer lateral to determine location for lateral. A table attached to this section lists laterals required.

CONTRACT 3-2017 LATERALS					
DOWNSTREAM MH	UPSTREAM MH	ADDRESS	SIZE	LATERAL TERMINATION LOCATION RELATIVE TO ROAD	COMMENTS
LINE A					
A-04	A-05	Farm Field (Sego)	4"	Same Side	
A-07	A-08	Farm Field (Crain)	4"	Same Side	Tie-in at MH A-07 Due to Casing Pipe

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CONTRACT 3-2017 LATERALS					
DOWNSTREAM MH	UPSTREAM MH	ADDRESS	SIZE	LATERAL TERMINATION LOCATION RELATIVE TO ROAD	COMMENTS
A-09	A-10	233 West Railroad Avenue	4"	Same Side	Tie-in at MH A-10 Due to Casing Pipe
		225 West Railroad Avenue	4"	Same Side	Tie-in at MH A-10 Due to Casing Pipe
A-10	A-11	221 West Railroad Avenue	4"	Same Side	Tie-in at MH A-10 Due to Casing Pipe
LINE D					
A-11	D-01	140 East Maple Street	4"	Opposite Side	
		139 East Maple Street	4"	Same Side	
		130 East Maple Street	4"	Opposite Side	
D-01	D-02	122 East Maple Street	4"	Opposite Side	
		114 East Maple Street	4"	Opposite Side	
		113 East Maple Street	4"	Same Side	
		6628 KY 1136	4"	Opposite Side	
		101 East Maple Street	4"	Same Side	
LINE H					
D-01	H-01	129 West Maple Street	4"	Same Side	
		121 West Maple Street	4"	Same Side	
		129 North Bell Avenue	4"	Same Side	
H-01	H-02	150 KY 222	4"	Same Side	
H-03	H-04	203 KY 222	4"	Same Side	
		151 KY 222	4"	Same Side	
H-04	H-05	211 KY 222	6"	Opposite Side	
		122 South Railroad Avenue	4"	Same Side	
		215 KY 222	6"	Opposite Side	
H-05	H-06	200 South Bell Avenue	4"	Same Side	
H-08	H-09	210 South Bell Avenue	4"	Same Side	
		206 South Bell Avenue	4"	Same Side	
LINE K					

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CONTRACT 3-2017 LATERALS					
DOWNSTREAM MH	UPSTREAM MH	ADDRESS	SIZE	LATERAL TERMINATION LOCATION RELATIVE TO ROAD	COMMENTS
H-10	K-01	189 College Avenue	4"	Same Side	
		169 College Avenue	4"	Same Side	
		179 High Street	4"	Same Side	
		157 College Avenue	4"	Same Side	
K-01	K-02	149 College Avenue	4"	Same Side	
		145 College Avenue	4"	Same Side	
K-03	K-04	136B College Street	4"	Opposite Side	
		129 College Street	6"	Same Side	
		136A KY 1136	4"	Opposite Side	
K-04	K-05	222 KY 1136	4"	Same Side	
K-06	K-07	135 KY 1136	6"	Same Side	
		223 KY 1136	4"	Same Side	
		229 KY 1136	4"	Same Side	
LINE L					
L-01	Ex. MH	School Building	6"	Same Side	
LINE M					
M-04	M-05	452 KY 222	6"	Same Side	
M-07	M-08	459 KY 222	4"	Same Side	
M-08	M-09	Farm Field (Brown)	4"	Same Side	
M-10	M-11	251 Jagers Road	4"	Same Side	
M-11	M-12	Farm Field (Jagers)	4"	Same Side	
		244 Jagers Road	4"	Opposite Side	
		213 Jagers Road	4"	Same Side	
		18 Shipp Lane	4"	Same Side	
LINE Q					
H-02	Q-01	200 KY 222	4"	Same Side	
		204 KY 222	6"	Same Side	
		115 West Railroad Avenue	6"	Same Side	
		212 KY 222	6"	Same Side	
		216 KY 222	6"	Same Side	

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CONTRACT 3-2017 ALTERNATIVES					
DOWNSTREAM MH	UPSTREAM MH	ADDRESS	SIZE	LATERAL TERMINATION LOCATION RELATIVE TO ROAD	COMMENTS
LINE B					
A-08	B-01	135 KY 1136	4"	Opposite Side	Bore Required
		245 KY 1136	4"	Same Side	
LINE C					
B-01	C-01	6487 KY 1136	4"	Same Side	
		6551 KY 1136	4"	Opposite Side	
		150 West Maple Street	4"	Opposite Side	
LINE D					
D-03	D-04	Vacant Lot (Cooke)	4"	Same Side	
D-04	D-05	119 KY 1136	4"	Same Side	
		110 KY 222	4"	Opposite Side	Bore Required
		118 KY 222	6"	Same Side	
LINE F					
D-03	F-01	6611 KY 1136	4"	Opposite Side	
		128 West Maple Street	4"	Opposite Side	
F-01	F-02	Vacant Lot (Cooke)	4"	Same Side	
F-02	F-03	137 West Maple Street	4"	Same Side	
		219 KY 1136	4"	Same Side	
LINE H					
H-10	H-11	226 South Bell Avenue	4"	Same Side	
H-11	H-12	181 High Street	4"	Same Side	
H-12	H-13	233 High Street	6"	Same Side	
H-14	H-15	241 High Street	4"	Same Side	
LINE I					
H-01	I-01	144 KY 222	4"	Same Side	
		138 KY 222	6"	Same Side	
		134 KY 222	4"	Same Side	
I-01	I-02	128 KY 222	4"	Same Side	

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CONTRACT 3-2017 ALTERNATIVES					
DOWNSTREAM MH	UPSTREAM MH	ADDRESS	SIZE	LATERAL TERMINATION LOCATION RELATIVE TO ROAD	COMMENTS
		128 KY 1136	4"	Same Side	
		120 KY 222	4"	Same Side	
LINE J					
H-04	J-01	133 College Street	4"	Same Side	
J-01	J-02	145 KY 222	4"	Same Side	
		147 KY 222	4"	Same Side	
		Vacant Lot (Hagen)	4"	Same Side	
		135 KY 222	4"	Same Side	
		Vacant Lot (Hardin Co. School)	4"	Same Side	
		127 KY 222	4"	Same Side	
J-02	J-03	121 KY 222	4"	Same Side	
		128 College Avenue	4"	Same Side	
		124 KY 1136	4"	Same Side	
LINE N					
N-03	N-04	436 KY 222	6"	Same Side	
N-04	N-05	434 KY 222	6"	Same Side	
N-05	N-06	110 East Railroad Street	6"	Same Side	
		122 East Railroad Street	4"	Same Side	
		132 East Railroad Street	4"	Same Side	
		Vacant Lot (Sego)	4"	Same Side	
		140 East Railroad Street	4"	Same Side	
LINE O					
M-07	O-01	Vacant Lot (Carter)	4"	Same Side	
		Vacant Lot (Carter)	4"	Same Side	
O-01	O-02	421 KY 222	4"	Same Side	
		433 KY 222	6"	Same Side	
		KY 222 (Lions Club)	6"	Same Side	
		405 KY 222	6"	Same Side	
		104B KY 222	6"	Opposite Side	Bore Required

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5980.020/1-, 2-, 3-, and 4-2017

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CONTRACT 3-2017 ALTERNATIVES					
DOWNSTREAM MH	UPSTREAM MH	ADDRESS	SIZE	LATERAL TERMINATION LOCATION RELATIVE TO ROAD	COMMENTS
		104A KY 222	6"	Opposite Side	Bore Required
LINE P					
M-12	P-01	162 Jaggers Road	4"	Opposite Side	
		67 Shipp Lane	4"	Same Side	
P-01	P-02	Jaggers Road (Lions Club)	4"	Opposite Side	Tie-in at MH P-02 Due to Casing Pipe
		201 Jaggers Road	6"	Same Side	Tie-in at MH P-02 Due to Casing Pipe
LINE U					
U-03	U-04	6339 KY 1136	6"	Opposite Side	Bore Required
		Farm Field (Beavers)	4"	Same Side	
U-04	U-05	Farm Field (Beavers)	4"	Same Side	
U-05	U-06	20 Oxmoor Drive	4"	Same Side	
U-07	U-08	21 Oxmoor Drive	4"	Same Side	
		Farm Field (Wheeler)	4"	Opposite Side	Bore Required
U-08	U-09	Farm Field (Priddy)	4"	Same Side	
U-09	U-10	KY 1136 (Scott)	4"	Same Side	
		6198 KY 1136	4"	Same Side	
U-11	U-12	Farm Field (Wheeler)	4"	Opposite Side	Bore Required
U-13	U-14	5950 KY 1136	4"	Same Side	
U-15	U-16	5940 KY 1136	4"	Same Side	
		5929 KY 1136	4"	Opposite Side	Bore Required
U-17	U-18	Farm Field (Wheeler)	4"	Opposite Side	Bore Required
		Farm Field (Brown)	4"	Same Side	
U-18	U-19	Farm Field (Wheeler)	4"	Opposite Side	Bore Required
		Farm Field (Brown)	4"	Same Side	
U-19	U-20	5676 KY 1136	4"	Same Side	
U-20	U-21	Farm Field (Halcomb)	4"	Same Side	
U-21	U-22	Farm Field (Wheeler)	4"	Opposite Side	Bore Required

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CONTRACT 3-2017 ALTERNATIVES					
DOWNSTREAM MH	UPSTREAM MH	ADDRESS	SIZE	LATERAL TERMINATION LOCATION RELATIVE TO ROAD	COMMENTS
U-22	U-23	Vacant Land (Riggs)	4"	Same Side	
U-23	U-24	4799 KY 1136	4"	Opposite Side	Bore Required
U-25	U-26	5575 KY 1136	4"	Opposite Side	Bore Required
U-26	U-27	Vacant Land (Riggs)	4"	Same Side	
U-27	U-28	5555 KY 1136	4"	Opposite Side	Bore Required
		Farm Field (Halcomb)	4"	Same Side	

CONTRACT 4-2017 LATERALS					
DOWNSTREAM MH	UPSTREAM MH	ADDRESS	SIZE	LATERAL TERMINATION LOCATION RELATIVE TO ROAD	COMMENTS
LINE R					
R-13	R-14	Farm Field (Skees)	4"	Same Side	
		8186 31W	4"	Same Side	
R-14	R-15	Farm Field (KCI)	4"	Same Side	
R-15	R-16	Farm Field (Brown)	4"	Opposite Side	Bore Required
		8080 31W	4"	Same Side	
R-17	R-18	Farm Field (Thurman)	4"	Same Side	
R-18	R-19	Farm Field (Mackey)	4"	Same Side	
		Vacant Land (Unknown)	4"	Opposite Side	Bore Required
R-19	R-20	Farm Field (Hudson)	4"	Opposite Side	Bore Required
		Vacant Land (Unknown)	4"	Opposite Side	Bore Required
R-20	R-21	7781 31W	4"	Opposite Side	Bore Required
		Vacant Land (Sharp)	4"	Opposite Side	Bore Required
R-21	R-22	7719 31W	4"	Opposite Side	Bore Required
		Farm Field (Jenkins)	4"	Same Side	
		7679 31W	4"	Opposite Side	Bore Required
R-22	R-23	Vacant Land (Unknown)	4"	Opposite Side	Bore Required
		Farm Field (Hudson)	4"	Opposite Side	Bore Required
R-23	R-24	7591 31W	4"	Opposite Side	Bore Required

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CONTRACT 4-2017 LATERALS					
DOWNSTREAM MH	UPSTREAM MH	ADDRESS	SIZE	LATERAL TERMINATION LOCATION RELATIVE TO ROAD	COMMENTS
		7549 31W	4"	Opposite Side	Bore Required
R-24	R-25	Vacant Land (Kentucky)	4"	Opposite Side	Bore Required
		Vacant Land (Unknown)	4"	Opposite Side	Bore Required
R-25	R-26	7439 31W	4"	Opposite Side	Bore Required
		7395 31W	4"	Opposite Side	Bore Required
R-26	R-27	Farm Field (Hudson)	4"	Opposite Side	Bore Required
		Farm Field (Skidmore)	4"	Same Side	
R-28	R-29	5574 Sportsman Lake Road	4"	Opposite Side	Bore Required
R-29	R-30	5536 Sportsman Lake Road	4"	Opposite Side	Bore Required
		Vacant Land (Pence)	4"	Opposite Side	Bore Required
		5504 Sportsman Lake Road	4"	Opposite Side	Bore Required
R-32	R-33	6915 31W	6"	Opposite Side	Bore Required
		Vacant Land (Mattingly)	6"	Same Side	
R-36	R-37	Vacant Land (Kentucky)	6"	Same Side	
LINE R1					
R1-03	R1-04	Vacant Land (Kentucky)	6"	Same Side	
R1-06	R1-07	6827 31W	6"	Same Side	
LINE T					
T-05	T-06	KY 222 (Best)	6"	Same Side	
		671 KY 222	4"	Same Side	
T-07	T-08	676 KY 222	6"	Same Side	
LINE T1					
T1-04	T1-05	473 KY 222	6"	Same Side	

12.4 1.2.9 IRON PIPE AND FITTINGS

See Section 09882 for details about the lining system.

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12.5 1.2.16 PIPE RESTRAINT

Provide restraints per table below:

FORCE MAIN SIZE [IN]	90° BEND [FT]	45° BEND [FT]	22½° BEND [FT]	11¼° BEND [FT]	SHUTOFF VALVE [FT]	UPPER VERTICAL 45° BEND [FT]	LOWER VERTICAL 45° BEND [FT]
4	36	18	9	9	63	27	9
6	54	18	9	9	89	45	9
8	54	27	18	9	116	54	18
10	72	36	18	9	139	63	18
12	72	36	18	9	164	72	18
16	93	45	27	9	211	90	27

Fittings are horizontal unless noted. This table assumes a 150 psi test pressure plus a 100 psi water hammer allowance, PVC pipe, and a 3-foot bury. Lengths shall be adjusted for other conditions and fittings.

12.6 1.2.18 SURFACE WATER CROSSINGS

The sewer main shall be placed inside a solid wall PVC SDR 35 pipe or approved equal. The PVC pipe used shall be of adequate diameter and thickness to support all loads and to permit installation of the sewer main to plan line and grade. Minimum size of PVC pipe shall be as indicated in the Drawings.

A concrete cap shall be placed over the PVC casing pipe. The concrete cap shall start at the spring line of the pipe and extend at least 6 inches above the PVC casing pipe. See details on Drawings.

When installing pipe crossings, CONTRACTOR shall keep pipe full of water until the pipe is bedded and covered and then the trench is backfilled with well graded 3 inches minimum to 6 inches maximum stone to the bottom of the crossing profile. All Work shall be done with suitable equipment and erosion control measures to prevent bed disturbance or silt deposition. Excavation shall be made so as to provide relatively level bottom conditions and to have side slopes at the edge of the area from which material is removed of not more than one vertical to four horizontal.

In lieu of open cut crossing CONTRACTOR may elect to use boring and jacking as described herein. No additional compensation will be provided.

See Division 1 for any permit requirements. All spoil material shall be disposed of at upland sites. CONTRACTOR shall give notice to OWNER and KDOW no less than 5 days before the Work is to begin.

12.7 1.3 VALVES

The following valves shall be used on the Project:

Valve Applications	Type
Shutoff Valves in Force Main	Plug Valves

12.8 1.4 PRECAST REINFORCED CONCRETE MANHOLES

Manholes located on the Hardin County property shall have manholes set 3 feet above ground surface.

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Verify with Easement Descriptions which manholes shall be buried 2.5 feet deep.

See Section 09882 for details about the lining system. Manholes located after a force main manhole discharge connection shall be lined. See Drawings for specific manholes.

12.9 1.13 SPECIAL MATERIALS AND EQUIPMENT

CONTRACTOR shall provide 2-inch wide marking tape placed 12-inches above force main only.

Combination air and vacuum valve and air release valve shall be A.R.I. Model D-020 designed for wastewater. Valves shall sizes as listed in the table below. Allowable working pressure shall be 0.7 to 250 psi. Valve shall have stainless steel lower body with conical shape upper portion and funnel shaped lower portion to maximize return of particles in wastewater back into force main and stainless steel upper body that holds the sealing mechanism. The upper body shall be easily unscrewed from the lower body to facilitate sealing mechanism replacement. An independent spring-guided linkage shall be provided between the lower float and rod and the sealing mechanism. All internal metal parts shall be stainless steel. Float sized to provide for air and vacuum operations shall be stainless steel. Provide stainless steel camlock on upper body and ball valve at base of lower body for back flushing.

Payment for valves shall include furnishing and installing valve, valve appurtenances, connection to force main, valve manhole and casting, and valve discharge piping. See Drawings for details.

SHEET NUMBER	STATION	FORCE MAIN SIZE	VALVE SIZE
30	31+77	6-IN	3-IN
30	31+77	10-IN	4-IN
30	31+77	12-IN	4-IN
37	113+38	6-IN	3-IN
37	113+38	16-IN	4-IN
40	148+85	6-IN	3-IN
40	148+85	16-IN	4-IN
43	176+67	16-IN	4-IN
51	284+38	8-IN	4-IN
51	284+38	16-IN	4-IN
53	313+03	8-IN	4-IN
53	313+03	16-IN	4-IN
54	320+90	8-IN	4-IN
54	320+90	16-IN	4-IN
61	18+86	4-IN	3-IN
65	73+50	4-IN	3-IN

12.10 2.1 SERVICE LINE LOCATIONS

OWNER will coordinate lateral locations with CONTRACTOR.

12.11 3.1 GENERAL EXCAVATION

CONTRACTOR to note that all trees within the construction sites and permanent easements that met the definition of Indiana Bat Habitat have already been cleared by separate contract in spring of 2016. Except for specific easements, any remaining incidental tree clearing, within an easement, can take place at any

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time of the year and without restriction. Refer to Special Easement Conditions before removing any tree within an easement.

12.12 3.10 TUNNELING, BORING, JACKING, OR BORING AND JACKING

Steel Pipe for Casing Pipe: Steel pipe shall conform to ASTM A139 Grade B. The minimum yield strength shall be 35,000 psi. The minimum wall thickness shall be as follows:

Nominal Size (Inches)	Minimum Wall Thickness (Inches)
< 27	0.250
27 to 30	0.375
36	0.500
42	0.625
48	0.625
54	0.750
60	0.875
66	0.875
72	1.000

Thicker walls shall be provided to meet jacking pressures, soil loading, or to conform to permit requirements for the Work. See CSX Railroad Permit.

Sections of pipe shall be field welded with full depth single "V" groove (butt joint) weld. If internal bells are fabricated and used, the pipe shall be welded in the same manner as if no internal bells were used, that is, pipe shall have full depth welds.

The front of the casing pipe shall be provided with a mechanical arrangement or device that positively prevents the auger from leading the pipe so that no unsupported excavation is ahead of the pipe. The auguring process shall be set such that it permits a balance between jacking pressures and the ratio of carrier pipe advancement to the quantity of soil excavated to eliminate voids in the soil. This is especially critical in the event granular, loose, or unstable soils are encountered at the face of the casing pipe. CONTRACTOR shall maintain a record of soil removed against carrier pipe volume as a check against formation of voids.

All Work around and in the CSX Railroad right-of-way shall be in accordance with the specifications for pipeline occupancy of railroad property and the permit issued by the railroad included in the Contract Documents. This includes installation of casing and carrier pipe which shall be installed in accordance with these Specifications. Any costs to OWNER as a result of the Work not being in accordance with CSX requirements, will be deducted from Contract 3-2017 CONTRACTOR's Bid. See CSX Railroad Design and Construction Standard Specifications for details.

12.13 4.5 SEWER SERVICE BRANCH AND LATERAL INSTALLATION

On roads maintained by the State (KY 1136, KY 222, 31W) laterals for buildings located on the opposite side of the street from the sanitary sewer shall be bored so as to avoid disturbing the pavement or shoulders. See boring and jacking specifications herein. CONTRACTOR shall use sanitary sewer lateral Types 1, 2, 4, and 5 as shown on Drawing 01-975-75A. Sanitary sewer lateral Types 3 and 6 are not allowed.

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12.14 5.1 BACKFILL MATERIAL

See Section 02222 for allowable backfill material for use in Class 1 and Class 2 locations. All other backfill shall be provided per this specification.

Any stripped topsoil shall be replaced to original depth. CONTRACTOR shall dispose of any excess material left over from the Project on sites approved by OWNER. Verify with Easement Descriptions which property owners want their topsoil set aside and put back during restoration. CONTRACTOR shall coordinate "set aside" location with property owner.

12.15 5.4 BACKFILL CONSOLIDATION

Class 1 and Class 2 compaction in accordance with Section 02222 shall be provided for indicated areas in Section 02222. All other areas shall be compacted per this specification.

12.16 5.5 MAINTENANCE OF SURFACE

CONTRACTOR shall provide and maintain a temporary surface over all utility trenches to accommodate local traffic and emergency vehicles. All necessary labor, materials, equipment, and miscellaneous items shall be considered incidental.

12.17 6.1 STREET CONSTRUCTION-GENERAL

See Section 01500 for availability of water.

12.18 8.3 ASPHALTIC CONCRETE PAVING

All pavement and gravel replacement shall be in accordance with the Standard Specifications and as follows.

CONTRACTOR shall remove bituminous pavement as a part of the general excavation. The width of pavement removed shall be the minimum possible and acceptable for convenient and safe installation of structures, utilities, and appurtenances. All bituminous pavement shall be cut on neat, straight lines and shall not be damaged beyond the limits of the excavation. Should the cut edge be damaged, a new cut shall be made in neat, straight lines parallel to the original cut encompassing all damaged areas. Pavement removal shall be extended to a seam or joint if seam or joint is within 3 feet of damaged pavement.

12.19 8.5 PAVEMENT STRIPING

CONTRACTOR shall restore all disturbed pavement striping and markings in accordance with KDOW specifications and Manual on Uniform Traffic Control Devices.

12.20 9.1 RESTORATION AND SITE WORK-SCOPE

See Section 01500 for availability of water.

12.21 9.5 PLANTINGS

CONTRACTOR shall inspect landscaping before starting major portions of the Work, make a list of plantings to be removed during the Work, provide the list to OWNER for review and approval, and replace plantings in-kind upon completion of the utility or street construction.

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12.22 10.2.4 TELEVISED INSPECTION

All new sanitary sewers shall be televised.

12.23 10.3 TRAFFIC CONTROL

CONTRACTOR shall comply with the requirements of Section 01560.

12.24 10.4 EROSION CONTROL

CONTRACTOR shall comply with Section 02270.

12.25 11.2 UTILITY CONSTRUCTION

For sanitary sewer unit prices, depth refers to the difference between original grade and the invert of the sewer.

12.26 11.36 SPECIAL ITEMS OF WORK, MATERIAL, AND EQUIPMENT

Monitoring Wells are located on this project. There are two monitoring wells located along Line H. The first monitoring well (MW-9) is located approximately at Station 14+75 and is approximately 13-FT deep. The second monitoring well (MW-10) is located approximately at Station 15+75 and is approximately 17-FT deep. They are currently active and if they are damaged by CONTRACTOR a registered contractor would need to drill new wells.

All repairs and replacements will be at CONTRACTOR's expense.

Contact Information:

Chase Environmental Group, Inc.
Zach Bayne
502-267-1455

The second set of monitoring wells are at the Pilot Station along Line R. They are located around the last manhole (MH R-39) of Line R. If these monitoring wells would need to be moved a meeting with the State must be held first to establish CONTRACTOR's requirements. All cost to borne by CONTRACTOR.

Contact Information:

Geoscience Consultants
Tim Crumbie
502-868-0975

END DIVISION 20

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DIVISION 25

SUBMERSIBLE PUMPING STATION

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1.1 SCOPE

General: This division includes Specifications for providing a submersible pumping station. The station shall consist of two submersible motor driven wastewater pumps, piping, wet well structure, valve manhole, valves, electrical controls and other necessary appurtenances as shown on the Drawings or called for in the Specifications.

Materials of construction for the pumps and related equipment shall be suitable for the environment in which they are to be located.

All hardware located in the wet well shall be stainless steel.

The following Divisions and Sections apply to the installation of the pumping station:

Concrete Work (Not street construction related)	Division 3
Painting	Division 9
Utility and Street Construction	Division 20
Electrical	Division 16
Chain Link Fencing	Section 02831

Pumping station shall be in conformance with requirements of the Kentucky Division of Water and all applicable industry codes and laws.

2.1 GENERAL

Testing Pipelines: CONTRACTOR shall include the cost of all testing, cleaning and disinfection in the price Bid.

All Work shall be observed, tested, and found acceptable as required by federal, state and local rules and regulations and as specified in this section. Unless otherwise approved in writing before testing begins, all tests shall be witnessed by ENGINEER, and others as necessary. Test results shall be recorded and reports or appropriate certificates shall be submitted to ENGINEER in triplicate.

All piping shall be tested in accordance with Division 20. All underground piping shall be backfilled or properly secured to avoid damage during testing. Should underground piping fail test, CONTRACTOR shall be responsible for removal and replacement of backfill as required. All piping, interior or exposed, shall be subject to test before being covered with insulation, or paint. All piping and appurtenances shall be watertight or airtight and free from visible leaks.

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All piping shall be flushed or blown out after installation prior to testing. CONTRACTOR shall provide all necessary piping connections, water, air, test pumping equipment, water meter, bulkheads, valves, pressure gauge and other equipment, materials and facilities necessary to complete the specified tests. CONTRACTOR shall provide all temporary sectionalizing devices and vents as required for testing.

General Arrangement Drawings: General arrangement drawings, including support system, of 3-inch or larger interior and 3-inch or larger exterior (above- and belowground) ductile iron piping shall be submitted to ENGINEER for approval. Additional shop drawing requirements are found in Division 1–General Requirements. Shop drawings for all interior and aboveground exterior piping shall be two-line drawings, drawn to scale.

3.1 ACCESS DOORS AND CASTINGS

Wet Well Access: Provide aluminum double leaf access doors as manufactured by Flygt, Bilco, Halliday, or equal for the openings indicated on the Drawings. Doors shall be angle frame design. The doors shall include a positive hold open arm with release handle and a tubular stainless steel compression spring operator. Provide doors with flush slam lock with inside handle and removable key wrench. Aluminum doors shall be mill finish. All aluminum surfaces in contact with concrete shall be painted with bitumastic coating as prescribed by door manufacturer. Door hardware shall be stainless steel throughout.

Doors shall be cast into top slab. CONTRACTOR shall coordinate location of door to provide proper clearance between door and pumps and to allow for proper placement of pumps in the wet well.

Doors shall be reinforced for minimum HS 20 loading 300 pounds per square foot loading.

Provide stainless steel or fiberglass unistruts, as necessary, attached to doors to mount accessories. Accessories (upper guide holder, cable holder, power and float cable holder, etc.) shall be stainless steel.

Access cover shall be provided with fall through protection consisting of aluminum grating designed to withstand live load of 300 pounds per square foot. Grating shall allow for visual inspection, limited maintenance, and float adjustment while the grate is in place. Grate shall be provided with a permanent hinging system which will lock grate in 90 degree position once opened. A locking device to prevent unauthorized entry to the confined space shall be provided. Aluminum grating shall be powder-coated safety orange.

Valve Vault Access: Provide aluminum single leaf access door as specified above. Castings shall be cast into valve manhole top slab. CONTRACTOR shall coordinate location of access with valve manhole steps and interior piping.

3.2 SIGNS

Danger Sign: CONTRACTOR shall provide danger sign at the entrance to the wet well. Sign shall be fiberglass with black and red and white background, Brady Systems B-120, or equal. Sign shall be mounted on wet well top slab with expansion anchors and shall have the following wording:

DANGER
PERMIT–REQUIRED
CONFINED SPACE
DO NOT ENTER

4.1 PIPE AND PIPE FITTINGS

Size and Type: All materials shall conform to the size and type shown on the Drawings or called for in the Specifications.

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In joining two dissimilar types of pipe, standard fittings shall be used when available. In the event fittings are not available, the type of joint shall be reviewed by ENGINEER.

Iron Pipe and Fittings: Ductile iron pipe and ductile or grey cast iron fittings conforming to Division 20 shall be provided for the pumping station and valve vault. Transition to force main material, if force main is of different material, shall be made downstream of the valve vault using appropriate transition fitting.

5.1 VALVES

Shutoff Valves: Unless otherwise indicated on the Drawings, shutoff valves shall be plug valves as specified in Division 20.

Check Valves: Unless otherwise indicated on the Drawings check valves shall be swing check valves with outside lever and weight as specified in Division 20.

6.1 INSTALLATION OF PIPE AND APPURTENANCES

Interior or Exposed Piping: Provide pipe supports for all piping. All interior or exposed pipelines shall be securely supported by adjustable saddles, brackets, or adjustable hangers supported directly by concrete, masonry work or tile. Strap hangers, tin clips or U-hooks will not be acceptable. Piping shall be supported, even though not shown on the Drawings, using base fittings and concrete pads to 6 inches above the floor, Grinnell 264, B-line, or equal, adjustable pipe saddle stand with floor flange to 6 feet above the floor, and supporting clamps or inserts more than 6 feet above the floor. In general, the maximum spacing of supports shall not exceed 10 feet on centers. Except as specified for plumbing system, all PVC piping shall be supported using galvanized supports for flexible piping. Maximum spacing shall not exceed 5 feet on centers. Piping shall be adequately supported and braced to resist thrust at bends and joints. Plumbing system shall be installed with hangers and supports in accordance with the Plumbing Code. CONTRACTOR shall furnish and place hangers, supports, wall pipes and sleeves in the forms before concrete is poured wherever needed or shown on the Drawings.

All piping shall be adequately supported and braced to resist thrust at bends and joints. Use base elbows, poured concrete or rod ties. The weight of the piping shall be supported independently of connected equipment.

Underground Piping: Underground piping shall be installed as specified in Division 20.

7.1 PUMPS

General: The pumps shall be Flygt Corporation, or equal meeting the following requirements using constant speed operation.

Pumps supplied under this Contract shall be capable of meeting the intermediate operating condition with change of impeller only. In the future, new pumps, motors, base elbow, and controls will be required to meet the ultimate condition. However, access door opening, pump separation, and guide bars shall be constructed to allow installation of a pump to meet the ultimate condition.

The Drawings and Specifications were prepared based on Flygt Corporation. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes to accommodate other equipment, including, but not limited to, structural, mechanical, and electrical work. CONTRACTOR shall also pay any additional costs necessary for revisions of Drawings and/or Specifications by ENGINEER.

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OPERATING CONDITIONS

OPERATING CONDITIONS							
		Head Conditions at Given Flows					
		Normal		Maximum		Minimum	
Pump	Location	GPM	TDH (ft)	GPM	TDH (ft)	GPM	TDH (ft)
NP3153SH	IP No. 1	237	136	203	143	291	126
NP3085SH	IP No. 3	127	58	105	63	186	45
NP3153MT	Rose Run	360	76	292	79	531	69

Pump	Location	HP	Voltage	Phase	RPM	Minimum Pump Eff.*	Minimum Motor Eff.*
NP3153SH	IP No. 1	23	460	3	3510	47%	91%
NP3085SH	IP No. 3	4	460	3	3430	48%	81%
NP3153MT	Rose Run	20	460	3	1760	44%	87%

* Minimum efficiency at normal operating conditions.

Pump Series	Location	Series	Model	Impeller	Diameter (in.)
NP3153SH	IP No. 1	NP	3153	167	4
NP3085SH	IP No. 3	NP	3085	126	4
NP3153MT	Rose Run	NP	3153	237	6

- a. Operate at the normal condition within +10% of given capacity at given head, or within +5% of given head at given capacity.
- b. While operating under suction head at the normal operating conditions, the pump design shall be such that the pump will operate satisfactorily without cavitation, excessive noise, or vibration when installed as shown on the Drawings and operating at the head specified.
- c. Motor horsepower shown is the minimum requirement. The motor shall be large enough not to be overloaded at any point on the design curve for the pump chosen to meet the operating conditions.
- d. The maximum and minimum head conditions are given as a guide to the shape of the head discharge curve. The pumps shall have a head discharge curve of the same shape or steeper within the guidelines previously specified.
- e. Be designed to operate in submerged condition in the space allotted.
- f. Be vertical, nonclog centrifugal wastewater pumps with integral motors designed and assembled by same manufacturer.
- g. Be capable of handling solids and long stringy materials, found in raw unscreened wastewater.
- h. With its appurtenances and cable, be capable of operation with continuous submergence without loss of watertight integrity to a depth of at least 65 feet.
- i. Be capable of running continuously at full nameplate rated load while the pump is submerged, partially submerged or;

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- j. The use of shower systems, secondary pumps, or cooling systems to cool the motor shall not be acceptable.
- k. Be UL, CSA, or FM approved for Class I, Division 1, Group C and D hazardous locations.

Pump Retrieval System: The design of the pumps shall be such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection, permanently installed in the wet well. The pump shall be easily removable for inspection or service, requiring no bolts, nuts or other fasteners to be disconnected, or need for personnel to enter the wet well.

A sliding guide bracket shall be an integral part of the pump unit. The volute casing shall have a machined discharge flange to automatically and firmly connect with the discharge connection, which when bolted to the floor of the wet well and discharge line, will receive the wet well discharge connecting flange without the need of adjustment, fasteners, clamps or similar devices.

Alignment of the pump to the discharge connection shall be the result of a simple linear downward motion of the pump unit guided by no less than two stainless steel guide bars. Guide bars shall be of a diameter and wall thickness as recommended by the pump manufacturer. Provide stainless steel top guide bars brackets and intermediate guide bars brackets as required. Guide bars shall extend from access door to the discharge connection. No other motion of the pump unit, such as tilting or rotating, shall be required. Sealing of the pump to the discharge flange connection shall be by a machined metal-to-metal contact. Sealing of the discharge interface by means of a diaphragm, O-ring or other devices will not be considered acceptable, nor equal. No portion of the pump unit shall bear directly on the floor of the wet well. The entire weight of the pump shall be borne by the pump discharge elbow. There shall be no more than one 90 degree bend allowed between the volute discharge flange and station piping. Discharge connection to discharge pipe shall be an ANSI B16.1 Class 125 flange.

Pumps shall be fitted with a stainless steel cable of adequate strength to permit raising and lowering of the pumps for inspection or removal. Hoist end of pump retrieval cable shall be fitted with a swaged ball to allow of a swaged ball to allow for connection to pump lifting equipment. All components shall be of adequate size, length, and strength for the pump being lifted and shall be provided so as to allow cable to be connected to and automatically be wound on a winch.

Pump Construction: All major parts, such as the stator casing, lubricant casing, sliding bracket, discharge connection, volute and impeller shall be of cast iron with smooth surfaces. All exposed bolts, screws and nuts shall be stainless steel construction. All metal surfaces coming in contact with the pumped liquid other than steel or brass shall be protected by a manufacturer selected paint system.

All mating surfaces of major parts shall be machined and fitted with O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by automatic compression in two planes and O-ring contact made on four surfaces, without the requirement of specific torque limits to affect this. Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered adequate, or equal. Tolerances of all parts shall be such that allows replacement of any part without additional machining required to provide sealing as described above. No secondary sealing compounds, greases or other devices shall be used.

Pump Volute: Pump volute shall be of single piece grey cast iron of non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide the trash release pathways and the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so as to remain unobstructed. The insert ring shall be of hardened cast iron construction and shall provide effective sealing between the multivane semiopen impeller and the volute housing.

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Pump Motor: The pump motor shall be housed in an air-filled watertight chamber and shall have moisture-resistant Class H insulation. The pump motor shall be NEMA Design B designed for continuous duty. Motor shall be capable of sustaining at least 15 evenly spaced starts per hour.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of $\pm 10\%$. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C.

A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output KW and efficiency. This chart shall also include data on starting and no-load characteristics.

Motor Schedule: If motor horsepower is increased to meet the requirements of this specification, CONTRACTOR is responsible for increasing all wiring, starters, drives, and other electrical components as required by Code, at no additional cost to OWNER.

Pump Protection:

The motor stator shall incorporate three thermal switches in series to monitor the temperature of each phase winding. At a temperature preset to protect the motor the thermal switches shall stop the motor and be capable of activating an alarm. These thermal switches shall be used in conjunction with and be supplemental to motor overload protection.

A Float-type leakage sensor (FLS) shall be provided to detect fluid in the stator. When activated, the sensor shall be capable of stopping the motor and activating an alarm. The thermal switches and sensor shall be connected to a monitoring unit which shall be designed to be mounted in the control panel.

A Mini-CAS unit rated for 120 VAC power supply shall be provided for installation in the MCC bucket, per Division 16.

Provide a stainless steel kellum grip for each cable.

Pump Shaft: Pump and motor shaft shall be one unit. Couplings are not acceptable. The shaft shall be made of stainless steel. The shaft shall rotate on two permanently lubricated bearings with a minimum L-10 bearing life of 50,000 hours when pump is operating at any usable point of the pump curve. Bearings shall compensate for axial thrust and radial forces.

Mechanical Seals: Each pump shall be provided with a tandem mechanical shaft seal system consisting of two independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces. The lower primary seal unit between the pump and lubricant chamber shall contain one stationary and one positively driven rotating tungsten carbide ring. The upper secondary seal unit between the lubricant chamber and the motor housing shall contain one stationary and one positively driven rotating tungsten carbide seal ring. Each interface shall be held in contact by its own spring system and not require being supplemented by external liquid pressures. Both seals shall be mounted on the shaft. The lower seal shall not be mounted on the impeller hub. The seals shall require neither maintenance nor adjustment, nor depend on direction of rotation for sealing. Shaft seals without positively driven rotating members or conventional double mechanical seals with a common single or double spring acting between the upper and lower units, requiring a pressure differential to offset external pressure and effect sealing shall not be considered acceptable, nor equal to the dual independent seal system specified.

The pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive antileak seal shall be easily accessible from the outside. No seal damage

COPY OF BID SET

shall result from operating the pump in an unsubmerged condition. The seal system shall not rely on the pumped media for lubrication.

The impeller shall be of hardened cast iron dynamically balanced, semi-open, multivane, backswept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft, held by an impeller bolt and treated with a corrosion inhibitor.

Pump Motor Cable: The pump motor cable shall be suitable for submersible pump applications. This shall be indicated by a code or legend permanently printed on the cable. Cable size shall conform to NEC and ICEA Standards and shall be of adequate size to allow motor voltage conversion without replacing the cable. Provide a stainless steel Kellum grip strain relief on motor cable to support cable at the cover. Provide minimum 50 feet of cable for each pump, more as necessary. Cable shall be of sufficient length to provide continuous run from in-place pump to point of cable connection. All ends of pump cables shall be fitted with a rubber shrink-fit boot to protect cable prior to installation.

Cable Entry Seal: A cable entry seal shall be provided where the pump cable enters the pump. The cable entry seal design shall preclude specific torque requirements to provide a watertight and submersible seal. The cable entry shall consist of cylindrical elastomeric grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by stator lead sealing gland or a terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be required or used.

Pump Cooling System: Pump shall be provided with cooling system of thermal radiators integral to the stator housing, cast in one unit. Pump shall be capable of operating in a dry condition without damage to motor or pump.

Pump Controls: All equipment and controls specified to be furnished with the equipment shall comply with the requirements of Division 16.

Anchor Bolts: CONTRACTOR shall provide anchor bolts necessary for equipment furnished. Anchor bolts shall be stainless steel and be of ample strength for the intended service.

Pump Finishes: It is the intent of these Specifications that the submersible pumps be furnished shop primed and factory finished painted. Priming and finish painting shall be as recommended by manufacturer and shall be suitable for the uses described in these Specifications. Touch-up paint shall be provided by manufacturer.

Pump Testing:

Factory Test: Each pumping unit to be furnished shall be fully performance tested with water in the manufacturer's facility in accordance with the Standards of the Hydraulic Institute to determine compliance with the rated conditions. The pump tests shall be witnessed by OWNER at OWNER's option. Notify OWNER at least three weeks in advance regarding the proposed test dates and location. Certified test curves, test data, and computations shall be submitted for approval prior to shipment and shall include the following:

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1. Pump performance curves for each of the speeds needed to meet the specified operating conditions defined under Section 1.02(B). Each pump performance curve shall include at least 4 operating points and shall show:
 - a. Head versus Discharge.
 - b. Pump Efficiency.
 - c. Break Horsepower.
 - d. NPSHr for maximum flow conditions.
 - e. Hydrostatic pressure test for casing at 100 psi.
2. Installed Test: Prior to startup at OWNER's facility, manufacturer's representative shall certify that equipment has been properly aligned and installed. During equipment startup, manufacturer's representative shall confirm each pump is operating properly as specified. Report shall be submitted verifying test. Pump shall be modified if specified conditions are not met.
3. Start-Up Tests: The pump manufacturer shall perform the following inspections and tests on each pump at start-up:
 - a. Impeller, motor rating, and electrical connections shall first be checked for compliance to the specifications.
 - b. A motor and cable insulation test for moisture content or insulation defects.
 - c. Verify correct rotation.
 - d. Verify proper voltage.
 - e. Verify proper current draw on each phase.
 - f. Verify thermal sensor trip will shut down motor in Hand and Auto mode.
 - g. A written certified test report giving the above information shall be supplied after start-up.

Pump Warranty: The pump manufacturer shall warrant the units being supplied to OWNER against defects in workmanship and materials for a period of 5 years or 10,000 hours under normal use, operation and service. The warranty shall be in printed form and apply to all similar units.

Pump Hoist: Provide one portable pump hoist for pump removal. Pump hoist shall be Thern, Inc. Series 5110, portable davit crane, or equal. Hoist shall have minimum 1,000 pound capacity. Provide stainless steel crane. Provide stainless steel spur gear hand winch. Base for hoist shall be stainless steel socket base (flush mount).

8.1 PAYMENT

Cost for construction of the pumping station and valve manhole, connecting appurtenances and piping, electrical controls, and appurtenances, site work and paving, and site fencing as specified or as shown on the Drawings shall be paid for according to the prices bid for the Work.

END DIVISION 25

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DIVISION 26

ODOR CONTROL SYSTEM

PART 1-GENERAL

1.01 SCOPE

- A. Work under this section includes a complete odor control chemical variable dosage chemical feed system for the control of hydrogen sulfide. The system shall consist of a feed system composed of chemical feed pumps, feed controls, liquid storage tanks, and all piping and appurtenances required to feed odor control chemical into the wastewater system, and one full load of odor control chemical product to facilitate start-up and system optimization. All materials shall be provided in accordance with these Specifications.
- B. All components of the system shall be compatible with the conditions and chemicals to which they are subjected to during the normal operation of the system. Compounds with which the materials must be compatible include, but are not limited to:
 - 1. Hydrogen Sulfide.
 - 2. Odor control chemical solution.

1.02 PROCESS DESCRIPTION

- A. For the Industrial Park Pump Station No. 1 the system shall contain controls as necessary to facilitate single discrete dosing profile (24 hour setpoints) that varies in 1-hour increments in a stepping fashion over a 24-hr period. For the Rose Run Pump Station the system shall contain controls as necessary to facilitate variation in feed rates over a 24-hr period. A calibration cylinder shall be permanently installed to facilitate calibration of feed pumps.

1.03 MANUFACTURER

- A. All components of the feed system will be provided by a single manufacturer who shall have sole-source responsibility for the system.
- B. The manufacturer of this equipment shall be one recognized and established in the design, production, and operation of chemical feed injection systems for the specific purpose of liquid phase odor control.
- C. The manufacturer of the feed system shall be an Underwriters Laboratories listed manufacturer of Enclosed Industrial Control Panels.
- D. The system shall be provided by Siemens Industry, Inc. of Sarasota, Florida, or equal.

1.04 SUBMITTAL

- A. CONTRACTOR shall submit complete shop drawings and engineering data to ENGINEER. These submittals shall include, at a minimum:
 - 1. Drawings showing plan and elevation views of the feed system.
 - 2. Control system layout drawing.
 - 3. Control systems electrical diagram.

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4. Manufacture's catalogue information on major system components including, but not limited to:
 - a. Chemical Feed Pumps.
 - b. Odor control chemical Feed Controls.
 - c. Liquid Storage Tanks.
 - d. Operator Interface.
 5. Statement of design conditions and performance guarantee.
 6. Statement of warranty.
- B. CONTRACTOR shall submit complete Operation and Maintenance manuals to OWNER. These manuals shall include at a minimum:
1. Information in hazards associated with the system and the appropriate safety precautions.
 2. Safety Data Sheet.
 3. Equipment installation instructions.
 4. Equipment startup instructions.
 5. Equipment maintenance procedures.
 6. Troubleshooting guide.
 7. Individual operation and maintenance information on major system components, including but not limited to:
 - a. Chemical Feed Pumps.
 - b. Odor control chemical Feed Controls.
 - c. Liquid Storage Tanks.
 - d. Operator Interface.

1.05 SUBSTITUTIONS

- A. Any substitutions or deviations in equipment or arrangement from that shown on the Drawings specified herein shall be the responsibility of CONTRACTOR. Any deviations must be accompanied by detailed structural, mechanical, electrical drawings and data for review by ENGINEER. All costs associated with review of the substitutions or deviations and costs associated with Drawing changes as a result of approval shall be borne by CONTRACTOR. There shall be no additional costs to OWNER due to substitutions or deviations.

1.06 WARRANTY

- A. Standard 1-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of 1 year from the earlier of either the date established for partial utilization in accordance with GC14.04 and 14.05, as modified in the Supplementary Conditions, or Substantial Completion of the project. The chemical storage tanks shall be warranted for a period of five years from warranty start date.

PART 2-PRODUCTS

2.01 ODOR CONTROL CHEMICAL PRODUCT INFORMATION

- A. Technical Requirements:
1. The material supplied shall be an aqueous solution of calcium nitrate containing a minimum of 3.5 pounds of nitrate-oxygen per gallon, or equal.

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2. The material shall be capable of reducing the dissolved hydrogen sulfide concentration in wastewater to less than 0.1 mg/l.
3. The material shall be free of any objectionable odor-producing compounds.
4. The pH of the material shall not be less than 4.0 or greater than 7.5.

B. Safety Requirements:

1. The material shall contain no hazardous substances as defined by both the Federal EPA's and State CERCLA lists.
2. The material shall be exempt from Federal DOT placard requirements.
3. Recommended handling procedures for the material shall require protective gloves and safety glasses only. Any material recommending more sophisticated equipment (i.e., face shield, body suit, etc.) during routine handling will not be considered.

2.02 CHEMICAL STORAGE TANKS—GENERAL

- A. The chemical storage tank shall be constructed of Polyethylene materially suited to the process. No other material of construction shall be acceptable.
- B. The tanks shall be manufactured in accordance with ASTM D 1998-97 Standard Specification for Polyethylene Upright Storage Tanks, Type 1 only.
- C. Vessel Construction:
1. Mechanical properties. The nominal value for the properties of the materials shall be based on the molded parts:

Property	ASTM	Value	Units
DENSITY	D1505	59(0.937-0.944)	Lb/ft ³ (S.G.)
ESCR spec. thickness 0.125"	D1693	900-1000	Hrs.
Tensile Strength Ultimate 2"/min.	D638 Type IV	2600	PSI
Elongation at Break 2"/min.	D638 Type IV	450	%
Vicat Softening Temp.	D1525	255	°F
Brittleness Temp.	D746	-180	°F
Flexural Modulus	D790	100,000-110,000	PSI

2. Design Parameters:
 - a. Hoop Stress. The vessels shall be designed with a hoop stress value no greater than 600 psi with a safety factor of no less than 2, using the Barlow Formula for calculating wall thickness.
 - b. Wall Thickness. The minimum required wall thickness of the cylindrical shell at any fluid level shall be determined by the Barlow Formula. The wall thickness shall be based on the maximum temperature of the service.
3. Cut edges. All edges where openings are cut into the vessel shall be trimmed smooth.
4. Appearance. Type 1 finished vessel walls shall be free, as commercially practicable of visual defects such as foreign inclusions, air bubbles, pinholes, pimples, crazing, cracking, and delaminations that will impair the serviceability of the vessel.
5. Dimensions and Tolerance. The vessel diameter shall be measured externally. The tolerances on the outside diameter, including out of roundness, shall be $\pm 3\%$. Measurement shall be taken in a vertical position.

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- D. Fittings:
1. All fittings with the exception of the overfill protection site glass, shall be located on the tank top or dome. No penetration of the tank side-wall shall be made.
 2. Plastic Fittings. Plastic fittings shall be "bulk-head" or "two-flange" style and shall be constructed of PVC. There shall be 4 bolts on any bolted flanges up to and including 3 inch, 8 bolts on fittings 4 inch to 8 inch diameter, and 12 bolts on 10 inch to 12 inch fittings. All bolts shall be all thread design with heads completely encapsulated in polyethylene. The polyethylene encapsulation shall fully cover the bolt head and a minimum of 1/4-inch of the threads closest to the bolt head. The polyethylene shall be color coded to distinguish bolt material. Each bolt shall have a gasket, which is on the inside of the vessel. All bolts shall be of 316 stainless steel.
 3. Openings that are cut in vessel to install fittings shall not have sharp corners. Holes shall have minimum clearance to promote best performance of fittings.
 4. For all flanged connectors, the flange drilling and bolting shall be in accordance with ANSI/ASME B-16.5 for 150-psi pressure class straddling the principle centerline of the vessel.
- E. Tank Manway Covers for Industrial Park Pump Station No. 1:
1. Manway cover shall be 15 to 24-inch diameter.
 2. Manway covers shall have either a threaded or bolted cover or gasket.
- F. Tank Manway Cover for Rose Run Pump Station.
1. Manway covers shall be 10 to 24 inch diameter, and will be dependent upon the tank dimensions.
 2. Manway covers shall have either a threaded or bolted cover or gasket.

2.03 CHEMICAL STORAGE TANK-SPECIFICATIONS

- A. The chemical storage tank for Industrial Park Pump Station No. 1 shall have the following capacity and approximate dimensions ($\pm 5\%$):

Parameter	Chemical Tanks
Nominal Capacity	3,000 U.S. gal
Diameter	7'6"
Height	10'2"
Empty Weight	800 lb.
Specific Gravity	1.9

- B. The chemical storage tank for Rose Run Pump Station shall have the following capacity and approximate dimensions ($\pm 5\%$):

Parameter	Chemical Tanks
Nominal Capacity	1,500 U.S. gal
Diameter	7'2"
Height	6'1"

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Parameter	Chemical Tanks
Empty Weight	320 lb.
Specific Gravity	1.9

2.04 ODOR CONTROL CHEMICAL FEED CONTROLS

- A. General: The operation of the Chemical Feed System shall be controlled from a Control Panel.
- B. Enclosure: The control panel enclosure for Industrial Park Pump Station No. 1 shall be constructed of Stainless Steel, and shall be rated NEMA 4X. The hinged door shall have two quarter-turn latches and shall be capable of locking via a padlock. All components shall be mounted on a swing-out door. The enclosure shall be mounted on the heated calibration stand.
- C. The control panel enclosure for Rose Run Pump Station shall be constructed of stainless steel and shall be rated NEMA 3R. It shall be equipped with a door with a continuous hinge. The hinged door shall have two latches and shall be capable of locking via a padlock. The enclosure shall be mounted on the control stand.
- D. Components: The Control Box for Industrial Park Pump Station No. 1 shall contain the following:
1. One—Operator Interface.
 2. One—On/Off Switches for Auxiliary Equipment with push to test LED Indicator Lights.
 3. Two—Off/Auto Switches for Chemical Feed Pump Control with push to test LED Indicator Lights.
 4. One—Set of Contacts with surge arrestor to accept Tank Level device.
 5. Two—Pump Contactors.
- E. The Control Box for Rose Run Pump Station shall contain the following:
1. Two—24 Hour Time Clocks.
 2. One—15 Amp Circuit Breaker, 115 volt.
 3. One—Ground Fault Receptacle.
 4. Five—On/Off Switches with LED Indicator Lights.
 5. Two—Chemical Feed Pumps.
 6. One—Cooling Fan.
 7. Two—Dry Contact to Receive Signal from Remote Source.
- F. Controls Layout: All manually operated controls (control switches, pilot lights, etc.) shall be located on a panel behind the enclosure door. The panel shall be outfitted with a main power disconnect located in the Control Stand.
- G. Standards: All control system design, fabrication and wiring shall conform to the standards of Underwriter's Laboratories, National Electrical Code, and any other applicable federal, state, or local codes.
- H. System Operation: Chemical Feed Pumps for Industrial Park Pump Station No. 1. The bellows pump shall be controlled by a two-position OFF/AUTO switch. The control system shall utilize 24 discrete dosing set points one setpoint for each hour of the day. The same 24 discrete dosing setpoint is then repeated and used for each day of the week.

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1. When in the AUTO position, the pump shall be controlled by the advanced dosing controller. The advanced dosing controller shall vary the feed rate in 1-hour increments as specified by the user. The pumps shall be turned on and off by the advanced dosing controller to match the specified dose curve.
 2. System shall automatically calculate the dose with either one pump or two pumps activated and the specified volume of product.
 3. If the tank level is in alarm condition (empty, low or high) relay contacts shall be energized.
 4. Automatic functions shall be protected by one-level security.
 5. The chemical dosing scheme shall be a stepping function from any given hour to another.
 6. Daily chemical dosing curve shall also be adjustable by a global setting to increase the feed rate percentage across all 24 daily set points.
 7. System shall have selectable High-Low-Empty digital output alarms and provide for remote customer lockout contacts for remote customer shutdown.
 8. Feed pumps shall have the capability to be interlocked with the sewage pumps and shall have the capability to be automatically shutdown on empty tank alarm.
 9. System shall calculate be capable of providing alarms for leak detection.
- I. Chemical Feed Pumps for Rose Run Pump Station. The bellows pump shall be controlled by a three-position HAND/OFF/AUTO switch. When in the AUTO position the pump shall be controlled by a timer. The timer shall turn the pump on and off based upon preset time intervals. When in the HAND position the pump shall run, regardless of the preset time interval. Either one or both chemical feed pumps may turn on or off at preset speeds and preset times.
- J. Control Stand: Pump control box shall be mounted on a stainless steel pedestal.
1. Calibration Cylinder. The stand shall be used to house a calibration cylinder used to measure the chemical being injected into the system. A three-way valve shall be located at the top and bottom of the calibration tube to facilitate flow measurement. Access inside this pedestal shall be accomplished through a door located on the front of the pedestal. Instructions for use of this cylinder shall be permanently affixed to the interior of the enclosure.
 2. Disconnect Switch. A main power disconnect shall be located in the control stand.

2.05 CHEMICAL FEED PUMPS

- A. General: For Industrial Park Pump Station No. 1 provide Siemens Bellows Pump(s) as shown on the following table, or equal. Each pump shall include motor, base, sealed bearings, flexible coupling and check valve filters.

Quantity	Model No.	Adjustable Flow Rate Range (mL/min)	Max Discharge Pressure (psi)
2	15908-002	50-500	40

- B. For Rose Run Pump Station provide Siemens Water Technologies LLC Bellows Pump(s) as shown on the following table, or equal. Each pump shall include motor, base, sealed bearings, flexible coupling and check valve filters.

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Quantity	Model No.	Bellows Size	Adjustable Flow Rate Range (mL/min)	Max Discharge Pressure (psi)
2	15907-001	1.0"	5-50	40

- C. Performance: Pump rates and maximum discharge pressures shall be in accordance with the table above.
1. The pumps shall be self-priming capable of suction lifts, when dry, up to seven feet, and with bellows full, they will prime up to twenty feet.
 2. Flow rate of each pump shall be adjustable by diameter of bellows and adjustment of stroke length. A calibration cylinder and valves will be installed to calibrate pump feed rates.
 3. Pump suction and discharge shall be 3/8-inch ID polypropylene barbed connection for "T" tubing. A 1 1/2-inch wye strainer will be installed.

- D. Construction: Material:

Reference	Material
Bellows	Polypropylene
Poppet Valves	EPT®
O-rings	EPT®
Springs	Hastelloy C

- E. Motors: Motor shall be totally enclosed 115 volt, 60 Hz, 0.034 HP, single-phase and shall be rated for continuous duty.

2.06 PIPING AND APPURTENANCES

- A. All suction and discharge piping shall be standard 1/2-inch, Schedule 80 PVC. All valves, fittings, and connectors shall be Schedule 80 PVC.
- B. All fill line piping shall be two-inch Schedule 80 PVC. All fill line valves, fittings, and connectors shall be Schedule 80 PVC.
- C. Fill line shall have a two-inch stainless steel male camlock with a two-inch plastic female camlock cap.
- D. All chemical feed seals shall be compatible with the chemicals to be used in the regular operation, maintenance, and cleaning of the feed system.
- E. All fittings shall be solvent-welded or threaded.
- F. Contractor shall install chemical feed discharge lines so that the product is injecting directly into the waste streams and not onto structures or equipment.

2.07 LEVEL DETECTION

- A. For Industrial Park Pump Station No. 1 provide tank liquid level indication inclusive in the feed system controller. The system shall utilize a signal generated from pressure transducer to measure the tank liquid level. A digital display shall be available on the control panel to view tank level.

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- B. System shall accept inputs from up to two storage tanks and allow for horizontal tank calculations.
- C. For Rose Run Pump Station provide one pressure transducing tank level indicator. The system shall utilize a differential pressure signal to measure the tank liquid level. A digital display shall be provided to indicate liquid level. The system shall contain 5 adjustable relays to allow for alarms and other electrical uses. The system shall be capable of transmitting tank levels over a cellular network to be accessed through the internet.

2.08 TESTING AND OPTIMIZATION EQUIPMENT

- A. The Manufacturer shall provide the following testing and optimization equipment:
 - 1. Dissolved sulfide field test kit that is capable of measuring dissolved sulfide less than 0.1 mg/L. The test kit shall use an industry accepted method for field testing dissolved sulfide in wastewater.
 - 2. Nitrate field test kit that is capable of measuring nitrate nitrogen less than 0.1 mg/L.

PART 3-EXECUTION

3.01 SITE AND UTILITIES

- A. Electrical: One 120 VAC, 60 Hz, 15 amp single-phase electrical service shall be required.
- B. Drain: A minimum 2-inch P.V.C. gravity pad drain to sewer is recommended.
- C. Concrete Foundation.
- D. Force main taps for injection and flow/pressure sensor if applicable.
- E. All trenching excavation and backfill.

3.02 EQUIPMENT SHOP TESTING

- A. Before shipping the equipment, the Manufacturer shall perform shop tests. These tests shall include at a minimum:
 - 1. Visual inspection of all equipment.
 - 2. Complete assembly, start-up, and "wet-test" of feed pumps and calibration piping.

3.03 INSTALLATION

- A. The system shall be installed in accordance with the manufacturer's instructions. All installation personnel shall be trained and qualified in the areas of plumbing, electrical work, and instrumentation as required to complete the installation.

3.04 FIELD TESTS

- A. For Industrial Park Pump Station No. 1 the performance of the system shall be demonstrated to reduce dissolved hydrogen sulfide concentration in the wastewater to less than 0.1 mg/l. The manufacturer shall use an industry approved field testing method to demonstrate the results.

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- B. For Rose Run Pump Station the performance of the system shall be demonstrated to reduce dissolved hydrogen sulfide concentration in the wastewater to less than 0.1 mg/l. The manufacturer shall use an industry approved field testing method to demonstrate the results.
- C. If required, CONTRACTOR shall make any changes to the system, at its own expense, that may be necessary to provide satisfactory and efficient operation of this system.

END OF SECTION

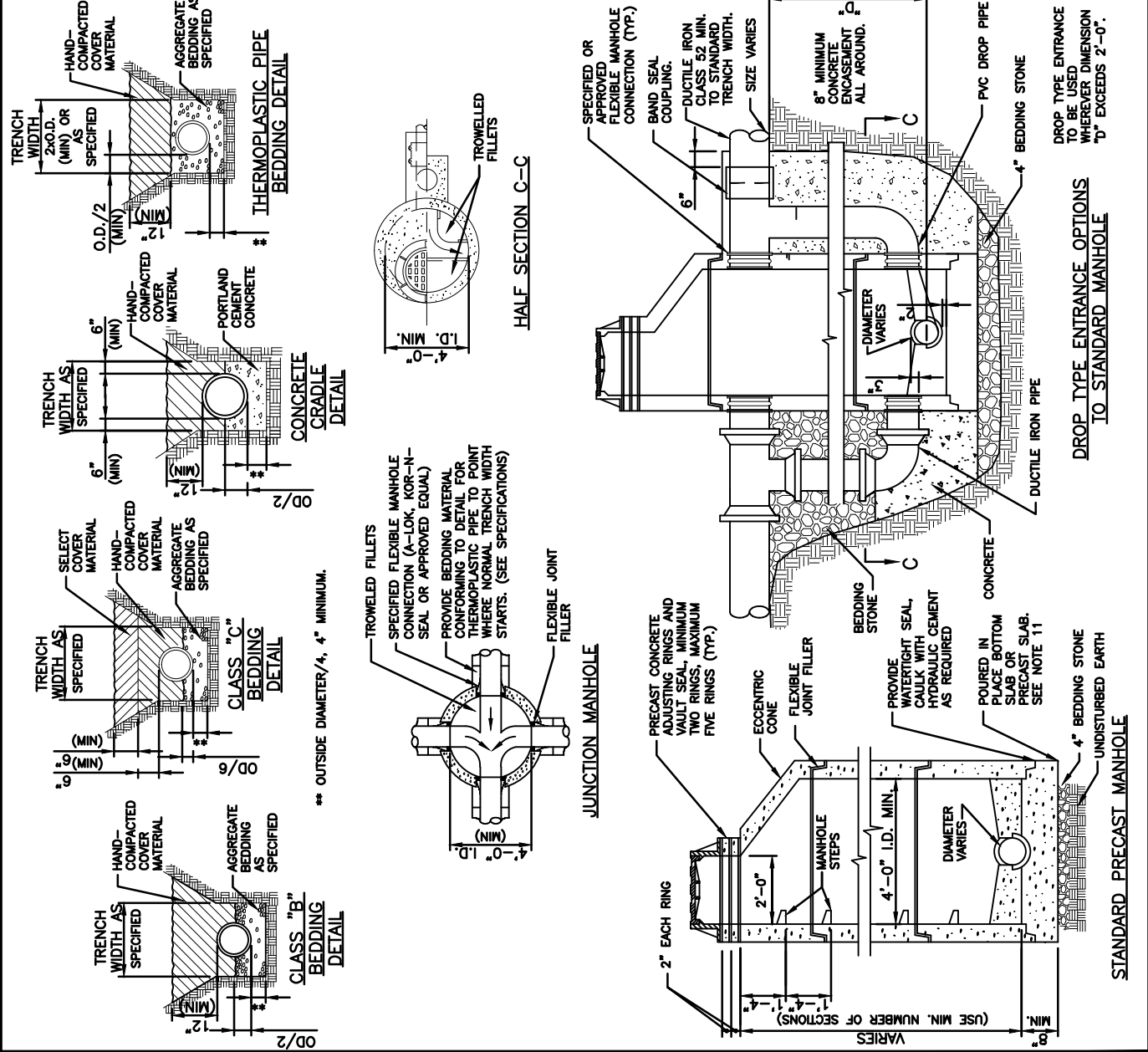
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DRAWINGS

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- NOTES**
1. DETAILS RELATIVE TO ITEMS SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.
 2. VARIATIONS IN DIMENSIONS AND DESIGN MAY BE PERMISSIBLE, PROVIDING EQUIVALENT CAPACITY AND STRENGTH ARE ATTAINED.
 3. ALL CONCRETE FILLETS SHALL BE HAND TROWELED WITH A 1/4" FT. SLOPE.
 4. INSIDE DIMENSIONS FOR MANHOLES: USE MINIMUM 4' DIAMETER FOR SEWER LESS THAN 18" IN DIAMETER; USE MINIMUM 5' DIAMETER FOR SEWER 18" THRU 24" IN DIAMETER; USE MINIMUM 6' DIAMETER OR MINIMUM 6' SQUARE FOR SEWER OVER 24" IN DIAMETER.
 5. BEDDING CLASSES "B" AND "C" SHALL MEET OR EXCEED ASTM C12 REQUIREMENTS.
 6. DROP TYPE ENTRANCE TO STANDARD MANHOLE WILL BE PAID FOR SEPARATELY IF SO LISTED IN THE BID.
 7. SEE DRAWINGS FOR DROP TYPE ENTRANCES FOR SANITARY SEWERS LARGER THAN 15".
 8. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF REGULATORY BODIES OF THE STATE AND APPLICABLE MUNICIPAL ORDINANCES.
 9. ALL NEW CONSTRUCTION SHALL BE PLACED ON UNDISTURBED EARTH OR STONE BEDDING.
 10. FLAT SLAB TOPS SHALL BE DESIGNED FOR H-20 TRUCK LOADING AND SHALL MEET REQUIREMENTS OF ASTM C-478.
 11. BASE SLABS SHALL BE REINFORCED AS FOLLOWS: REINFORCING SHALL BE PLACED IN EACH DIRECTION AT 2" CLEAR FROM TOP SURFACE OF SLAB. REINFORCING SHALL BE GRADE 60. USE OF CAST-IN-PLACE SLAB SHALL NOT RELIEVE CONTRACTOR OF REQUIREMENTS TO PROVIDE WATERTIGHT JOINTS.
 12. FLAT SLABS SHALL BE PROVIDED IN SHALLOW DEPTH SITUATIONS IN LIEU OF ECCENTRIC CONES.



SANITARY SEWER APPURTENANCES

STANDARD DETAIL



01-975-43A

OCTOBER 2011

NOTES:
 1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE REQUIREMENTS OF REGULATORY BODIES OF THE STATE AND APPLICABLE MUNICIPAL ORDINANCES.

2. DETAILS RELATIVE TO ITEMS SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

3. VARIATIONS IN DIMENSIONS AND DESIGN MAY BE PERMISSIBLE, PROVIDING EQUIVALENT CAPACITY AND STRENGTH ARE ATTAINED.

4. ALL NEW CONSTRUCTION SHALL BE PLACED ON UNDISTURBED EARTH OR STONE BEDDING.

5. BEDDING CLASSES "B" AND "C" SHALL MEET OR EXCEED ASTM C12 REQUIREMENTS.

6. ALL LATERALS SHALL BE LAID AT A STANDARD SLOPE OF 1/4-INCH PER FOOT UNLESS OTHERWISE NOTED ON THE DRAWINGS. OR SPECIFIED. IN NO CASE SHALL LATERAL SLOPE BE LESS THAN 1/8-INCH PER FOOT. MAXIMUM LATERAL SLOPE SHALL BE 1 TO 1.

7. END PLUGS OR STOPPERS FOR THE ENDS OF LATERALS AND BRANCH FITTINGS SHALL BE PROVIDED.

8. 2x4'S SHALL BE PLACED AT ALL LATERALS ENDS SO THAT ONE PROTRUDES 12 INCHES ABOVE FINISHED GRADE AND ONE IS LOCATED IN THE GROUND AT THE END OF THE LATERAL. 2x4'S SHALL BE PAINTED FLOURESCENT ORANGE. 2x4'S SHALL EACH BE AT LEAST 4 FT. LONG.

9. BAR STEEL REINFORCEMENT SHALL BE IMBEDDED 1 1/2-INCH CLEAR MINIMUM.

10. THE TOP OF ANY MANHOLE STRUCTURE SHALL BE LEFT SUFFICIENTLY LOW TO PERMIT PROPER ADJUSTMENT OF COVER TO GRADE.

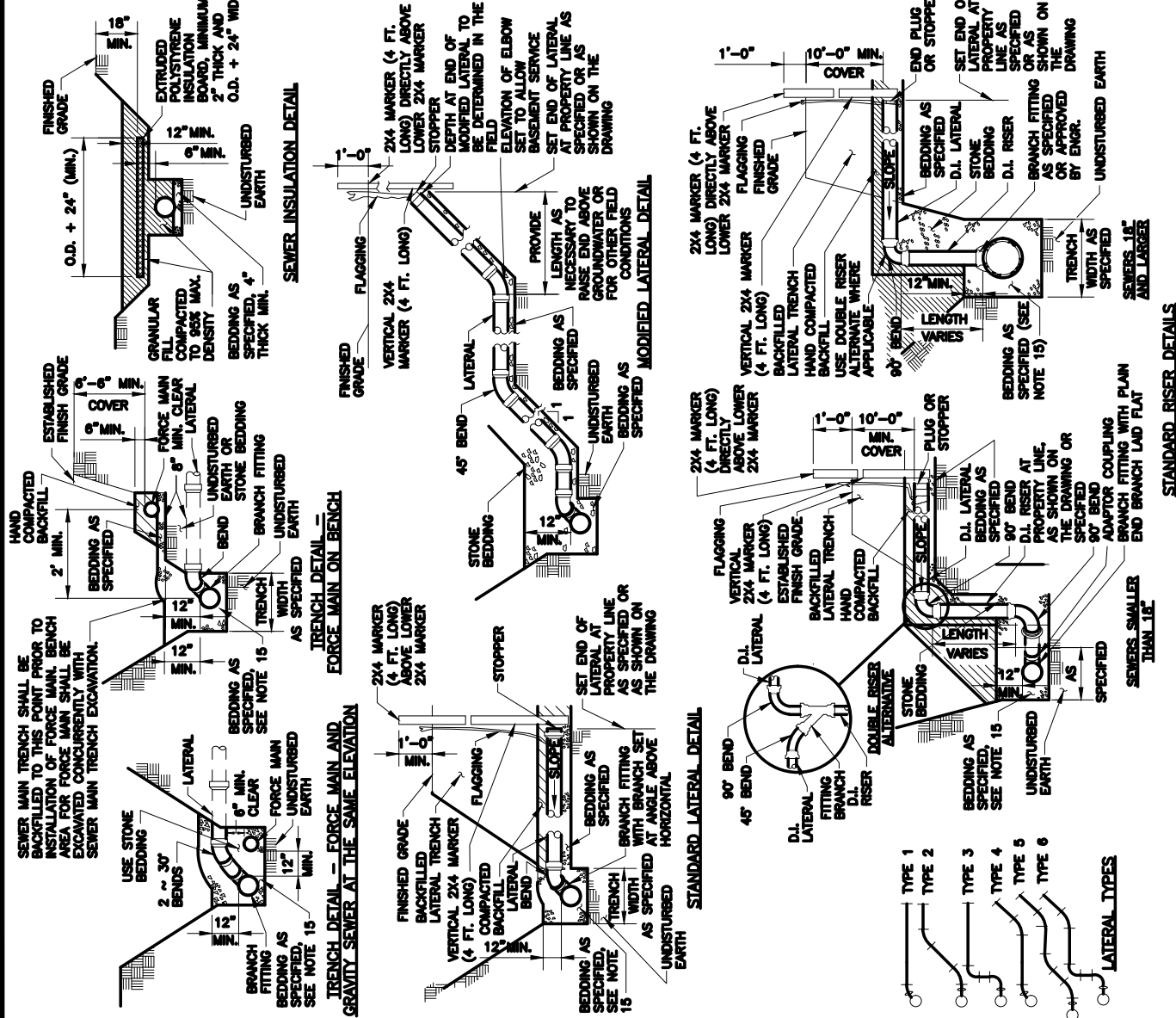
11. INSTALL DOUBLE RISERS WHERE SHOWN ON THE DRAWINGS OR SPECIFIED.

12. STANDARD LATERALS AND MODIFIED LATERALS SHALL BE CONSTRUCTED OF MATERIAL AS SPECIFIED.

13. RISERS AND LATERALS FROM RISERS SHALL BE CONSTRUCTED OF DUCTILE IRON. FITTINGS FOR RISERS AND LATERALS FROM RISERS SHALL BE GRAY IRON OR DUCTILE IRON.

14. FLAGGING SHALL BE 4-INCH WIDE STANDARD ORANGE VINYL TAPE. THE FLAGGING AROUND END OF ALL LATERALS AND EXTEND UNBROKEN TO FINISHED GRADE DIRECTLY ABOVE ENDS OF LATERALS.

15. STONE BEDDING SHALL BE USED AROUND AND TO ONE FT. ABOVE TOP OF ALL SEWER MAINS AT LATERAL CONNECTIONS. PROVIDE BEDDING AS SPECIFIED ELSEWHERE.



SANITARY SEWER LATERALS

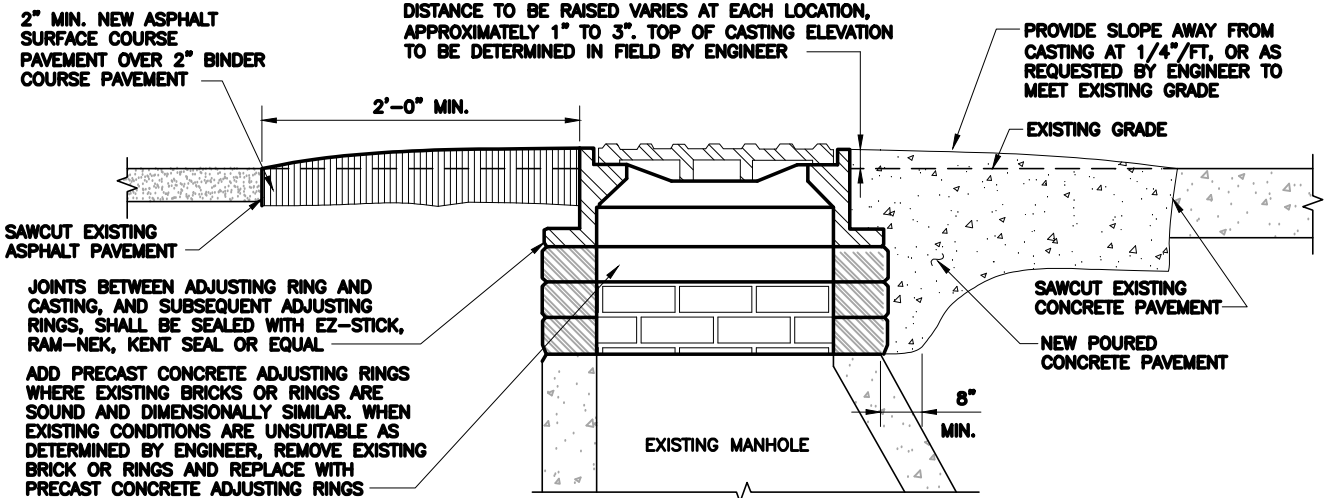
STANDARD DETAIL



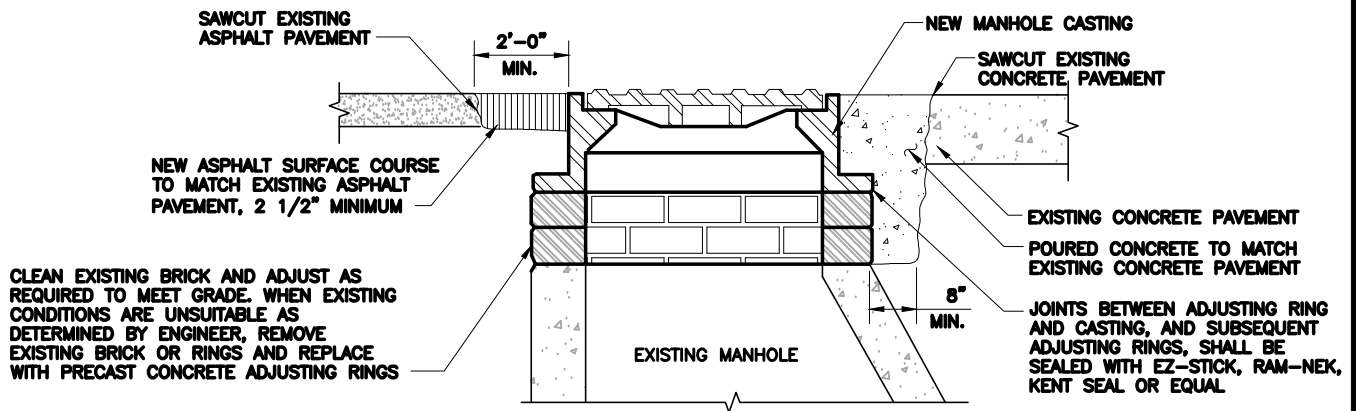
01-975-75A

OCTOBER 2011

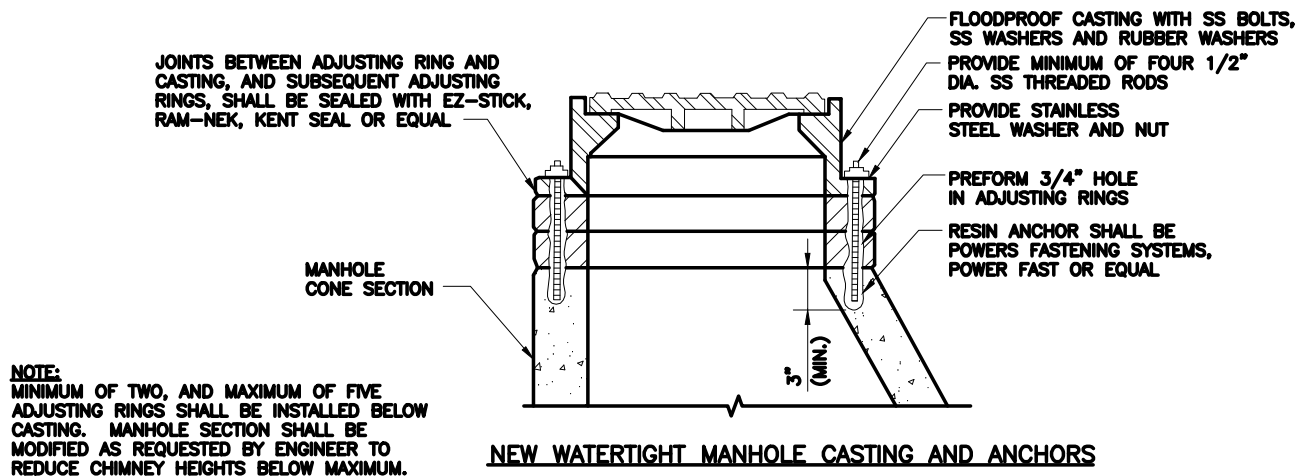
COPY OF BID SET



RAISE MANHOLE CASTING



REPLACE MANHOLE CASTING



MANHOLE CASTINGS ADJUSTMENT AND ANCHORING

STANDARD DETAIL



01-975-109A

OCTOBER 2011

COPY OF BID SET

SAMPLE DRAWINGS

<p>CONDUCTORS</p> <p>CONDUCTOR</p> <p>CONDUCTORS NOT CONNECTED</p> <p>CONDUCTORS CONNECTED</p> <p>CONDUCTOR SHIELD</p> <p>FIELD CONDUCTOR</p> <p>EARTH GROUND</p> <p>CHASSIS GROUND</p> <p>SHIELD GROUND (USED ONLY IF REQUIRED BY SPEC.)</p>	<p>SWITCHES</p> <p>DESCRIPTION TEXT (EXAMPLE LAMP TEST)</p> <p>NORMALLY OPEN PUSHBUTTON</p> <p>NORMALLY CLOSED PUSHBUTTON</p> <p>NORMALLY CLOSED PUSHBUTTON HEAD E-STOP</p> <p>MECHANICAL CONNECTION</p> <p>TWO POSITION SELECTOR SWITCH SHOWN IN 'POS1' CONTACT MADE IN 'POS2'</p> <p>THREE POSITION SELECTOR SWITCH SHOWN IN 'POS1' POSITION (ARROW INDICATES SPRING RETURN FROM 'POS3')</p> <p>CONTACT MADE IN 'POS3'</p> <p>FOUR POSITION SELECTOR SWITCH SHOWN IN 'POS1' POSITION</p> <p>CONTACT MADE IN 'POS3'</p> <p>LIMIT SWITCHES</p> <p>NORMALLY OPEN</p> <p>NORMALLY CLOSED</p> <p>NORMALLY OPEN HELD CLOSED</p> <p>NORMALLY CLOSED HELD OPEN</p>	<p>PROCESS SWITCHES</p> <p>TORQUE SWITCH NORMALLY OPEN CLOSE ON INCREASE TORQUE</p> <p>TORQUE SWITCH NORMALLY CLOSED OPEN ON INCREASE TORQUE</p> <p>LIQUID LEVEL SWITCH NORMALLY OPEN CLOSE ON RISE</p> <p>LIQUID LEVEL SWITCH NORMALLY CLOSED OPEN ON RISE</p> <p>FLOW SWITCH NORMALLY OPEN CLOSE ON INCREASE FLOW</p> <p>FLOW SWITCH NORMALLY CLOSED OPEN ON INCREASE FLOW</p> <p>PRESSURE SWITCH NORMALLY OPEN CLOSE ON RISE</p> <p>PRESSURE SWITCH NORMALLY CLOSED OPEN ON RISE</p> <p>TEMPERATURE SWITCH NORMALLY OPEN CLOSE ON RISE</p> <p>TEMPERATURE SWITCH NORMALLY CLOSED OPEN ON RISE</p> <p>PILOT LIGHTS</p> <p>PILOT LIGHT COLOR: AMBER</p> <p>COLOR CODES A-AMBER W-WHITE R-RED B-BLUE G-GREEN</p> <p>PUSH TO TEST PILOT LIGHT</p>	<p>INPUT/OUTPUT DEVICES</p> <p>DIGITAL INPUT ADDRESS RACK/SLOT/POINT</p> <p>DIGITAL OUTPUT ADDRESS RACK/SLOT/POINT</p> <p>ANALOG INPUT ADDRESS RACK/SLOT/POINT</p> <p>ANALOG OUTPUT ADDRESS RACK/SLOT/POINT</p> <p>COIL CONTACTS</p> <p>NORMALLY OPEN CONTACT</p> <p>NORMALLY CLOSED CONTACT</p> <p>NORMALLY OPEN CONTACT ON DELAY</p> <p>NORMALLY CLOSED CONTACT ON DELAY</p> <p>NORMALLY OPEN CONTACT OFF DELAY</p> <p>NORMALLY CLOSED CONTACT OFF DELAY</p> <p>WIRE COLOR STANDARDS</p> <p>BLACK, INCOMING POWER AC</p> <p>WHITE, NEUTRAL AC</p> <p>GREEN, GROUND</p> <p>RED, CONTROL POWER AC</p> <p>BLU, CONTROL POWER DC</p> <p>BLU/S, BLUE WITH STRIP, CONTROL POWER COMMON DC</p> <p>SHLD, SHIELDED 2 CONDUCTOR BLACK(++)</p> <p>WHT, WHITE, SEPARATE EXTERNAL CONTROL POWER SOURCE</p> <p>YEL, YELLOW, SEPARATE EXTERNAL CONTROL POWER SOURCE</p>	<p>MISCELLANEOUS</p> <p>CIRCUIT BREAKER WITH AMPERAGE</p> <p>FUSE WITH AMPERAGE</p> <p>AUDIBLE DEVICE</p> <p>ELAPSED TIME METER</p> <p>RESISTOR 250 OHM</p> <p>RECTIFIER, DIODE</p> <p>CAPACITOR, ELECT.</p> <p>TRANSFORMER SECONDARY VOLTAGE AND RATING INDICATED AS APPLICABLE</p> <p>INSTRUMENTATION DEVICES</p> <p>SUBPANEL MOUNTED DEVICE WITH LOOP OR SEQUENCE NUMBER</p> <p>PANEL MOUNTED DEVICE WITH LOOP OR SEQUENCE NUMBER</p> <p>FIELD MOUNTED DEVICE WITH LOOP OR SEQUENCE NUMBER</p> <p>ISA CODES FI - FLOW RATE INDICATOR LI - LEVEL INDICATOR FI - FLOW TRANSMITTER FY - FLOW INTEGRATOR FY - FLOW QUANTITY</p>															
<p>TERMINALS</p> <p>TERMINAL BLOCK FOR FIELD TERMINATION</p> <p>TERMINAL BLOCK FOR INTERNAL USE ONLY</p> <p>DEVICE TERMINATION POINT</p> <p>FUSED TERMINAL BLOCK FOR DEVICES LOCATED INTERNALLY</p> <p>RELAY COILS</p> <p>DEVICE ID CONTROL RELAY</p> <p>MOTOR STARTER</p> <p>ELECTRIC TIMER WITH ADJUSTABLE TIMING RANGE</p> <p>SOLENOID</p> <p>THERMAL OVERLOAD</p>	<p>RESERVED WIRE NUMBERS</p> <p>GROUND FAULT CIRCUIT HOT</p> <p>GROUND FAULT CIRCUIT NEUTRAL</p> <p>24V DC POSITIVE</p> <p>24V DC COMMON</p>	<p>REVISION</p> <table border="1" style="width: 100%;"> <thead> <tr> <th>DATE</th> <th>REVISION</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	DATE	REVISION	DESCRIPTION													<p>DATE LAST EDITED: 12/6/2007</p>	<p>DETAILED CROSS REFERENCE</p> <p>SEQUENCE 00-99</p> <p>DRAWING CROSS REFERENCE 1-99</p> <p>FAMILY CODE ABBREVIATION</p> <p>EXAMPLE: CREDI</p> <p>DRAWING NUMBER 000-999</p> <p>SEPARATOR</p> <p>PANEL DESIGNATION A-X</p> <p>PROJECT NUMBER</p>
DATE	REVISION	DESCRIPTION																	

Sample symbol sheet

PROJ. NO.
SHEET 1 OF 1

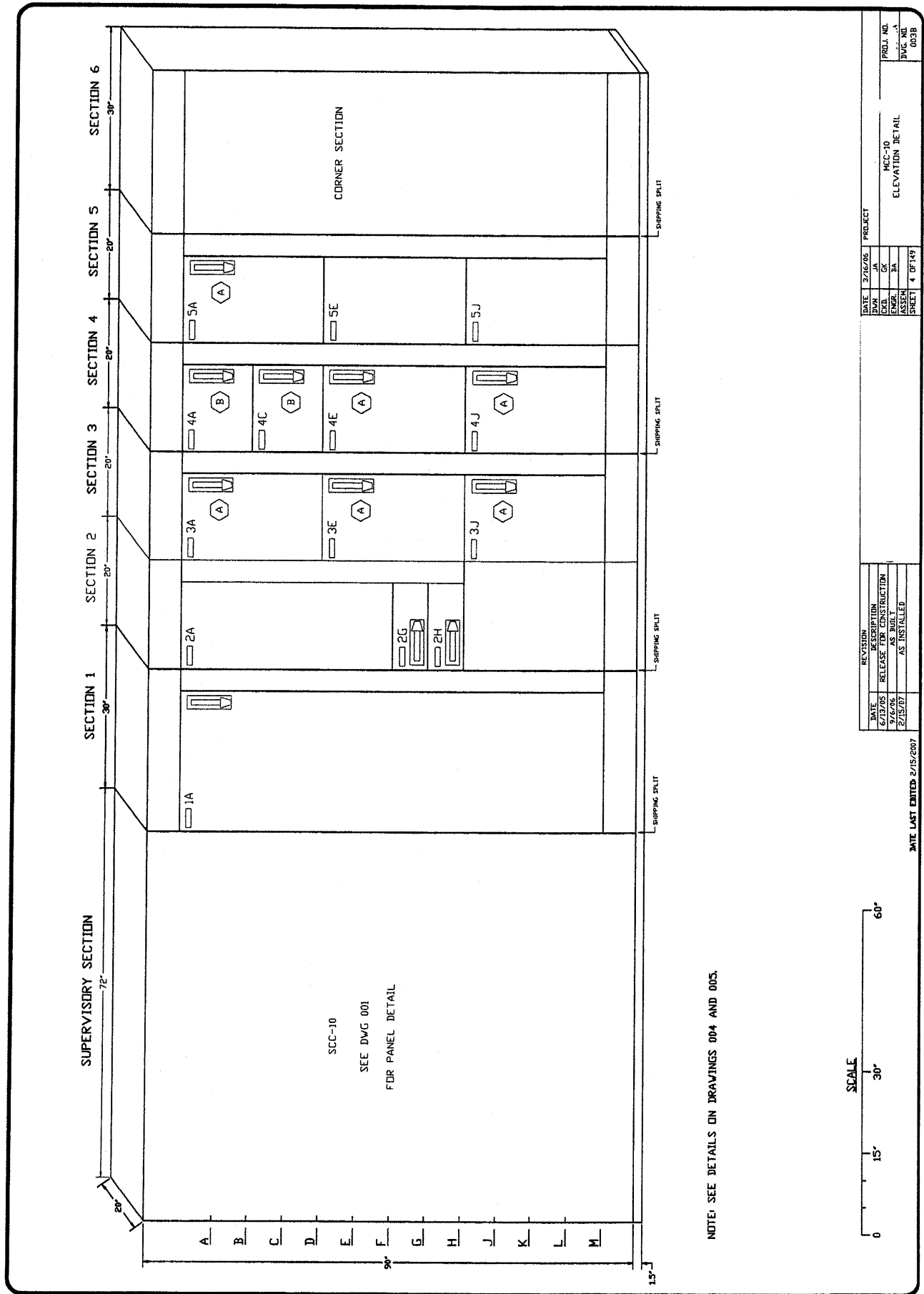
COPY OF BID SET

Standard Abbreviations

<u>Abbreviation</u>	<u>Description</u>	<u>Abbreviation</u>	<u>Description</u>
A	Air Compressed	OV	Overvoltage
AC	Air Condition	PB	Pushbutton
AD	Auto Dialer	PC	Pull Cord
AH	Alarm Horn	PC	Personal Computer
AL	Alarm Light	PFC	Power Factor Capacitor
AM	Amp Meter/Ammeter	PL	Pilot Light
ANN	Annunciator	PLC	Programmable Logic Controller
AR	Alternating Relay	PM	Power or Phase Monitor
AWG	American Wire Gauge	PN	Pneumatic
BA	Battery	PR	Pressure Regulator
BLU	Blue	PS	Pressure Switch
BRN	Brown	PS	Power Supply
CA	Cable	PSH	Pressure Switch High
CB	Circuit Breaker	PSL	Pressure Switch Low
CR	Control Relay	REC	Receptacle
CT	Current Transformer	SP	Surge Protector
DB	Distribution Block	SS	Selector Switch
DI	Diode	STP	Shielded Twisted Pair
DS	Disconnect Switch	SV	Solenoid Valve
EC	Electronic Control Device	TD	Time Delay Relay
ETM	Elapsed Time Meter	TG	Toggle Switch
EN	Enclosure	TS	Temperature Switch
FO	Fiber Optic	TSP	Twisted Shielded Pair
FS	Flow Switch	TT	Temperature Transmitter
FU	Fuse	UPS	Uninterruptible Power Supply
GFI	Ground Fault Interrupter	UTP	Unshielded Twisted Pair
GND	Ground	VA	Voltampere
GRN	Green	VFD	Variable
HTR	Heater	VM	Voltmeter
LA	Lightning Arrestor	WHT	White
LP	Lighting Panel	WS	Weight Switch
LR	Latching Relay	WT	Weight Transmitter
LS	Level Switch	XFMR	Transformer
MS	Motor Starter Contactor	SI	Signal Isolator
M	Motor	SS	Speed Switch
NP	Nameplate	ZS	Position Switch
OIT	Operator Interface Terminal		
OL or O/L	Overload		
ORG	Orange		

*Sample List of
Abbreviations*

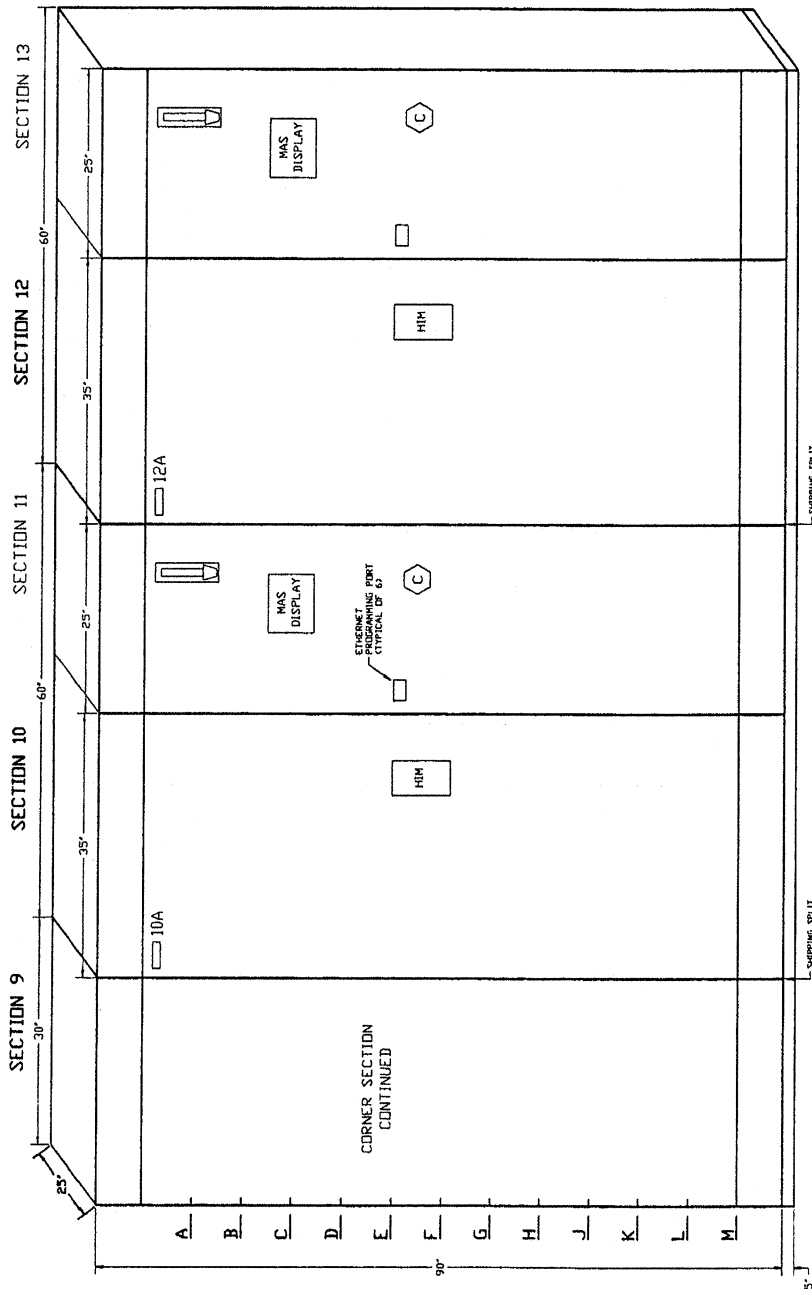
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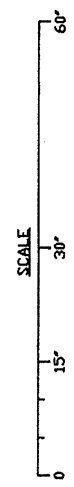
NOTE: SEE DETAILS ON DRAWINGS 004 AND 005.

Sample Exterior
Layout Drawing

COPY OF BID SET



NOTE: SEE DETAILS ON DRAWINGS 004 AND 005.
 SECTIONS 10 THROUGH 13 ARE MOUNTED "BACK-TO-BACK"
 WITH SECTIONS 14 THROUGH 17.

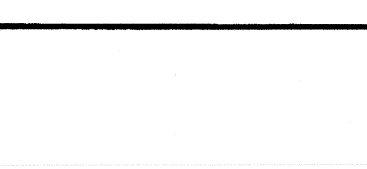
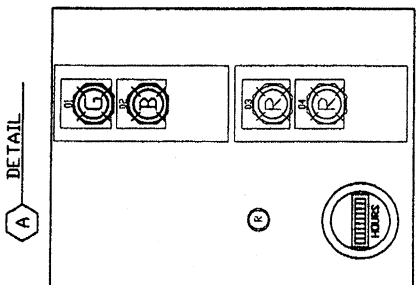
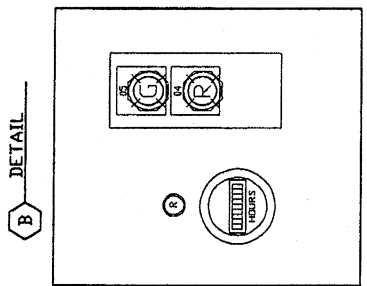
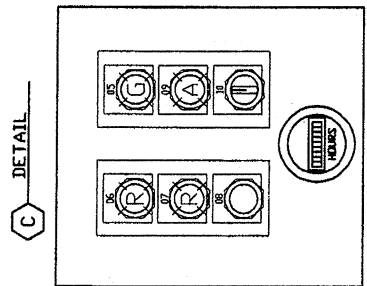
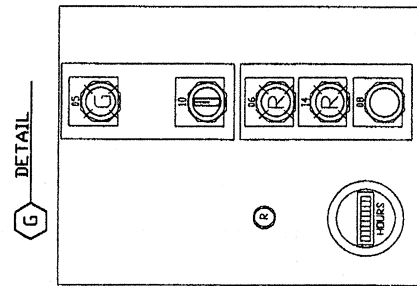
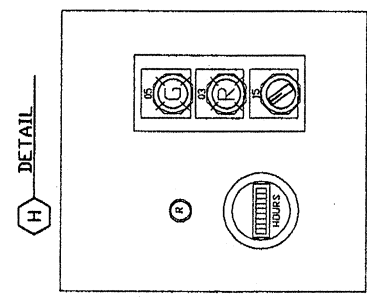


DATE	REVISION
6/12/05	DESCRIPTION
9/16/06	RELEASE FOR CONSTRUCTION
2/15/07	AS BUILT
	AS INSTALLED

DATE	3/16/06	PROJECT	
DRG.	GK	NCC-10	
ENGR.	BA	ELEVATION DETAIL	
ASST.			
SHEET	6 OF 119		
PROJ. NO.			003D
DWG. NO.			

Sample Exterior
 Layout Drawing

COPY OF BID SET

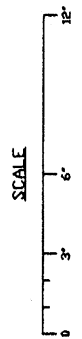


LEGEND PLATE SCHEDULE

TAG	DESCR	DESC3	SIZE	REMARKS
01	FORWARD		1-13/16" SD	
02	REVERSE		1-13/16" SD	
03	OVERLOAD		1-13/16" SD	
04	OVERCURRENT		1-13/16" SD	
05	RUN		1-13/16" SD	
06	VFD FAULT		1-13/16" SD	
07	MOTOR/BEARING	HIGH TEMP	1-13/16" SD	
08	RESET		1-13/16" SD	
09	JIBBY/MOTOR	MOISTURE	1-13/16" SD	
10	HAND AUTO	OFF	1-13/16" SD	
11	ZERO SPEED	ALARM	1-13/16" SD	
12	ESTOP	ACTIVATED	1-13/16" SD	
13	INSPECTION	DOOR OPEN	1-13/16" SD	
14	MOTOR	INVERTEMP	1-13/16" SD	
15	OFF	DN	1-13/16" SD	

DATE	3/26/06	PROJECT	
CHKD	AK		
EMR	BA		
ASSN			
SHEET	11 OF 149		

DATE	6/13/05	REVISION	RELEASE FOR CONSTRUCTION
	9/6/06		AS BUILT
	2/15/07		AS INSTALLED



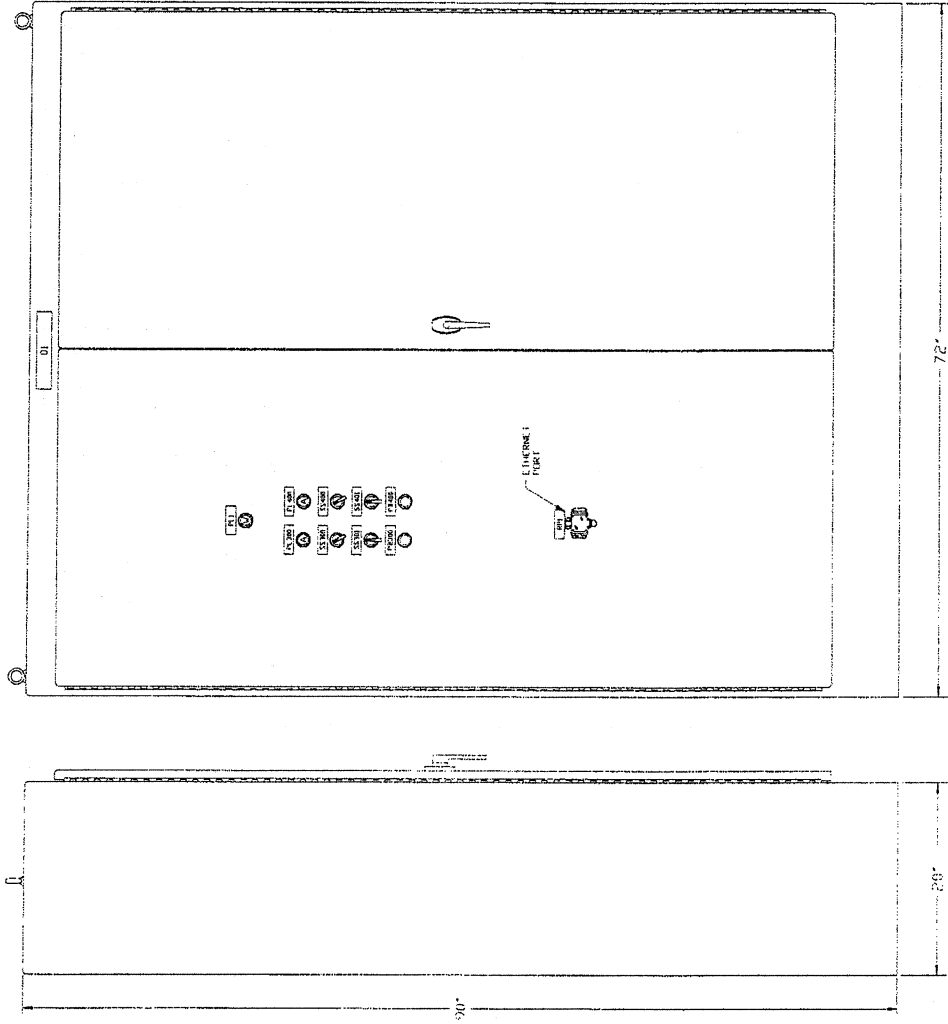
Sample Exterior
Layout Drawing

DATE LAST EDITED 2/15/2007

PROJECT MCC-10
BUCKET DETAILS

PREL. NO. 1-00
DWG. NO. 004

COPY OF BID SET



FRONT VIEW

SIDE VIEW

SCALE
 0 6 12 24

DATE	REVISION	DESCRIPTION
6/12/05	1	RELEASE FOR CONSTRUCTION
9/16/06	2	AS BUILT
2/15/07	3	AS INSTALLED

DATE LAST EDITED: 2/15/2007

TAG	DESC1	DESC2	NAMEPLATE	SCHEDULE	SIZE	REMARKS
01	SEC-10		DESC3		15x8	
PR300	RESET				1X3	
PR400	RESET				1X3	
PL1	POWER DN UPS				1X3	
PL300	INFLUENT	VET WELL NO1		BACKUP FLODATS ACTIVE	1X3	
PL400	INFLUENT	VET WELL NO2		BACKUP FLODATS ACTIVE	1X3	
SS300	BACKUP FLODATS	DN - AUTO			1X3	
SS301	LEAD PUMP	03 - AUTO - 05			1X3	
SS400	BACKUP FLODATS	DN - AUTO			1X3	
SS401	LEAD PUMP	04 - AUTO - 06			1X3	
PP1	ETHERNET	PROGRAMMING PORT			1X3	

NAME PLATES ARE BLACK WITH WHITE LETTERS

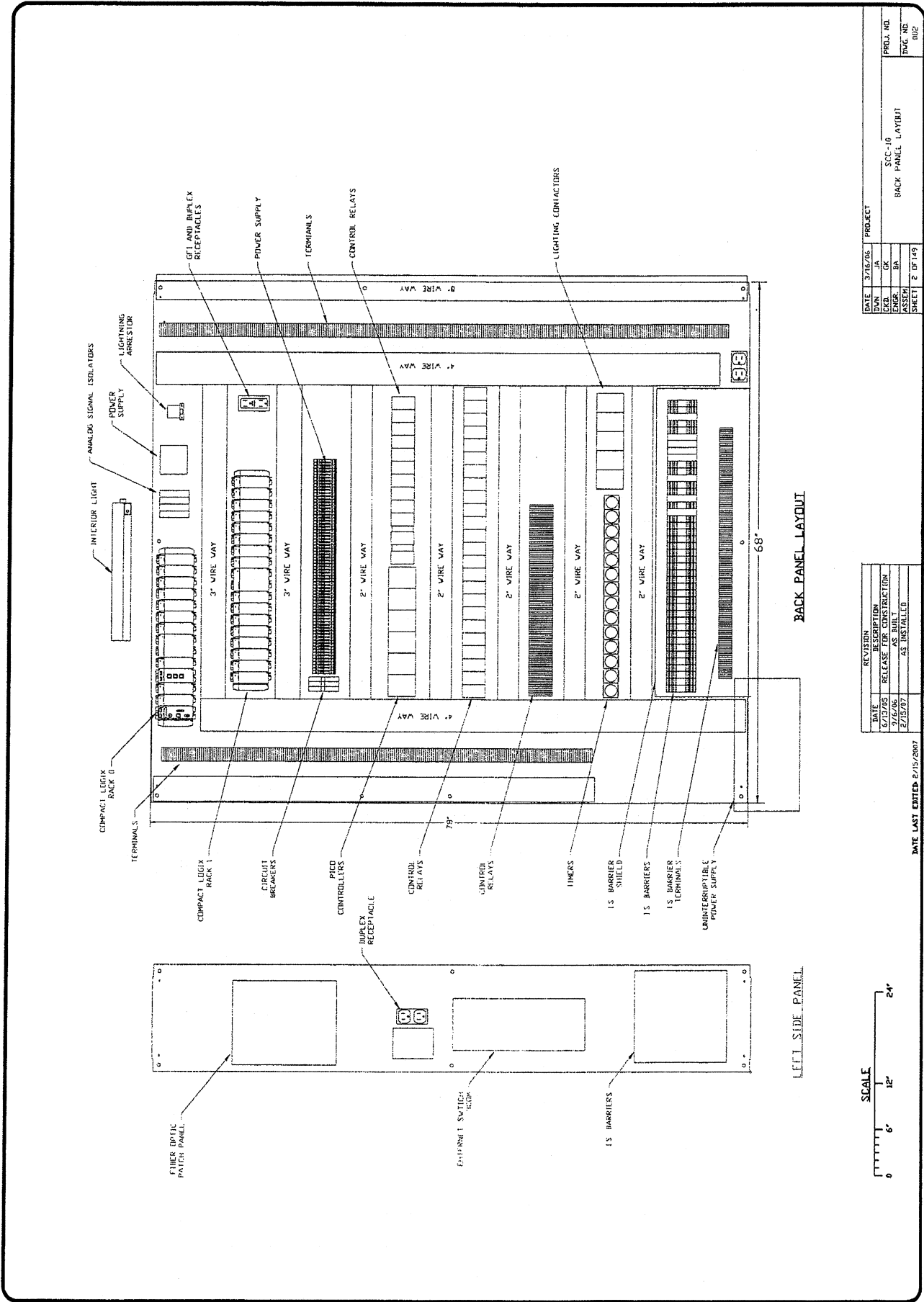
NOTES

- ENCLOSURE IS A NEMA TYPE 12 FREESTANDING HOFFMAN A-9072200 S/D WITH INNER PANEL HOFFMAN A-9087201
- FINISH IS ANSI 61 GRAY
- UL # BF-3171536

DATE	3/16/06	PROJECT
DATE	3/16/06	PROJECT
ENG	CK	ENCLOSURE DETAIL
ASSEM	BA	
SHEET	1 OF 149	
PROJ. NO.		
DWG. NO.		

Sample Exterior Layout Drawing

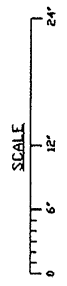
COPY OF BID SET



DATE	3/12/06	PROJECT	PROJ. NO.
DRAWN	JA		
ENGR.	JA		
ASSEM.	JA		
SHEET	2 OF 143		

DATE	REVISION	BY	FUNCTION
6/13/05	RELEASE FOR CONSTRUCTION	AS BUILT	
3/12/06		AS BUILT	
2/12/07		AS INSTALLED	

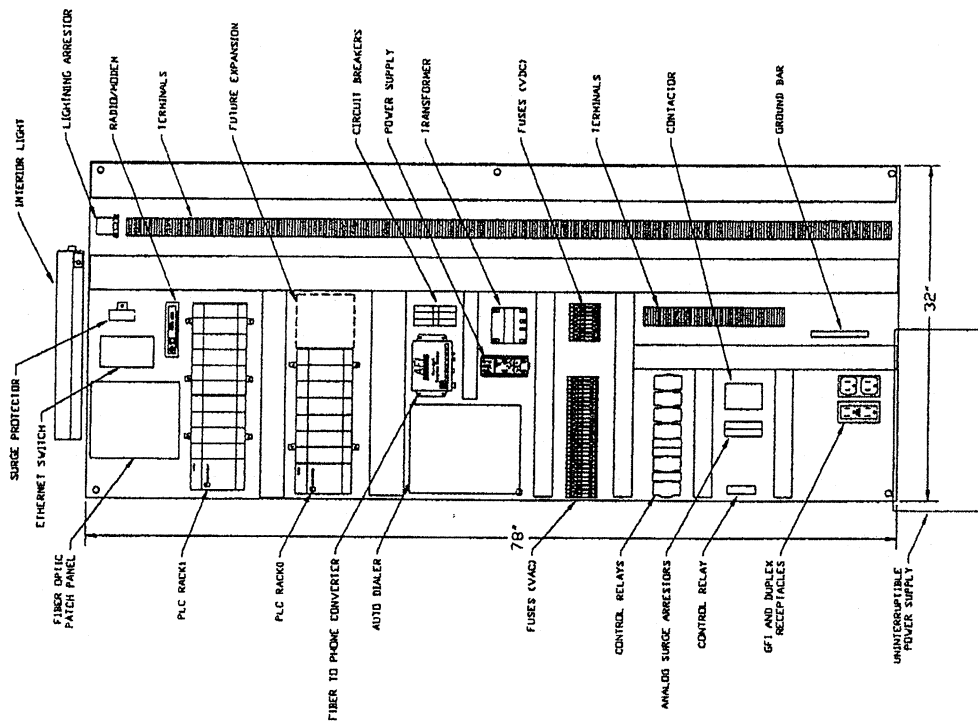
DATE LAST EDITED 2/15/2007



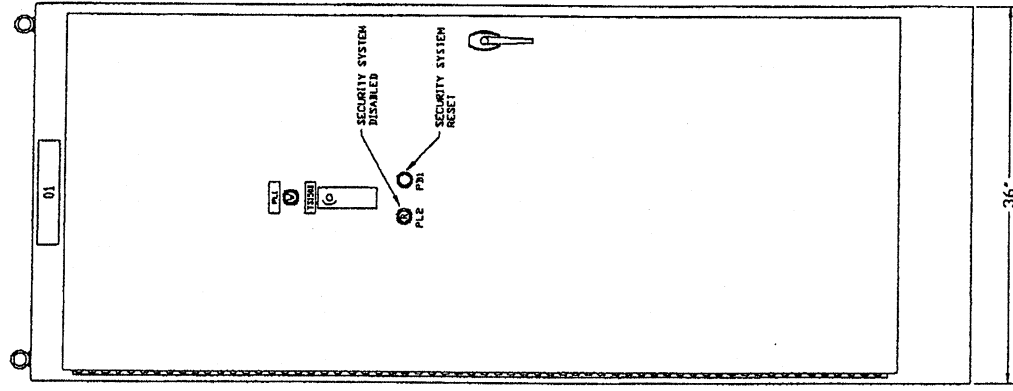
DATE	3/12/06	PROJECT	PROJ. NO.
DRAWN	JA		
ENGR.	JA		
ASSEM.	JA		
SHEET	2 OF 143		

BACK PANEL LAYOUT
Sample Interior Layout Drawing

COPY OF BID SET



PANEL LAYOUT

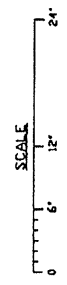


TAG	LINE 1	LINE 2	LINE 3	SIZE	REMARKS
01	SEC-MAN			5x10	
PL1	POWER DM UPS			12x3	
TS1580	LOW BUILDING TEMPERATURE			12x3	

MANIFOLDS ARE BLACK WITH WHITE LETTERS

DATE	REVISION	DESCRIPTION

SUBMITTAL USE ONLY
NOT FOR
CONSTRUCTION
DATE LAST EDITED: 12/16/2007



- NOTES:
- ENCLOSURE IS A NEMA TYPE 12 FREESTANDING HOFFMAN A903620FS, WITH INNER PANEL HOFFMAN A90P36FL.
 - FINISH IS ANST 61 GRAY.
 - UL 508A

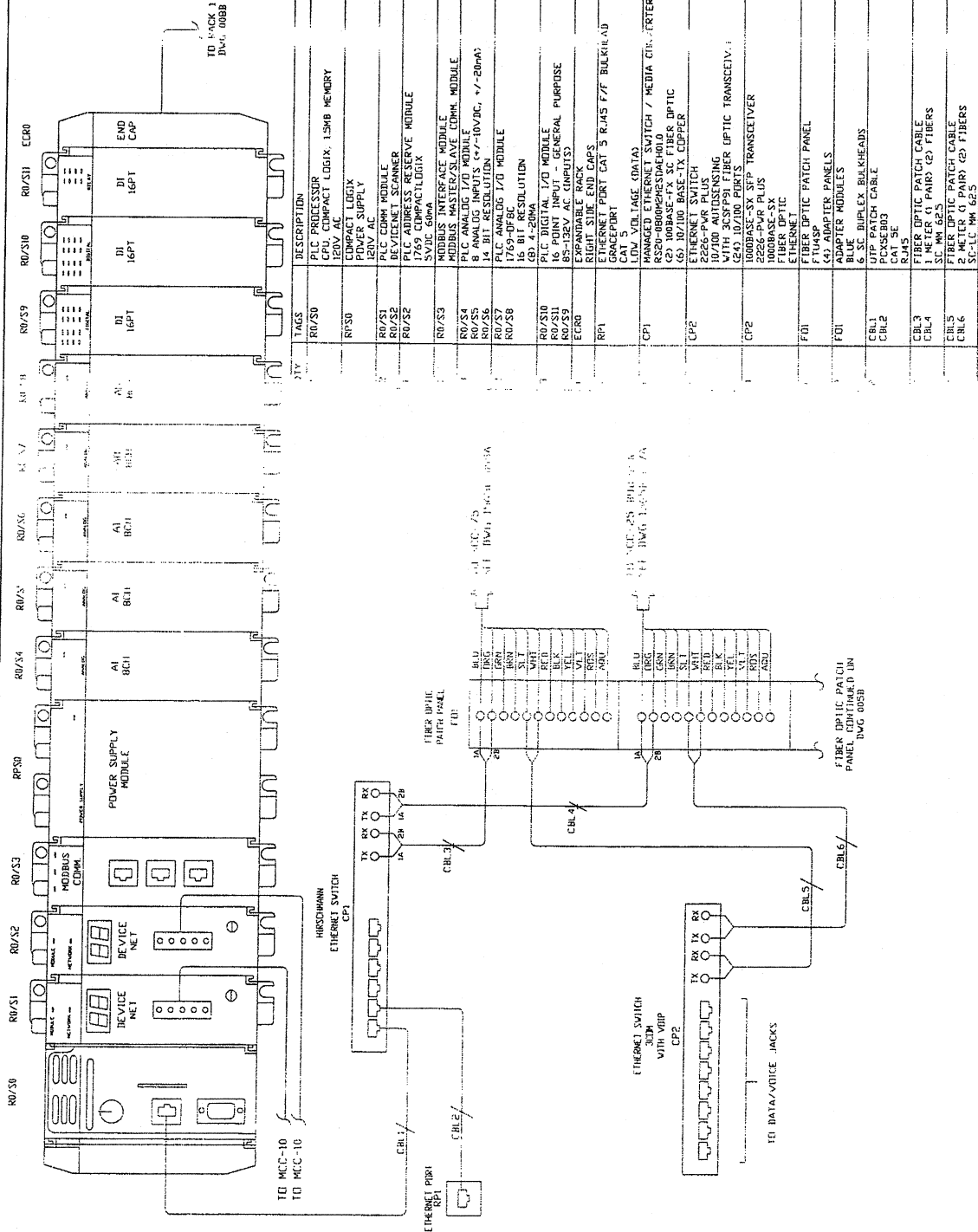
DATE: 10/12/2007 PROJECT: SEC-MAN ENCLOSURE DETAIL
DWG: JA
CHK: GK
ENGR: JI
ASSTN:
SHEET: 1 OF 34

PANEL NO. 001
PAGE NO. 001

Sample Exterior and Interior Layout
Drawing

COPY OF BID SET

COMPACT LOGIX 1/0 SCHEDULE



TAGS	DESCRIPTION	MFG	CATALOG
R0/S0	PLC PROCESSOR CPU, COMPACT LOGIX 1.5MB MEMORY	ALLEN BRADLEY	1769-LSE
R0/S1	COMPACT LOGIX 1.5MB MEMORY	ALLEN BRADLEY	1769-PA4
R0/S2	PLC ADDRESS RESERVE MODULE	ALLEN BRADLEY	1769-SIM
R0/S3	MODBUS INTERFACE MODULE	ALLEN BRADLEY	1769-ARM
R0/S4	PLC ANALOG I/O MODULE	PROSIFT	MV169-HCM
R0/S5	8 ANALOG INPUTS (+/-10V/BC, +/-20mA)	ALLEN BRADLEY	1769-TF8
R0/S6	14 BIT RESOLUTION	ALLEN BRADLEY	1769-TF8
R0/S7	1769-0P00 I/O MODULE	ALLEN BRADLEY	1769-TF8
R0/S8	16 BIT RESOLUTION	ALLEN BRADLEY	1769-TF8
R0/S10	PLC DIGITAL I/O MODULE	ALLEN BRADLEY	1769-TF8
R0/S11	PLC DIGITAL I/O MODULE	ALLEN BRADLEY	1769-TF8
R0/S12	EXPANDABLE RACK	ALLEN BRADLEY	1769-TF8
R0/S13	RIGHT SIDE END CAPS	ALLEN BRADLEY	1769-TF8
R0/S14	ETHERNET PORT CAT 5 RJ45 F/F BULKHEAD	GRACE ENG PRODUCTS	P-R2-B3
R0/S15	MANAGED ETHERNET SWITCH / MEDIA CONVERTER	HIRSCHMANN	943 434-003
R0/S16	10/100 BASE-TX SC FIBER DPTIC	HIRSCHMANN	943 434-003
R0/S17	2226-PAK PATCH	3CDM	3C16490-US
R0/S18	10/100 AUTOSENSING	3CDM	3C16490-US
R0/S19	WITH 3CSFP91 FIBER OPTIC TRANSCIEV. I	3CDM	3CSFP91
R0/S20	1000BASE-SX FIBER DPTIC	3CDM	3CSFP91
R0/S21	FIBER OPTIC PATCH PANEL	HUBBELL	F7UASP
R0/S22	4x ADAPTER PANELS	HUBBELL	FSPSC06
R0/S23	SC DUPLEX BULKHEADS	HUBBELL	PCK5E03
R0/S24	PATCH CORD	HUBBELL	PCK5E03
R0/S25	CAT 5E RJ45	HUBBELL	PCK5E03
R0/S26	FIBER OPTIC PATCH CABLE	HUBBELL	HPF05C0010M
R0/S27	2 METER 6 PAIR (6) FIBERS	HUBBELL	HPF05C0010M
R0/S28	FIBER OPTIC PATCH CABLE	HUBBELL	HPF05C0010M
R0/S29	2 METER 6 PAIR (6) FIBERS	HUBBELL	HPF05C0010M
R0/S30	SC-1C MM 62.5	HUBBELL	HPF05C0010M

DATE	BY	DESCRIPTION
11/12/2007	W. J.
11/12/2007	W. J.
11/12/2007	W. J.
11/12/2007	W. J.

DATE	11/12/2007
BY	W. J. ...
DESCRIPTION	...
DATE	11/12/2007
BY	W. J. ...
DESCRIPTION	...

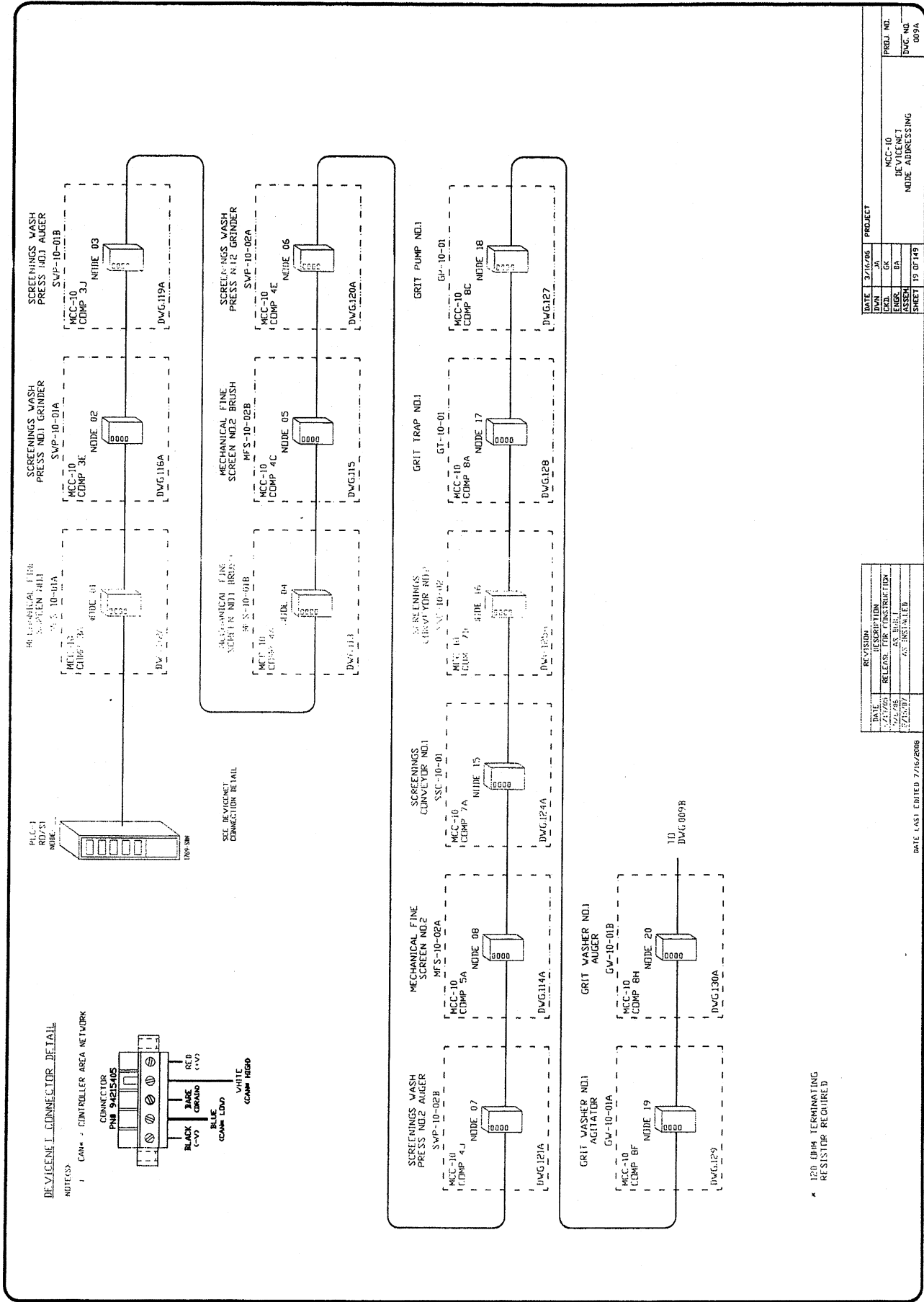
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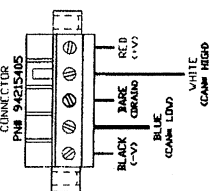
Sample Interconnection Diagram

PROJECT	PLC 1/0 SCHEDULE
PRJL NO	0462 US
BOBA	0004

COPY OF BID SET



DEVIANCE CONNECTOR DETAIL
NOTES:
1. CAN+ CONTROLLER AREA NETWORK



* 120 OHM TERMINATING RESISTORS REQUIRED

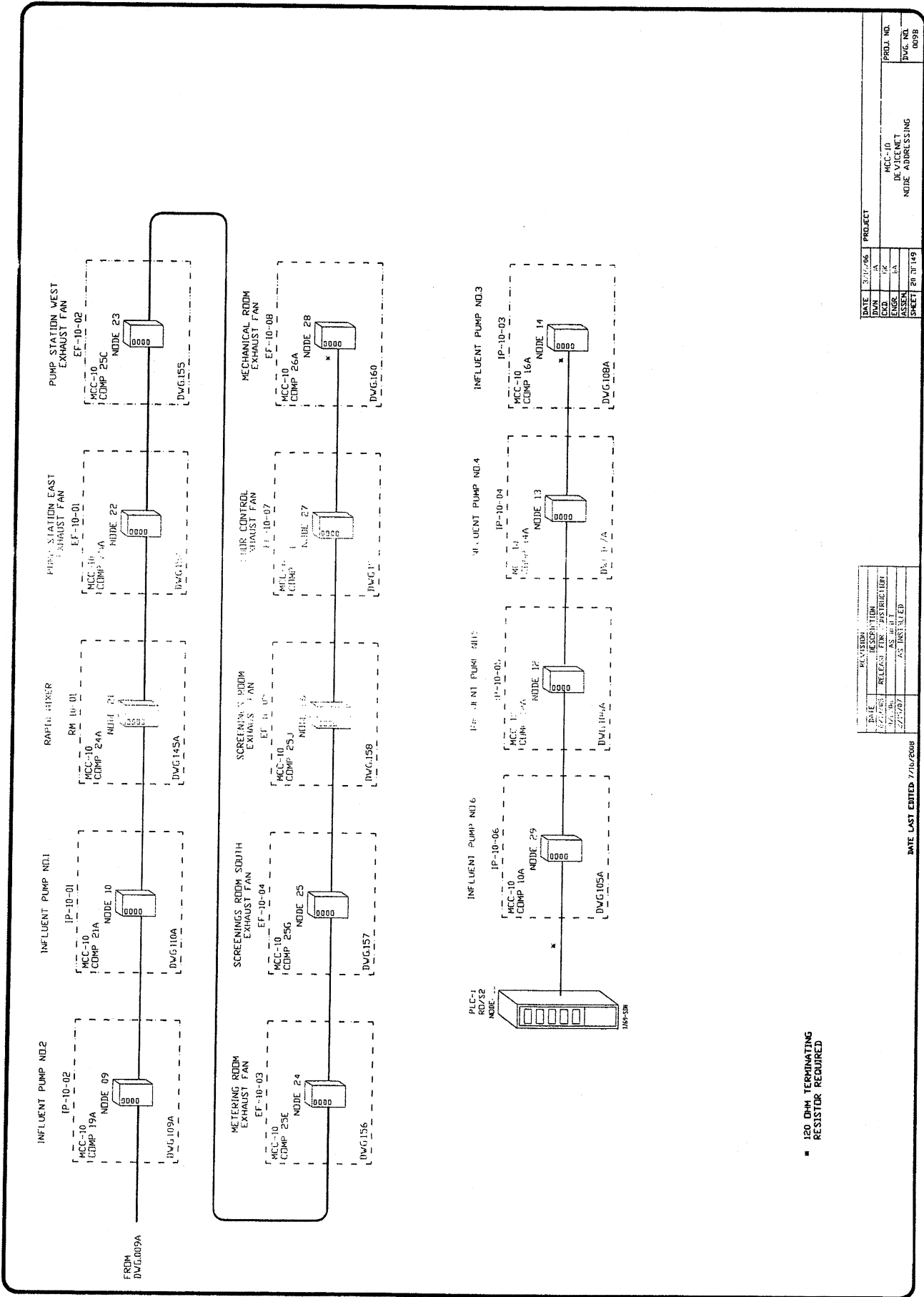
DATE	3/16/05	PROJECT
DRAWN	JR	
CHECKED	SA	
DESIGNED	SA	
PROJECT	MCC-10	
PROJECT	REVISED	
PROJECT	NODE ADDRESSING	
SHEET	19 OF 19	
		PROJ. NO.
		DWG. NO.
		009A

DATE	REVISION
7/16/08	DESCRIPTION
7/16/08	RELEASED FOR CONSTRUCTION
7/16/08	AS BUILT
7/16/08	AS INSTALLED

DATE LAST EDITED 7/16/2008

Sample Network Diagram

COPY OF BID SET



150 OHM TERMINATING RESISTOR REQUIRED

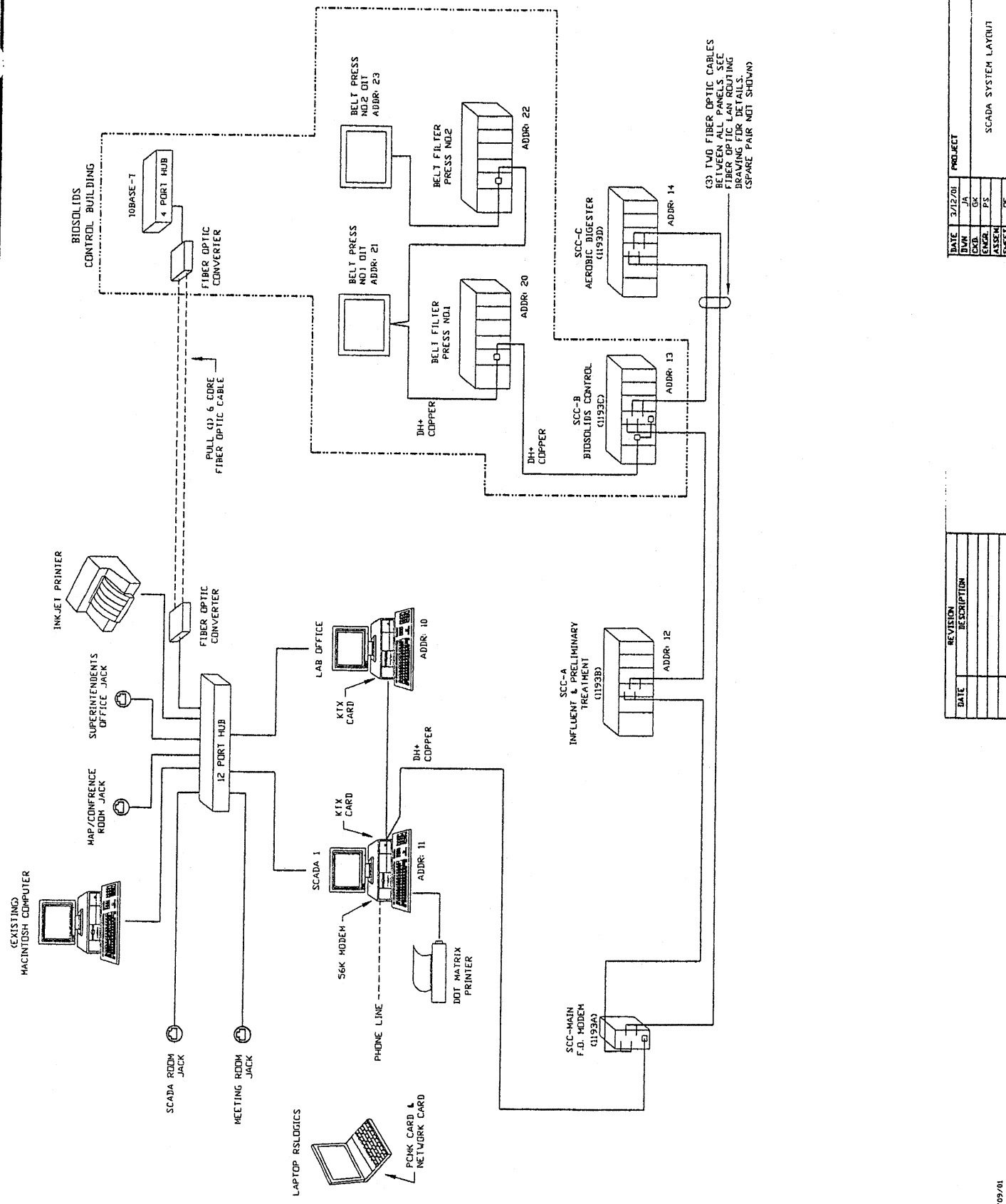
DATE		PROJECT	
REV	DATE	MCC 10	PROJ. NO.
ENGR	1/2/07	DE VICT	DWG. NO.
ASST	1/2/07	NODE ADDRESSING	0098
SHEET	20 OF 149		

DATE		DESCRIPTION	
1/2/07	2/2/07	RELEASE FOR DISTRIBUTION	
1/2/07	2/2/07	AS BUILT	
1/2/07	2/2/07	AS INSTALLED	

DATE LAST EDITED 7/16/2008

Sample Network Diagram

COPY OF BID SET



(3) TWO FIBER OPTIC CABLES BETWEEN ALL PANELS. SEE FIBER OPTIC LAN ROUTING DRAWING FOR DETAILS. (SPARE PAIR NOT SHOWN)

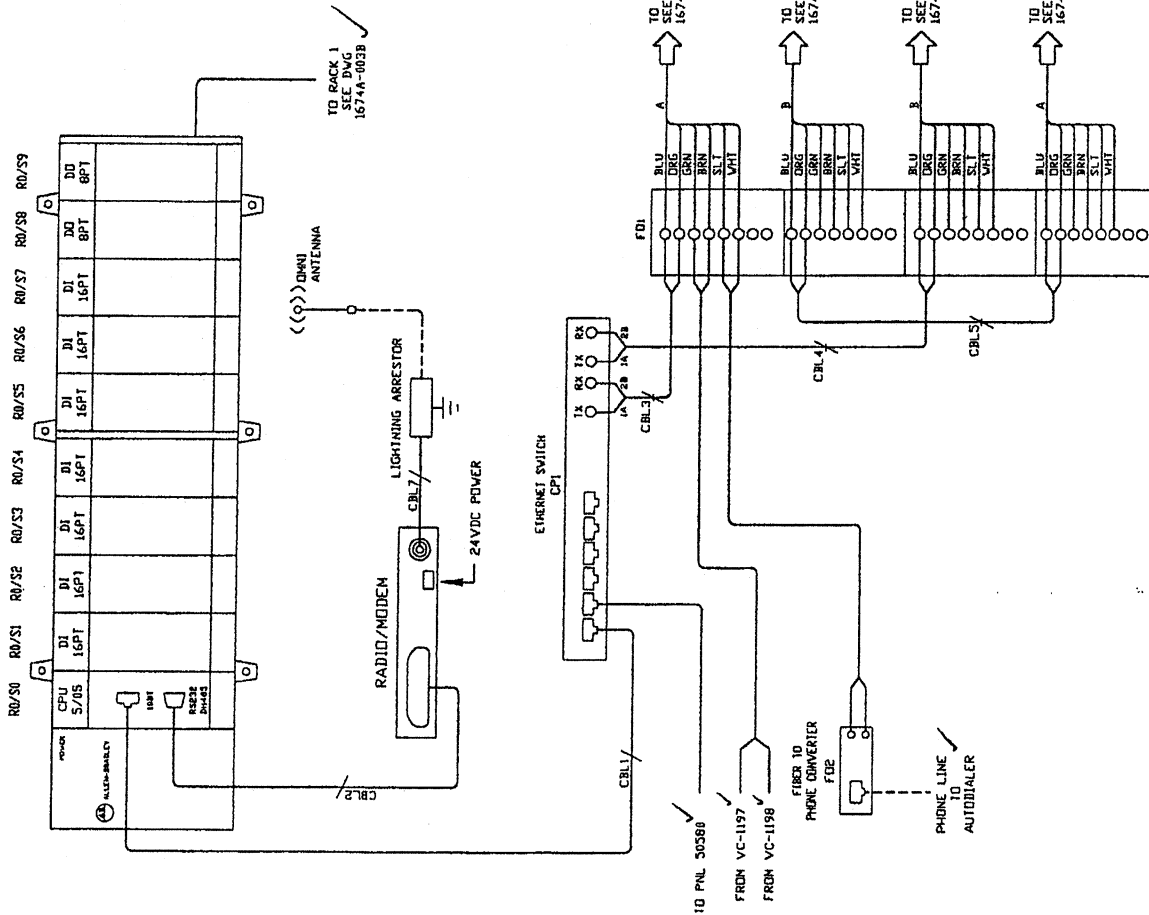
DATE	3/12/01	PROJECT	
DRAWN	JA	PROJ. NO.	
CHECKED	GR	AVG. NO.	001
DESIGNED	PS		
INVESTIGATED	DF		
SHEET			

DATE	REVISION	DESCRIPTION

Sample Network Diagram

COPY OF BID SET

SLCS00 I/O SCHEDULE



QTY	TAGS	DESCRIPTION	MFG	CATALOG
1	RO	PLC RACK	ALLEN BRADLEY	1746-A10
1	RPS0	10 SLOT BASE RACK RACK POWER SUPPLY (SA & SVDC) 120/240V AC	ALLEN BRADLEY	1746-P2
1	RO/S0	PLC CPU WITH ETHERNET CPU S705 WITH 32K MEMORY	ALLEN BRADLEY	1747-L552
7	RO/S1 RO/S2 RO/S3 RO/S4 RO/S5 RO/S6 RO/S7	16 POINT I/O MODULE 85-TEV AC	ALLEN BRADLEY	1746-IA16
2	RO/S8 RO/S9	PLC DIGITAL I/O MODULE 32 POINT RELAY CONTACT OUTPUT (ISOLATED)	ALLEN BRADLEY	1746-DX8
1	CF1	ETHERNET HUB 85-TEV AC	HIRSCHMANN	943 434-021
1	FD1	FIBER OPTIC PATCH PANEL, BLACK	SIEMON COMPANY	SVIC3-N-01
4	FD1	ETHERNET PATCH PANEL RICKHEAD CONNECTOR MODULE	SIEMON COMPANY	RIC-F-3CB-01
1	FDE	TELEPHONE LINE EXTENDER 86 SERIES 12VAC 500ma	AMERICAN FIBERTEK	MT-86CC
1	CBL1	UTP PATCH CABLE N/A	HUBBELL	PCX5E803
1	CBL2	3 FEET SERIAL COMMUNICATIONS CABLE	CABLE WHOLESAL	10DI-03203
3	CBL3 CBL4 CBL5	DI9E/D99M STRAIGHT THROUGH FIBER OPTIC PATCH CABLE 1 METER (1 PAIR) (2) FIBERS SC WH 425	HUBBELL	BFFCSGCC1MM
1	CBL7	ANTENNA CABLE RG42B/U RG42 - 3FT LENGTH MMALE - FINE	TESSCO	448350

DATE	REVISION	DESCRIPTION

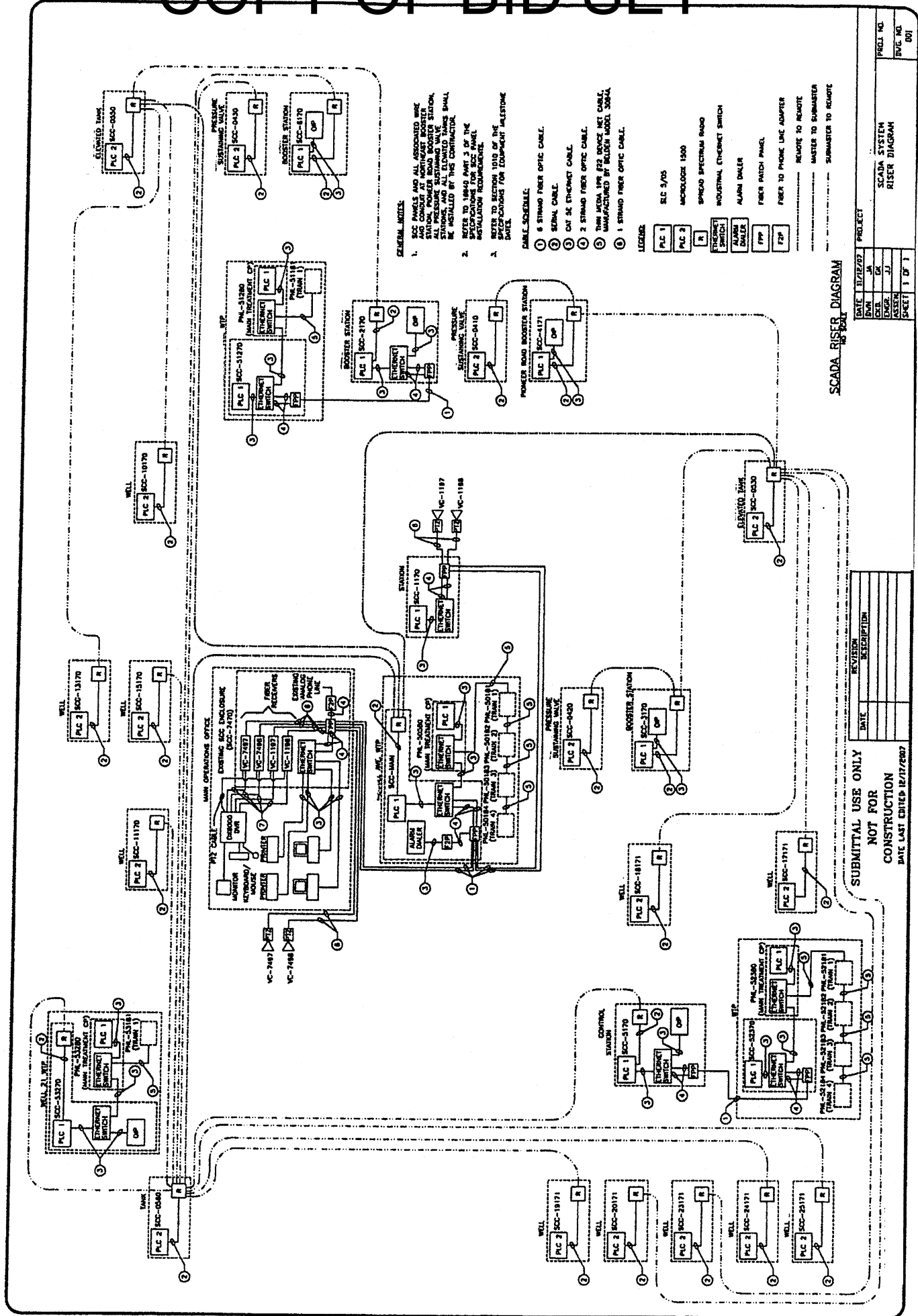
SUBMITTAL USE ONLY
NOT FOR CONSTRUCTION
 DATE LAST EDITED 12/4/2007

DATE	PROJECT
10/17/2007	SCC-HAIN
JR	PLC I/O SCHEDULE
UC	
ASSEN	
SHEET	3 OF 24

PROJ. NO.	REV. NO.
	003A

Sample Interconnection Diagram

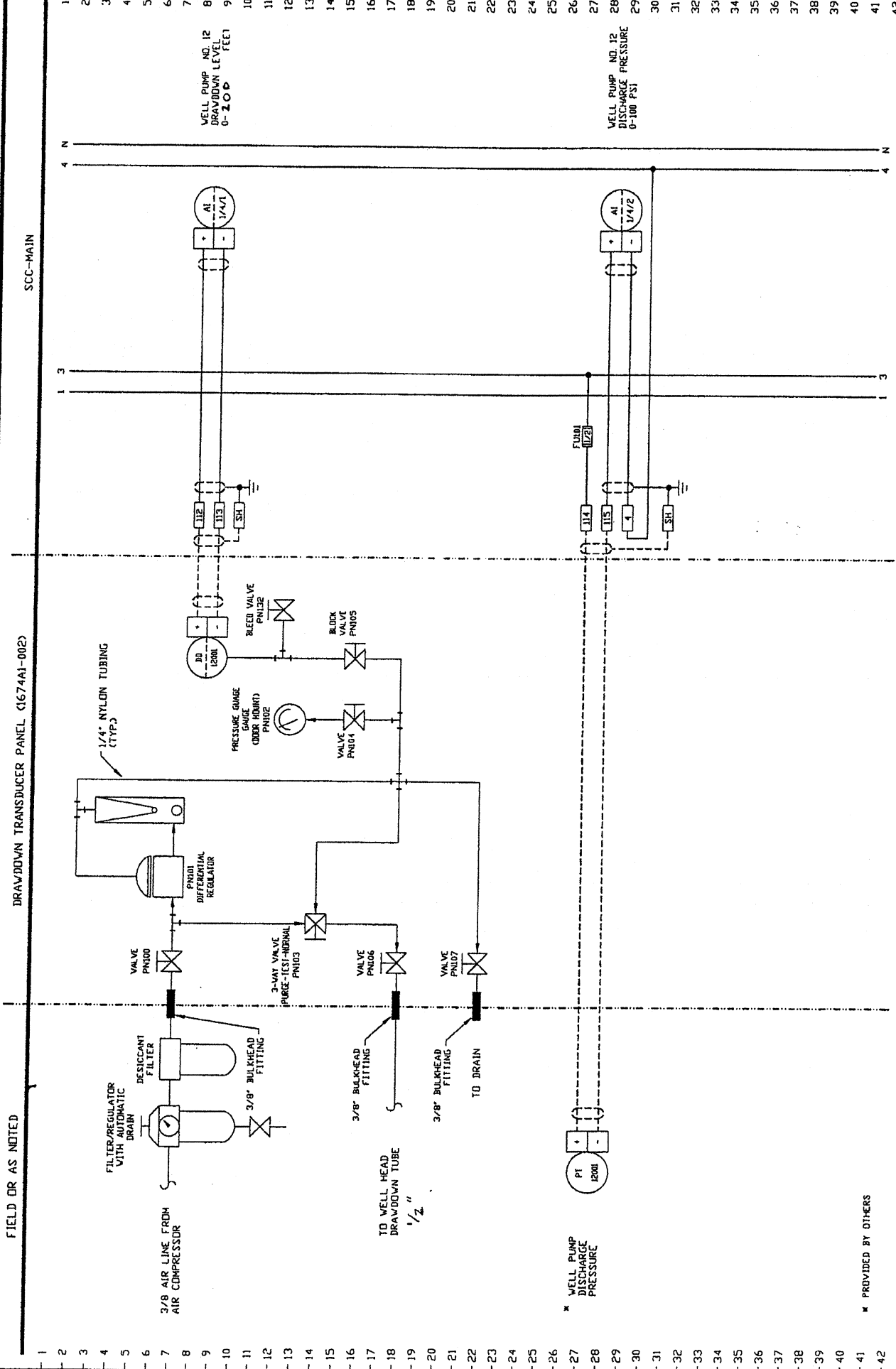
COPY OF BID SET



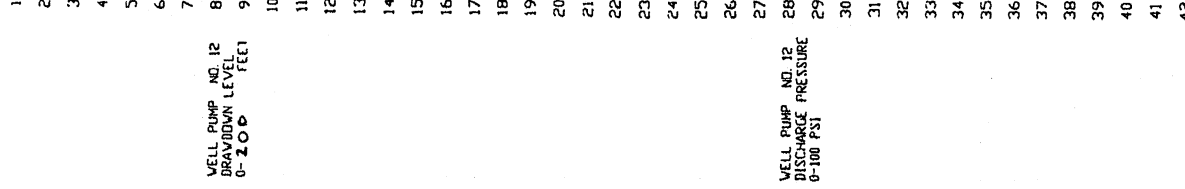
Sample Interconnection Diagram

DRAWDOWN TRANSDUCER PANEL (1674A1-002)

FIELD OR AS NOTED



SCC-MAIN



WELL PUMP NO. 12
DRAWDOWN LEVEL
0-200'

WELL PUMP NO. 12
DISCHARGE PRESSURE
0-100 PSI

DATE	REVISION	DESCRIPTION

DATE 12/10/2007
SUBMITTAL USE ONLY
NOT FOR CONSTRUCTION
DATE LAST EDITED: 12/10/2007

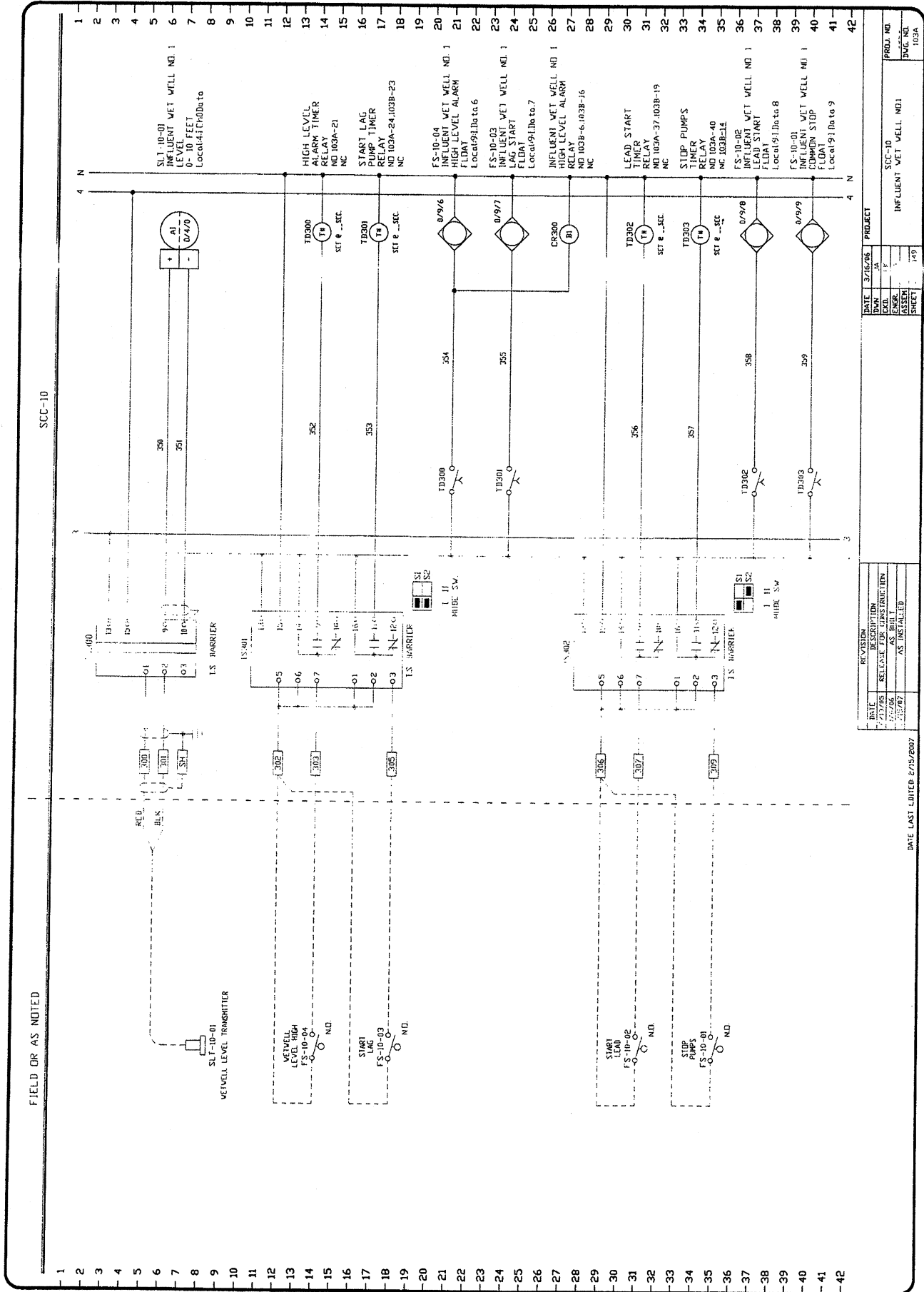
DATE	REV	BY	CHK	APP	PROJECT
10/12/2007	JA	GC	JJ	9 OF 24	SCC-MAIN WELL PUMP NO. 12

PROJ. NO. 101B
DWC. NO. 101B

* PROVIDED BY OTHERS

Sample elementary schematic

COPY OF BID SET

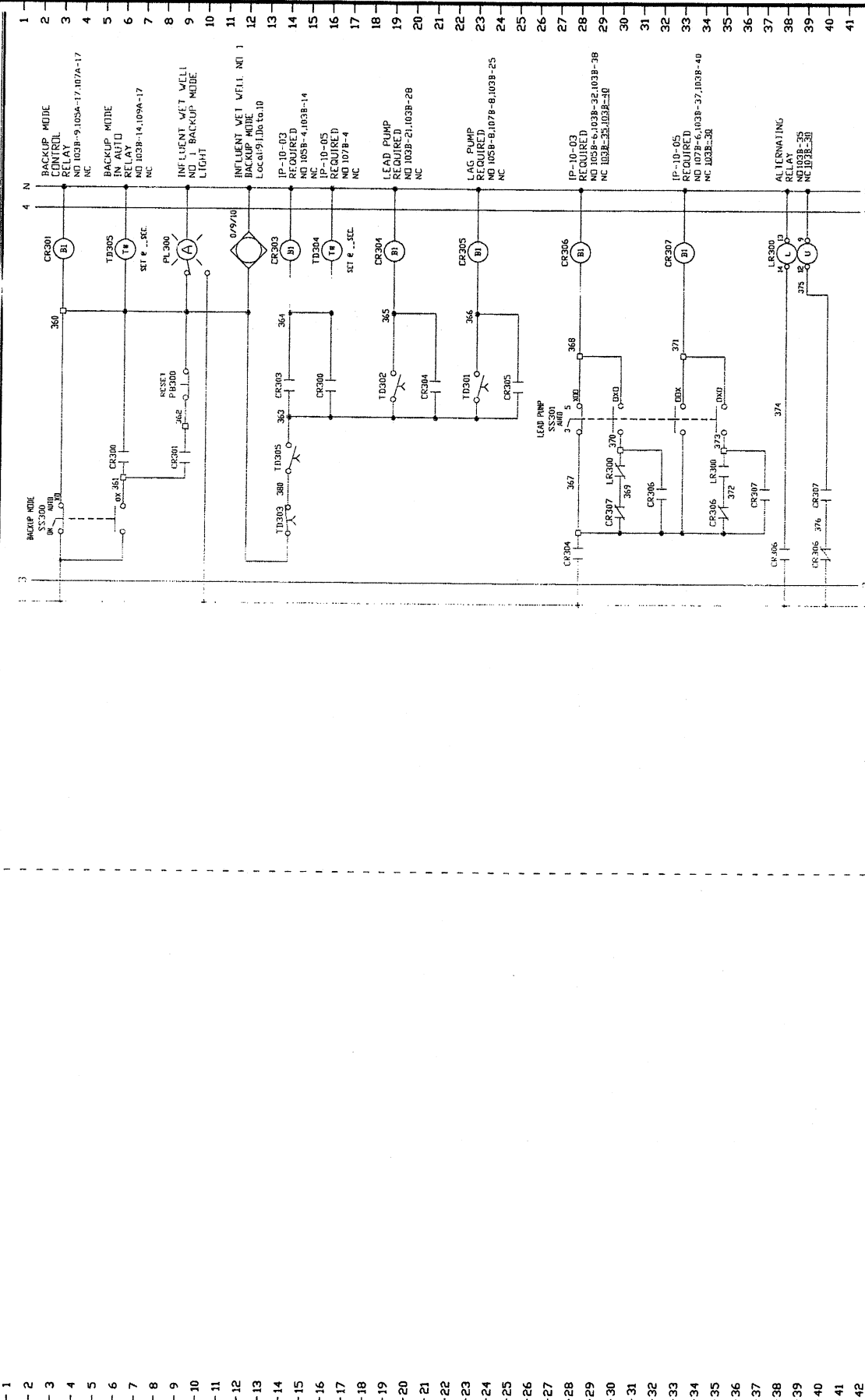


Sample Elementary Schematic

COPY OF BID SET

FIELD OR AS NOTED

SCC-10



DATE	REVISION	DESCRIPTION
7/16/05	1	RELEASE FOR CONSTRUCTION
7/16/05	2	AS BUILT
7/16/07	3	AS INSTALLED

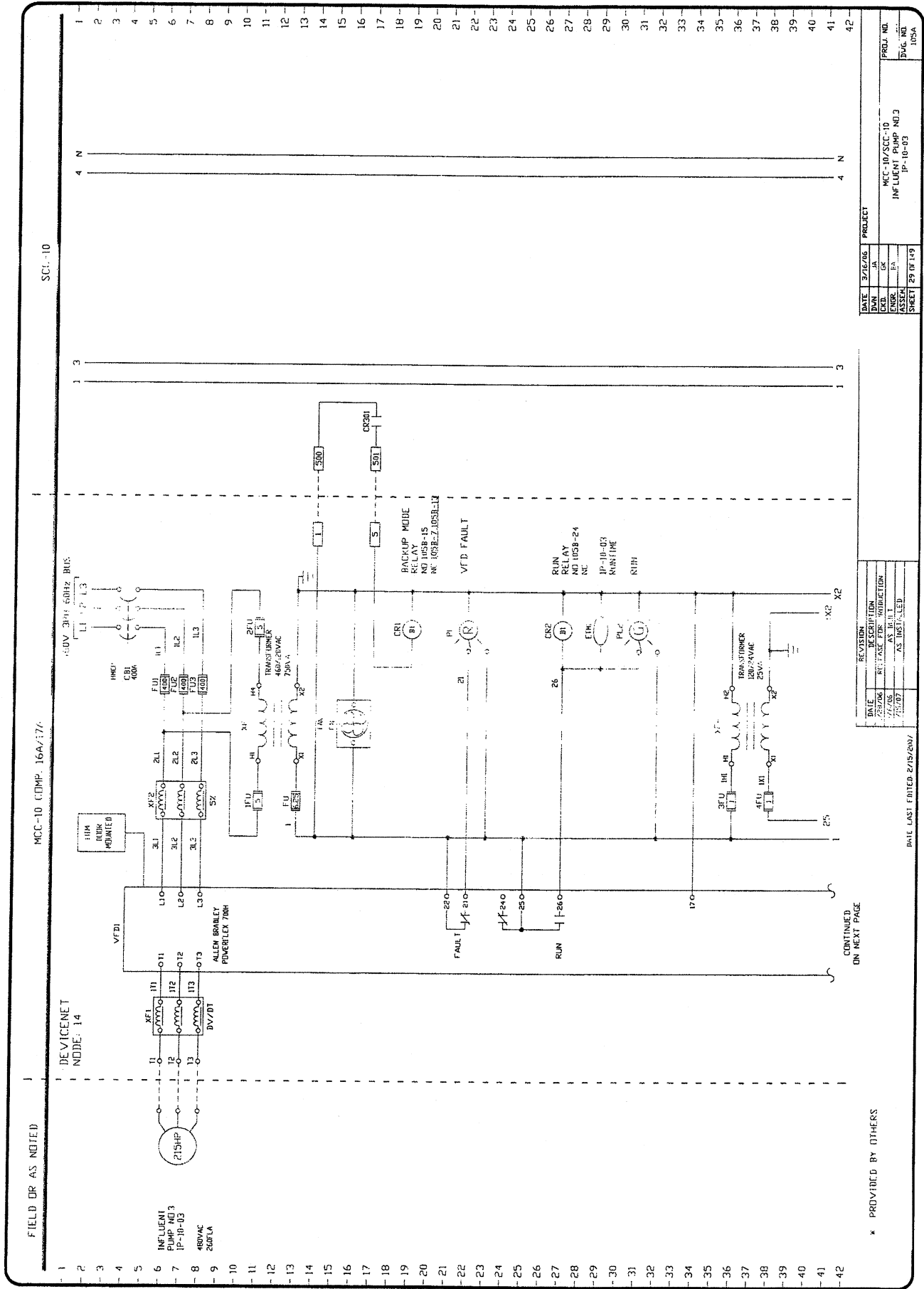
DATE	3/16/05	PROJECT
NO	376	SCC-10
REV	377	INFLUENT WET WELL NO.1
ASSE	378	
SHEET	379	

PROJ. NO.	DWG. NO.
103B	103B

Sample Elementary Schematic

DATE LAST EDITED 2/15/2007

COPY OF BID SET



SCH-10

MCC-10 (DMP, 16A/17)

FIELD OR AS NOTED

DEVICENET NODE: 14

DATE	3/16/06	PROJECT
DESIGNED BY	SK	
ENGR. BY	SK	
ASSEMBLED BY	EA	
SHEET	29 OF 119	

MCC-10/SCH-10
INFLUENT PUMP NO.3
IP-10-03

PROJ. NO.
Dwg. No.
105A

DATE	REVISION	DESCRIPTION
7/1/06	1	REVISED FOR MODIFICATION
7/1/07	2	AS INSTALLED

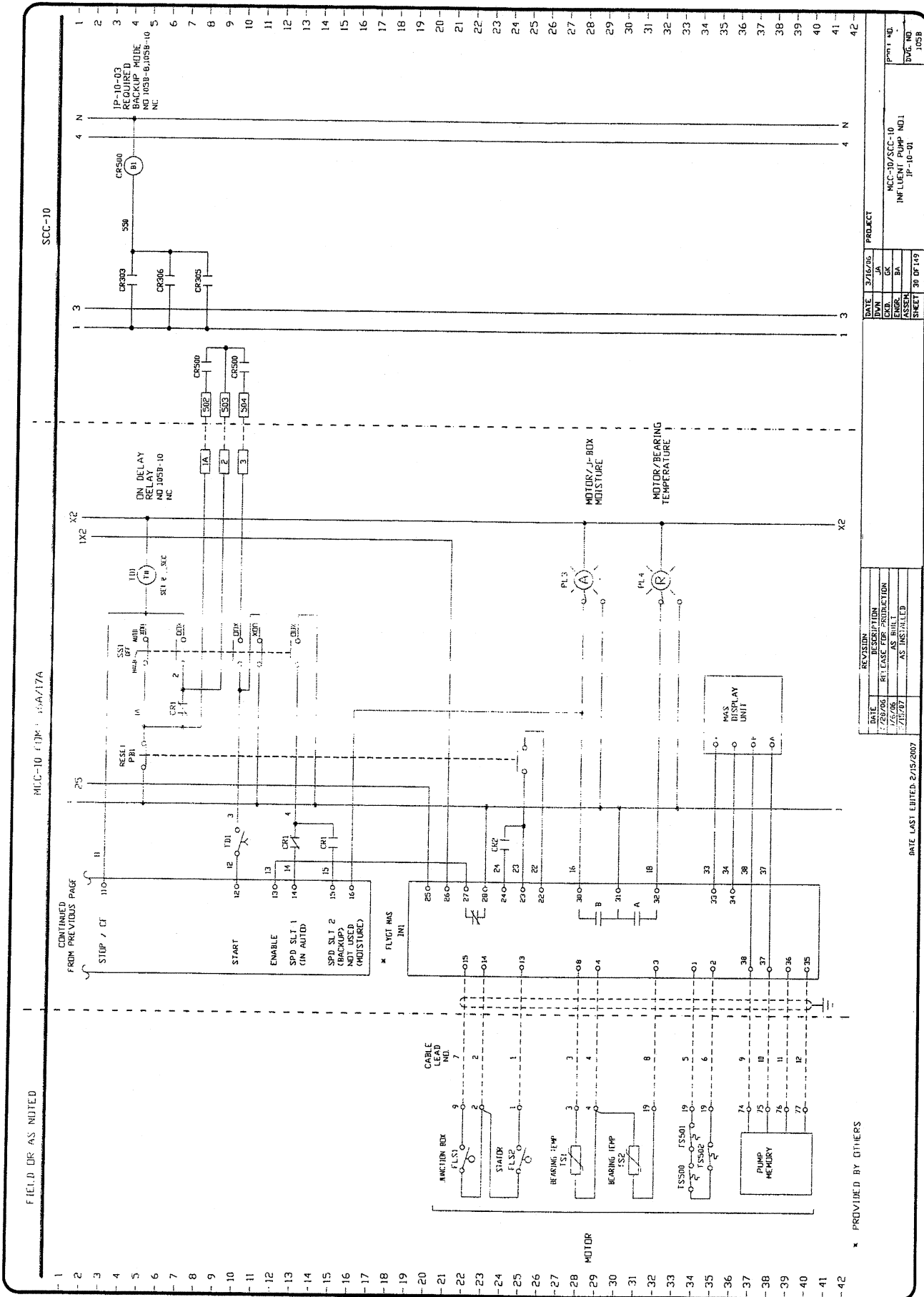
DATE LAST EDITED 2/16/2007

CONTINUED ON NEXT PAGE

* PROVIDED BY OTHERS

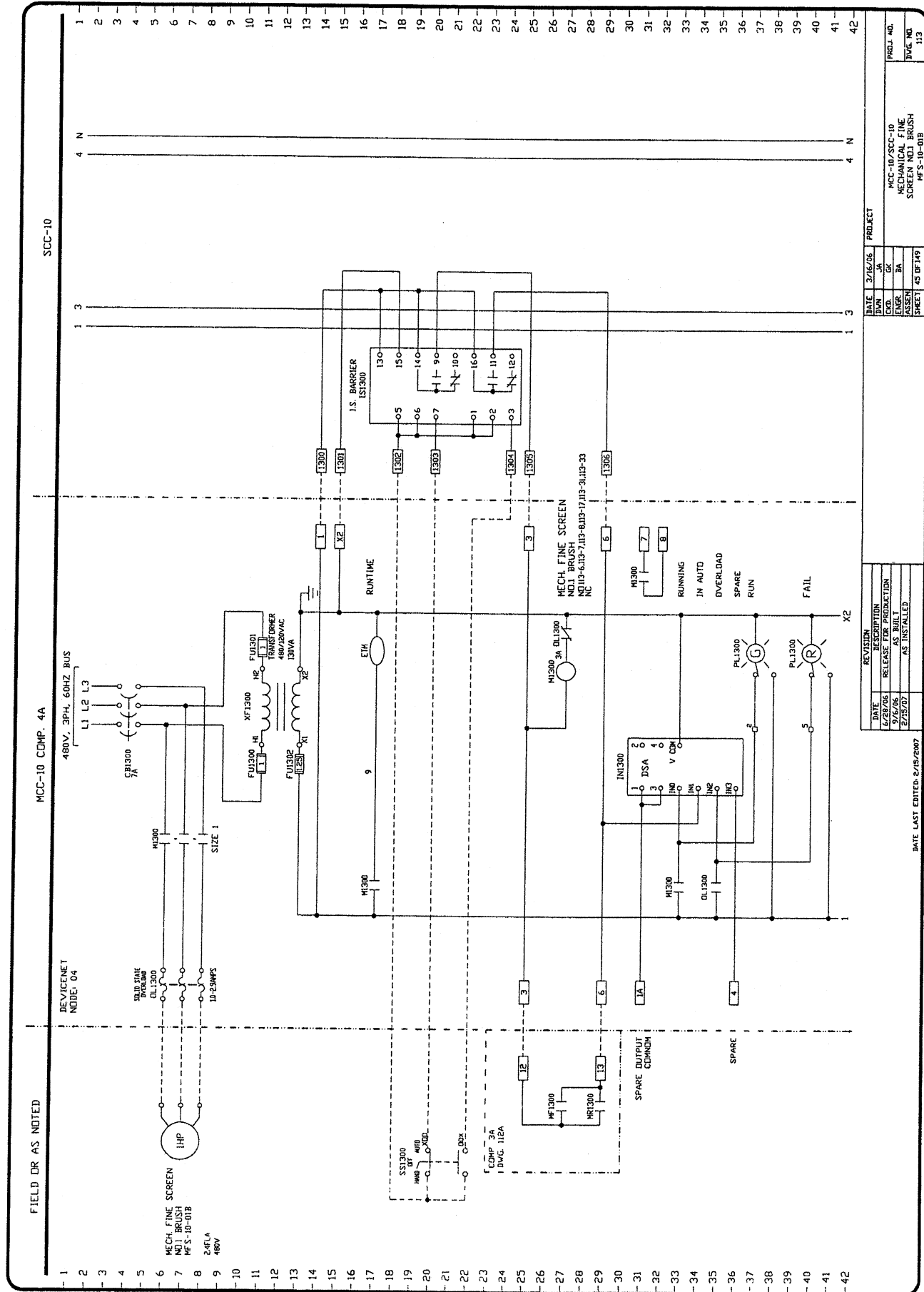
Sample Elementary schematic

COPY OF BID SET



Sample Elementary Schematic

COPY OF BID SET



FIELD OR AS NOTED

MCC-10 COMP. 4A

SCC-10

DATE	REVISION	DESCRIPTION
9/16/06	1	RELEASE FOR SUBMITTAL
2/15/07	2	AS INSTALLED

DATE	3/16/06	PROJECT
DWN	JR	
CHK	GK	
APP	BA	
ISSUED	AS OF 1/9	
SHEET		

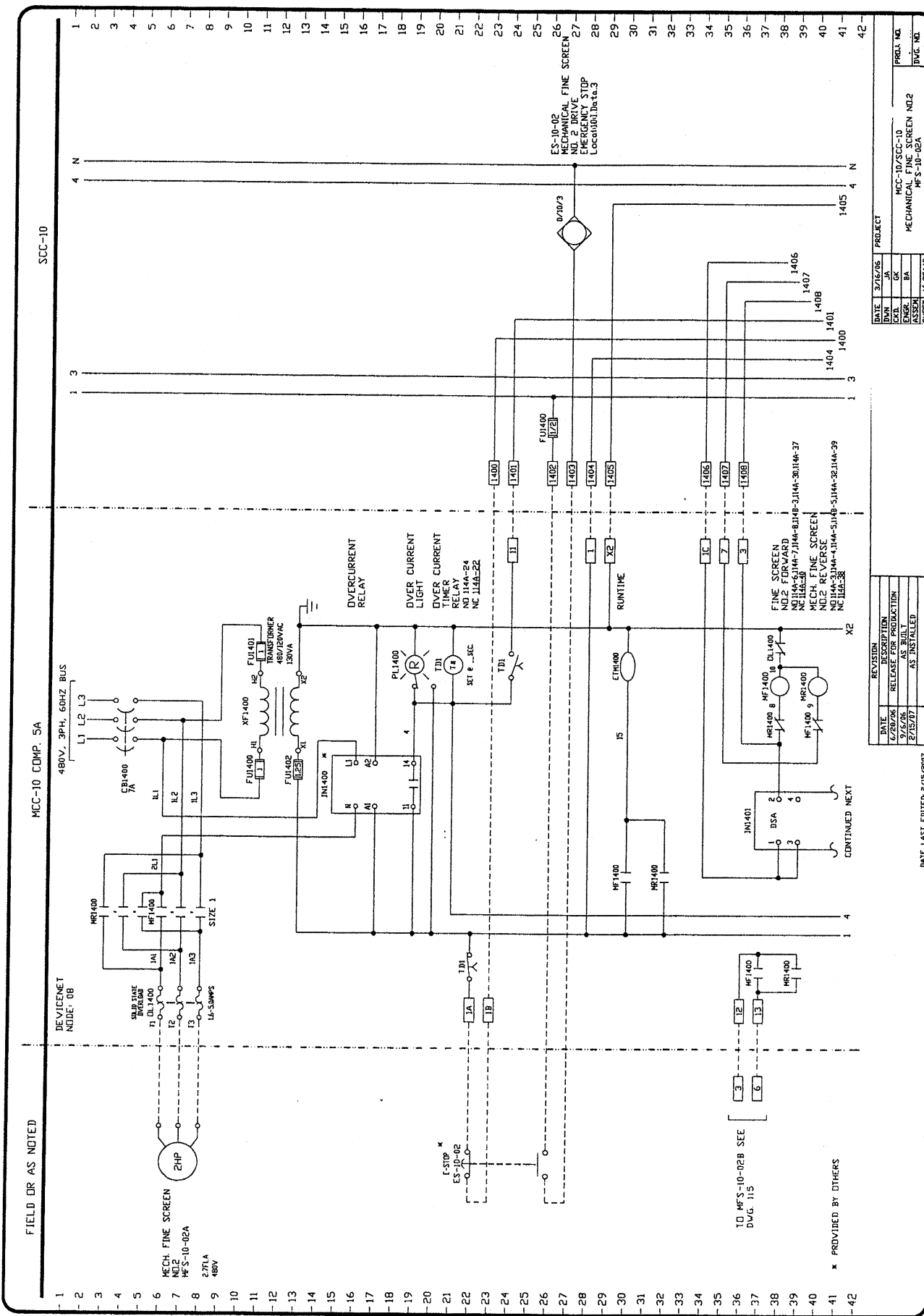
PROJ. NO.	DWG. NO.
MCC-10/SCC-10	
MECHANICAL FINE SCREEN NO.1 BRUSH	
PPS-10-01B	

Sample Elementary Schematic

DATE LAST EDITED: 2/15/2007

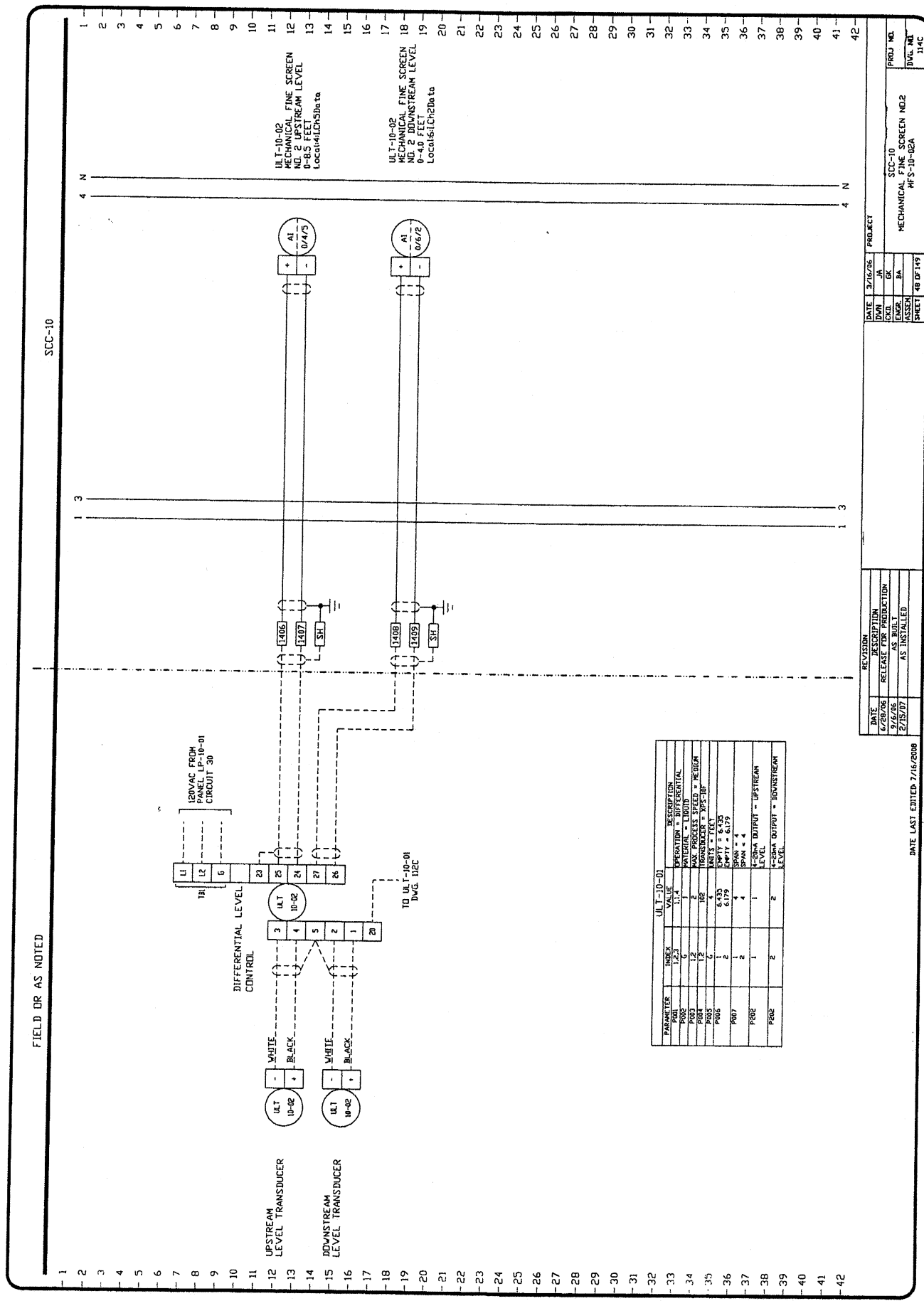
COPY OF BID SET

Sample Elementary Schematic



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Sample Elementary Schematic



PARAMETER	INDEX	UNIT	DESCRIPTION
OPERATION	1, 2, 3	1, 1, 4	OPERATION = DIFFERENTIAL
MATERIAL	6		MATERIAL = LIQUID
PROCESS SPEED	1, 2	108	PROCESS SPEED = PERIOD
MATERIALS	6		MATERIALS = FEET
EMPTY	2	6.135	EMPTY = 6.135
SPAN	2	6.179	SPAN = 6.179
LEVEL	1	4	LEVEL OUTPUT = UPSTREAM
LEVEL	2	2	LEVEL OUTPUT = DOWNSTREAM

DATE	REVISION	DESCRIPTION
6/28/06	1	RELEASE FOR PRODUCTION
9/16/06	2	AS BUILT
2/15/07	3	AS INSTALLED

DATE	3/16/06	PROJECT
DATE	JA	PROJECT
DESIGN	DK	PROJECT
REVISION	BA	PROJECT
ISSUED		PROJECT
SHEET	48 OF 149	PROJECT

DATE	3/16/06	PROJECT
DATE	JA	PROJECT
DESIGN	DK	PROJECT
REVISION	BA	PROJECT
ISSUED		PROJECT
SHEET	48 OF 149	PROJECT

DATE	3/16/06	PROJECT
DATE	JA	PROJECT
DESIGN	DK	PROJECT
REVISION	BA	PROJECT
ISSUED		PROJECT
SHEET	48 OF 149	PROJECT

DATE LAST EDITED 7/16/2008

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SOILS INFORMATION

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Report of **GEOTECHNICAL EXPLORATION**

AMERICAN ENGINEERS, INC.

NOLIN RIVER SEWER
INFRASTRUCTURE

GEOTECHNICAL
EXPLORATION

GLENDALE, KY

AUGUST 2014

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August 5, 2014

Mr. James Jeffries
Hardin County Water District No. 2
360 Ring Road
Elizabethtown, Kentucky 42701

Re: Report of Geotechnical Exploration
Nolin River Sewer Infrastructure
Hardin County, Kentucky
AEI Project No. 212-323

Dear Mr. Jeffries:

American Engineers, Inc. Field Services Center is pleased to submit this geotechnical report that details the results of our geotechnical exploration performed at the above referenced site.

The attached report describes the site and subsurface conditions and also details our recommendations for the proposed project. The Appendices to the report contain boring layout drawings, typed boring logs, and the results of all laboratory testing.

We appreciate the opportunity to be of service to you on this project and hope to provide further support on this and other projects in the future. Please contact us if you have any questions regarding this report.

Respectfully submitted,
AMERICAN ENGINEERS, INC.



Zachary Pennington
Graduate Geologist



Dennis Mitchell, PE
Senior Geotechnical Engineer

**REPORT OF GEOTECHNICAL EXPLORATION
HARDIN COUNTY WATER DISTRICT NO. 2
NOLIN RIVER SEWER INFRASTRUCTURE UPGRADES
HARDIN COUNTY, KENTUCKY**

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APPENDICES

Appendix A – Boring Layout

Appendix B – Typed Boring Logs

Appendix C – Laboratory Tests

REPORT OF GEOTECHNICAL EXPLORATION HARDIN COUNTY WATER DISTRICT NO. 2 NOLIN RIVER SEWER INFRASTRUCTURE UPGRADES HARDIN COUNTY, KENTUCKY

1 GENERAL SITE DESCRIPTION

The sites of the proposed Nolin River Sewer Infrastructure additions are located in Hardin County or near Glendale, Kentucky. Currently, construction of a pump station and wet well is scheduled. It is also our understanding that boring and jacking is proposed for many of the roadway crossings in support of the new gravity sewer line construction. At the time of the exploration, each site was covered in a growth of mixed grasses, asphaltic pavement, crushed stone or recently harvested fields with sparse tree cover. Topographic relief can generally be described as level to gently rolling.

Foundation loads for the pump stations were unknown at the time of this report but are not anticipated to result in significant concentrated loads.

2 GENERAL SITE GEOLOGY

Available geologic mapping (Geologic Map of the Sonora Quadrangle, Hardin and Larue Counties, Kentucky, USGS, 1973 and Geologic Map of the Tonieville Quadrangle, Larue and Hardin Counties, Kentucky, 1966) shows the sites to be underlain by Upper Mississippian-aged deposits of the Ste. Genevieve Limestone and St. Louis Limestone Formations. Quaternary-aged alluvium deposits will also likely be encountered near any existing creeks and streams. The limestone of these formations was typically described as yellowish gray to olive gray, very fine to medium grained, highly oolitic in part, argillaceous, dolomitic, silty, and thin to thick bedded. Dolomite, shale, and chert may also be encountered within these formations. Mapping described the alluvium as a heterogeneous mixture of sand, silt, clay and gravel. Residual clays weathered from the St. Louis Limestone and Ste. Genevieve Formations are typically reddish brown to red in color, moderate to highly plastic and contain abundant chert fragments.

Karst potential mapping was reviewed for each site and very high karst potential was shown for each site. Sinkholes were commonly noted in proximity to the sites both from review of mapping and during the investigation. The Ste. Genevieve Limestone and St. Louis Limestone Formations are known for the presence and development of karst features. Previous development can also mask the presence of existing karst features. Minor faulting was also indicated on each 7.5-minute quadrangle map. It is impossible to investigate a site to such an extent to fully identify the possibility of future geologically related problems during the course of a typical geotechnical investigation. It should be understood by the owner that there is some risk of future ground subsidence in areas where karst activity has been known to historically exist.

3 SCOPE OF WORK PERFORMED

The 2013 geotechnical exploration consisted of drilling 16 soil borings (B-2 through B-17 and Rose Run #1 and #2) and one soil boring with rock core. The core was obtained from Rose Run #2. B-1 and B-101, proximate to one another, B-5, B-6, B-108 and B-109 were not drilled because property owners denied access to our drill crew. An additional soil test boring was drilled at the proposed control building to a predetermined boring termination depth of 20 feet. The remaining borings were drilled at the proposed roadway crossings to a depth of approximately five feet below the invert depths. It is our understanding that several of the initial crossing locations were revised from the original 2013 plan necessitating the need for additional borings. Therefore, an additional 17 soil borings were completed in 2014; and are denoted as 100 series borings (B-102 through B-120). Borings were staked and elevated by Hardin County Water District No. 2 personnel. A boring layout is included in Appendix A.

The borings were drilled by an AEI drill crew using a truck-mounted drill rig equipped with continuous flight hollow-stem augers and an NQ2-size diamond coring bit when coring was performed. Standard penetration tests (SPT's) were performed in each of the soil test borings at 2 ½ foot intervals in the upper ten feet and on five foot centers thereafter during the 2013 exploration. During the 2014 exploration borings were completed at five foot intervals throughout until the predetermined boring termination depth was reached or auger refusal was encountered. A Soils Technician was on site throughout the fieldwork to log the soils and rock encountered during the drilling operation. The recovered soil samples and rock core were further classified in the lab by experienced laboratory personnel and verified by a Geotechnical Engineer.

The natural moisture content of the soil samples was determined in the laboratory. The natural moisture content is denoted as (W%) and shown as a percentage of the dry weight of the soil on the boring logs. In addition, Atterberg Limits testing, unconfined compressive strength testing and grain size testing were performed on samples representative of the predominant soil horizons. The results of the laboratory tests are summarized in Appendix C.

The soils were classified in the laboratory in general accordance with the Unified Soil Classification System (USCS). The Unified symbol for each stratum is shown in the legend for the typed boring logs. The testing was performed in accordance with the generally accepted standards for such tests.

4 RESULTS OF THE EXPLORATION

4.1 GENERAL

Information provided in the Appendices for this report includes boring locations, logs of the borings, and other relevant geotechnical information. A description of the

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subsurface soil, bedrock and groundwater conditions follows. Table 1 outlines the boring locations, proposed invert depths, no refusal depths and refusal depths.

Table 1: Summary of Borings

Bore Number	Line	Location	Invert Depth of Proposed Sewer (ft)	No Refusal Depth (ft)	Refusal Depth (ft)
B-2	A	Intersection of New Glendale Road and East Railroad Avenue	17.64	23.0	
B-3	D	Intersection of New Glendale Road and East Maple Street	13.35	18.0	
B-4	D	Intersection of New Glendale Road and West Maple Street	16.65		19.4
B-7	H	West Railroad Avenue and KY 222	14.30	19.0	
B-8	H	South Railroad Avenue and KY 222	13.34	18.0	
B-9	M	KY 222 (East of Glendale)	17.10	21.5	
B-10	M	KY 222 (East of Glendale)	18.03	23.0	
B-11	R	Interstate 65 Crossing (North of Gilead Church Road)	9.89	15.0	
B-12	R	Interstate 65 Crossing (North of Gilead Church Road)	16.67	21.5	
B-13	R	31W (North of Gilead Church Road)	15.89	21.5	
B-14	R	31W (North of Gilead Church Road)	12.95	18.0	
B-15	R	Intersection of 31W and KY 222	27.26	32.0	
B-16	R	Intersection of 31W and KY 222	28.90	34.0	
B-17	R1	Intersection of 31W and KY 222	20.11	25.0	
Rose Run #1		On New Glendale Rd., east of New Glendale Rd./E. Railroad Ave. Int.		21.5	
Rose Run #2		On New Glendale Rd., east of New Glendale Rd./E. Railroad Ave. Int.			36.7
B-102	A	Int. of New Glendale Rd. & W. Railroad Ave.	14.29	21.5	
B-103	A	Int. of New Glendale Rd. & W. Railroad Ave.	14.66	21.5	
B-104	A	On W. Railroad Ave. between New Glendale Rd. & E. Maple St.	20.75		18.8
B-105	A	Int. of W. Railroad Ave. & E. Maple St.	18.74	26.5	

Table 1: Summary of Borings (Continued)

Bore Number	Line	Location	Invert Depth of Proposed Sewer (ft)	No Refusal Depth (ft)	Refusal Depth (ft)
B-106	C	Int. of New Glendale Rd. & Crain Rd.	11.40	16.5	
B-107	C	Int. of New Glendale Rd. & Crain Rd.	12.84	16.5	
B-110	C	Int. of KY 222 & N. Bell Ave.	16.94	21.5	
B-111	H	Int. of KY 222 & S. Bell Ave.	16.56	21.5	
B-112	H	Int. of New Glendale Rd. & College St.	12.10	16.5	
B-113	K	Int. of New Glendale Rd. & College St.	8.59	16.5	
B-114	K	On 31W, S. of KY 222	38.40		35.4
B-115	R1	On 31W, S. of KY 222	36.22	41.5	
B-116	R1	On 31W, S. of KY 222	43.24		50.9
B-117	R1	On KY 222 W. of 31W	15.55	21.5	
B-118	R1	On KY 222 W. of 31W	18.17	21.5	
B-119	R1	On KY 222, E. of Robey Dr.	15.16	21.5	
B-120	T	On KY 222, E. of Robey Dr.	12.12	16.5	

4.2 SUBSURFACE SOIL CONDITIONS

The generalized subsurface conditions encountered at the boring locations, including descriptions of the various strata and their depths and thicknesses are presented on the typed Boring Logs in Appendix B. Asphaltic pavement was encountered in the borings at the existing ground surface to a depth of ranging from 3.5 inches to 6 inches; with six inches being typical. Asphaltic pavement was typically underlain by approximately six to ten inches of crushed aggregate. Crushed aggregate was encountered in boring B-110 with a thickness of approximately 25 inches. In the remaining borings (B-2 through B-4, B-9 through B-17, Rose Run #1 & #2, B-102, B-106, B-107 and B-113 through B-120) topsoil was encountered at the surface and ranged in thickness from about 3.5 to 25 inches. Beneath the surface materials, low to high plasticity clay soils were typically encountered. These soils can typically be classified as lean clay, CL, (Clay of Low plasticity), or as fat clay, CH, (Clay of High plasticity) in accordance with the USCS. The soils typically contained trace to some fine to coarse-sized gravel and trace to some fine sand, are brown to reddish brown or red in color, moist to wet of presumed plastic limit and medium stiff to stiff in soil strength consistency with isolated soft and very stiff zones. Plasticity of the clays soils encountered during the investigation generally increases with depth. In borings B-114 and B-115, clayey sand and poorly graded sand

were encountered, respectively. **All samples collected from B-118 had a strong petroleum odor.**

SPT-N values in the clays ranged from zero to 37 blows per foot (bpf), with most between six and 15 bpf. Corresponding estimated unconfined compressive strength (Q_p) values ranged from less than 0.25 to more than 4.5 tons per square foot (tsf) with most values between about one and four tsf. Together, the SPT-N and Q_p values are indicative of generally medium stiff to stiff strength consistencies with isolated very soft and very stiff zones. The softest soils were typically encountered within several feet of the bedrock surface, likely the result of groundwater fluctuations near the soil/rock interface. The clayey sand and poorly graded sand ranged in relative density from medium dense to loose, as indicated by SPT N-values that range from 11 to 22.

Atterberg limits testing and visual classification of recovered soil samples indicate that the clay soils typically classify as CL (Clay of Low plasticity), lean clay and as CH (Clay of High plasticity), fat clay, in accordance with the USCS. Liquid limit test results ranged from 24 to 62 percent with corresponding plasticity indices ranging from 5 to 36 percent. Moisture contents of the clays range from about 12 to 47 percent with most between 19 and 36 percent.

Results of Atterberg limits and moisture content testing indicate that the residual clays are typically near to ten percent wet of the plastic limit. Unconfined compressive strength testing was performed on selected undisturbed soil samples obtained from the Rose Run Pump Station borings and ranged from about 2,320 to 9,150 pounds per square foot (psf), indicative of medium stiff to very stiff strength consistencies. Lab testing results are noted on the Boring Logs in Appendix A and Laboratory Testing Results, in Appendix C.

4.3 BEDROCK CONDITIONS

Refusal, as indicated by the driller on the field boring logs, indicates a depth where either essentially no downward progress can be made by the auger or where the N-value indicates essentially no penetration of the split-spoon sampler. It is normally indicative of a very hard or very dense material such as large boulders or the upper bedrock surface. Auger refusal was encountered in the following borings: B-4, B-104, B-114, B-116 and Rose Run #2 at depths of approximately 19, 19, 35, 51 and 37 feet, respectively.

Auger refusal was not encountered in the remaining borings prior to reaching the predetermined boring termination depth. In Rose Run #2 rock coring was performed about five feet beyond the auger refusal depth. The recovered rock core was described as limestone with interbedded calcareous siltstone, fine to medium crystalline, silty, gray, moderately hard to hard, very thin to thin bedded, vuggy and moderately weathered throughout. Core recovery percentages ranged from 94 to 100 percent while Rock Quality Designation (RQD) values ranged from 34 to 60 percent. Based on

review of the recovered rock core and the calculated recovery and RQD percentages, it is anticipated that the bedrock which underlies each of the sites cannot be excavated using conventional methods. It is likely that hoe-ramming or blasting would be required for any significant rock removal.

4.4 GROUNDWATER CONDITIONS

Groundwater was encountered in the following borings: B-16, B-17, B-117 and B118 at depths of approximately 25, 19, 20 and 20 feet, respectively. These borings are proximate to one another and are located near the intersection of Hwy 31W and KY 222. In cohesive soils such as those encountered at the site, a long time is required for the hydrostatic groundwater level to come to equilibrium in the borehole. The short-term groundwater levels reported by the drill crew are not generally indicative of the long-term groundwater level. To accurately determine the long-term groundwater level, as well as the seasonal and precipitation induced fluctuations of the groundwater level, it is necessary to install piezometers in the borings, and monitor them for an extended length of time. Frequently, groundwater conditions affecting construction in this region are caused by trapped or perched groundwater, which occurs within the soil materials or at the soil/rock interface in irregular, discontinuous locations. If these water bodies are encountered during excavation, they can produce seepage durations and rates that will vary depending on the recent rainfall activity and the hydraulic conductivity of the material.

4.5 SEISMIC CONDITIONS

According to the Kentucky Building Code, 2007 Edition, and the subsurface conditions encountered in the borings, Site Class D should be utilized for foundation design for any proposed at grade structures. Any structures bearing on rock can be designed utilizing Site Class B.

Soil liquefaction analysis was outside the scope of this investigation. Prior studies in this region on similar soil types indicate that the potential for liquefaction is low and is primarily dependent on the variability of site soils and earthquake severity.

Consideration for seismic loading and liquefaction potential beyond this level of investigation is left to the discretion of the structural framing and foundation design engineer.

5 ANALYSES AND RECOMMENDATIONS

The recommendations that follow are based on our conceptual understanding of the project. As the site design is advanced, please notify us of any significant design changes so that our recommendations can be reviewed and modified as necessary.

5.1 EXCAVATIONS

Excavations for pipe installation and boring and receiving pits should be properly sloped in accordance with the Kentucky Occupational Safety and Health Standards for the Construction Industry 29 CFR Part 1926, Subpart P – Excavations. Clay soils exhibiting N-values of 12 or greater above the water table can be classified as Type A soil. Clay soils, including sandy and silty clay, exhibiting N-values of 4 to 11 and above the water table can be classified as Type B soil. Clay soils exhibiting N-values less than 4 or below the water table or otherwise seeping as well as gravel, sand and silty sand should be classified as Type C.

The above should only be considered as a guideline for design of open cut excavations. Each excavation must be evaluated by a competent person as outlined by the referenced OSHA document as the excavations are completed. Type B and C soils at the site should be laid back on slopes of 3/4 Horizontal: 1 Vertical (3/4H: 1V) and 1 ½ H: 1V, respectively.

6 ROSE RUN PUMP STATION

6.1 General site work

6.1.1 Topsoil Stripping

Prior to earthwork operations, topsoil and surface plant material root mat should be stripped from both cut and fill areas. The topsoil can be stockpiled and used for landscaping purposes

6.1.2 Subgrade Evaluation/Conditioning

Once the topsoil is removed, areas to receive fill should be “proofrolled” under the observation of an AEI Geotechnical Engineer or Technician to evaluate the subgrade for suitability for fill placement. The proofrolling should be performed using heavy construction equipment such as a fully loaded single or tandem axle dump truck (approximately 20-25 tons), passing repeatedly over the subgrade at a slow rate of speed.

Subgrade soils that are considered unstable after proofrolling should be stabilized by additional compaction or by one or more of the following methods; in-place stabilization using chemical methods (lime/soil cement), removal and replacement with engineered fill, partial depth removal and replacement with a crushed (angular) aggregate layer, or shot rock. The specific method of treatment will be based on the conditions present at the time the proofrolling is performed and local availability of materials and economic factors. The selection of the appropriate method to mitigate degrading subgrade soils is dependent on the time of year site work is anticipated, cost, anticipated effectiveness, and scheduling impacts. AEI can assist in selecting this method considering all factors.

Once the subgrade is judged to be relatively uniform and suitable for support of engineered fill, fill areas should be brought to design elevations with on site soil and/or suitable off-site borrow material placed and compacted as specified in Section 6.1.6 Fill Placement.

6.1.3 On-Site Soils

The near-surface soil at the Rose Run Pump Station site is moderate plasticity clay that classify as CL and CH in accordance with the USCS. Efforts should be made to schedule earthwork activities during the late spring to early fall months since these soils will pump, rut, and lose strength with moisture contents more than several points wet or dry of the optimum moisture content for compaction. These soils are judged suitable for use as fill material at the site provided provisions are made for wetting or drying the soils for compaction and are placed and compacted in accordance with Section 6.1.6.

6.1.4 General Fill Requirements

Any material, whether borrowed on-site or imported to the site, placed as engineered fill on the project site beneath the proposed on-grade structures such as pavement, parking lots, sidewalks, etc., should be an approved material, free of environmental contamination, vegetation, topsoil, organic material, wet soil, construction debris, and rock fragments greater than six inches in diameter. We recommend that any borrow material, if needed, consist of granular or lean clay materials or mixtures thereof with Unified Classifications of CL, SC, or GC. We further recommend high plasticity clays, known as fat clays (CH soils) not be *imported* to the sites due to their potential for volume changes with fluctuations in moisture content.

The preferred borrow material should have a Plasticity Index (PI) less than 20 and a standard Proctor maximum dry density of at least 95 pcf. Engineering classification and standard Proctor tests should be performed on all potential borrow soils, and the test results evaluated by an AEI Geotechnical Engineer to evaluate the suitability of the soil for use as engineered fill.

6.1.5 Off-Site Soils

If off-site material is needed it should meet the requirements specified in 6.1.4 above.

6.1.6 Fill Placement

Lean clay, CL, soil placed under building areas should be placed in maximum eight inch (loose thickness) horizontal lifts, with each lift being compacted to a minimum of 98 percent of the standard Proctor maximum dry density, at a moisture content from optimum to 2 percent wet of optimum. The compaction requirement may be reduced to 95 percent in proposed paved areas and to 92 percent in proposed landscape areas. Representative and adequate field density testing should be performed by AEI to verify that compaction requirements have been met.

6.1.7 Soil Movement

Site grading should be maintained during construction so that positive drainage is promoted at all times. Final site grading should be accomplished in such a manner as to divert surface runoff and roof drains away from the foundation elements and paved areas. Precipitation runoff should be collected in storm sewers as quickly as possible. Maintenance should be performed regularly on paved areas to seal pavement cracks and reduce surface water infiltration into the pavement subgrade.

6.2 Structure Foundations

6.2.1 Recommended Bearing Pressure

For the pump station foundation elements bearing on residual clays or engineered fill, an allowable bearing capacity of 2,000 pounds per square foot may be utilized for design. Footings which do not achieve the design bearing capacity should be undercut to suitable material and backfilled with lean clay fill as outlined in Section 6.1.6 or with KDOH No. 57 stone.

6.2.2 Acceptance of Foundation Bearing Surfaces

Prior to placement of reinforcing steel in spread footings, an AEI Engineer or Engineering Technician should review the bearing surface to verify that the design bearing capacity provided can be achieved. The spread footings should also be reviewed to verify that the bottom is level and free of mud, loose soil or other questionable material that might affect foundation support.

6.2.3 Groundwater

Any groundwater encountered in spread footing excavations should be removed prior to concrete placement. Zones of seepage should be anticipated at the soil/rock interface.

6.2.4 Potential Foundation Movement

A detailed settlement analysis was beyond the scope of this investigation. It is anticipated that less than 1 inch of total settlement will occur with soil bearing footings with differential settlement anticipated to be in the range of $\frac{1}{2}$ to $\frac{3}{4}$ inch. Settlement of rock bearing footings is anticipated to be negligible.

These estimates assume that the foundations are designed and constructed according to the recommendations in this report and in conjunction with sound foundation construction practice.

6.2.5 Below Grade Walls

Below grade walls should include sand or gravel backfill. The design should also include weepholes or other provisions to prevent hydrostatic pressures behind the wall. For retaining walls free to rotate without top fixity, an equivalent fluid pressure of 60 pcf should be used for design. For below grade walls with top fixity restrained from rotation

such as basement walls, an equivalent fluid pressure of 80 pcf should be used for design. If positive drainage cannot be achieved, then values of 90 pcf and 100 pcf, respectively should be utilized for design.

Lateral pressures exerted on below grade walls adjacent to a rock face should be designed utilizing a constant earth pressure of 100 psf for each foot of over-excavation between the wall and the rock face. The over-excavated area should be backfilled with compacted No. 57 stone or a similar approved granular backfill.

Earth pressure on below grade walls will result in a lateral load on the foundations. A passive earth pressure coefficient of 2.45 should be used along with a safety factor of 2.0 for determining the allowable passive pressure in front of the wall. For a unit weight of 125 pcf, this results in an equivalent fluid pressure of 150 pcf. A coefficient of friction of 0.35 can also be used between the concrete foundation and soil bearing materials when calculating resisting forces. The coefficient of friction between concrete and clean sound rock is 0.7.

6.2.6 Grade Supported Floor Slab Recommendations

We recommend on-grade supported floor slabs be isolated from the pump station foundations and allowed to float free and settle differentially with the pump station. We have estimated an Effective Modulus of Subgrade Reaction (K) of 90 pci for floor slab design.

The final floor slab design, including the amount of and type of steel reinforcement (welded wire mesh or bar reinforcing) will be dependent on the structural engineer's evaluation of the final grade slab thickness, concrete compressive strength, and actual slab loadings. Additional design and construction recommendations are provided as follows:

- The floor slab should be supported on a minimum 4-inch compacted layer of free draining granular base material to distribute concentrated loads, improve drainage, and reduce the risk of deterioration of the prepared subgrade during construction. The stone should be kept moist not wet, immediately before placement of concrete to limit differential curing conditions at the top and bottom of the slab.
- A vapor barrier of appropriate thickness may be utilized on the granular subbase to reduce migration of moisture through the slab. However, proper concrete mix designs, placement and curing methods must be used to reduce the potential for concrete shrinkage problems that are sometimes associated with the use of a vapor barrier. Reference to ACI 302.1 R 96, "Guide for Concrete Floor and Slab Construction", should be utilized. Joints between slab sections

should contain keys or dowels to permit slab rotation but to reduce extreme vertical differential displacements.

6.3 GENERAL CONSIDERATIONS

6.3.1 Construction Monitoring/Testing

All construction operations involving foundation construction should be performed in the presence of an experienced representative of AEI. The representative would operate under the direct supervision of an AEI Geotechnical Engineer. Field observations should be performed prior to and during concrete placement operations.

6.3.2 Limitations

The conclusions and recommendations presented herein are based on information gathered from the borings advanced during this exploration using that degree of care and skill ordinarily exercised under similar circumstances by competent members of the engineering profession. No warranties can be made regarding the continuity of conditions between the borings.

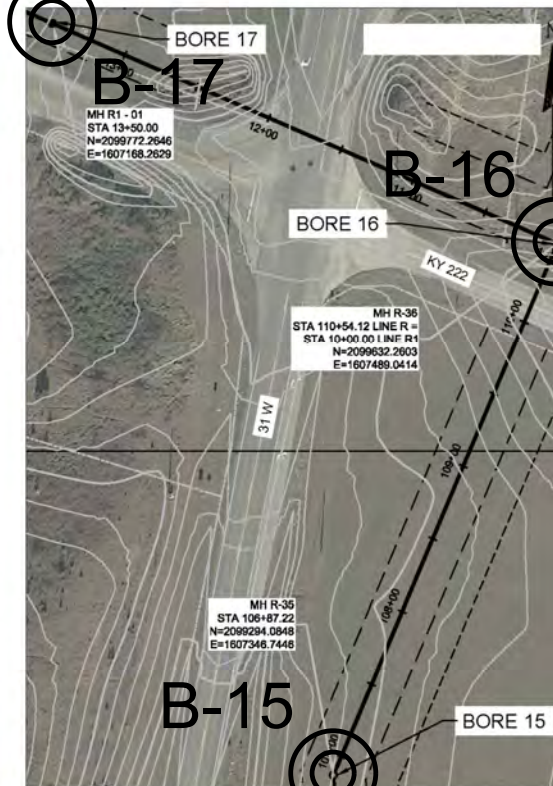
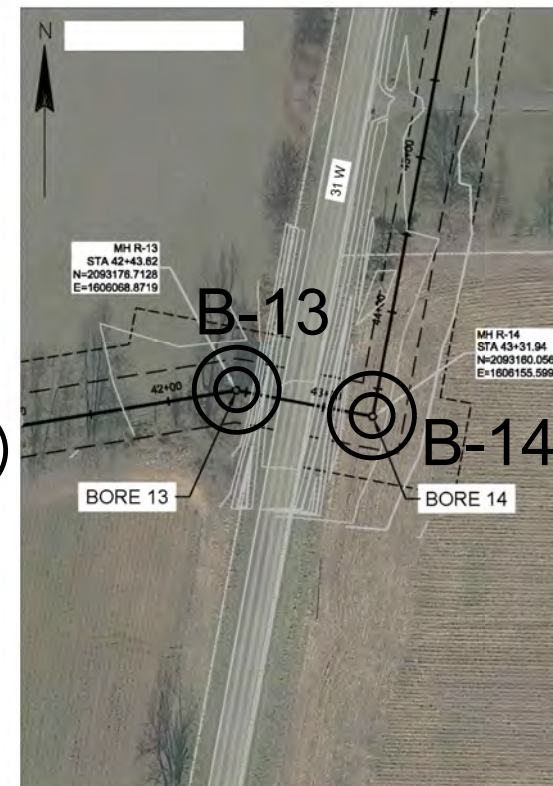
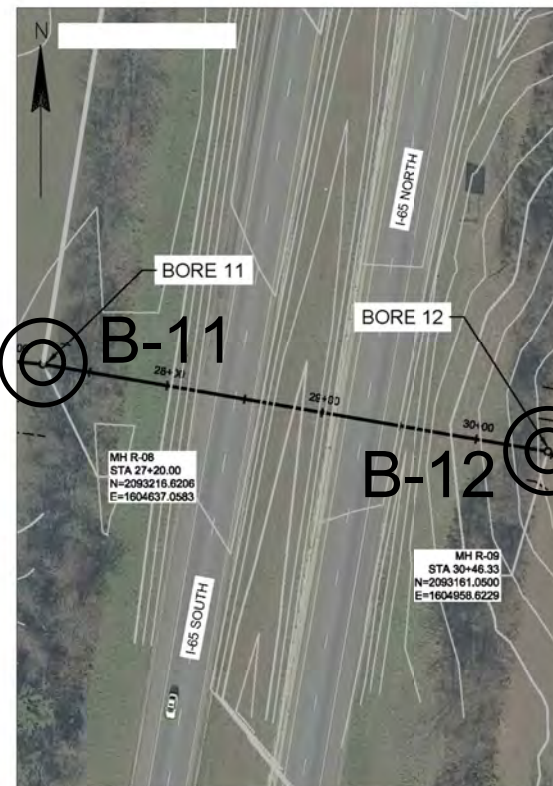
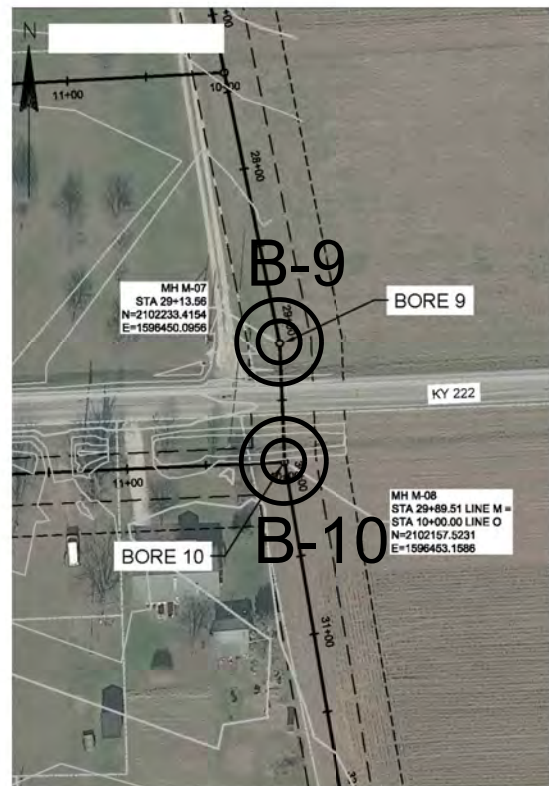
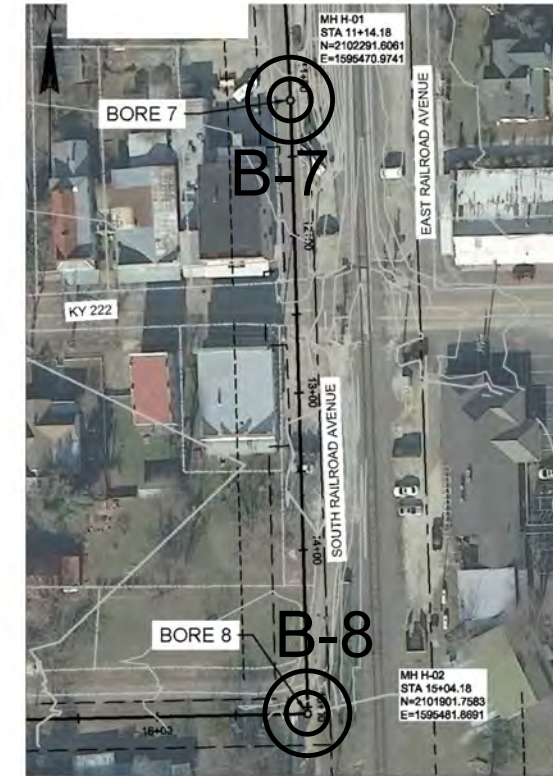
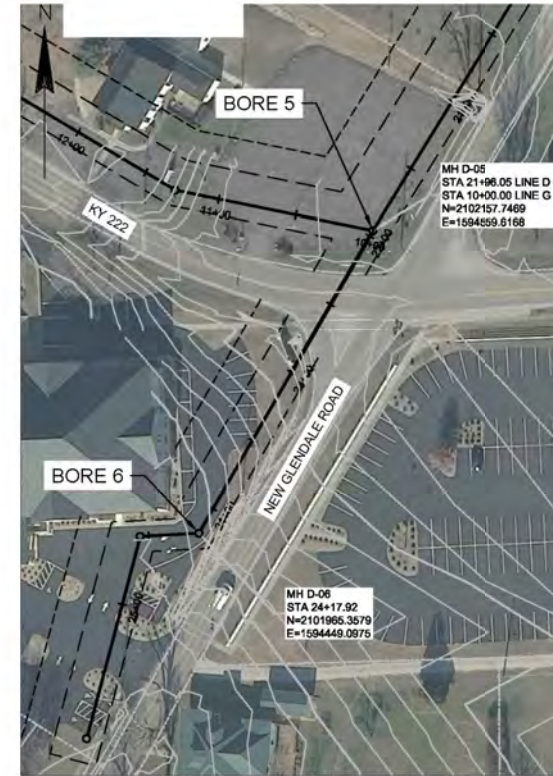
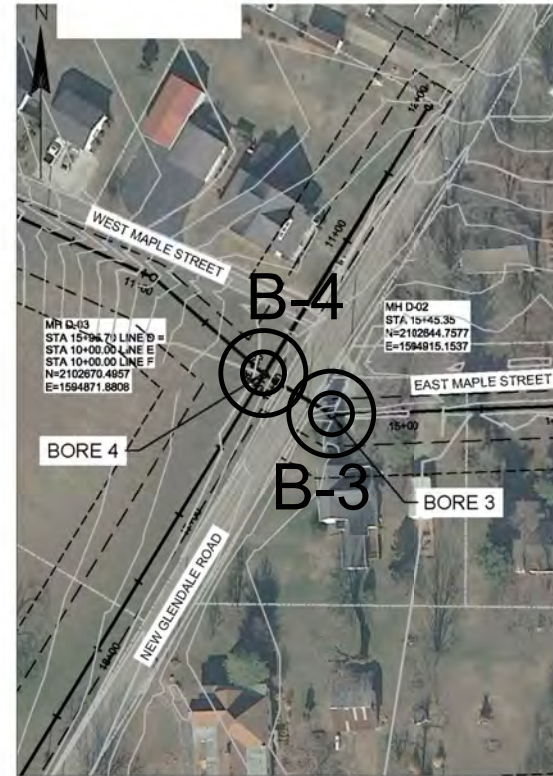
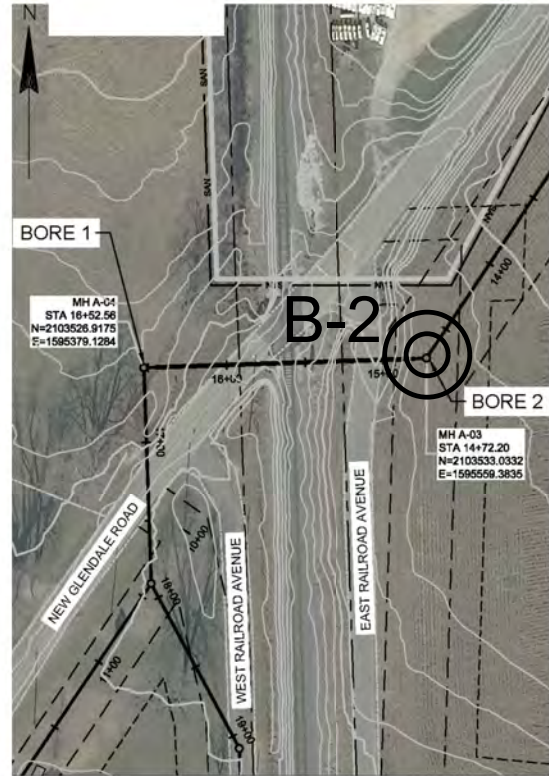
We will retain samples acquired for this project for a period of 30 days subsequent to the submittal date printed on the cover of this report. After this period, the samples will be discarded unless otherwise requested.

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APPENDIX A

Boring Layout

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LEGEND
 SOIL TEST BORING WITH STANDARD PENETRATION TESTS

NO.	DATE	DESCRIPTION

BORING LAYOUT

CLIENT:
HARDIN COUNTY
WATER DISTRICT #2

PROJECT:
NOLIN RIVER SEWER
INFRASTRUCTURE
GLENDALE, KY

PLANS PREPARED AND SUBMITTED BY:

 AMERICAN ENGINEERS, INC.
 10500 WILSON AVENUE
 SUITE 100
 BOSTON, MA 02116
 (617) 451-9422
 www.aei.com

SCALE:
NTS

DATE:
12-30-13

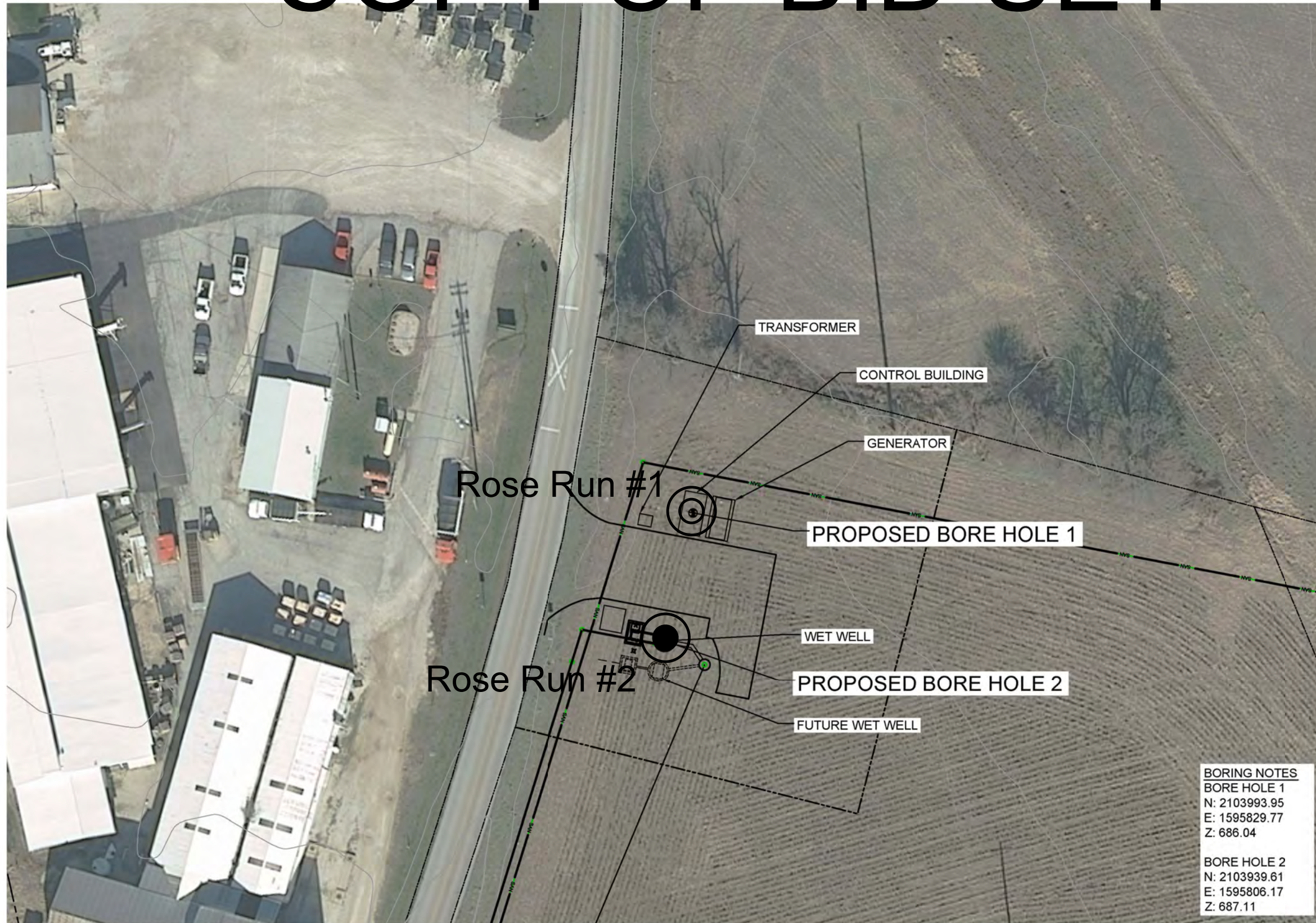
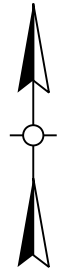
DRAWN BY:
J. CHILDRESS

CHECKED BY:
D. MITCHELL

FILE:
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BORING NOTES
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 E: 1595829.77
 Z: 686.04

BORE HOLE 2
 N: 2103939.61
 E: 1595806.17
 Z: 687.11

- LEGEND**
-  SOIL TEST BORING WITH STANDARD PENETRATION TESTS
 -  SOIL TEST BORING WITH STANDARD PENETRATION TESTS AND ROCK CORE

NO.	DATE	DESCRIPTION

BORING LAYOUT

CLIENT:
 HARDIN COUNTY
 WATER DISTRICT #2

PROJECT:
 NOLIN RIVER SEWER
 INFRASTRUCTURE
 GLENDALE, KY

PLANS PREPARED AND SUBMITTED BY:
 J. CHILDRESS
 AMERICAN ENGINEERS, INC.
 1000 UNIVERSITY PARKWAY
 SUITE 200
 COVINGTON, KY 40301
 (502) 246-3813
 www.aei.com

SCALE:
 NTS

DATE:
 12-30-13

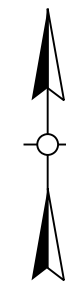
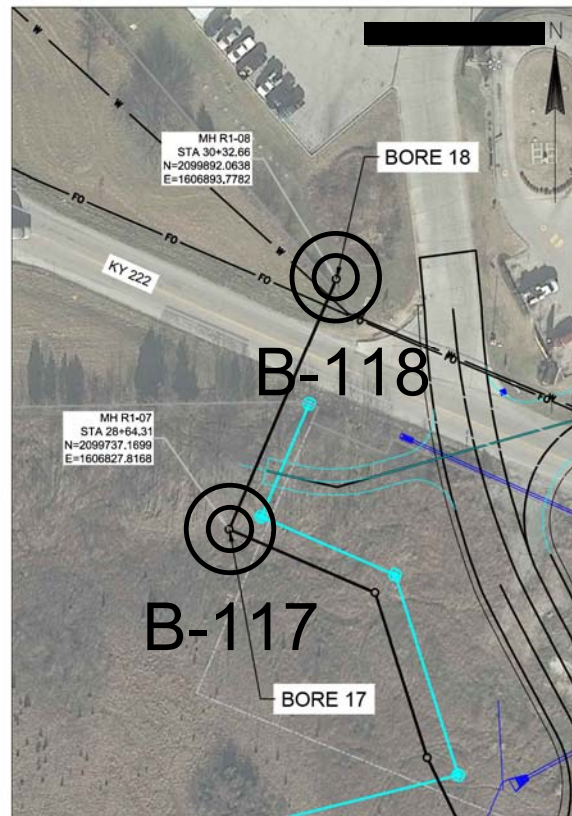
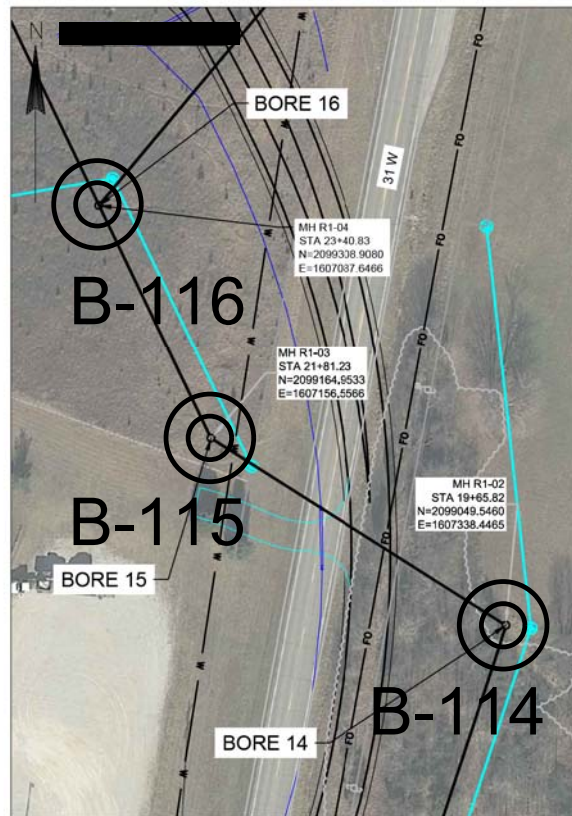
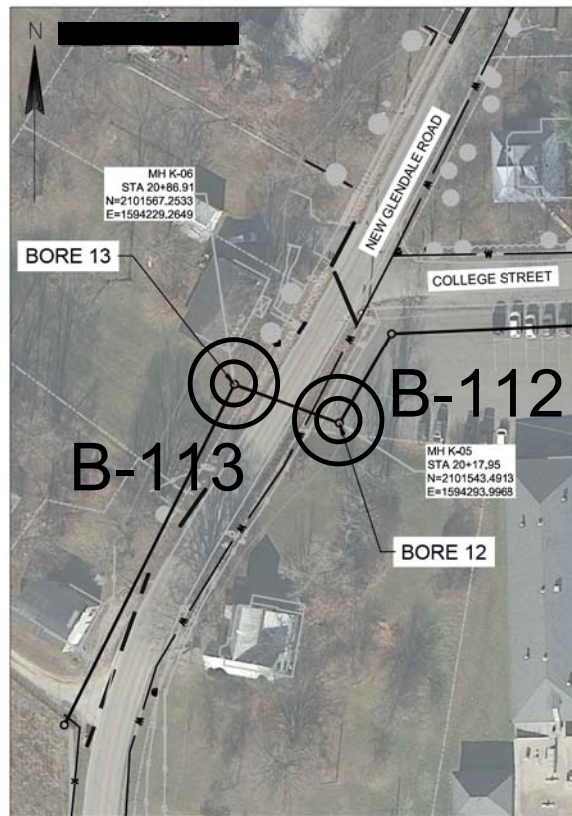
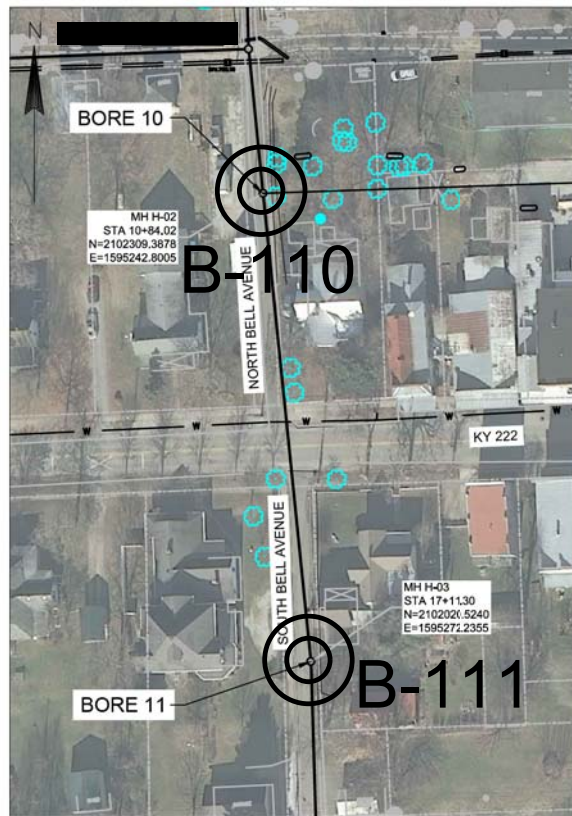
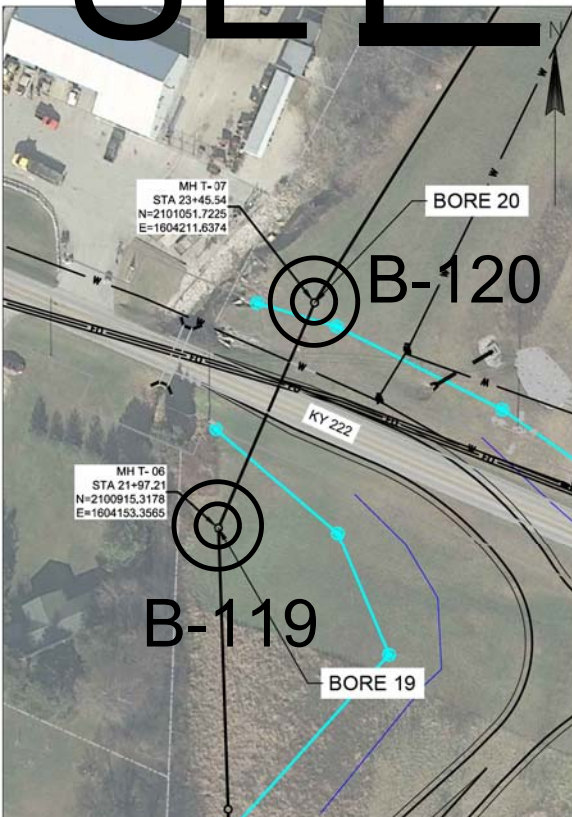
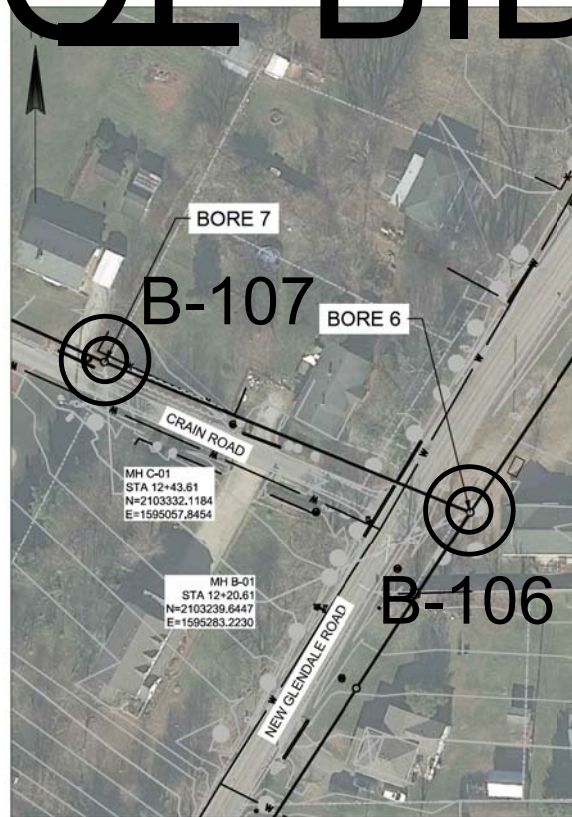
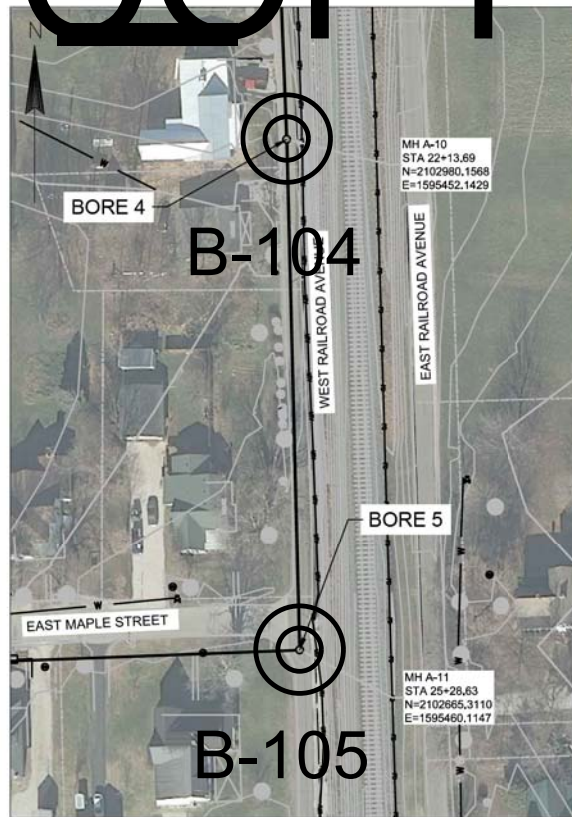
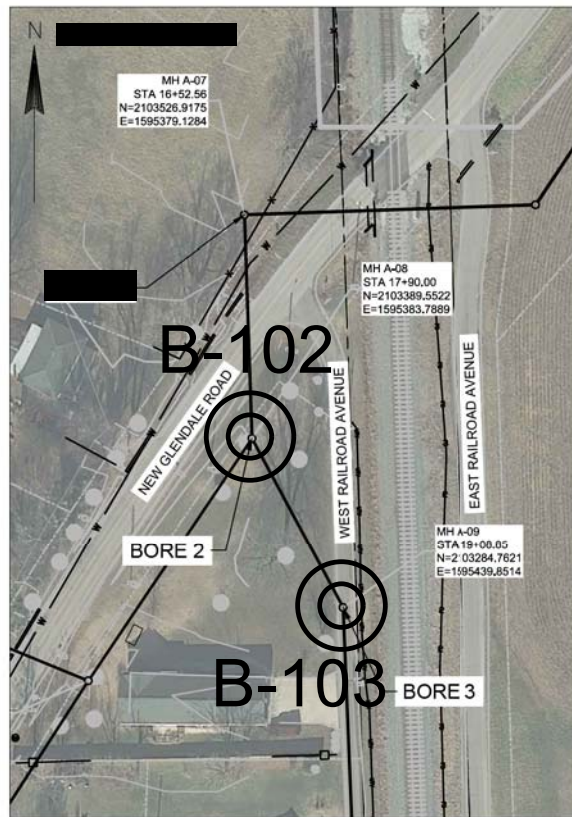
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 J. CHILDRESS

CHECKED BY:
 D. MITCHELL

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 Geotech/2013 Exploration/
 Boring Layout.dgn

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LEGEND
 SOIL TEST BORING WITH STANDARD PENETRATION TESTS

NO.	DATE	DESCRIPTION

BORING LAYOUT

CLIENT:
 HARDIN COUNTY
 WATER DISTRICT #2

PROJECT:
 NOLIN RIVER SEWER
 INFRASTRUCTURE
 GLENDALE, KY

PLANS PREPARED AND SUBMITTED BY:

 AMERICAN ENGINEERS, INC.
 1705 Anderson Drive
 Louisville, KY 40222
 (502) 265-3811 www.aei.cc

SCALE:
 NTS
 DATE:
 7-24-14
 DRAWN BY:
 J. CHILDRESS
 CHECKED BY:
 D. MITCHELL

FILE:
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APPENDIX B

Boring Logs

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CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

COHESIVE SOILS (Clay, Silt, and Mixtures)

<u>CONSISTENCY</u>	<u>SPT N-VALUE</u>	<u>Qu/Qp (tsf)</u>	<u>PLASTICITY</u>	
Very Soft	2 blows/ft or less	0 – 0.25	Degree of	Plasticity
Soft	2 to 4 blows/ft	0.25 – 0.49	<u>Plasticity</u>	<u>Index (PI)</u>
Medium Stiff	4 to 8 blows/ft	0.50 – 0.99	Low	0 – 7
Stiff	8 to 15 blows/ft	1.00 – 2.00	Medium	8 – 22
Very Stiff	15 to 30 blows/ft	2.00 – 4.00	High	over 22
Hard	30 blows/ft or more	> 4.00		

NON-COHESIVE SOILS (Silt, Sand, Gravel, and Mixtures)

<u>DENSITY</u>	<u>SPT N-VALUE</u>	<u>PARTICLE SIZE IDENTIFICATION</u>	
Very Loose	4 blows/ft or less	Boulders	12 inch diameter or more
Loose	4 to 10 blows/ft	Cobbles	3 to 12 inch diameter
Medium Dense	10 to 30 blows/ft	Gravel	Coarse – 1 to 3 inch
Dense	30 to 50 blows/ft		Medium – ½ to 1 inch
Very Dense	50 blows/ft or more		Fine – ¼ to ½ inch
		Sand	Coarse – 0.6mm to ¼ inch
			Medium – 0.2mm to 0.6mm
			Fine – 0.05mm to 0.2mm
		Silt	0.05mm to 0.005mm
		Clay	0.005mm

<u>RELATIVE PROPORTIONS</u>	
<u>Descriptive Term</u>	<u>Percent</u>
Trace	1 – 10
Trace to Some	11 – 20
Some	21 – 35
And	36 – 50

NOTES

Classification – The Unified Soil Classification System is used to identify soil unless otherwise noted.

Standard “N” Penetration Test (SPT) (ASTM D1586) – Driving a 2-inch O.D., 1 3/8-inch I.D. sampler a distance of 1 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6-inches to seat the sampler into undisturbed soil, and then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the field drill log (e.g., 10/8/7). On the report log, the Standard Penetration Test result (i.e., the N value) is normally presented and consists of the sum of the 2nd and 3rd penetration counts (i.e., $N = 8 + 7 = 15$ blows/ft.)

Soil Property Symbols

Qu:	Unconfined Compressive Strength	N:	Standard Penetration Value (see above)
Qp:	Unconfined Comp. Strength (pocket pent.)	omc:	Optimum Moisture content
LL:	Liquid Limit, % (Atterberg Limit)	PL:	Plastic Limit, % (Atterberg Limit)
PI:	Plasticity Index	mdd:	Maximum Dry Density

FIELD TESTING PROCEDURES

The general field procedures employed by the Field Services Center are summarized in the following outline. The procedures utilized by the AEI Field Service Center are recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Soil Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the surface conditions. Borings are advanced into the ground using continuous flight augers. At prescribed intervals throughout the boring depths, soil samples are obtained with a split- spoon or thin-walled sampler and sealed in airtight glass jars and labeled. The sampler is first seated 6 inches to penetrate loose cuttings and then driven an additional foot, where possible, with blows from a 140 pound hammer falling 30 inches. The number of blows required to drive the sampler each six-inch increment is recorded. The penetration resistance, or "N-value" is designated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split spoon sampling procedures used during the exploration are in general accordance with ASTM D 1586. Split spoon samples are considered to provide *disturbed* samples, yet are appropriate for most engineering applications. Thin-walled (Shelby tube) samples are considered to provide *undisturbed* samples and obtained when warranted in general accordance with ASTM D 1587.

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Core Drilling Procedures for use on refusal materials. Prior to coring, casing is set in the boring through the overburden soils. Refusal materials are then cored according to ASTM D-2113 using a diamond bit attached to the end of a hollow double tube core barrel. This device is rotated at high speeds and the cuttings are brought to the surface by circulating water. Samples of the material penetrated are protected and retained in the inner tube, which is retrieved at the end of each drill run. Upon retrieval of the inner tube the core is recovered, measured and placed in boxes for storage.

The subsurface conditions encountered during drilling are reported on a field test boring record by the driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soil in general accordance with the procedures outlined in ASTM D 2487 and D 2488 and prepares the final boring records which are the basis for all evaluations and recommendations.

Representative portions of soil samples are placed in sealed containers and transported to the laboratory. In the laboratory, the samples are examined to verify the driller's field classifications. Test Boring Records are attached which show the soil descriptions and penetration resistances.

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The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designate the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

Water table readings are normally taken in conjunction with borings and are recorded on the “Boring Logs”. These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using as electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Sampling Terminology

Undisturbed Sampling: Thin-walled or Shelby tube samples used for visual examination, classification tests and quantitative laboratory testing. This procedure is described by ASTM D 1587. Each tube, together with the encased soil, is carefully removed from the ground, made airtight and transported to the laboratory. Locations and depths of undisturbed samples are shown on the “Boring Logs.”

Bag Sampling: Bulk samples of soil are obtained at selected locations. These samples consist of soil brought to the surface by the drilling augers, or obtained from test pits or the ground surface using hand tools. Samples are placed in bags, with sealed jar samples of the material, and taken to our laboratory for testing where more mass material is required (i.e. Proctors and CBR's). The locations of these samples are indicated on the appropriate logs, or on the Boring Location Plan.

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AMERICAN ENGINEERS, INC.
 PROFESSIONAL ENGINEERING
 65 Aberdeen Drive
 Glasgow, KY 42141
 (270) 651-7220

B-2
 PAGE 1 OF 1

CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>9/11/13</u> COMPLETED <u>9/11/13</u> DRILLER <u>James Felts</u> DRILLING METHOD <u>Hollow Stem Auger</u> LOGGED BY <u>Jason Childress</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>691.6 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
---	--

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (6 inches) (CL) lean CLAY, trace fine sand, reddish brown to light brown with gray mottle, moist to wet, stiff									
5			▲ SPT 1	100	5-6-6 (12)	3.5	19				
			▲ SPT 2	100	3-5-5 (10)	3.0	20				
			▲ SPT 3	100	2-5-7 (12)	3.5	24				
10			▲ SPT 4	100	3-4-6 (10)	1.75	23				
15		(CH) fat CLAY, trace fine to medium sand, dark red with light brown mottle, wet, stiff	▲ SPT 5	100	4-6-9 (15)	3.5	33				
20		Rock-like resistance	▲ SPT 6	100	3-4-5 (9)	2.5	32				
			▲ SPT 7	100	5-7-7 (14)	2.5	33				
Bottom of borehole at 23.0 feet.											

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>9/8/13</u> COMPLETED <u>9/8/13</u> DRILLER <u>James Felts</u> DRILLING METHOD <u>Hollow Stem Auger</u> LOGGED BY <u>Jason Childress</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>705.6 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 inches)									
		(CL-ML) silty CLAY, trace to some fine sand, light brown, wet, medium stiff	SPT 1	53	2-2-3 (5)	0.75	21				
5		gray mottle	SPT 2	100	3-4-5 (9)	3.0	21				
			SPT 3	100	3-4-3 (7)	1.0	19				
10		(CL) sandy lean CLAY, reddish brown, wet, medium stiff	SPT 4	100	3-4-3 (7)	0.75	23				
15		(CH) fat CLAY, trace fine sand, trace coarse gravel, dark red, wet, stiff	SPT 5	100	2-3-3 (6)	2.0	25				
			SPT 6	100	4-6-7 (13)	2.0	25				
Bottom of borehole at 18.0 feet.											

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>9/9/13</u> COMPLETED <u>9/9/13</u> DRILLER <u>James Felts</u> DRILLING METHOD <u>Hollow Stem Auger</u> LOGGED BY <u>Jason Childress</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>701.6 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ASPHALT (6 inches)									
		CRUSHED AGGREGATE (7 inches)									
		(CL) lean CLAY, some fine to medium sand, light brown with gray mottle, wet, medium stiff	SPT 1	100	3-3-4 (7)	3.5	19				
5			SPT 2	100	3-4-4 (8)	1.5	18				
		(CH) fat CLAY, trace fine sand, dark red, moist to wet, stiff	SPT 3	40	3-5-7 (12)	3.25	30				
10			SPT 4	100	3-4-6 (10)	3.5	27				
15		trace fine to coarse gravel	SPT 5	100	3-5-5 (10)	3.25	44				

Bottom of borehole at 19.0 feet.

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 9/8/13 **COMPLETED** 9/8/13
DRILLER James Felts
DRILLING METHOD Hollow Stem Auger
LOGGED BY Jason Childress **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 703.7 ft
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		CRUSHED AGGREGATE (12 inches)									
0 - 11.5		(CL) lean CLAY, some fine sand, light brown with gray mottle, wet, medium stiff	SPT 1	73	2-2-3 (5)	0.75	21				
5			SPT 2	100	2-4-3 (7)	2.25	18				
10			SPT 3	100	3-3-5 (8)	1.75	22				
11.5 - 16.5		(CH) fat CLAY, trace to some fine sand, trace fine gravel, dark red, moist to wet, stiff	SPT 4	100	5-6-9 (15)	2.25	18				
15			SPT 5	100	3-5-7 (12)	3.75	30				
			SPT 6	100	4-6-9 (15)	4.0	36				

Bottom of borehole at 18.0 feet.

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 10/29/13 **COMPLETED** 10/29/13
DRILLER James Felts
DRILLING METHOD Hollow Stem Auger
LOGGED BY Jason Childress **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 697.7 ft
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (10 inches)									
5		(CL) lean CLAY, trace fine sand, brown to reddish brown, moist to wet, medium stiff to stiff	SPT 1	100	3-3-4 (7)	2.5	20				
5			SPT 2	100	3-4-6 (10)	3.75	28				
10		(CH) fat CLAY, trace to some fine to coarse gravel, red, moist to wet, stiff to medium stiff	SPT 3	100	3-4-6 (10)	2.5	31				
10			SPT 4	100	3-4-5 (9)	3.0	28				
15			SPT 5	100	3-4-5 (9)	3.5	36				
20			SPT 6	100	4-3-3 (6)	2.0	47				

Bottom of borehole at 21.5 feet.

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>10/29/13</u> COMPLETED <u>10/29/13</u> DRILLER <u>James Felts</u> DRILLING METHOD <u>Hollow Stem Auger</u> LOGGED BY <u>Jason Childress</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>699.4 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	[Dotted pattern]	TOPSOIL (16 inches)	SPT 1	93	1-2-3 (5)	1.25	22				
	[Diagonal lines /]	(CL) lean CLAY, trace fine sand, brown to reddish brown, moist to wet, medium stiff to stiff									
5			SPT 2	100	3-3-6 (9)	3.5	21				
	[Diagonal lines \]	(CH) fat CLAY, trace to some fine to coarse gravel, red, moist to wet, stiff	SPT 3	100	4-5-7 (12)	3.5	30				
10			SPT 4	100	4-5-7 (12)	4.25	25				
15			SPT 5	100	3-5-7 (12)	4.25	24				
20			SPT 6	100	2-4-6 (10)	3.0	27				
			SPT 7	100	3-5-7 (12)	2.5	31				
Bottom of borehole at 23.0 feet.											

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>9/12/13</u> COMPLETED <u>9/12/13</u> DRILLER <u>James Felts</u> DRILLING METHOD <u>Hollow Stem Auger</u> LOGGED BY <u>Jason Childress</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>679.4 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS	
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		TOPSOIL (5 inches) (CL) lean CLAY, some fine to coarse gravel, light brown to red, moist to wet, stiff										
5			▲ SPT 1	100	6-6-5 (11)	4.5	37					
10		(CH) fat CLAY, trace to some fine to coarse gravel, red to dark red, moist to wet, stiff to medium stiff	▲ SPT 2	73	3-3-8 (11)	3.0	42					
			▲ SPT 3	80	7-6-5 (11)	2.75	29					
			▲ SPT 4	80	2-5-3 (8)	2.5	34					

Bottom of borehole at 15.0 feet.

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>10/29/13</u> COMPLETED <u>10/29/13</u> DRILLER <u>James Felts</u> DRILLING METHOD <u>Hollow Stem Auger</u> LOGGED BY <u>Jason Childress</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>688.4 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (11 inches)									
		(CH) fat CLAY, trace to some fine to coarse gravel, red, damp to wet, stiff to medium stiff	▲ SPT 1	93	4-6-8 (14)	4.5	23				
5			▲ SPT 2	93	4-6-6 (12)	4.5	22				
			▲ SPT 3	100	5-13-9 (22)	4.5	27				
10			▲ SPT 4	100	5-7-7 (14)	4.5	37				
15			▲ SPT 5	13	5-7-8 (15)	4.5	36				
20			▲ SPT 6	87	4-3-3 (6)	3.25	24				
Bottom of borehole at 21.5 feet.											

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>10/30/13</u> COMPLETED <u>10/30/13</u> DRILLER <u>James Felts</u> DRILLING METHOD <u>Hollow Stem Auger</u> LOGGED BY <u>Jason Childress</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>693.7 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (8 inches) (CL) lean CLAY, trace fine sand, trace fine gravel, brown to reddish brown to red, moist to wet, stiff to medium stiff	SPT 1	87	2-3-4 (7)	1.0	22				
5			SPT 2	100	3-4-3 (7)	2.5	20				
10			SPT 3	100	3-4-4 (8)	2.5	21				
15		(CH) fat CLAY, trace fine to medium gravel, red, moist to wet, medium stiff	SPT 4	100	3-4-4 (8)	2.5	25				
20			SPT 5	100	3-3-5 (8)	1.5	37				
			SPT 6	33	3-4-4 (8)	1.5	40				
Bottom of borehole at 21.5 feet.											

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>10/30/13</u> COMPLETED <u>10/30/13</u> DRILLER <u>James Felts</u> DRILLING METHOD <u>Hollow Stem Auger</u> LOGGED BY <u>Jason Childress</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>691.3 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (10 inches)									
		(CL) sandy lean CLAY, trace fine gravel, brown to red, moist to wet, medium stiff to very stiff									
5			SPT 1	100	2-3-4 (7)	2.5	21				
			SPT 2	100	4-5-7 (12)	3.5	20				
			SPT 3	100	5-8-10 (18)	3.25	20				
10			SPT 4	93	5-10-11 (21)	3.25	20				
15		(CH) fat CLAY, trace to some fine gravel, red, wet, stiff	SPT 5	100	5-8-6 (14)	3.0	46				
			SPT 6	80	3-5-6 (11)	2.5	40				

Bottom of borehole at 18.0 feet.

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CLIENT <u>Hardin County Water District No. 2</u>	PROJECT NAME <u>Nolin River Sewer Infrastructure</u>
PROJECT NUMBER <u>212-323</u>	PROJECT LOCATION <u>Glendale, KY</u>
DATE STARTED <u>9/12/13</u> COMPLETED <u>9/12/13</u>	GROUND ELEVATION <u>759 ft</u>
DRILLER <u>James Felts</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>Hollow Stem Auger</u>	AT TIME OF DRILLING <u>---</u>
LOGGED BY <u>Jason Childress</u> CHECKED BY <u>Dennis Mitchell</u>	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	3:3	TOPSOIL (6 inches) (CL) lean CLAY, some fine to medium sand, light brown to gray, moist to wet, stiff to medium stiff									
5			▲ SPT 1	100	4-5-6 (11)	4.0	18				
			▲ SPT 2	80	2-3-5 (8)	3.75	18				
			▲ SPT 3	100	2-3-4 (7)	1.75	19				
10			▲ SPT 4	100	2-2-3 (5)	1.0	18				
15			▲ SPT 5	100	2-2-3 (5)	2.5	18				
20		(CH) fat CLAY, trace fine gravel, some fine to coarse sand, reddish brown, moist to wet, stiff	▲ SPT 6	80	3-7-7 (14)	3.0	26				
25			▲ SPT 7	13	4-6-5 (11)	1.5	20				
30			▲ SPT 8	100	2-4-5 (9)	1.5	32				
Bottom of borehole at 32.0 feet.											

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 9/11/13 **COMPLETED** 9/11/13
DRILLER James Felts
DRILLING METHOD Hollow Stem Auger
LOGGED BY Jason Childress **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 763.1 ft
GROUND WATER LEVELS:
 ∇ **AT TIME OF DRILLING** 25.0 ft / Elev 738.10 ft
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (10 inches)									
		(CL) lean CLAY, some fine to coarse sand, brown to reddish brown, moist, medium stiff									
		(CH) fat CLAY, some fine to coarse sand, red, moist to wet, medium stiff to stiff	▲ SPT 1	100	3-3-4 (7)	3.5	20				
5			▲ SPT 2	100	3-6-6 (12)	4.5	33				
			▲ SPT 3	100	4-5-7 (12)	4.5	26				
10			▲ SPT 4	100	4-6-7 (13)	4.5	18				
15		trace fine to medium gravel	▲ SPT 5	100	3-4-7 (11)	2.5	30				
20		increased sand content	▲ SPT 6	100	3-3-4 (7)	1.75	26				
25	∇		▲ SPT 7	27	9-6-5 (11)	0.5	28				
30			▲ SPT 8	27	2-3-3 (6)	<0.25	38				
Bottom of borehole at 34.0 feet.											

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 9/11/13 **COMPLETED** 9/11/13
DRILLER James Felts
DRILLING METHOD Hollow Stem Auger
LOGGED BY Jason Childress **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 756.2 ft
GROUND WATER LEVELS:
 ▽ **AT TIME OF DRILLING** 19.0 ft / Elev 737.20 ft
AT END OF DRILLING ---
AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (6 inches)									
		(CL) sandy lean CLAY, trace fine to medium gravel, reddish brown, moist to wet, medium stiff	SPT 1	67	2-2-3 (5)	1.0	18				
5		CRUSHED AGGREGATE	SPT 2	33	5-4-4 (8)	n/a	12				
		(CL) sandy lean CLAY, trace fine to medium gravel, reddish brown, moist to wet, medium stiff	SPT 3	80	0-0-0 (0)	0.5	21				
		(ML) FILL- SILT with interbedded soft clays and organic matter (roots, wood, etc.)	SPT 4	67	0-0-0 (0)	<0.25	24				
15		(CH) fat CLAY, dark red with gray mottle, moist to wet, stiff	SPT 5	100	2-4-6 (10)	4.25	23				
20	▽		SPT 6	100	2-6-8 (14)	4.5	30				

Bottom of borehole at 25.0 feet.

COPY OF BID SET



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Rose Run #1

PAGE 1 OF 1

CLIENT Hardin County Water District No. 2

PROJECT NUMBER 212-323

DATE STARTED 9/10/13 **COMPLETED** 9/10/13

DRILLER James Felts

DRILLING METHOD Hollow Stem Auger

LOGGED BY Jason Childress **CHECKED BY** Dennis Mitchell

NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure

PROJECT LOCATION Glendale, KY

GROUND ELEVATION 686.8 ft

GROUND WATER LEVELS:

AT TIME OF DRILLING ---

AT END OF DRILLING ---

AFTER DRILLING ---

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/5/14 15:46 - T:\12 PROJECTS\212-323 NOLIN RIVER SEWER INFRASTRUCTURE\GEO\GEO\2013 EXPLORATION\2013 NOLIN RIVER SEWER.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	TOPSOIL (6 inches)	(CL) sandy lean CLAY, light brown with gray mottle, moist, very stiff									
1	(CL) sandy lean CLAY, light brown with gray mottle, moist, very stiff		ST 1	75		4.5	20	38	19	19	
5	(CH) fat CLAY, red, moist to wet, stiff to very stiff		SPT 2	100	4-4-6 (10)	3.25	26				
7	(CH) fat CLAY, red, moist to wet, stiff to very stiff		ST 3	90		4.5	31	58	25	33	
10	some fine to coarse gravel rock like resistance to 13 feet		SPT 4	100	3-6-10 (16)	1.0	41				
15	some fine to coarse gravel rock like resistance to 13 feet		ST 5	30		2.0	29				
20	some fine to coarse gravel rock like resistance to 13 feet		SPT 6	13	6-9-12 (21)	1.0	31				

Bottom of borehole at 21.5 feet.

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Rose Run #2

PAGE 1 OF 2

CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 9/10/13 **COMPLETED** 9/10/13
DRILLER James Felts
DRILLING METHOD Hollow Stem Auger
LOGGED BY Jason Childress **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 686.8 ft
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	TOPSOIL (6 inches)	(CL) lean CLAY, some fine sand, light brown with gray mottle, moist to wet, stiff	SPT 1	100	3-4-5 (9)	2.5	22				
5	(CH) fat CLAY, trace fine sand, dark red with gray mottle, moist to wet, stiff with very soft zones		ST 2	90		3.5	22	37	19	18	
10	trace fine gravel		SPT 3	100	3-4-5 (9)	3.0	25				
15	rock-like resistance		ST 4	85		3.5	26	49	24	25	
20	trace fine gravel		SPT 5	100	3-5-15 (20)	3.5	33				
25	rock-like resistance		ST 6	70		4.5	25	55	22	33	
30	trace fine gravel		SPT 7	33	2-3-5 (8)	1.5	36				
35	very soft zone rock-like resistance to auger refusal		SPT 8	20	0-0-0 (0)	1.0	33				

(Continued Next Page)

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Rose Run #2

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CLIENT Hardin County Water District No. 2

PROJECT NAME Nolin River Sewer Infrastructure

PROJECT NUMBER 212-323

PROJECT LOCATION Glendale, KY

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/5/14 15:46 - T:12 PROJECTS\212-323 NOLIN RIVER SEWER INFRASTRUCTURE\GEO\GINT\2013 EXPLORATION\2013 NOLIN RIVER SEWER.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		(CH) fat CLAY, trace fine sand, dark red with gray mottle, moist to wet, stiff with very soft zones (<i>continued</i>)	SPT 9	53	0-5-12 (17)	<0.25	37				
40		LIMESTONE with interbedded calcareous siltstone, fine to medium crystalline, silty, gray, moderately hard to hard, very thin to thin bedded, vuggy, moderately weathered throughout	RC 10	94 (34)							
			RC 11	100 (60)							
Refusal at 36.7 feet. Bottom of borehole at 41.9 feet.											

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 6/16/14 **COMPLETED** 6/16/14
DRILLER Don Cash
DRILLING METHOD Hollow-stem augers
LOGGED BY Zack Pennington **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 694.9 ft
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/5/14 15:51 - T:\12 PROJECTS\212-323 NOLIN RIVER SEWER INFRASTRUCTURE\GEO\GINT\2014 EXPLORATION\GLENDALE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (25 inches)									
5		(CH) fat CLAY, trace sand, trace gravel, reddish brown to red, moist, stiff	SPT 1	93	4-5-6 (11)	3.25	25				
10			SPT 2	100	3-4-7 (11)	3.5	27				
15			SPT 3	100	3-4-6 (10)	4.0	36	59	27	32	
20			SPT 4	100	3-5-6 (11)	2.75	37				
Bottom of borehole at 21.5 feet.											

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>6/12/14</u> COMPLETED <u>6/12/14</u> DRILLER <u>Don Cash</u> DRILLING METHOD <u>Hollow-stem augers</u> LOGGED BY <u>Zack Pennington</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>695.9 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS	
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0	●●●●●	ASPHALT (5 inches)										
	▨▨▨▨▨	CRUSHED AGGREGATE (9.5 inches)										
	▨▨▨▨▨	(CH) fat CLAY, trace sand, trace gravel, reddish brown to red, moist, stiff to very stiff										
5			▲ SPT 1	73	3-5-6 (11)	1.5	22					
10			▲ SPT 2	67	7-7-6 (13)	1.25	23					
15			▲ SPT 3	67	5-8-9 (17)	1.0	23	62	26	36		
20			▲ SPT 4	100	7-6-4 (10)	2.0	28					

Bottom of borehole at 21.5 feet.

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>6/11/14</u> COMPLETED <u>6/11/14</u> DRILLER <u>Don Cash</u> DRILLING METHOD <u>Hollow-stem augers</u> LOGGED BY <u>Zack Pennington</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>703.5 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	●●●●	ASPHALT (5 inches)									
	●●●●	CRUSHED AGGREGATE (10 inches)									
	▨▨▨▨	(CH) fat CLAY, trace gravel, reddish brown, moist, stiff									
5	▨▨▨▨		▲ SPT 1	100	3-5-6 (11)	3.0	24				
10	▨▨▨▨		▲ SPT 2	100	4-6-8 (14)	3.0	25				
15	▨▨▨▨		▲ SPT 3	100	2-4-5 (9)	2.75	24				
Refusal at 18.8 feet. Bottom of borehole at 18.8 feet.											

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 6/11/14 **COMPLETED** 6/11/14
DRILLER Don Cash
DRILLING METHOD Hollow-stem augers
LOGGED BY Zack Pennington **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 703.1 ft
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	●	ASPHALT (5 inches)									
	●	CRUSHED AGGREGATE (8.5 inches)									
	●	(CH) fat CLAY, trace sand, trace gravel, reddish brown to red, moist to wet, medium stiff to stiff									
5	●		▲ SPT 1	80	6-3-3 (6)	0	21				
10	●		▲ SPT 2	7	6-8-6 (14)						
15	●		▲ SPT 3	87	2-12-25 (37)	2.25	36				
20	●		▲ SPT 4	100	2-2-3 (5)	1.0	32				
25	●		▲ SPT 5	67	2-3-5 (8)	0.5	28				
Bottom of borehole at 26.5 feet.											

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>6/16/14</u> COMPLETED <u>6/16/14</u> DRILLER <u>Don Cash</u> DRILLING METHOD <u>Hollow-stem augers</u> LOGGED BY <u>Zack Pennington</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>695.9 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	TOPSOIL (4 inches)	(CL) lean CLAY, trace sand, trace gravel, light brown to gray, moist, stiff									
5			SPT 1	93	4-5-7 (12)	2.0	18				
10	(CH) fat CLAY	(CH) fat CLAY, trace sand, trace gravel, reddish brown to red, moist, stiff	SPT 2	100	2-4-5 (9)	2.5	21				
15			SPT 3	93	1-3-6 (9)	4.25	39				

Bottom of borehole at 16.5 feet.

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 6/12/14 **COMPLETED** 6/12/14
DRILLER Don Cash
DRILLING METHOD Hollow Stem Auger
LOGGED BY Zack Pennington **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 698.6 ft
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/5/14 15:51 - T:\12 PROJECTS\212-323 NOLIN RIVER SEWER INFRASTRUCTURE\GEO\GINT\2014 EXPLORATION\GLENDALE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (12 inches)									
	(CL) lean CLAY, trace sand, trace gravel, reddish brown to red, moist, medium stiff to stiff										
5			▲ SPT 1	87	1-2-3 (5)	1	26				
10			▲ SPT 2	100	4-6-7 (13)	2.5	22	39	18	21	
15			▲ SPT 3	100	2-4-6 (10)	3	37				

Bottom of borehole at 16.5 feet.

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 6/17/14 **COMPLETED** 6/17/14
DRILLER Don Cash
DRILLING METHOD Hollow-stem augers
LOGGED BY Zack Pennington **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 703.6 ft
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/5/14 15:51 - T:\12 PROJECTS\212-323 NOLIN RIVER SEWER INFRASTRUCTURE\GEO\GINT\2014 EXPLORATION\GLENDALE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		ASPHALT (6 inches) CRUSHED AGGREGATE (25 inches)									
5		(CL) lean CLAY, trace sand, trace gravel, light to dark reddish brown, moist, soft to medium stiff	SPT 1	60	4-2-2 (4)	2.5	21				
10			SPT 2	87	2-1-3 (4)	1.25	22				
15			SPT 3	100	2-3-3 (6)	1.25	23	28	16	12	
20			SPT 4	100	3-3-4 (7)	2.0	22				

Bottom of borehole at 21.5 feet.

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>6/17/14</u> COMPLETED <u>6/17/14</u> DRILLER <u>Don Cash</u> DRILLING METHOD <u>Hollow-stem augers</u> LOGGED BY <u>Zack Pennington</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>707.5 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	●	ASPHALT (5 inches)									
	●	CRUSHED AGGREGATE (7 inches)									
	●	(CL) lean CLAY, trace sand, trace gravel, reddish brown, moist, medium stiff to stiff									
5	●		▲ SPT 1	53	5-3-5 (8)	2.0	19				
10	●		▲ SPT 2	100	6-4-6 (10)	4.5+	21				
15	●		▲ SPT 3	87	4-4-5 (9)	3.0	37				
20	●		▲ SPT 4	100	3-3-5 (8)	2.25	32				

Bottom of borehole at 21.5 feet.

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>6/12/14</u> COMPLETED <u>6/12/14</u> DRILLER <u>Don Cash</u> DRILLING METHOD <u>Hollow-stem augers</u> LOGGED BY <u>Zack Pennington</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>738.8 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	●	ASPHALT (3.5 inches)									
	●	CRUSHED AGGREGATE (6 inches)									
	●	(CL) lean CLAY, trace fine sand, trace fine gravel, reddish brown to red, moist, stiff									
5	●		▲ SPT 1	93	3-5-7 (12)	4.5+	21				
10	●		▲ SPT 2	100	4-6-8 (14)	2.75	22	43	22	21	
15	●		▲ SPT 3	100	2-5-7 (12)	4.25	23				

Bottom of borehole at 16.5 feet.

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>6/12/14</u> COMPLETED <u>6/12/14</u> DRILLER <u>Don Cash</u> DRILLING METHOD <u>Hollow-stem augers</u> LOGGED BY <u>Zack Pennington</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>739.4 ft</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	[Dotted pattern]	TOPSOIL (25 inches)									
5	[Diagonal hatching]	(CH) fat CLAY, trace fine sand, trace fine gravel, reddish brown to red, dry to moist, stiff	▲ SPT 1	93	2-4-5 (9)	3.75	19				
10	[Diagonal hatching]		▲ SPT 2	93	2-4-6 (10)	3.0	33				
15	[Diagonal hatching]		▲ SPT 3	87	2-4-4 (8)	3.25	28				
Bottom of borehole at 16.5 feet.											

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 6/17/14 **COMPLETED** 6/17/14
DRILLER Don Cash
DRILLING METHOD Hollow-stem augers
LOGGED BY Zack Pennington **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 759.7 ft
GROUND WATER LEVELS:
 ∇ **AT TIME OF DRILLING** 30.0 ft / Elev 729.70 ft
AT END OF DRILLING ---
AFTER DRILLING ---

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/5/14 15:51 - T1:12 PROJECTS1212-323 NOLIN RIVER SEWER INFRASTRUCTURE\GEO\GINT\2014 EXPLORATION\GLENDALE.GPJ

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (11 inches)									
		(SC) Clayey SAND, trace fine gravel, reddish brown to red, moist, medium dense									
5			▲ SPT 1	73	5-10-12 (22)	1.5	12				
10			▲ SPT 2	93	6-6-8 (14)	2.25	16				
15			▲ SPT 3	67	3-6-5 (11)	1.25	15				
20			▲ SPT 4	60	4-7-4 (11)	1.5	15				
25			▲ SPT 5	100	12-10-6 (16)	2	17				
30	∇		▲ SPT 6	100	10-9-7 (16)	1.25	14				
35											

(Continued Next Page)

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CLIENT Hardin County Water District No. 2

PROJECT NAME Nolin River Sewer Infrastructure

PROJECT NUMBER 212-323

PROJECT LOCATION Glendale, KY

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35		Refusal at 35.4 feet. Bottom of borehole at 35.4 feet.	SPT 7	100	50	1.25	14	24	19	5	

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 6/18/14 **COMPLETED** 6/18/14
DRILLER Don Cash
DRILLING METHOD Hollow-stem augers
LOGGED BY Zack Pennington **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 758.4 ft
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (3.5 inches) (ML) SILT, trace fine sand, light brown to brown, dry, very stiff									
5		(CL) sandy lean CLAY, trace fine gravel, reddish brown, dry, very stiff	SPT 1	67	9-7-10 (17)	2.75	16				
10		(SP-SC) poorly graded SAND with clay, reddish brown to red, moist to wet, loose to medium dense	SPT 2	100	4-8-11 (19)	2.0	16				
15		Soil becomes wet at approximately 17'	SPT 3	100	5-10-12 (22)	2.0	16				
20			SPT 4	80	5-4-6 (10)	2.5	17				
25			SPT 5	100	5-4-7 (11)	2.0	24				
30		(CL) sandy lean CLAY, trace fine gravel, reddish brown, moist to wet, stiff to very stiff	SPT 6	100	5-7-10 (17)	2.25	20				
35											

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CLIENT Hardin County Water District No. 2 **PROJECT NAME** Nolin River Sewer Infrastructure
PROJECT NUMBER 212-323 **PROJECT LOCATION** Glendale, KY

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
35											
	[Hatched Pattern]	(CL) sandy lean CLAY, trace fine gravel, reddish brown, moist to wet, stiff to very stiff (<i>continued</i>)	▲ SPT 7	100	6-6-7 (13)	1.75	19	27	13	14	
40			▲ SPT 8	100	8-9-10 (19)	2.0	19				
Bottom of borehole at 41.5 feet.											

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 6/30/14 **COMPLETED** 6/30/14
DRILLER Don Cash
DRILLING METHOD Hollow-stem augers
LOGGED BY Zack Pennington **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 766.1 ft
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (14 inches)									
		(CL) sandy lean CLAY, trace fine gravel, light brown to reddish brown, dry to moist, medium stiff to very stiff									
5			SPT 1	100	6-10-9 (19)	3.25	17				
10			SPT 2	100	3-3-4 (7)	2.25	24				
15			SPT 3	80	3-8-6 (14)	2.0	21				
20			SPT 4	100	3-6-7 (13)	3.25	22				
25			SPT 5	100	3-4-6 (10)	3.25	21	47	21	26	
30			SPT 6	100	3-5-6 (11)	2.75	34				
35											

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CLIENT <u>Hardin County Water District No. 2</u>	PROJECT NAME <u>Nolin River Sewer Infrastructure</u>
PROJECT NUMBER <u>212-323</u>	PROJECT LOCATION <u>Glendale, KY</u>
DATE STARTED <u>6/18/14</u> COMPLETED <u>6/18/14</u>	GROUND ELEVATION <u>740.5 ft</u>
DRILLER <u>Don Cash</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>Hollow-stem augers</u>	▽ AT TIME OF DRILLING <u>20.0 ft / Elev 720.50 ft</u>
LOGGED BY <u>Zack Pennington</u> CHECKED BY <u>Dennis Mitchell</u>	AT END OF DRILLING <u>---</u>
NOTES <u>Relocated 20' off of highway 222 and due south of hole #18</u>	AFTER DRILLING <u>---</u>

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	[Dotted pattern]	TOPSOIL (10 inches) (ML) SILT, trace fine sand, brown, dry, medium stiff									
5	[Diagonal hatching]	(CH) fat CLAY, trace fine sand, trace fine gravel, reddish brown to brown, moist to wet, medium stiff	▲ SPT 1	80	5-4-5 (9)	3.5	19				
10	[Diagonal hatching]	Soil becomes very moist to wet at approximately 11.1'	▲ SPT 2	100	3-3-5 (8)	1.25	22				
15	[Diagonal hatching]	Soil becomes wet at approximately 14.5'	▲ SPT 3	100	2-4-6 (10)	0.75	25				
20	[Diagonal hatching]	Water in hole at approximately 20'	▲ SPT 4	100	2-2-4 (6)	1.75	37				

Bottom of borehole at 21.5 feet.

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CLIENT Hardin County Water District No. 2
PROJECT NUMBER 212-323
DATE STARTED 6/12/14 **COMPLETED** 6/12/14
DRILLER Don Cash
DRILLING METHOD Hollow-stem augers
LOGGED BY Zack Pennington **CHECKED BY** Dennis Mitchell
NOTES _____

PROJECT NAME Nolin River Sewer Infrastructure
PROJECT LOCATION Glendale, KY
GROUND ELEVATION 737.7 ft
GROUND WATER LEVELS:
 ∇ **AT TIME OF DRILLING** 19.5 ft / Elev 718.20 ft
AT END OF DRILLING ---
AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0	[Dotted pattern]	TOPSOIL (18 inches)									
5	[Diagonal hatching]	(CL) lean CLAY, some fine sand, trace fine gravel, brown to light gray, moist to wet, stiff to very soft	▲ SPT 1	93	2-4-7 (11)	2.75	16				
10	[Diagonal hatching]		▲ SPT 2	100	2-4-6 (10)	2.0	25				
15	[Diagonal hatching]		▲ SPT 3	100	3-2-2 (4)	0.25	23	28	14	14	
20	[Diagonal hatching]		▲ SPT 4	100	0-0-0 (0)	<0.25	22				

Bottom of borehole at 21.5 feet.

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CLIENT <u>Hardin County Water District No. 2</u> PROJECT NUMBER <u>212-323</u> DATE STARTED <u>6/12/14</u> COMPLETED <u>6/12/14</u> DRILLER <u>Don Cash</u> DRILLING METHOD <u>Hollow-stem augers</u> LOGGED BY <u>Zack Pennington</u> CHECKED BY <u>Dennis Mitchell</u> NOTES _____	PROJECT NAME <u>Nolin River Sewer Infrastructure</u> PROJECT LOCATION <u>Glendale, KY</u> GROUND ELEVATION <u>735.8 ft</u> GROUND WATER LEVELS: ∇ AT TIME OF DRILLING <u>11.5 ft / Elev 724.30 ft</u> AT END OF DRILLING <u>---</u> AFTER DRILLING <u>---</u>
---	--

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N-VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			REMARKS
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL (18 inches)									
		(SP) SAND, fine to very fine grained, light brown to tan, wet, medium dense									
5		Soil becomes wet at approximately 5'	▲ SPT 1	87	4-6-8 (14)	1.5	15				
		(CH) fat CLAY, trace fine sand, trace fine gravel, reddish brown to red, wet, medium stiff									
10			▲ SPT 2	93	6-3-5 (8)	0.75	24				
15			▲ SPT 3	73	2-3-5 (8)	1.75	42				

Bottom of borehole at 16.5 feet.

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APPENDIX C

Laboratory Testing Results

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ATTERBERG LIMITS RESULTS



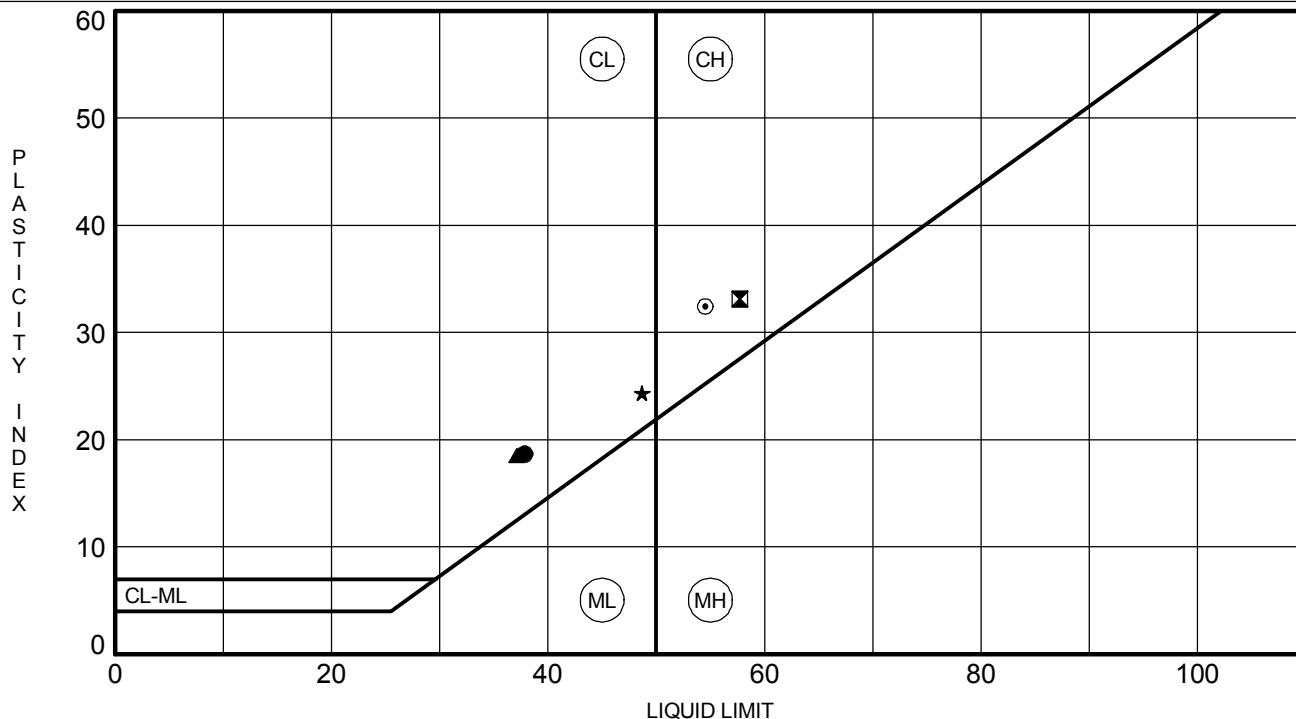
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CLIENT Hardin County Water District No. 2

PROJECT NAME Nolin River Sewer Infrastructure

PROJECT NUMBER 212-323

PROJECT LOCATION Glendale, KY



BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
● Rose Run #1	2.5	38	19	19		brown to gray lean clay
☒ Rose Run #1	7.5	58	25	33		red fat clay with gray mottle
▲ Rose Run #2	5.0	37	19	18		gray to brown lean clay
★ Rose Run #2	10.0	49	24	25		red lean clay
⊙ Rose Run #2	20.0	55	22	33		red gravelly fat clay

ATTERBERG LIMITS - GINT STD US LAB.GDT - 8/5/14 15:47 - T:\12 PROJECTS\212-323 NOLIN RIVER SEWER INFRASTRUCTURE\GEO\GINT\2013 EXPLORATION\2013 NOLIN RIVER SEWER.GPJ

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UNCONFINED COMPRESSION TEST



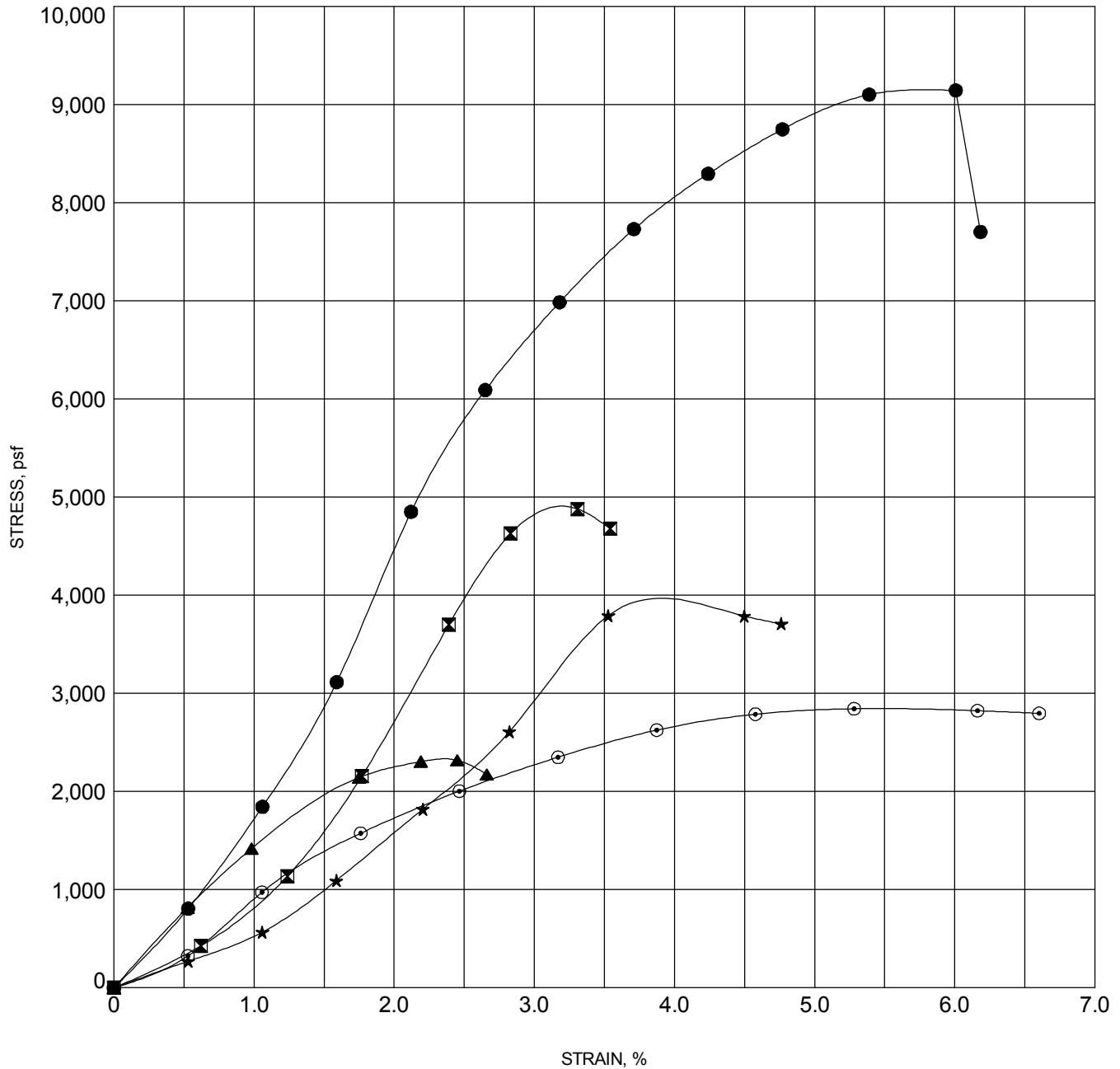
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CLIENT Hardin County Water District No. 2

PROJECT NAME Nolin River Sewer Infrastructure

PROJECT NUMBER 212-323

PROJECT LOCATION Glendale, KY



BOREHOLE	DEPTH	Classification	γ_d	Qu
● Rose Run #1	2.5	brown to gray lean clay	105	9147
◩ Rose Run #1	7.5	red fat clay with gray mottle	87	4881
▲ Rose Run #2	5.0	gray to brown lean clay	101	2319
★ Rose Run #2	10.0	red lean clay	98	3793
⊙ Rose Run #2	20.0	red gravelly fat clay	95	2844

UNCONFINED - GINT STD US LAB.GDT - 8/5/14 15:47 - T:\12 PROJECTS\212-323 NOLIN RIVER SEWER INFRASTRUCTURE\GEO\TECH\2013 EXPLORATION\2013 NOLIN RIVER SEWER.GPJ

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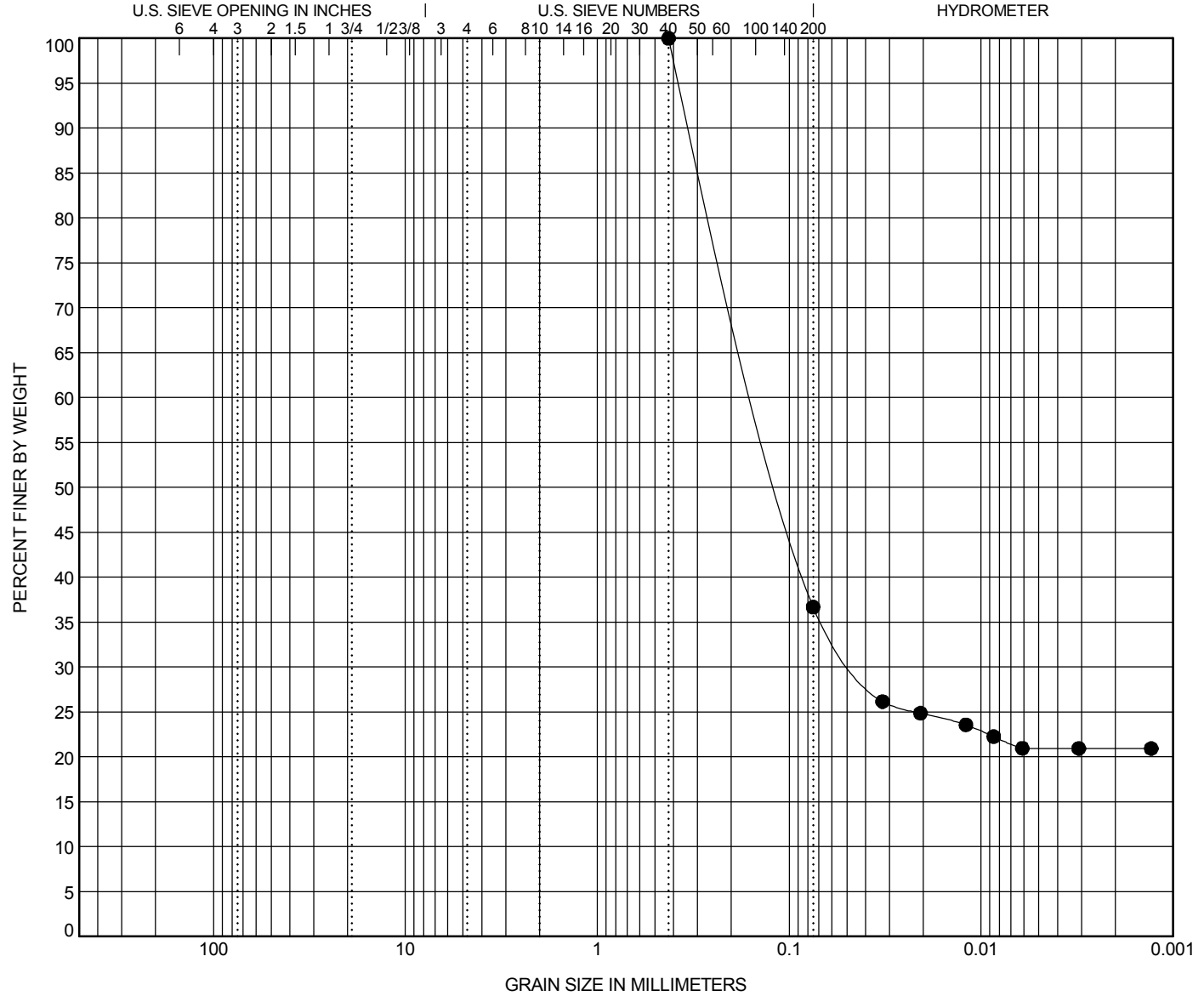
GRAIN SIZE DISTRIBUTION

CLIENT Hardin County Water District No. 2

PROJECT NAME Nolin River Sewer Infrastructure

PROJECT NUMBER 212-323

PROJECT LOCATION Glendale, KY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● B-114	35.0	reddish brown to red clayey sand					24	19	5		

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-114	35.0	0.425	0.142	0.044		0.0	63.3	15.7	21.0

GRAIN SIZE - GINT STD. US LAB. GDT - 8/5/14 15:43 - T:\12 PROJECTS\212-323 NOLIN RIVER SEWER INFRASTRUCTURE\GEO\TECH\2014 EXPLORATION\GLENDALE.GPJ

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Your Geotechnical Engineering Report

To help manage your risks, this information is being provided because subsurface issues are a major cause of construction delays, cost overruns, disputes, and claims.

Geotechnical Services are Performed for Specific Projects, Purposes, and People

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering exploration conducted for an engineer may not fulfill the needs of a contractor or even another engineer. Each geotechnical engineering exploration and report is unique and is prepared solely for the client. No one except the client should rely on the geotechnical engineering report without first consulting with the geotechnical engineer who prepared it. The report should not be applied for any project or purpose except the one originally intended.

Read the Entire Report

To avoid serious problems, the full geotechnical engineering report should be read in its entirety. Do not only read selected sections or the executive summary.

A Unique Set of Project-Specific Factors is the Basis for a Geotechnical Engineering Report

Geotechnical engineers consider a numerous unique, project-specific factors when determining the scope of a study. Typical factors include: the client's goals, objectives, project costs, risk management preferences, proposed structures, structures on site, topography, and other proposed or existing site improvements, such as access roads, parking lots, and utilities. Unless indicated otherwise by the geotechnical engineer who conducted the original exploration, a geotechnical engineering report should not be relied upon if it was:

- not prepared for you or your project,
- not prepared for the specific site explored, or
- completed before important changes to the project were implemented.

Typical changes that can lessen the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a multi-story hotel to a parking lot
- finished floor elevation, location, orientation, or weight of the proposed structure, anticipated loads or
- project ownership

Geotechnical engineers cannot be held liable or

responsible for issues that occur because their report did not take into account development items of which they were not informed. The geotechnical engineer should always be notified of any project changes. Upon notification, it should be requested of the geotechnical engineer to give an assessment of the impact of the project changes.

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that exist at the time of the exploration. A geotechnical engineering report should not be relied upon if its reliability could be in question due to factors such as man-made events as construction on or adjacent to the site, natural events such as floods, earthquakes, or groundwater fluctuation, or time. To determine if a geotechnical report is still reliable, contact the geotechnical engineer. Major problems could be avoided by performing a minimal amount of additional analysis and/or testing.

Most Geotechnical Findings are Professional Opinions

Geotechnical site explorations identify subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field logs and laboratory data and apply their professional judgment to make conclusions about the subsurface conditions throughout the site. Actual subsurface conditions may differ from those indicated in the report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risk associated with unanticipated conditions.

The Recommendations within a Report Are Not Final

Do not put too much faith on the construction recommendations included in the report. The recommendations are not final due to geotechnical engineers developing them principally from judgment and opinion. Only by observing actual subsurface conditions revealed during construction can geotechnical engineers finalize their recommendations. Responsibility and liability cannot be assumed for the recommendations

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within the report by the geotechnical engineer who developed the report if that engineer does not perform construction observation.

A Geotechnical Engineering Report Is Subject To Misinterpretation

Misinterpretation of geotechnical engineering reports has resulted in costly problems. The risk of misinterpretation can be lowered after the submittal of the final report by having the geotechnical engineer consult with appropriate members of the design team. The geotechnical engineer could also be retained to review crucial parts of the plans and specifications put together by the design team. The geotechnical engineering report can also be misinterpreted by contractors which can result in many problems. By participating in pre-bid and preconstruction meetings and providing construction observations by the geotechnical engineer, many risks can be reduced.

Final Boring Logs Should not be Re-drawn

Geotechnical engineers prepare final boring logs and testing results based on field logs and laboratory data. The logs included in a final geotechnical engineering report should never be redrawn to be included in architectural or design drawings due to errors that could be made. Electronic reproduction is acceptable, along with photographic reproduction, but it should be understood that separating logs from the report can elevate risk.

Contractors Need a Complete Report and Guidance

By limiting what is provided for bid preparation, contractors are not liable for unforeseen subsurface conditions although some owners and design professionals believe the opposite to be true. The complete geotechnical engineering report, accompanied with a cover letter or transmittal, should be provided to contractors to help prevent costly problems. The letter states that the report was not prepared for purposes of bid

development and the report's accuracy is limited. Although a fee may be required, encourage the contractors to consult with the geotechnical engineer who prepared the report and/or to conduct additional studies to obtain the specific types of information they need or prefer. A prebid conference involving the owner, geotechnical engineer, and contractors can prove to be very valuable. If needed, allow contractors sufficient time to perform additional studies. Upon doing this you might be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Closely Read Responsibility Provisions

Geotechnical engineering is not as exact as other engineering disciplines. This lack of understanding by clients, design professionals, and contractors has created unrealistic expectations that have led to disappointments, claims, and disputes. To minimize such risks, a variety of explanatory provisions may be included in the report by the geotechnical engineer. To help others recognize their own responsibilities and risks, many of these provisions indicate where the geotechnical engineer's responsibilities begin and end. These provisions should be read carefully, questions asked if needed, and the geotechnical engineer should provide satisfactory responses.

Environmental Issues/Concerns are not Covered

Unforeseen environmental issues can lead to project delays or even failures. Geotechnical engineering reports do not usually include environmental findings, conclusions, or recommendations. As with a geotechnical engineering report, do not rely on an environmental report that was prepared for someone else.



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65 Aberdeen Drive
Glasgow, KY 42141
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Indianapolis, Indiana | 317.423.0935

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*Corporate Headquarters

