

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

**PETITION OF COMMUNITY UTILITIES OF)
INDIANA, INC. FOR APPROVAL OF (1))
EXPENDITURES FOR CONSTRUCTION OF)
ADDITIONS AND IMPROVEMENTS TO)
PETITIONER'S WASTEWATER UTILITY)
PROPERTIES, AND (2) THE INCLUSION OF THE)
VALUE OF SUCH NEW FACILITIES, INCLUDING)
PLAN DEVELOPMENT AND IMPLEMENTATION)
COSTS, IN PETITIONER'S RATE BASE IN FUTURE)
CASES.)**

CAUSE NO. 45389

**PETITIONER'S SUBMISSION OF DIRECT TESTIMONY OF
SEAN CARONARO**

VOLUME 6

CONTRACT DOCUMENTS AND SPECIFICATIONS

FOR

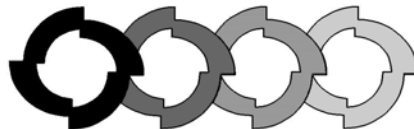
TWIN LAKES SANITARY SEWER IMPROVEMENTS - PHASE 1

PREPARED FOR

COMMUNITY UTILITIES OF INDIANA, INC.

PREPARED BY

**RHMG ENGINEERS, INC.
CONSULTING ENGINEERS
975 CAMPUS DRIVE
MUNDELEIN, IL 60060**



PROJECT NO. 21901140

MARCH, 2020



INDEX TO CONTRACT DOCUMENTS

FOR

TWIN LAKES
 SANITARY SEWER IMPROVEMENTS - PHASE 1

PREPARED FOR

COMMUNITY UTILITIES OF INDIANA, INC.

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ADVERTISEMENT FOR BIDS

COMMUNITY UTILITIES OF INDIANA, INC.
TWIN LAKES SANITARY SEWER IMPROVEMENTS - PHASE 1

PUBLIC NOTICE is hereby given that Sealed Proposals will be received by Community Utilities of Indiana, Inc., at the office of RHMG Engineers, Inc., 975 Campus Drive, Mundelein, IL 60060 until 2:00 PM local time on April 2, 2020 at which time all proposals will be privately opened for the construction of the Twin Lakes Sanitary Sewer Improvements - Phase 1 in accordance with the Drawings, Specifications and Contract Documents prepared by RHMG Engineers, Inc., Consulting Engineers.

The work for which proposals are invited consists of the construction of:

- Approximately 5,579 lf of polyvinyl chloride (PVC) forcemain ranging in diameters from 8-inches to 12-inches constructed with open cut and horizontal directional drilling methods.
- Approximately 3,013 lf of 14-inch diameter ductile iron forcemain constructed with open cut and horizontal directional drilling methods.
- Approximately 550 lf of 16-inch diameter high density polyethylene (HDPE) forcemain ranging constructed with horizontal directional drilling method.
- An approximate 45 lf bored and jacked crossing of 123rd Avenue, with 24-inch casing pipe and 14-inch carrier pipe.
- Approximately 90 lf of 14-inch ductile iron pipe installation using augering methods.
- Approximately 230 lf of PVC sanitary sewer ranging in diameters from 8-inches to 18-inches.
- Construction of a new raw wastewater submersible lift station, including concrete wet well and valve vault, submersible pumps, piping, valving, electrical and control work, and all necessary appurtenances.
- Rehabilitation of two existing raw wastewater submersible lift stations, including new submersible pumps installed in the existing wet well, new concrete valve vault, new piping, valving, electrical and control work, and all necessary appurtenances.
- Installation of three new 125 KW, natural gas generators
- Sitework, paving, restoration, landscaping work, and all associated appurtenances, as detailed and specified.

All construction to take place in unincorporated Lake County, Indiana.

DRAWINGS, SPECIFICATIONS AND CONTRACT DOCUMENTS

Drawings, Specifications and Contract Documents may be obtained upon by contacting ksheldon@rhmg.com at the office of RHMG Engineers, Inc., 975 Campus Drive, Mundelein, IL 60060, phone (847)362-5959. Each set includes Drawings, Specifications and Contract Documents which will be digitally transmitted to the applicant.

Copies of the Drawings, Specifications and Contract Documents may be examined at:

RHMG Engineers, Inc.
975 Campus Drive
Mundelein, IL 60060

McGraw-Hill Construction
www.network.construction.com
(This is a subscriber-based website.)

ConstructConnect
docprocessing@CMDGroup.com
(This is a subscriber-based website.)

PROPOSAL GUARANTY

Each proposal must be submitted on the proper forms contained in the Contract Documents and shall be accompanied by a certified check, cash or bid bond, or an acceptable form of Proposal Guaranty in an amount equal to at least five percent (5%) of the amount of the Proposal, payable to the Order of Community Utilities of Indiana, Inc. as a guaranty that if the Proposal is accepted, the Bidder will execute the Contract and file acceptable Performance Bond and Payment Bond after the award of the Contract. No Bid shall be withdrawn after the opening of bids without the consent of the Owner for a period of one hundred eighty (180) days after the scheduled time of receiving bids.

PERFORMANCE BOND AND LABOR AND MATERIALS PAYMENT BOND

The successful bidder will be required to furnish a satisfactory Performance Bond and Labor and Materials Payment Bond in the full amount of the Bid or Proposal.

PRE-BID CONFERENCE

A pre-bid conference will be held on March 19, 2020 at 11:00 a.m. local time at the Community Utilities of Indiana wastewater treatment plant garage, located at 9201 E. 123rd Avenue, Crown Point, IN 46307 to familiarize bidders with this project and conduct a site tour.

Bidders are strongly encouraged to attend the pre-bid conference to review project site conditions. **This project is located within the Lakes of the Four Seasons development, which is a gated community with restricted access. Access to the project site at other times may be possible with arrangements made in advance with Mr. Loren Grosvenor at Loren.Grosvenor@uiwater.com or at (815)509-0317.**

CONTRACT TIME

The project is to be substantially complete within 365 calendar days commencing from the issuance of the Notice to Proceed. Final completion is required within 425 calendar days, commencing from the issuance of the Notice to Proceed.

PREVAILING WAGES NOT REQUIRED

Community Utilities of Indiana is a private utility company and private funds will be used for this project. This project is exempt from use of union workers and prevailing wage rate requirements.

STATE SALES TAX EXEMPTION

This project is exempt from state sales tax. Owner will provide sales exempt tax number to the successful Bidder.

OWNER'S RIGHTS RESERVED

Owner reserves the right to reject any or all Proposals or any portion thereof or to accept any proposal or portion thereof and to waive any informality or technicality in any Proposal in the interest of Owner.

Dated this 6th day of March, 2020.

Community Utilities of Indiana, Inc.

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SECTION 00100

INSTRUCTIONS TO BIDDERS

1. GENERAL

1.01 PROJECT IDENTIFICATION

- A. Proposals are requested for the construction of the Twin Lakes Sanitary Sewer Improvements - Phase 1 for Community Utilities of Indiana, Inc., hereinafter called the Owner, to be performed in accordance with Drawings, Specifications and Contract Documents prepared by RHMG Engineers, Inc., hereinafter called the Engineer/Architect (E/A) or Engineer.

1.02 BIDDING DOCUMENTS

A. Definition

1. Bidding Documents include the Advertisement for Bids, Instructions to Bidders, Bid Form, other sample bidding and contract forms, and the proposed Contract Documents, including any Addenda issued prior to receipt of bids.

B. Copies

1. Bidding Documents may be obtained in compliance with the Advertisement for Bids. No partial sets of the Bidding Documents will be issued. Complete sets of Bidding Documents shall be used in preparing bids; neither the Owner nor the E/A will assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
2. The Owner will furnish to the successful bidder two (2) sets of Bidding Documents at no cost to the successful bidder.
3. Owner and Engineer, in making copies available, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

C. Questions

1. Any Bidder who is in doubt as to the true meaning of any part of the Bidding Documents, or finds a discrepancy or omission therein, may submit to the E/A a written request for an interpretation or correction. The person submitting the request shall be responsible for its delivery to the E/A at least seven (7) days prior to the bid opening date. Any interpretation, correction or

change of the Bidding Documents will be made by Addendum. Interpretations, corrections or changes made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes.

2. Neither Owner nor Engineer will give oral answers or instructions in response to any inquiries received prior to the award of the Contract regarding the meaning of the Bidding Documents or the Contract nor any oral indication as to the validity of any such inquiry. Any such oral answer, instruction or indication shall not be binding, shall be deemed to be unauthorized and given informally for the convenience of the person making the inquiry, shall not be guaranteed, and shall not be relied upon by any prospective Bidder. By submitting a Bidder's Proposal, each Bidder shall be deemed to have agreed that such information has not been used as a basis of its Bidder's Proposal and that the giving of any such information does not entitle such Bidder to assert any claim or demand against Owner or Engineer on account thereof.

D. Addenda

1. Addenda will be mailed or otherwise delivered to all planholders who received a complete set of Bidding Documents from the E/A. All Addenda issued during the time of bidding, shall be covered in the Bid, and shall become a part of the Contract. Receipt of each Addendum shall be acknowledged in the Bid Form; failure to do so may subject the Bidder to disqualification.

1.03 EXAMINATION OF DOCUMENTS AND INSPECTION OF SITE

- A. Before submitting a Bid, Bidders shall carefully examine the Bidding Documents and inspect the project site to fully inform themselves of all existing conditions and limitations. Each Bidder, by submitting his Bid, represents that he has so examined the Bidding Documents and inspected the site, that he understands the provisions of the Bidding Documents and that he has familiarized himself with the local conditions under which the work is to be performed. Bidders will not be given extra payment or contract time for conditions which could have been determined by such examinations.

1.04 BIDDING PROCEDURE

A. Form of Bid

1. Each Bid shall be submitted on the Bid Form prepared by the E/A and included as one of the Bidding Documents. The Bidder is not permitted to make changes in the Bid Form provided. The Bidder shall fill in spaces on the

Bid Form by typewriter or manually in ink. When a Bidder submits a bid with spaces containing erasures or other changes, each erasure or change must be initialed by the person signing the Bid.

2. The Bidder must fill in all relevant blank spaces. Where so indicated by the makeup of the Bid Form, amounts shall be expressed in both words and figures, and in case of discrepancy between the two, the amount in words shall govern. In Unit Price type bids, the Bidder must furnish a Unit Price for all items, regardless of the quantity. In case of discrepancy between the Unit Price and the Total Amount, the Unit Price shall govern.
3. No conditional Bids will be accepted. Alternate Bids will not be considered unless called for. Oral proposals or modifications will not be considered.
4. The Bid shall include the legal name of the Bidder and a statement whether the Bidder is a sole proprietor, a partnership, a corporation, or any other legal entity, and the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a Contract. A bid by a corporation shall further give the State of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current Power of Attorney attached certifying agent's authority to bind Bidder.

B. Bid Security

1. Each Bid shall be accompanied by a Bid Security in the form of a certified check or bid bond in an amount equal to at least five percent (5%) of the Total Bid Price, payable without condition to the Owner, as a guaranty that the Bidder, if awarded the Contract, will promptly execute the Agreement in accordance with the Bidding Documents, and will furnish Performance and Labor and Material Payment Bonds as specified herein. Bid Bond, if used, shall be on the form provided as Section 00410.
2. Surety companies executing bonds must hold certificates of authority as acceptable sureties (31CFR223) and be authorized to transact business in the state where the Project is located.
3. If for any reason the Bidder withdraws his bid after Bid Opening and prior to the time specified under "Modification and Withdrawal" herein or fails to execute an Agreement or to provide the specified bonds, such Bidder shall be in default. The defaulting Bidder and his surety shall pay to the Owner all costs incurred by the Owner for procuring the performance of the work

required by the Bidding Documents which exceed the amount of his Bid, including engineering and legal costs.

4. The Bid Security of all except the three (3) apparent lowest Bidders will be returned within 10 days after the review of Bids.

C. Submission of Bids.

1. The Bid, the Bid Security, and any other documents required to be submitted with the bid shall be enclosed in a sealed opaque envelope. This envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name and the Bidder's name and address. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "Bid Enclosed" on the face thereof. No bids will be accepted via email or facsimile (fax) machine.
2. Bids shall be delivered to the designated location prior to the time and date for receipt of Bids indicated in the Advertisement for Bids or any extension thereof made by Addendum. Bids received after the time and date for receipt of Bids will be returned unopened to the person or firm submitting the bid.
3. The Bidder shall assume full responsibility for timely delivery of his Bid to the designated location.

D. Modification and Withdrawal

1. Bidders may withdraw Bids at any time prior to the Bid Opening time and date. Withdrawal requests shall be made in writing and must be received by the Owner before the time and date stated or as addended for the Bid Opening. Properly withdrawn Bids will be returned unopened to the Person or firm submitting the bid.
2. A Bidder may modify his Bid at any time prior to the Bid Opening time and date by withdrawing his Bid and submitting a new Bid in the same manner as specified herein under "Submission of Bid". A Bid submitted in place of a withdrawn Bid shall be clearly marked as such on the outside of the envelope and on the Bid Form.
3. If a Contract is not awarded within one hundred eighty (180) calendar days after opening of Bids, a Bidder may file a written request with the Owner for the withdrawal of his Bid.

1.05 CONSIDERATION OF BIDS AND BASIS OF AWARD

A. Basis of Award

1. Except in cases where the Owner exercises the right to reject all Bids, the Contract will be awarded by the Owner, as soon as practicable after Opening of Bids, to the responsive, responsible Bidder who has submitted the lowest Bid.
2. The lowest Bid will be determined by comparison of the "TOTAL BID AMOUNT FOR DETERMINATION OF LOWEST BID" as stated in writing on the Bid Form.
3. The Owner reserves the right to reject any or all Proposals or any portion thereof, and to waive any informality or technicality in any Proposal in the interest of the Owner.
4. The Owner reserves the right to increase or decrease contract quantities by 25 percent. Increases or decreases in the contract quantities will be added or deducted from the contract according to the unit bid prices. No allowance will be made for changes to the unit bid prices.

B. Evaluation of Responsiveness

1. The responsiveness of Bidders will be judged on the basis of the completeness of the Bid submitted. To be responsive, a Bid must be submitted on the forms provided as part of the Bid Documents and shall include the following:
 - a. Bid Form with all of the following properly completed:
 - (1) Acknowledgement of receipt of all Addenda.
 - (2) Bid Amount, including Unit Prices for all items.
 - (3) Signatures required for a binding Bid.
 - b. Notarized power-of-attorney, if required.
 - c. Bid Security complying with the requirements of the Bidding Documents.
 - d. Contractor Qualification Form included in Section 00330.
2. If, upon opening the Bid, any of the items required to be responsive are found to be missing or incomplete, the Bidder will be judged non-responsive and the bid will be rejected.

C. Evaluation of Responsibility

1. To be judged responsible, the Bidder shall meet the following standards:
 - a. Have adequate financial resources for performance, the necessary experience, organization, technical qualifications, and facilities, or a firm commitment, arrangement, or ability to obtain such (including proposed subcontracts).
 - b. Be able to comply with the required completion schedule for the project by demonstrating number of equipment and employees available for this project and appropriate controls over subcontractors.
 - c. Have a satisfactory record of integrity, judgment, and performance.
 - d. Maintain a drug free workplace.
 - e. Have adequate safety procedures and management, including safety records in accordance with OSHA standards.
 - f. Have an adequate financial management system and audit procedure which provides efficient and effective accountability and control of all property, funds, and assets.
 - g. Conform with the civil rights, equal employment opportunity and labor law requirements of the Bid Documents.
2. Within three calendar days of being notified of being the apparent lowest, responsive Bidder, the Bidder shall submit for himself and any subcontractor providing more than \$300,000 of services in conjunction with this project the following information to the Owner for evaluation to determine compliance with the responsibility requirements:
 - a. A statement of the Bidder's organization, including resumes of key personnel, especially those personnel proposed for work on this Project.
 - b. A list of names, titles, addresses, and telephone numbers of individuals who have responsibility for operation of equipment comparable in design, construction and use to the units proposed that the bidder has furnished.
 - c. A current (within the last 12 months) audited financial statement prepared in accordance with

generally accepted accounting procedures. The financial statement shall include, as a minimum an income statement, a statement of changes and related footnotes, a balance sheet, and certification that the financial status of the company has not materially changed since the audit.

d. A list of at least three (3) references for similar projects completed within the last five years. Include contact person, title, telephone number, address, scope of project, contract value, and date completed.

e. Contractor Qualification form included in Section 00330.

3. Except as specified under the heading "Evaluation of Responsiveness", if any information required by the Bidding Documents to be submitted with the Bid or subsequent to bidding but prior to Award is not submitted as required, the Bid will be considered irregular. Failure to promptly correct the irregularity upon notification by the Owner may cause the Bidder to be judged non-responsible.

1.06 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

- A. The successful Bidder, simultaneously with the execution of the Agreement, shall furnish a Performance Bond and a Labor and Material Payment Bond, each in an amount equal to 100 percent of the Contract Price. The Bonds shall be secured from a surety company acceptable to the Owner. The forms of the Bonds the successful Bidder will be required to execute are included in the Bidding Documents as Sections 00610 and 00620.

1.07 MAJOR EQUIPMENT

- A. Each Bidder must indicate in his Bid the equipment manufacturers of Major Equipment he will provide if awarded the Contract. The Bidder shall list one manufacturer for each piece of equipment. If the Bidder fails to indicate a manufacturer or indicates a manufacturer that is not applicable or lists more than one manufacturer, the Owner will state what manufacturer is to be furnished.

1.08 SUBSTITUTION OF MAJOR EQUIPMENT

- A. The Bid Price shall be based upon providing equipment that complies with the Contract Documents and is manufactured by the manufacturer named in the Specifications.

- B. For major equipment, which is defined as those items listed in the "Major Equipment" paragraph of the Bid Form, Bidders may propose to provide equipment by manufacturers other than those named in the Bid Form. In order to propose a substitute manufacturer, the Bidder shall indicate in the Bid Form the manufacturer of the proposed substitute and the amount to be deducted from or added to the Base Bid if a proposed substitution is accepted by the Owner. The amount deducted from or added to the Base Bid, if a proposed substitution is accepted, shall include all changes which may be required to accommodate the proposed equipment, including changes to structures, finishes, mechanical work, electrical work, instrumentation, other equipment, etc., and all associated engineering redesign fees.
- C. Contract award for the Work will be based upon the Base Bid. No proposed substitutions will be evaluated until after execution of the Agreement. The Contractor will be required to submit information on proposed substitutions as specified in Section 01600. No proposed substitution will be accepted unless, in the opinion of the E/A and Owner, it complies with the following:
1. The proposed substitute equipment complies with the Contract Documents in all respects, except manufacturer and minor details.
 2. The proposed substitute equipment will satisfactorily and continuously perform the required functions in a manner at least equal to the specified equipment.
- D. If a proposed substitution is accepted, a change order will be issued in compliance with the General Conditions, Section 00700. No additional Contract Time will be allowed in change orders resulting from the acceptance of proposed major equipment substitutions.

END OF SECTION



SECTION 00300

BID FORM

1. GENERAL

1.01 DESCRIPTION

A. The following Bid is hereby made to Community Utilities of Indiana, Inc. hereafter called the Owner. Bid is submitted by:

(insert legal name, address, and whether sole proprietor, partnership or corporation.)

1.02 THE UNDERSIGNED

A. Acknowledges receipt of:

1. Contract Documents, Specifications, and Drawings for the Twin Lakes Sanitary Sewer Improvements - Phase 1 project for Community Utilities of Indiana, Inc. prepared by RHMG Engineers, Inc.,

2. Addenda:

Number _____, dated _____.

Number _____, dated _____.

Number _____, dated _____.

Number _____, dated _____.

Number _____, dated _____.

B. Has examined the site and all Bidding Documents and understands that in submitting his Bid he waives all right to plead any misunderstanding regarding the same.

C. Agrees:

1. To hold his bid open for one hundred eighty (180) calendar days after the bid opening date.

2. To accept the provisions of the Instructions to Bidders regarding disposition of Bid Security.

3. To enter into and execute a contract with the Owner, if awarded on the basis of his Bid, and to furnish a Performance Bond and a Labor and Material Payment Bond in accordance with the Instructions to Bidders.
4. To accomplish the work in accordance with the Contract Documents.
5. To begin work no later than 10 calendar days after the issuance of a Notice to Proceed, unless otherwise provided, and to substantially complete the work, as defined in the General Conditions, on or before the dates or within the number of calendar days specified in the Agreement. Final completion shall be on or before the dates or within the number of calendar days specified in the Agreement.

1.03 CASH ALLOWANCE

- A. The Contractor shall include in his Bid the cash allowances indicated in the Supplementary Conditions.

1.04 QUANTITIES AND CONTRACT PRICES

- A. The undersigned agrees that the unit prices submitted herewith may be used in computing the value of extras and deductions and that quantities as shown on the plans or as specified herein are approximate only. The final contract price will be paid for as actually constructed or installed as specified in the various unit price contract items.

1.05 SCHEDULE OF UNIT PRICES

- A. I will construct this project for the following unit prices.

For complete information covering these items, see plans and specifications.

The undersigned submits herewith his schedule of unit prices covering the work to be performed under this contract:

1.05.B SCHEDULE OF UNIT PRICES

NOTES:

- 1) **CONTRACT UNIT PRICES FOR FORCEMAIN TO INCLUDE COST FOR LEAKAGE AND PRESSURE TESTING, ETC., AS APPLICABLE.**
- 2) **CONTRACT UNIT PRICES FOR SANITARY SEWER TO INCLUDE COST FOR SEWER CLEANING, LEAKAGE TESTING, TELEVISIONING AND DEFLECTION TESTING, ETC., AS APPLICABLE.**
- 3) **SEE SPECIFICATION SECTION 01025, "MEASUREMENT AND PAYMENT" AND/OR THE CONTRACT DRAWINGS FOR WORK, MATERIAL, ETC., INCLUDED IN EACH BID ITEM.**

LIFT STATION C, LIFT STATION C FORCEMAIN AND SANITARY SEWER					
ITEM NO.	UNIT PRICE ITEM	UNIT	APPROX. NO. OF UNITS	PRICE PER UNIT	EXTENSION
C1.	8-inch PVC, AWWA C900, DR18 Forcemain, MANDATORY open cut installation , STA 10+00 to STA 11+15 and STA 23+60 to STA 23+97	Foot	152	\$	\$
C2.	10-inch PVC, AWWA C900, DR18 Sewer, Open Cut, STA 23+97 to STA 24+17	Foot	20	\$	\$
C3.	4-ft. dia. Sanitary Sewer Manhole, STA 23+97	Each	1	\$	\$
C4.	Pig Launching Station, Including Pigging of Forcemain	Lump Sum	1	\$	\$
C5.	8" Plug Valve with Valve Box	Each	1	\$	\$
C6.	Undercut/Stabilization Stone for Forcemain and Gravity Sewer, 10+00 to STA 11+15 and STA 23+60 to STA 23+97, STA 23+97 to STA 24+17	Cubic Yard	20	\$	\$
C7.	Granular Trench Backfill for Forcemain and Gravity Sewer (all locations and depths), Paved Areas between STA 10+00 to STA 11+15 and STA 23+60 to STA 23+97, STA 23+97 to STA 24+17	Foot	75	\$	\$
C8.	Bituminous Roadway Pavement Removal and Replacement (1-1/2-inch Surface, 2-1/2-inch Binder, 12-inch Aggregate Base) between STA 10+00 to STA 11+15 and STA 23+60 to STA 23+97, STA 23+97 to STA 24+17	Foot	65	\$	\$
C9.	Landscaping: Seeding per Section 02485, Including 4-inch (Min.) Topsoil and Excelsior Blanket, between STA 10+00 to STA 11+15, STA 23+60 to STA 23+97, STA 23+97 to STA 24+17	Foot	85	\$	\$

LIFT STATION C FORCEMAIN FROM STA 11+15 TO STA 23+97 MAY BE CONSTRUCTED USING EITHER HORIZONTAL DIRECTIONAL DRILLING OR OPEN CUT METHODS. BIDDER SHALL SELECT ONE OF THE TWO METHODS TO BE USED BELOW:

CHOOSE ONE	I will construct the forcemain from STA 11+15 TO STA 23+60 using horizontal directional drilled installation.	Circle either: YES or NO	If Yes, complete Item C10 below. Cross out and do not complete Items C11 through C16 below.
	I will construct the forcemain from STA 11+15 TO STA 23+60 using open cut installation.	Circle either: YES or NO	If Yes, complete Items C11 through C16 below. Cross out and do not complete Item C10 below.

ITEM NO.	UNIT PRICE ITEM	UNIT	APPROX. NO. OF UNITS	PRICE PER UNIT	EXTENSION
C10.	8-inch PVC, AWWA C900, DR-18 Restrained Joint Forcemain, Horizontal Directional Drilled Installation, STA 11+15 TO STA 23+60	Foot	1,245	\$	\$
C11.	8-inch PVC, AWWA C900, DR-18 Forcemain, Open Cut Installation, STA 11+15 TO STA 23+60	Foot	1,245	\$	\$
C12.	Granular Trench Backfill for Forcemain (all locations and depths), Paved Areas, between STA 11+15 to STA 23+60	Foot	300	\$	\$
C13.	Bituminous Roadway Pavement Removal and Replacement (1-1/2-inch Surface, 2-1/2-inch Binder, 12-inch Aggregate Base), between STA 11+15 to STA 23+60	Foot	47	\$	\$
C14.	Bituminous Driveway Pavement Removal and Replacement (3-inch Surface, 6-inch Aggregate Base), between STA 11+15 to STA 23+60	Foot	147	\$	\$
C15.	Concrete Driveway Pavement Removal and Replacement (6-inch Concrete, 4-inch Aggregate Base), between STA 11+15 to STA 23+60	Foot	90	\$	\$
C16.	Landscaping: Seeding per Section 02485, Including 4-inch (Min.) Topsoil and Excelsior Blanket, between STA 11+15 to STA 23+60	Foot	1,060	\$	\$
C17.	Lift Station C and Site Improvements	Lump Sum	1	\$	\$
C18.	Lift Station Bypass Pumping	Lump Sum	1	\$	\$
C19.	Traffic Control per Specification Section 01000 and as noted on the Contract Drawings	Lump Sum	1	\$	\$
C20.	Dust and Mud Control per Specification Section 01000 and as Directed by the Engineer	Lump Sum	1	\$	\$
C21.	Soil Erosion and Sedimentation Control	Lump Sum	1	\$	\$
C22.	Portable Sediment Containment System	Lump Sum	1	\$	\$
C23.	Sanitary Service Repair / Reconnection	Each	8	\$	\$
C24.	Water Service Repair / Reconnection	Each	7	\$	\$
C25.	Repair of Existing Watermain / Forcemain Leaks / Breaks Not Caused by Contractor's Negligence	Each	4	\$	\$
C26.	Pre-Construction Video	Lump Sum	1	\$	\$
C27.	Mobilization	Lump Sum	1	\$	\$

TOTAL BID AMOUNT C (FOR LIFT STATION C, LIFT STATION C FORCEMAIN AND SANITARY SEWER)

_____ WORDS
 \$ _____ FIGURES

LIFT STATION B, LIFT STATION B FORCEMAIN AND SANITARY SEWER					
ITEM NO.	UNIT PRICE ITEM	UNIT	APPROX. NO. OF UNITS	PRICE PER UNIT	EXTENSION
B1.	8-inch PVC, AWWA C900, DR18 Forcemain, MANDATORY open cut installation , STA 10+00 to STA 10+36 and STA 11+55 to STA 13+38	Foot	230	\$	\$
B2.	12-inch PVC, AWWA C900, DR18 Forcemain, MANDATORY open cut installation , STA 17+15 to STA 17+35, STA 21+00 to STA 23+25, STA 24+90 to STA 25+20, STA 31+40 to STA 31+70, STA 37+55 to STA 37+95, STA 51+00 to STA 51+70	Foot	431	\$	\$
B3.	18-inch PVC, AWWA C-905, DR-18 Sewer, Open Cut, STA 51+70 to STA 52+97	Foot	143	\$	\$
B4.	8-inch PVC, AWWA C900, DR18 Sewer, Open Cut, Between MH's 301 and 302	Foot	67	\$	\$
B5.	8" Plug Valve with Valve Box	Each	2	\$	\$
B6.	4-ft. dia. Sanitary Sewer Manhole, STA 37+ 86 and 51+70	Each	2	\$	\$
B7.	Pig Launching Station, Including Pigging of Forcemain	Lump Sum	1	\$	\$
B8.	Air Release Valve & Vault	Each	4	\$	\$
B9.	Undercut/Stabilization Stone for Forcemain and Gravity Sewer, STA 10+00 to STA 10+36, STA 11+55 to STA 13+38, STA 17+15 to STA 17+35, STA 21+00 to STA 23+25, STA 24+90 to STA 25+20, STA 31+40 to STA 31+70, STA 37+55 to STA 37+95, STA 51+00 to STA 51+70, STA 51+70 to STA 52+97	Cubic Yard	110	\$	\$
B10.	Granular Trench Backfill for Forcemain and Gravity Sewer (all locations and depths), Paved Areas between STA 10+00 to STA 10+36, STA 11+55 to STA 13+38, STA 17+15 to STA 17+35, STA 21+00 to STA 23+25, STA 24+90 to STA 25+20, STA 31+40 to STA 31+70, STA 37+55 to STA 37+95, STA 51+00 to STA 51+70, STA 51+70 to STA 52+97	Foot	210	\$	\$
B11.	Bituminous Roadway Pavement Removal and Replacement (1-1/2-inch Surface, 2-1/2-inch Binder, 12-inch Aggregate Base) between STA 10+00 to STA 10+36 STA 11+55 to STA 13+38, STA 17+15 to STA 17+35, STA 21+00 to STA 23+25, STA 24+90 to STA 25+20, STA 31+40 to STA 31+70, STA 37+55 to STA 37+95, STA 51+00 to STA 51+70, STA 51+70 to STA 52+97	Foot	154	\$	\$
B12.	Bituminous Driveway Pavement Removal and Replacement (3-inch Surface, 6-inch Aggregate Base) between STA 51+70 to STA 52+97	Foot	10	\$	\$

ITEM NO.	UNIT PRICE ITEM	UNIT	APPROX. NO. OF UNITS	PRICE PER UNIT	EXTENSION
B13.	Concrete Driveway Pavement Removal and Replacement (6-inch Concrete, 4" Aggregate Base) between STA 17+15 to STA 17+35, STA 21+00 to STA 23+25, STA 24+90 to STA 25+20, STA 31+40 to STA 31+70, STA 37+55 to STA 37+95, STA 51+00 to STA 51+70	Foot	38	\$	\$
B14.	Aggregate Shoulder and Driveway Replacement, 8-inch, between STA 17+15 to STA 17+35, STA 21+00 to STA 23+25, STA 24+90 to STA 25+20, STA 31+40 to STA 31+70, STA 37+55 to STA 37+95, STA 51+00 to STA 51+70, STA 51+70 to STA 52+97	Foot	20	\$	\$
B15.	Landscaping: Seeding per Section 02485, Including 4-inch (Min.) Topsoil and Excelsior Blanket, between STA 10+00 to STA 10+36, STA 11+55 to STA 13+38, STA 17+15 to STA 17+35, STA 21+00 to STA 23+25, STA 24+90 to STA 25+20, STA 31+40 to STA 31+70, STA 37+55 to STA 37+95, STA 51+00 to STA 51+70, STA 51+70 to STA 52+97	Foot	710	\$	\$
B16.	8-inch PVC, AWWA C900, DR-18 Restrained Joint Forcemain, MANDATORY Horizontal Directional Drilled Installation , STA 10+36 to STA 11+55	Foot	119	\$	\$
B17.	12-inch PVC, AWWA C900, DR-18 Restrained Joint Forcemain, MANDATORY Horizontal Directional Drilled Installation , STA 23+25 to STA 24+90, STA 25+20 to STA 31+40, , STA 31+70 to STA 36+15	Foot	1,230	\$	\$

LIFT STATION B FORCEMAIN FROM STA 13+53 to STA 17+15 MAY BE CONSTRUCTED USING EITHER HORIZONTAL DIRECTIONAL DRILLING OR OPEN CUT METHODS. BIDDER SHALL SELECT ONE OF THE TWO METHODS TO BE USED BELOW:

CHOOSE ONE	I will construct the forcemain from STA 13+53 to STA 17+15 using horizontal directional drilled installation.	Circle either: YES or NO	If Yes, complete Item B18 below. Cross out and do not complete Items B19 through B20 below.		
	I will construct the forcemain from STA 13+53 to STA 17+15 using open cut installation.	Circle either: YES or NO	If Yes, complete Items B19 through B20 below. Cross out and do not complete Item B18 below.		
B18.	12-inch PVC, AWWA C900, DR-18 Restrained Joint Forcemain, Horizontal Directional Drilled Installation, STA 13+53 to STA 17+15	Foot	362	\$	\$
B19.	12-inch PVC, AWWA C900, DR-18 Forcemain, Open Cut Installation, STA 13+53 to STA 17+15	Foot	362	\$	\$
B20.	Landscaping: Seeding per Section 02485, Including 4-inch (Min.) Topsoil and Excelsior Blanket, between STA 13+53 to STA 17+15	Foot	370	\$	\$

ITEM NO.	UNIT PRICE ITEM	UNIT	APPROX. NO. OF UNITS	PRICE PER UNIT	EXTENSION
LIFT STATION B FORCEMAIN FROM STA 17+35 to STA 21+00 MAY BE CONSTRUCTED USING EITHER HORIZONTAL DIRECTIONAL DRILLING OR OPEN CUT METHODS. BIDDER SHALL SELECT ONE OF THE TWO METHODS TO BE USED BELOW:					
CHOOSE ONE	I will construct the forcemain from STA 17+35 to STA 21+00 using horizontal directional drilled installation.		Circle either: YES or NO	If Yes, complete Item B21 below. Cross out and do not complete Items B22 through B25 below.	
	I will construct the forcemain from STA 17+35 to STA 21+00 using open cut installation.		Circle either: YES or NO	If Yes, complete Items B22 through B25 below. Cross out and do not complete Item B21 below.	
B21.	12-inch PVC, AWWA C900, DR-18 Restrained Joint Forcemain, Horizontal Directional Drilled Installation, STA 17+35 to STA 21+00	Foot	365	\$	\$
B22.	12-inch PVC, AWWA C900, DR-18 Forcemain, Open Cut Installation, STA 17+35 to STA 21+00	Foot	365	\$	\$
B23.	Granular Trench Backfill for Forcemain (all locations and depths), Paved Areas, between STA 17+35 to STA 21+00	Foot	45	\$	\$
B24.	Bituminous Roadway Pavement Removal and Replacement (1-1/2-inch Surface, 2-1/2-inch Binder, 12-inch Aggregate Base), between STA 17+35 to STA 21+00	Foot	40	\$	\$
B25.	Landscaping: Seeding per Section 02485, Including 4-inch (Min.) Topsoil and Excelsior Blanket, between STA 17+35 to STA 21+00	Foot	335	\$	\$
LIFT STATION B FORCEMAIN FROM STA 36+15 to STA 37+55 MAY BE CONSTRUCTED USING EITHER HORIZONTAL DIRECTIONAL DRILLING OR OPEN CUT METHODS. BIDDER SHALL SELECT ONE OF THE TWO METHODS TO BE USED BELOW:					
CHOOSE ONE	I will construct the forcemain from STA 36+15 to STA 37+55 using horizontal directional drilled installation.		Circle either: YES or NO	If Yes, complete Item B26 below. Cross out and do not complete Items B27 through B30 below.	
	I will construct the forcemain from STA 36+15 to STA 37+55 using open cut installation.		Circle either: YES or NO	If Yes, complete Items B27 through B30 below. Cross out and do not complete Item B26 below.	
B26.	12-inch PVC, AWWA C900, DR-18 Restrained Joint Forcemain, Horizontal Directional Drilled Installation, STA 36+15 to STA 37+55	Foot	140	\$	\$
B27.	12-inch PVC, AWWA C900, DR-18 Forcemain, Open Cut Installation, STA 36+15 to STA 37+55	Foot	140	\$	\$
B28.	Granular Trench Backfill for Forcemain (all locations and depths), Paved Areas, between STA 36+15 to STA 37+55	Foot	25	\$	\$
B29.	Bituminous Driveway Pavement Removal and Replacement (1-1/2-inch Surface, 1-1/2-inch Binder, 6-inch Aggregate Base), Paved Areas, between STA 36+15 to STA 37+55	Foot	22	\$	\$
B30.	Landscaping: Seeding per Section 02485, Including 4-inch (Min.) Topsoil and Excelsior Blanket, Paved Areas, between STA 36+15 to STA 37+55	Foot	130	\$	\$

ITEM NO.	UNIT PRICE ITEM	UNIT	APPROX. NO. OF UNITS	PRICE PER UNIT	EXTENSION
LIFT STATION B FORCEMAIN FROM STA 37+95 to STA 51+00 MAY BE CONSTRUCTED USING EITHER HORIZONTAL DIRECTIONAL DRILLING OR OPEN CUT METHODS. BIDDER SHALL SELECT ONE OF THE TWO METHODS TO BE USED BELOW:					
CHOOSE ONE	I will construct the forcemain from STA 37+95 to STA 51+00 using horizontal directional drilled installation.		Circle either: YES or NO	If Yes, complete Item B31 below. Cross out and do not complete Items B32 through B37 below.	
	I will construct the forcemain from STA 37+95 to STA 51+00 using open cut installation.		Circle either: YES or NO	If Yes, complete Items B32 through B37 below. Cross out and do not complete Item B31 below.	
B31.	12-inch PVC, AWWA C900, DR-18 Restrained Joint Forcemain, Horizontal Directional Drilled Installation, STA 37+95 to STA 51+00	Foot	1,305	\$	\$
B32.	12-inch PVC, AWWA C900, DR-18 Forcemain, Open Cut Installation, STA 37+95 to STA 51+00	Foot	1,305	\$	\$
B33.	Granular Trench Backfill for Forcemain (all locations and depths), Paved Areas	Foot	190	\$	\$
B34.	Bituminous Roadway Pavement Removal and Replacement (1-1/2-inch Surface, 2-1/2-inch Binder, 12-inch Aggregate Base)	Foot	108	\$	\$
B35.	Bituminous Driveway Pavement Removal and Replacement (3-inch Surface, 6-inch Aggregate Base)	Foot	37	\$	\$
B36.	Concrete Driveway Pavement Removal and Replacement (6-inch Concrete, 4" Aggregate Base) between STA 37+95 to STA 51+00	Foot	38	\$	\$
B37.	Landscaping: Seeding per Section 02485, Including 4-inch (Min.) Topsoil and Excelsior Blanket	Foot	1,155	\$	\$
B38.	Lift Station B and Site Improvements	Lump Sum	1	\$	\$
B39.	Lift Station Bypass Pumping	Lump Sum	1	\$	\$
B40.	Traffic Control per Specification Section 01000 and as noted on the Contract Drawings	Lump Sum	1	\$	\$
B41.	Dust and Mud Control per Specification Section 01000 and as Directed by the Engineer	Lump Sum	1	\$	\$
B42.	Soil Erosion and Sedimentation Control	Lump Sum	1	\$	\$
B43.	Portable Sediment Containment System	Lump Sum	1	\$	\$
B44.	Sanitary Service Repair / Reconnection	Each	25	\$	\$
B45.	Water Service Repair / Reconnection	Each	21	\$	\$
B46.	Repair of Existing Watermain / Forcemain Leaks / Breaks Not Caused by Contractor's Negligence	Each	4	\$	\$
B47.	Pre-Construction Video	Lump Sum	1	\$	\$
B48.	Mobilization	Lump Sum	1	\$	\$

TOTAL BID AMOUNT B (FOR LIFT STATION B, LIFT STATION B FORCEMAIN AND SANITARY SEWER)

_____ WORDS
 \$ _____ FIGURES

LIFT STATION D AND LIFT STATION D FORCEMAIN					
ITEM NO.	UNIT PRICE ITEM	UNIT	APPROX. NO. OF UNITS	PRICE PER UNIT	EXTENSION
D1.	14-inch DI, CL 52 Forcemain, MANDATORY open cut installation , STA 10+00 to STA 11+60, STA 14+60 to STA 14+80, STA 18+55 to STA 18+85, STA 22+50 to STA 26+10, STA 36+25 to STA 36+72, STA 37+22 to STA 38+23, STA 38+63 to 39+88, STA 40+33 to 41+00, STA 46+50 to STA 46+91	Foot	958	\$	\$
D2.	14" Plug Valve with Valve Box	Each	1	\$	\$
D3.	4-ft. dia. Sanitary Sewer Manhole, STA 36+72	Each	1	\$	\$
D4.	Pig Launching Station, Including Pigging of Forcemain	Lump Sum	1	\$	\$
D5.	Air Release Valve & Vault	Each	3	\$	\$
D6.	Undercut/Stabilization Stone for Forcemain, STA 10+00 to STA 11+60, STA 14+60 to STA 14+80, STA 18+55 to STA 18+85, STA 22+50 to STA 26+10, STA 36+25 to STA 36+72, STA 37+22 to STA 38+23, STA 38+63 to 39+88, STA 40+33 to 41+00, STA 46+50 to STA 46+91	Cubic Yard	100	\$	\$
D7.	Granular Trench Backfill for Forcemain (all locations and depths), Paved Areas between STA 10+00 to STA 11+60, STA 14+60 to STA 14+80, STA 18+55 to STA 18+85, STA 22+50 to STA 26+10, STA 36+25 to STA 36+72, STA 37+22 to STA 38+23, STA 38+63 to 39+88, STA 40+33 to 41+00, STA 46+50 to STA 46+91	Foot	292	\$	\$
D8.	Bituminous Roadway Pavement Removal and Replacement (1-1/2-inch Surface, 2-1/2-inch Binder, 12-inch Aggregate Base) between STA 10+00 to STA 11+60, STA 14+60 to STA 14+80, STA 18+55 to STA 18+85, STA 22+50 to STA 26+10, STA 36+25 to STA 36+72, STA 37+22 to STA 38+23, STA 38+63 to 39+88, STA 40+33 to 41+00, STA 46+50 to STA 46+91	Foot	212	\$	\$
D9.	Concrete Driveway Pavement Removal and Replacement (6-inch Concrete, 4" Aggregate Base) between STA 10+00 to STA 11+60, STA 14+60 to STA 14+80, STA 18+55 to STA 18+85, STA 22+50 to STA 26+10, STA 36+25 to STA 36+72, STA 37+22 to STA 38+23, STA 38+63 to 39+88, STA 40+33 to 41+00, STA 46+50 to STA 46+91	Foot	64	\$	\$
D10.	Aggregate Shoulder and Driveway Replacement, 8-inch, between STA 10+00 to STA 11+60, STA 14+60 to STA 14+80, STA 18+55 to STA 18+85, STA 22+50 to STA 26+10, STA 36+25 to STA 36+72, STA 37+22 to STA 38+23, STA 38+63 to 39+88, STA 40+33 to 41+00, STA 46+50 to STA 46+91	Foot	20	\$	\$

ITEM NO.	UNIT PRICE ITEM	UNIT	APPROX. NO. OF UNITS	PRICE PER UNIT	EXTENSION
D11.	Landscaping: Seeding per Section 02485, Including 4-inch (Min.) Topsoil and Excelsior Blanket, between STA 10+00 to STA 11+60, STA 14+60 to STA 14+80, STA 18+55 to STA 18+85, STA 22+50 to STA 26+10, STA 36+25 to STA 36+72, STA 36+72 to STA 38+23, STA 38+63 to 39+88, STA 40+33 to 41+00, STA 46+50 to STA 46+91	Foot	745	\$	\$
LIFT STATION D FORCEMAIN FROM STA 11+60 to STA 13+00 MAY BE CONSTRUCTED USING EITHER HORIZONTAL DIRECTIONAL DRILLING OR OPEN CUT METHODS. BIDDER SHALL SELECT ONE OF THE TWO METHODS TO BE USED BELOW:					
CHOOSE ONE	I will construct the forcemain from STA 11+60 to STA 13+00 using horizontal directional drilled installation.		Circle either: YES or NO	If Yes, complete Item D12 below. Cross out and do not complete Items D13 through D16 below.	
	I will construct the forcemain from STA 11+60 to STA 13+00 using open cut installation.		Circle either: YES or NO	If Yes, complete Items D13 through D16 below. Cross out and do not complete Item D12 below.	
D12.	14-inch DI, CL 52 Restrained Joint Forcemain, Horizontal Directional Drilled Installation, STA 11+60 to STA 13+00	Foot	140	\$	\$
D13.	14-inch DI, CL52 Forcemain, Open Cut Installation, STA 11+60 to STA 13+00	Foot	140	\$	\$
D14.	Granular Trench Backfill for Forcemain (all locations and depths), Paved Areas, between STA 11+60 to STA 13+00	Foot	35	\$	\$
D15.	Bituminous Driveway Pavement Removal and Replacement (1-1/2-inch Surface, 1-1/2-inch Binder, 6-inch Aggregate Base), between STA 11+60 to STA 13+00	Foot	33	\$	\$
D16.	Landscaping: Seeding per Section 02485, Including 4-inch (Min.) Topsoil and Excelsior Blanket, between STA 11+60 to STA 13+00	Foot	120	\$	\$
D17.	14-inch DI, CL 52 Restrained Jont Forcemain, MANDATORY Horizontal Directional Drilled Installation , STA 13+00 to STA 14+60, STA 14+80 to STA 18+55, STA 18+85 to 22+50, STA 26+10 to STA 36+25	Foot	1,915	\$	\$
D18.	14-inch DI, CL 52 Restrained Joint Forcemain, MANDATORY Auger Installation , STA 36+72 to STA 37+22, STA 36+23 to STA 38+63	Foot	90	\$	\$
D19.	Bored & Jacked Crossing Including Casing Pipe and 14-inch Sewer Carrier Pipe), 123rd Avenue, STA 39+88 to STA 40+33	Foot	45	\$	\$

ITEM NO.	UNIT PRICE ITEM	UNIT	APPROX. NO. OF UNITS	PRICE PER UNIT	EXTENSION
D20.	16-inch HDPE AWWA C906, DR11 Forcemain, MANDATORY Horizontal Directional Drilled Installation , STA 41+00 to STA 46+50	Foot	550	\$	\$
D21.	Lift Station D and Site Improvements	Lump Sum	1	\$	\$
D22.	Lift Station Bypass Pumping	Lump Sum	1	\$	\$
D23.	Traffic Control per Specification Section 01000 and as noted on the Contract Drawings	Lump Sum	1	\$	\$
D24.	Dust and Mud Control per Specification Section 01000 and as Directed by the Engineer	Lump Sum	1	\$	\$
D25.	Soil Erosion and Sedimentation Control	Lump Sum	1	\$	\$
D26.	Portable Sediment Containment System	Lump Sum	1	\$	\$
D27.	Sanitary Service Repair / Reconnection	Each	15	\$	\$
D28.	Water Service Repair / Reconnection	Each	17	\$	\$
D29.	Repair of Existing Watermain / Forcemain Leaks / Breaks Not Caused by Contractor's Negligence	Each	4	\$	\$
D30.	Pre-Construction Video	Lump Sum	1	\$	\$
D31.	Mobilization	Lump Sum	1	\$	\$

TOTAL BID AMOUNT D (FOR LIFT STATION D AND LIFT STATION D FORCEMAIN)

WORDS

\$

TOTAL BID AMOUNT FOR DETERMINATION OF LOWEST BID (TOTAL BID AMOUNT C + TOTAL BID AMOUNT B + TOTAL BID AMOUNT D)

WORDS

\$

FIGURES

1.06 CLASSIFICATION OF WORK AND DETERMINATION OF QUANTITIES
FOR PAYMENT

The Contractor understands and agrees that he shall make the work readily accessible for inspection, classification of work, and determination of quantities for the various pay items by the Engineer. Further-more, the Engineer shall make such measurements and determinations as necessary to classify the work and determine the quantities for any purpose and such decisions will be final after three days if the Contractor does not submit a written notice as defined in the following paragraph.

If the Contractor differs with the Engineer's classification of the Work, or determination of quantities of the various pay items, he must notify the Engineer in writing within three days of the time that the construction of said work is started. Otherwise, the Owner will not consider any such difference as claim for payment.

Any such written notice received by the Engineer from the Contractor within the three day period shall be just reason for the Engineer to re-evaluate the work involved.

1.07 SUPPLEMENTAL BID EVALUATION INFORMATION

- A. If notified of being the apparent lowest, responsive bidder, I will submit information identified in the Instructions to Bidders for the purpose of evaluating my compliance with the responsibility requirements.

1.08 MAJOR EQUIPMENT

- A. The above Base Bid amounts are based upon equipment manufactured by the Base Bid Manufacturers listed below. I propose to provide equipment by the following substitute manufacturers. If awarded the Contract, I will accept a Change Order for the amount(s) listed below, if a proposed substitution is accepted by the Owner. I understand that the Owner is under no obligation to accept a proposed substitution and that substitutions are subject to the requirements specified in the Instruction to Bidders, Section 00100.

B. Where the "Base Bid Manufacturer" column lists more than one manufacturer, I have indicated which manufacturer's equipment will be provided by deleting the inapplicable manufacturers.

Item No.	Description	Base Bid Manufacturer	Substitute Manufacturers	Deduction (-) or Addition (+)
1	Submersible pumps & motors including controls, SCADA units, pumps access frame & covers, & appurtenances.	<u>Barnes</u>	(A) <u>Flygt/Xylem</u>	\$ _____
			(B) _____	\$ _____
			(C) _____	\$ _____
2	_____	_____	(A) _____	\$ _____
	_____	_____	(B) _____	\$ _____
	_____	_____	(C) _____	\$ _____
3	_____	_____	(A) _____	\$ _____
	_____	_____	(B) _____	\$ _____
	_____	_____	(C) _____	\$ _____

1.09 NON-COLLUSION STATEMENT

A. By submission of this Bid, the undersigned certifies, and in the case of a joint Bid, each party thereto certifies as to his own organization, that in connection with the Bid:

1. The prices in the Bid have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any manner relating to such prices with any other Bidder or with any competitor;
2. Unless otherwise required by law, the prices which have been quoted in the Bid have not knowingly been disclosed by the Bidder, prior to opening, directly or indirectly to any other Bidder or to any competitor; and,
3. No attempt has been made or will be made by the Bidder to induce any other person or firm to submit or not to submit a Bid for the purpose of restricting competition.
4. He is the person in the Bidder's organization responsible within that organization for the decision as to the prices being Bid and that he did not participate, and will not participate, in any action contrary to Paragraphs 1 through 3, above; or
5. He is not the person in the Bidder's organization responsible within that organization for the decision as to the prices being Bid but that he has been authorized

to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to Paragraphs 1 through 3, above, and as their agent shall so certify; and shall also certify that he has not participated, and will not participate in any action contrary to Paragraphs 1 through 3 above.

1.10 RESPECTFULLY SUBMITTED, signed and sealed this ____ day of _____, 20__.

Contractor: _____

By (Signature): _____

Title: _____

Business Address: _____

City/State: _____

ATTEST: _____

Secretary: _____

SEAL: _____

SECTION 00330

CONTRACTOR QUALIFICATION FORM

Please return this form as required per Section 00100 - Instructions to Bidders.

Pursuant to Section 00100, the Owner is required to determine whether or not a bidder is responsible. A responsible bidder is defined as "an entity (business) who has the capability in all respects to perform fully the contract requirements, and the tenacity, perseverance, experience, integrity, reliability, capacity, facilities, equipment, and credit which will assure good faith performance." The Owner will require that a responsible bidder demonstrate to Owner that bidder has sufficient staff of employees to perform work within the time frame established by the contract. Owner will further require that bidder provide documentation demonstrating satisfactory record for safety and compliance with OSHA rules and regulations. Information furnished by a bidder will be reviewed by the Owner and the Engineer. Said information shall not be otherwise disclosed without prior written consent by the bidder. Failure to submit this form by the date and time specified shall be cause for rejection of your bid.

Contractor Name: _____

Project Name: _____

1. For the current proposed project, list work to be performed by your own forces and percentage of project to be performed by your own forces:

2. List Proposed Major Subcontractors for this Project:

Name & Address	Trade	Amount	# Projects w/ Prime Contractor/ Bidder in Last 5 Yrs.
----------------	-------	--------	--

3. Business Organization:

— Sole Proprietor: An individual, whose signature is affixed to this bid.

— Partnership: State full names, titles and addresses of all responsible principals and/or partners:

— Corporation: State of incorporation: _____

How long in present business: _____

4. Number of personnel in organization:

Administrative _____

Engineering _____ Office _____

Shop _____ Field _____

5. Equipment Owned by Organization:

6. Bank Reference: _____

Address: _____

Contact Person: _____

7. Bonding Company: _____

Agency Name: _____

Agency Address: _____

Contact Person: _____

8. Insurance Company: _____

Agency Name: _____

Agency Address: _____

Contact Person: _____

9. Client References for Similar Scope Projects, List five
(Submit details on a separate sheet including all of the
following information for each):

- Project
- Client Name
- Address
- Contact Person
- Telephone #
- Project Description
- Contract Amount
- Year Completed

10. A. Have you within the last five years failed to complete
a contract?

_____ Yes _____ No

B. Are there any judgments, claims or suits pending or outstanding against you?

—— Yes —— No

If answer to either question is Yes, submit details on a separate sheet.

C. List all claims that have been filed by or against your firm due to construction contracts in the last five years, including arbitration:

11. Financial Statement:

Current Assets	\$ _____	
Fixed Assets (Depreciated)	\$ _____	
Other Assets	\$ _____	
Total Assets		\$ _____
Current Liabilities:	\$ _____	
Long Term Liabilities	\$ _____	
Total Liabilities		\$ _____
Net Worth		\$ _____

Date of Latest Balance Sheet: _____

Accounting Firm: _____
(Owner reserves the right to request a copy of financial statement.)

16. List the name and construction experience of the proposed superintendent(s) for this project:

17. List the name and qualifications/experience of the proposed site safety officer:

18. Provide a detailed schedule indicating compliance with required completion dates.

19. Provide anticipated payout schedule for the project.

20. Indicate methods to be utilized to ensure adequate control over subcontractors related to performance and schedule.

21. Provide completed Contractor's Safety Disclosure form (attached).

The undersigned hereby certifies that answers to the foregoing questions and all statements therein contained are true and correct. Surety, bank, subcontractor, supplier, or any other persons, firms or corporations with whom we have done business, or who have extended any credit to us are hereby authorized to furnish you with any information you may request concerning our organization including, but not limited to, information concerning

performance on previous work or credit standing with any of them.
We hereby release any and all such parties from any legal
responsibility whatsoever of having furnished such information to
you.

Name of Organization: _____

By: _____

Title: _____ Date: _____

CONTRACTOR'S SAFETY DISCLOSURE

Safety

1. Do you survey your subcontractor's safety and training programs? YES NO

Please Explain:

2. List your firm's Worker's Compensation Experience Modification Rates (EMR) for the last three years.

20____ 20____ 20____

Policy anniversary date:

For what state(s) is (are) the EMR(s) you are submitting?

Is the EMR for entire company or for a particular department or division?

3. Using information from your OSHA Form 200/300 , provide injury and/or illness data for the last three years for the following:

20____ 20____ 20____

a. Number of lost workday/restricted duty cases* _____

b. Number of recordable injury/illness cases with medical attention only** _____

c. What occupation was most frequently involved? _____

d. Number of fatalities*** _____

e. Number of first-aid cases only. _____

f. Total hours worked (do not include non-work time, even though paid.) _____

g. Incident rates for lost workday/restricted duty cases defined as follows: _____

$$\frac{N \times 200,000}{\text{Total Hours Worked (given year)}}$$

h. Incident rates for total recordable injury cases defined as follows: _____

$$\frac{N \times 200,000}{\text{Total Hours Worked (given year)}}$$

N = Lost workday/restricted duty cases/medical attention (Columns a + b + d above)

* As recorded on OSHA Form 200, Columns 2 and 9 or OSHA Form 300 Columns H and I

** OSHA Recordable Totals, OSHA Form 200, Column 6 and 13 or OSHA Form 300 Column J

*** OSHA Recordable Fatalities, OSHA Form 200, Column 1 and 8 or OSHA Form 300 Column G

Contractor may submit OSHA Forms 200/300 for the last 3 years in lieu of the above Section 2 information.

4. Please provide an explanation of the cause and corrective measures to any fatality, if occurred.

5. Do you have a formal written safety program? YES NO
 (If yes, please furnish)

Are the following elements present in your safety program?

- A stated policy YES NO
- A defined channel of communication for reporting accidental occurrences YES NO
- Identification of management and supervisory responsibilities YES NO
- Defined safety program goals YES NO
- An enforcement policy YES NO
- A description of each employee's safety related responsibilities YES NO
- Safety training requirements, program and documentation methods YES NO
- Job site supervisory orientation program YES NO
- Employee orientation program YES NO
- Hazard communication program YES NO
- Substance abuse policy YES NO
- Periodic inspection and work site observation requirements YES NO
- Accidental investigation with individual and periodic summary reports YES NO
- Emergency response and evaluation requirements YES NO

- Personal protective equipment training and documentation methods YES NO
- Provisions for periodic information and/or documented formal meetings YES NO
- A safety suggestion system YES NO
- Craft specific written safe practices code YES NO

6. Does your firm have full-time safety personnel YES NO

If yes, how many and what are their qualifications?

If no, who is responsible for your safety program and what are their qualifications?

7. Do you have a new employee orientation program? YES NO

Does it address the following:

- a. Contractor safety policy YES NO
- b. Contractor safety rules YES NO
- c. Contractor safety meeting attendance YES NO
- d. Contractor safety record YES NO
- e. Hazard recognition YES NO
- f. Hazard reporting YES NO
- g. First aid YES NO
- h. Injury reporting YES NO
- i. Personal protective equipment YES NO
- j. Respiratory protection YES NO
- k. Fire protection YES NO
- l. Scaffolding YES NO
- m. Housekeeping YES NO
- n. Toxic substances YES NO
- o. Electric safety YES NO
- p. Safety belts and lifelines YES NO
- q. Driving safety YES NO
- r. Signs, barricades, and flagging YES NO
- s. Trenching and excavation YES NO
- t. Rigging and crane safety YES NO
- u. Confined space entry YES NO
- v. Owner's safety requirements YES NO
- w. Environmental regulations YES NO
- x. Drug and alcohol abuse programs YES NO

8. Do you have specialized safety training for newly hired or promoted personnel? YES NO

Does it address the following:

- a. New employee orientation YES NO
- b. Safety supervision YES NO
- c. Tailgate/toolbox safety meetings YES NO
- d. Safe work practices YES NO
- e. Fire prevention and protection YES NO

- f. Hazard recognition YES NO
- g. Emergency procedures YES NO
- h. Incident report YES NO
- i. Accident investigation YES NO
- j. First aid procedures YES NO
- k. Subcontractor safety orientation YES NO

9. Are there orientation programs for newly awarded projects addressing specific safety hazards and requirements for the job? YES NO

10. Are site safety meetings held for employees? YES NO

Weekly___ Biweekly ___ Monthly ___ Other ___

Are they documented? YES NO

Are subcontractors included? YES NO

11. Do you designate a job-site safety coordinator? YES NO

If yes, percentage of time budgeted for this project?

If yes, what other functions does he have?

12. Are field safety inspections conducted? YES NO

If yes, by whom?

How Often?

13. Are actions taken when employees fail to comply with job-site safety regulations? Explain YES NO

14. To whom in Contractor's organization are accident reports/ investigations circulated?

15. Is safety criteria used during employee performance evaluations? YES NO

16. Does your firm have a safety recognition program? YES NO

Drug and Alcohol Abuse Programs

1. Does Contractor have a written drug and alcohol policy? YES NO
 If yes, please furnish a copy.

2. Does Contractor have a firearm and job-site search policy? YES NO
 If yes, please furnish a copy.

3. Are the following elements present in written policies?

- A written drug and alcohol policy YES NO
- An education program for supervisors YES NO
- Drug and alcohol awareness training for employees YES NO
- Written notice to employees of illegal drugs, alcohol, firearms and job-site search policy YES NO
- Pre-employment drug testing YES NO
- Job-site searches/inspections YES NO
- For-cause testing YES NO
- Post-incident testing YES NO
- Random testing of employees in safety sensitive positions YES NO
- Initial and annual written certifications to Owner YES NO

NOTE: Contractors must be prepared to provide OSHA required training and equipment certifications upon request.

Title: _____ Authorized Signature _____

SECTION 00410

BID BOND FORM

KNOW ALL MEN BY THESE PRESENT, that we, the undersigned,
(1) _____,
as Principal, and (2) _____,
as Surety, are hereby and firmly bound unto Community Utilities of
Indiana, Inc. in the penal sum of
(3) _____ Dollars (\$ _____) for
the payment of which, well and truly to be made, we hereby jointly
and severally bind ourselves, our heirs, executors,
administrators, successors, and assigns. Signed, this _____ day
of _____ 20__.

The condition of the above obligation is such that whereas
the Principal has submitted to Community Utilities of Indiana,
Inc. a certain Bid, attached hereto and hereby made a part hereof
to enter into a contract in writing, for the Twin Lakes Sanitary
Sewer Improvements - Phase 1 project.

NOW, THEREFORE,

- (a) If said Bid shall be rejected, or in the alternate,
- (b) If said Bid shall be accepted and the Principal shall
execute and deliver a contract, in the Form of Agreement
attached hereto (properly completed in accordance with
said Bid), and shall furnish a bond for his faithful
performance of said contract, and for the payment of all
persons performing labor or furnishing materials in
connection therewith, and shall in all other respects
perform the agreement created by the acceptance of said
Bid,

then this obligation shall be void, otherwise the same shall remain
in force and effect; it being expressly understood and agreed that
the liability of the Surety for any and all claims hereunder shall,
in no event, exceed the penal amount of this obligation as herein
stated.

-
- (1) Contractor
 - (2) Surety - IMPORTANT - Surety companies executing BONDS must
appear on the United States Treasury Department's
most current list of qualified companies (Circular
570 as amended) and be authorized to transact
business in the state where the project is located.
 - (3) Percent of the Contract specified in Section 00100,
Instructions to Bidders.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby give waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Surety

Principal

By _____ SEAL
Attorney-In-Fact

By _____ SEAL

Title _____

Attest:

Secretary _____

END OF SECTION

SECTION 00500

AGREEMENT FORM

1. GENERAL

1.01 THIS AGREEMENT, made this ____ day of _____, 20__, by and between Community Utilities of Indiana, Inc. hereinafter called the Owner and ⁽¹⁾ _____
_____ doing business as a ⁽²⁾ _____ and hereinafter called the Contractor.

1.02 The Owner and Contractor agree as follows:

A. Contract Documents

1. The Contract Documents consist of this Agreement; the Conditions of the Contract and Specifications as listed in the Index to the Contract Documents and Specifications; the Drawings as listed in the Index to the Drawings; all Addenda issued prior to and all Change orders issued after execution of this Agreement. These form the Contract and all are as fully a part of the Contract as if attached to this Agreement or repeated herein.

B. Scope of Work

1. The Contractor shall perform all work required by the Contract Documents for the Twin Lakes Sanitary Sewer Improvements - Phase 1 project.

C. Contract Time

1. The Contractor shall begin work within 10 days after the issuance of a written Notice to Proceed and shall substantially complete the work as defined in the General Conditions within 365 calendar days commencing from issuance of the Notice to Proceed. Final completion shall be within 425 days commencing from the issuance of the Notice to Proceed.

(1) Contractor

(2) Sole Proprietor, Partnership, or Corporation

D. Contract Price

1. The Owner will pay the Contractor in current funds for the performance of the approved Work, subject to additions and deductions by Change Order, the Total Contract Price of _____ Dollars and _____ Cents (\$ _____).

Payment will be made to the Contractor on the basis of the Schedule of Bid Prices included as a part of his Bid, which shall be as fully a part of the Contract as if attached or repeated herein.

E. Liquidated Damages and Incentives

The Owner and Contractor recognize that time is of the essence for this Construction Agreement and that Owner will suffer financial loss if the work is not completed within the Contract Time. Liquidated damages and incentives are as defined in Specification Section 00800 - Supplementary Conditions.

F. Payments

1. The Owner will make payments as provided in the General Conditions and Supplementary Conditions.

G. Engineer/Architect

1. The Project has been designed by RHMG Engineers, Inc. The Owner's representative during Construction is referred to in the Documents as the E/A or Engineer, whose authority is defined in the General Conditions and Supplementary Conditions.

1.03

IN WITNESS WHEREOF, the parties hereto have executed
this Agreement the day and year first above written.

(SEAL) Contractor _____
By _____
Printed Name _____
Title _____

Attest _____ Printed Name _____
Title _____

(SEAL) Owner _____
By _____
Printed Name _____
Title _____

Attest _____ Printed Name _____
Title _____

END OF SECTION

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SECTION 00610

PERFORMANCE BOND FORM

THIS INSTRUMENT WITNESSETH: That we (1) _____
_____ a (2) _____
organized under the laws of the State of _____
and regularly authorized to do business in the State of
(3) _____ as Principal, and we (4) _____
_____ a (2) _____ organized under
the laws of the State of _____ and regularly
authorized to do business in the State of (3) _____
as Surety, are held and firmly bound unto Community Utilities of
Indiana, Inc., hereinafter called the Owner in accordance with a
Contract hereinafter referred to, in the penal sum of (5) _____
_____ Dollars and _____ Cents
(\$ _____) lawful money of the United States, well and
truly to be paid unto the said Owner, for the payment of which we
bind ourselves, our heirs, executors, administrators, successors
and assignees, jointly and severally, firmly by these presents:

WHEREAS, the said Principal has entered into as written contract
with the Owner dated _____ for the Work
designated as Twin Lakes Sanitary Sewer Improvements - Phase 1,
located in Lake County, Indiana, in conformity with Contract
Documents hereby referred to and made a part hereof, the same to
all intents and purposes as if written at length herein, in which
Contract the said Principal has contracted to perform the work
specified in said Contract in accordance with the terms thereof;

NOW, THEREFORE, the condition of this obligation is such that if
the Principal shall faithfully perform the Contract on his (its)
part, and satisfy all covenants, terms, condition and agreements
incurred by the Principal in the performance of said Contract,
during the original term thereof, and any extensions thereof which

-
- (1) Contractor
 - (2) Sole Proprietor, Partnership, or Corporation
 - (3) State in which project is located
 - (4) Surety - IMPORTANT - Surety companies executing BONDS must
appear on the United States Treasury Department's
most current list of qualified companies (Circular
570 as amended) and be authorized to transact
business in the state where the project is located.
 - (5) 100 percent of the Contract

may be granted by the Owner, with or without notice to the Surety, and shall satisfy all claims and demands arising thereunder, and shall fully indemnify and save harmless the Owner from all cost and damage which the Owner might suffer by reason of the failure of the Principal to do so, and shall fully reimburse and repay to the Owner all costs, damages, and expenses which the Owner may incur in making good any default by the Principal, including any default based upon failure of the Principal, to fulfill his obligation to furnish maintenance, repairs, or replacements for any period of time after the work is completed, if provided for in said Contract, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

In addition, the Principal and Surety, jointly and severally, expressly guarantee that all materials furnished and workmanship performed under the Contract and in the construction of the work shall fulfill all requirements of the Contract and the Contract Documents with respect to them. This bond shall remain in effect for a period of five hundred forty (540) calendar days from the date of final acceptance.

It is hereby stipulated and agreed that any suit based upon any default of the Principal in fulfilling his obligations to furnish maintenance, repairs, or replacements for any period of time after the Work is completed, if provided for in the Contract, may be brought at any time up to six months after the expiration of the time specified in the Contract during which the Contractor has agreed to furnish such maintenance or make such repairs or replacements.

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder or the Contract Documents accompanying the same shall in any way affect its obligations on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Contract Documents.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in several counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

(SEAL)

(1) _____

Attest

By _____

Title _____

(SEAL)

(2) _____

Attest

By _____

(Attorney in Fact)

(1) Contractor

(2) Surety

END OF SECTION

(THIS PAGE LEFT INTENTIONALLY BLANK)

SECTION 00620

LABOR AND MATERIALS PAYMENT BOND FORM

THIS INSTRUMENT WITNESSETH: That we (1) _____
_____ a (2) _____
organized under the laws of the State of _____
and regularly authorized to do business in the State of
(3) _____ as Principal, and we
(4) _____
a(2) _____ organized under the laws of the
State of _____ and regularly authorized
to do business in the State of (3) _____
as Surety, are held and firmly bound unto Community Utilities of
Indiana, Inc. hereinafter called the Owner in accordance with a
Contract hereinafter referred to, in the penal sum of (5) _____
Dollars (\$ _____) lawful money of the United States, well and
truly to be paid unto the said Owner, for the payment of which we
bind ourselves, our heirs, executors, administrators, successors
and assignees, jointly and severally, firmly by these presents:

WHEREAS, the said Principal has entered into a written contract
with the Owner dated _____ for the work
designated as the Twin Lakes Sanitary Sewer Improvements - Phase
1 project in conformity with Contract Documents hereby referred to
and made a part hereof, the same to all intents and purposes as if
written at length herein, in which Contract the said Principal has
contracted to perform the work specified in said Contract in
accordance with the terms thereof;

NOW, THEREFORE, the condition of this obligation is such that if
the Principal shall faithfully satisfy all claims and demands
incurred by the Principal of said Contract, and shall pay all
obligations arising thereunder, and shall fully indemnify and save
harmless the Owner from all cost and damage which the Owner might
suffer by reason of the failure of the Principal to do so, and
shall fully reimburse and repay to the Owner all costs, damages,
and expenses which the Owner may incur in making good any

-
- (1) Contractor
 - (2) Sole Proprietor, Partnership, or Corporation
 - (3) State in which project is located
 - (4) Surety - IMPORTANT - Surety companies executing BONDS must appear
on the United States Treasury Department's most current
list of qualified companies (Circular 570 as amended and
be authorized to transact business in the state where
the project is located.
 - (5) 100 percent of the Contract

default by the Principal, and shall promptly make payment of wages to all persons supplying labor, equipment or materials for use in the prosecution of the work, whether by subcontractor or otherwise, and including all insurance premiums on said work as provided for in such Contract, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

In addition, the Principal and Surety, jointly and severally, expressly guarantee that the Owner will be held harmless from any liens, claims, demands or obligations in conjunction with materials or services provided with respect to this Contract. This bond shall remain in effect for a period of five hundred forty (540) calendar days from the date of final acceptance.

The Owner may sue on this Bond, and any person furnishing material or performing labor, either as an individual or as a Subcontractor, shall have the right to sue on this Bond in the name of the Owner for his use and benefit.

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder or the Contract Documents accompanying the same shall in any way affect its obligations on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Contract Documents.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in several counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

(SEAL) (1) _____
Attest By _____
_____ Title _____

(SEAL) (2) _____
Attest By _____
(Attorney in Fact)

(1) Contractor
(2) Surety

END OF SECTION

SECTION 00700

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By



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

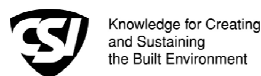
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American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400

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GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

* A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

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

2. *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

10. *Claim*--A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

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

* ~~12. *Contract Documents*-- Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's 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.A for definition.

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

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

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

maintained by Contractor, describing the nature and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

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. The General Requirements pertain to all sections 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 in connection with the Work.

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.

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.

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. *Related Entity* -- An officer, director, partner, employee, agent, consultant, or subcontractor.

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

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *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.

40. *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.

41. *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.

42. *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.

43. *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.

44. *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.

45. *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.

46. *Successful Bidder*--The Bidder submitting a responsive Bid to whom Owner makes an award.

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

48. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

49. *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.

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

51. *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.

52. *Work Change Directive*--A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times

but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

B. Intent of Certain Terms or Adjectives

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

C. Day

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

D. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

- a. does not conform to the Contract Documents, or
- b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or
- c. has been damaged prior to Engineer's - recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

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.~~

E. *Furnish, Install, Perform, Provide*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.

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

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor ~~and Owner~~ shall ~~each~~ deliver ~~to the other~~, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

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

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement

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*

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.

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.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work

1. The Progress Schedule will be acceptable to
* Engineer if it provides an orderly progression of the Work
to completion within the Contract Times. Such acceptance
* will not impose on Engineer responsibility for the
Progress Schedule, for sequencing, scheduling, or
progress of the Work nor interfere with or relieve
Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be
* acceptable to Engineer if it provides a workable
arrangement for reviewing and processing the required
submittals.

3. Contractor's Schedule of Values will be
* acceptable to Engineer as to form and substance if it
provides a reasonable allocation of the Contract Price to
component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 Intent

A. The Contract Documents are complementary;
what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to
describe a functionally complete Project (or part thereof)
to be constructed in accordance with the Contract Docu-
ments. Any labor, documentation, services, materials, or
equipment that may reasonably be inferred from the
Contract Documents or from prevailing custom or trade
usage as being required to produce the intended result will
be provided whether or not specifically called for at no
additional cost to Owner.

C. Clarifications and interpretations of the
Contract Documents shall be issued by Engineer as
provided in Article 9.

3.02 Reference Standards

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

1. Reference to standards, specifications,
manuals, or codes of any technical society, organization,
or association, or to Laws or Regulations, whether such
reference be specific or by implication, shall mean the
standard, specification, manual, code, or Laws or Regula-
tions 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

(unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing all of the Work under a direct or indirect contract with Contractor, shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or

2. reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaption by Engineer.

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

3.06 *Electronic Data*

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

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

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

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

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

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

Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. Limited Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. ~~Such "technical data" is identified in the Supplementary Conditions.~~ Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 Differing Subsurface or Physical Conditions

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

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by

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

C. Possible Price and Times Adjustments

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but

not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

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

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

- a. reviewing and checking all such information and data,
- b. locating all Underground Facilities shown or indicated in the Contract Documents,
- c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
- d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

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

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change

4.05 *Reference Points*

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

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

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

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06. G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

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

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by

Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

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

* 5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

~~B. Owner shall deliver to Contractor, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.~~

5.04 *Contractor's Liability Insurance*

* A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be

liable:

- * 1. claims under workers compensation, disability benefits, and other similar employee benefit acts;
- * 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
- * 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
- * 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
- * 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
- * 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
 - B. The policies of insurance required by this Paragraph 5.04 shall:
 - * ~~1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insured (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;~~
 - * 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 - * 3. include completed operations insurance;
 - * 4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 - * 5. contain a provision or endorsement that the coverage afforded will not be canceled, materially

changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

a. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 ~~Owner's Liability Insurance~~

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

* 5.06 *Property Insurance*

A. ~~Unless otherwise provided in the Supplementary Conditions, 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, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;~~

2. ~~be written on a Builder's Risk "all risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal,~~

3. ~~include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);~~

4. ~~cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;~~

5. ~~allow for partial utilization of the Work by Owner;~~

6. ~~include testing and startup; and~~

7. ~~be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.~~

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

* C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. 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 to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by 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, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion

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

5.08 *Receipt and Application of Insurance Proceeds*

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

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

Contract Documents, all Work at the Site shall be performed during regular working hours. Contract Documents shall 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.

any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the

6.03 *Services, Materials, and Equipment*

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

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

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

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

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

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and

quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

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

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

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,

3) it has a proven record of performance and availability of responsive service; and

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

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

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

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of

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

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

1) shall certify that the proposed substitute item will:

a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;

b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of

other contractors affected by any resulting change,

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. Engineer's Cost Reimbursement: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

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

6.06 Concerning Subcontractors, Suppliers, and Others

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

* B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor

2. shall ~~anything in the Contract Documents~~ create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be

performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supple-

* ~~Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.~~

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

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

6.11 *Use of Site and Other Areas*

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with

construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

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

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

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

6.12 *Record Documents*

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

neer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

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

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or , or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

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

1. Shop Drawings

* a. Submit number of copies specified in the ~~General Requirements~~.

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

2. *Samples*: Contractor shall also submit Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample with Material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

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

C. Submittal Procedures

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

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

b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review ~~and approval~~ will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review ~~and approval~~ will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review ~~and approval~~ of a separate item as such will not indicate approval of the assembly in which the item functions.

* ~~3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.~~

E. Resubmittal Procedures

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

6.18 Continuing the Work

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

6.19 Contractor's General Warranty and Guarantee

* A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review ~~and approval~~ of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

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

7. any correction of defective Work by Owner.

6.20 Indemnification

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

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents,

officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

~~2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.~~

*

6.21 *Delegation of Professional Design Services*

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

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

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.17.D.1, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

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

ARTICLE 7 - OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such

other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

- 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
- 2. the specific matters to be covered by such authority and responsibility will be itemized; and
- 3. the extent of such authority and responsibilities will be provided.

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

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

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

8.03 *Furnish Data*

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

8.04 *Pay When Due*

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

8.05 *Lands and Easements; Reports and Tests*

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

8.06 *Insurance*

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

8.07 *Change Orders*

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

8.08 *Inspections, Tests, and Approvals*

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

8.09 *Limitations on Owner's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

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

furnish a Resident Project Representative to assist Engineer in providing more extensive 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.

Paragraph 4.06.

8.11 Evidence of Financial Arrangements

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

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.04 Authorized Variations in Work

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

9.05 Rejecting Defective Work

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

9.06 Shop Drawings, Change Orders and Payments

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

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

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

* 9.01 Owner's Representative

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 Visits to Site

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

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

9.03 Project Representative

A. If Owner and Engineer agree, Engineer will

9.07 *Determinations for Unit Price Work*

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

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

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believe that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

*

9.09 *Limitations on Engineer's Authority and Responsibilities*

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

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

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to, the Resident Project Representative, if any, and assistants, if any.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

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

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

10.02 *Unauthorized Changes in the Work*

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

except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 Execution of Change Orders

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 Notification to Surety

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

10.05 Claims

A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim, shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to

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

C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part,

2. approve the Claim, or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor. ~~unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.~~

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

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

11.01 Cost of the Work

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the

Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expresses, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the

B. Cash Allowances

1. Contractor agrees that:

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

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

C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

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

11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

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

2. there is no corresponding adjustment with respect 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.

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

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

12.01 *Change of Contract Price*

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

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

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

1. a mutually acceptable fixed fee; or

12.02 *Change of Contract Times*

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

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor

as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

*

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

*

D. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

13.01 Notice of Defects

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

13.02 Access to Work

A. Owner, Engineer, their consultants and other

13.03 Tests and Inspections

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

*

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, and Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

*

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has

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

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

* 13.07 *Correction Period*

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

1. repair such defective land or areas; or
2. correct such defective Work; or
3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction

not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

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

D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

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

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not

period for that item may start to run from an earlier date if so provided in the Specifications .

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

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

13.09 *Owner May Correct Defective Work*

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

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession

of Contractor's tools, appliances, construction equipment and machinery at the Site, and all materials in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

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

14.02 *Progress Payments*

A. Applications for Payments

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but

delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

* ~~3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.~~

B. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations on the Site of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
- b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and to any other qualifications stated in the recommendation); and
- c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

- a. to supervise, direct, or control the Work, or
- b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
- c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
- d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
- e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Change Orders;
- c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
- d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due*

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

D. *Reduction in Payment*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

- a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
- b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
- c. there are other items entitling Owner to a set-off against the amount recommended; or
- d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

14.03 *Contractor's Warranty of Title*

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

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed

B. Promptly after Contractor's notification, , Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

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

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to 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 condi-

tions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

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

14.06 Final Inspection

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner 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.

- a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;
- b. consent of the surety, if any, to final payment;
- c. a list of all Claims against Owner that Contractor believes are unsettled; and
- d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Engineer's Review of Application and Acceptance

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

C. Payment Becomes Due

1. ~~Thirty days after the presentation~~ to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less

*

any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and , will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

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

14.09 *Waiver of Claims*

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

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

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

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

. 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

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

* for Payment within ~~30 days~~ after it is submitted or (iii)
 * Owner fails for ~~30 days~~ to pay Contractor any sum finally
 determined to be due, then Contractor may, upon seven
 days written notice to Owner and Engineer, and provided
 Owner or Engineer do not remedy such suspension or
 failure within that time, terminate the Contract and
 recover from Owner payment on the same terms as
 provided in Paragraph 15.03.

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

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 - DELETED

~~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 their intent to submit the Claim to a court of competent jurisdiction.~~

ARTICLE 17 - MISCELLANEOUS

17.01 Giving Notice

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

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

17.02 Computation of Times

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

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

1. GENERAL

1.01 SUPPLEMENTARY CONDITIONS

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

1.02 ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

A. SC-1.01

1. The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract have the meanings assigned to them in the General Conditions.
2. Under Paragraph 1.01.A.3, Application for Payment, change "ENGINEER" to "OWNER".
3. Modify Paragraph 1.01.A.12 Contract Documents, to read as follows:

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

4. Under Paragraph 1.01.A.19, Engineer, change "ENGINEER" to "ENGINEER or E/A".

5. Under Paragraph 1.01.A.37, Resident Project Representative, add "or OWNER" after "ENGINEER".

1.03 ARTICLE 2 - PRELIMINARY MATTERS

A. SC-2.07.A

1. Under paragraphs 2.07.A, 2.07.A.1, 2.07.A.2, and 2.07.A.3, Initial Acceptance of Schedules, add "and OWNER" to each mention of "ENGINEER".

1.04 ARTICLE 5 - BONDS AND INSURANCE

A. SC-5.03

1. Add the following paragraphs:

"B. All Certificates of Insurance shall be on ACORD Form #25 (2010/05). The insurance carriers on all insurance required to be provided by the Contractor shall be A.M. Best rated A- or better, licensed in the State of Indiana.

C. With respect to Worker's Compensation coverage, the required ACORD Form Certificate of Insurance shall show on said certificate or by attachment of a signed addendum thereto, information as to whether the Contractor is a Corporation, a Partnership, or a Sole Proprietorship. In addition, the certificate or signed addendum thereto, shall also include information showing whether or not all officers of the corporation, all partners of the firm, and/or the sole proprietor, as the case may be, are endorsed on the Worker's Compensation Policy as covered persons for Worker's Compensation Benefits.

D. All submitted Certificates of Insurance evidencing insurance coverage must be signed by an officer of the agency or broker firm (if same is a corporation) or by the agency/broker sole proprietor and/or partner of a partnership, which-ever the case may be.

E. In addition the agents and/or brokers signing and submitting said certificate(s) must also submit upon Owner's request a Certificate(s) of Insurance containing the name of the carrier, policy number, limits and inception/expiration dates of said carrier which provides the current in effect Errors and Omissions coverage of the submitting agency(s)/broker(s). The Contractor shall furnish to the OWNER upon OWNER's request the insurance policies required by the Contract Documents.

- F. In the event any submitted Certificate(s) of Insurance contain Umbrella and/or Excess liability coverage it is required that there be attached to said certificate(s) an addendum which details the names of all carriers, their policy numbers, the type of policy, limit of coverage and inception/expiration dates of all the underlying policies listed on said Umbrella/Excess policy declaration page.
- G. All Certifications of Insurance shall be signed by an authorized insurance company employee or by an authorized insurance company agent. Insurance carriers shall be licensed in the State in which the project is to be completed."

B. SC-5.04

1. The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:

- a. 5.04.A.1. and 5.04.A.2. Workers' Compensation, etc. under paragraphs 5.04.A.1. and 5.04.A.2. of the General Conditions:

(1) State:	Statutory
(2) Applicable Federal (e.g. Longshoreman's)	Statutory
(3) Employer's Liability	
\$1,000,000	Each Accident
\$1,000,000	Disease Policy Limit
\$1,000,000	Disease Each Employee

- b. 5.04.A.3., 5.04.A.4. and 5.04.A.5. Comprehensive General Liability Coverage, including completed operations shall provide for coverage of not less than the following amounts:

(1) Bodily Injury	
\$2,000,000	Each Occurrence
\$5,000,000	Annual Aggregate, Products and Completed Operations
(2) Broad Form Property Damage	
\$2,000,000	Each Occurrence
\$5,000,000	Annual Aggregate

(3) Broad Form Property Damage liability insurance will provide Explosion Collapse and Underground coverages where applicable.

(4) Personal Injury, with employment exclusion deleted
\$5,000,000 Annual Aggregate

c. 5.04.A.6. Comprehensive Automobile Liability: Provide either split limit coverage or combined single limit coverage as follows:

Split Limit Coverage:

(1) Bodily Injury:
\$1,000,000 Each Person
\$1,000,000 Each Accident

(2) Broad Form Property Damage:
\$1,000,000 Each Occurrence

Combined Single Limit Coverage:
\$1,000,000 Combined Single Limit

C. SC-5.04.B.1.

1. The OWNER, ENGINEER, Lakes of the Four Seasons Property Owners Association, and Lake County Indiana Highway Department shall be named as additional insureds on all insurance to be provided by the Contractor except for Workers Compensation and Automobile Liability. Insurance shall include coverage for the respective officers, directors, partners, employees, agents and other consultants and subcontractors of each and any of all additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby. Certificates of Insurance shall be provided to the OWNER, ENGINEER, and all additional insureds.

D. SC-5.04.B.2.

1. Add the following: "All required coverages and limits shall be deemed primary coverage and not excess coverage."

E. SC-5.04.B.4.

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

- a. Bodily Injury
\$2,000,000 Each Occurrence
\$5,000,000 Annual Aggregate
- b. Broad Form Property Damage:
\$2,000,000 Each Occurrence
\$5,000,000 Annual Aggregate

F. SC-5.04.B.5.

1. Add "and ENGINEER" after "OWNER".

G. SC-5.06.A.

1. Entirely delete paragraph 5.06.A. and substitute the following:

"A. The CONTRACTOR shall take out and maintain during the life of this Contract, a comprehensive builders risk insurance policy on an all risk basis including, but not limited to, fire, extended coverage, vandalism and malicious mischief, sprinkler leakage, flood, lightning, earth-quake, and collapse, providing coverage for an amount equal to the contract price. The insurance shall name the OWNER, ENGINEER and CONTRACTOR as insureds and shall include coverage, but not by way of limitation, for all damage or loss to the work and appurtenances, all materials, supplies, equipment, construction plant and temporary structures. No exclusions shall be authorized except that the policy may be made subject to the standard nuclear and wartime clauses. The policy shall provide the OWNER the right to occupy the premises without termination of the policy until final acceptance of the project. Copies of this policy shall be submitted to the OWNER and the ENGINEER. It is understood and agreed that the insurance coverage and limit required in this paragraph shall not limit contractor's liability for damage for loss to the work and appurtenances, all materials, supplies, equipment, construction plant and temporary structures." The policy shall be maintained in effect until final payment is made, unless otherwise agreed to in writing by OWNER, CONTRACTOR, AND ENGINEER with thirty days written notice to each other additional insured to whom a certificate of insurance was issued."

- H. SC-5.06.C.
 - 1. Under paragraph 5.06.C. following "CONTRACTOR", add "and ENGINEER".
- 1.05 ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES
 - A. SC-6.06.B.
 - 1. Under paragraph 6.06.B., add "The CONTRACTOR shall identify all Sub-contractors, major suppliers and other persons or organizations who will provide principal items of material and equipment."
 - B. SC-6.08.A, add the following:

"Contractor shall pay all charges of utility owners for connections to the Work, and Owner shall pay all charges of such utility owners for capital costs related thereto, such as plant investment."
 - C. SC-6.17.A.1.a
 - 1. Under paragraph 6.17.A.1.a change "General Requirements" to "Project Requirements."
 - D. SC-6.17.D.3.
 - 1. Entirely delete paragraph 6.17.D.3. and substitute the following:

"6.17.D.3. ENGINEER's review of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of submission as required by paragraph 6.17.C.3. and ENGINEER has given written consent of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample review; nor will any review by ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of paragraph 6.17.C.1."
 - E. S.C.-6.19.A.
 - 1. Under paragraph 6.19.A., add "The CONTRACTOR warrants to the OWNER that all materials and equipment furnished under this Contract will be new unless otherwise specified. Nothing in the General or Supplementary Conditions shall invalidate longer guaranty periods as specified in the Specifications."

F. S.C.-6.20

1. In the first sentence of Paragraph 6.20.A., add "Lakes of the Four Seasons Property Owners Association, and Lake County Indiana Highway Department" after the words "Owner and Engineer".
2. Add the following paragraph 6.20.D.:

"6.20.D. The duty of indemnification of the Owner by the Contractor injured by Section 6.20 shall be incorporated into each agreement between Contractor and his Subcontractors so that the Subcontractors shall indemnify and hold harmless Owner and Engineer, Lakes of the Four Seasons Property Owners Association, and Lake County Indiana Highway Department and the officers, directors, partners, employees, agents and consultants of each and any of them from each 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."

1.06 ARTICLE 7 - OTHER WORK

A. SC-7.02.B.

1. Under paragraph 7.02.B. add "or Section 01000 Project Requirements" after "Supplementary Conditions."

1.07 ARTICLE 9 - ENGINEERS STATUS DURING CONSTRUCTION

A. SC-9.01

1. Under Paragraph 9.01, add "The OWNER will issue all instructions to the Contractor through the ENGINEER."

B. SC-9.08.E.

1. Add the following paragraph 9.08.E.:

"9.08.E. If the CONTRACTOR is of the opinion that any work required, necessitated, or ordered violates the terms and provisions of the Contract, he must promptly

notify the OWNER, in writing, of his contentions with respect thereto and request a final determination thereon. If the ENGINEER determines that the work in question is contract and not extra work, or that the order complained of is proper, he will direct the Contractor to proceed and the CONTRACTOR shall promptly comply. In order, however, to reserve his right to claim compensation for such work or damages resulting from such compliance, the CONTRACTOR must, within five days after receiving notice of the determination and direction, notify the OWNER, in writing, that the work is being performed or that the determination and direction is being complied with, under protest. Failure of the CONTRACTOR to so notify OWNER shall be deemed as a waiver of claim for extra compensation or damages therefor. Before final acceptance by the OWNER, all matters of dispute must be adjusted to the mutual satisfaction of the parties thereto. Final determinations and decisions, in case any questions shall arise, shall constitute a condition precedent to the right of the CONTRACTOR to receive the money therefor, until the matter in question has been adjusted."

1.08 ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

A. SC-10.05.G.

1. Add the following paragraph 10.05.G:

"10.05.G. Submission of a claim to the Engineer pursuant to this Section shall not relieve the Contractor or his subcontractors of his obligation as set forth in Section 6.18 to continue work."

1.09 ARTICLE 12 - CHANGE OF CONTRACT PRICE, CHANGE OF CONTRACT TIMES

A. SC-12.03

1. Under paragraph 12.03.A. add "as determined by the Engineer" after "abnormal weather conditions."
2. Under paragraph 12.03.C. add "as determined by the Engineer" after "abnormal weather conditions."

B. SC - 12.04. through 12.06.

1. Add the following paragraphs:

"12.04 The date of beginning and the time for completion of the Work are essential conditions of the Contract and the Work embraced shall be commenced on a date specified in the Notice To Proceed."

"12.05 The CONTRACTOR shall proceed with the Work at such rate of progress to insure full completion within the Contract Time. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER, that the Contract Time for the completion of the Work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the Work."

"12.06 Owner and Contractor recognize that time is of the essence of this Construction Agreement and that Owner will suffer financial loss if the work is not completed within the contract time, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. If the CONTRACTOR shall fail to complete the Work within the Contract Time, or extension of time granted by the OWNER, then the CONTRACTOR shall pay the OWNER, or have the OWNER withhold from such sums as may be due him, the following:

1. Additional engineering expenses of \$1,000 per day, for each day the CONTRACTOR is late achieving substantial completion.
2. Additional engineering expenses of \$500 per day, for each day the CONTRACTOR is late in achieving final completion.

The OWNER and CONTRACTOR agree that the above described amounts are a reasonable forecast of anticipated OWNER's damages, but may not include all damages to be paid by the CONTRACTOR for failure to complete the work within the Contract Time.

B. SC - 12.07.

1. Add the following paragraphs:

"12.07 Fines

- A. The cost of any fines levied by agencies with jurisdiction over the project will be the responsibility of the Contractor."

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

A. SC-13.03.A.

1. Under Paragraph 13.03.A., add the following:

"Inspection" by the OWNER, the ENGINEER, or other designated OWNER representative, as the term is used in the CONTRACT DOCUMENTS does not mean responsibility for the supervision of the construction process, site conditions, operations, equipment, personnel or the maintenance of a safe place to work or any safety in, on, or about the site of WORK or associated with the WORK."

B. SC-13.03.C.

1. At the end of Paragraph 13.03.C, add the following:
"Such inspections, testings, and approvals to be arranged, obtained, and paid for by the Contractor shall include, but not be limited to, all those required for compliance with state and local regulations for proper disposal of construction or demolition debris.

D. SC-13.07.A.

1. In the first sentence of Paragraph 13.07.A., change "one year" to "540 calendar days".

1.11 ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

A. SC-14.02.A.3.

1. Delete paragraph 14.02.A.3. and add the following paragraph:

"3. The Owner shall retain ten (10) percent of the amount of each payment until final completion and acceptance of all work concerned by the Contract Documents. The Owner at any time, however, after fifty (50) percent of the work has been completed, if he finds satisfactory progress is being made may reduce retainage to five (5) percent of the contract price (zero retainage on the last 50% of the work). When the work is substantially complete (operation or beneficial occupancy), the retained amount may be further reduced below five (5) percent to only that amount necessary to assure completion."

B. SC-14.02.C.1.

1. Under paragraph 14.02.C.1., Payment Becomes Due, change "Ten days after presentation..." to "Thirty days after presentation...".

C. SC-14.07.C.1.

1. Under paragraph 14.07.C.1., Payment Becomes Due, change "Thirty days after presentation..." to "Forty-five days after presentation...".

1.12 ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

A. SC-15.04.A.

1. Under paragraph 15.04.A., Contractor May Stop Work or Terminate, change "30 days" to "forty-five days".

B. SC-15.04.B

1. Under paragraph 15.04.B, Contractor May Stop Work or Terminate, change "30 days" to "forty-five days."

END OF SECTION

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Section 00910

NOTICE OF AWARD

To: _____

PROJECT: Twin Lakes Sanitary Sewer Improvements - Phase 1

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

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

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

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

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

Dated this ___ day of _____, 20__.

COMMUNITY UTILITIES OF INDIANA, INC.

By: _____
(Owner's Representative)

Name: _____

Title: _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____, this the _____ day of _____, 20__

By: _____

Name: _____

Title: _____

END OF SECTION

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SECTION 00920
NOTICE TO PROCEED

To: _____ Date: _____

_____ Project:
Twin Lakes Sanitary Sewer
System Improvements - Phase 1

You are hereby notified to commence Work in accordance with the Agreement dated _____, on or before _____, 20__. You are required to substantially complete the Work, as defined in the General Conditions, within 365 consecutive calendar days from date of the Notice to Proceed as indicated above (by _____, 20__). Final completion of all Work is required within 425 consecutive calendar days from the date of the Notice to Proceed (by _____, 20__).

COMMUNITY UTILITIES OF INDIANA, INC.

By: _____
Name: _____
Title: _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by

_____,
this the _____ day of _____, 20__

By: _____
Name: _____
Title: _____

END OF SECTION

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SECTION 00935
CERTIFICATE OF SUBSTANTIAL COMPLETION

DATE OF ISSUANCE: _____
OWNER: _____
CONTRACTOR: _____
PROJECT: _____
OWNER's Contract No. _____
ENGINEER's Project No. _____

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within ___ days of the above date of Substantial Completion.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees shall be as follows:

OWNER: _____

CONTRACTOR: The Contractor shall maintain all required insurance until Final Payment of the project is achieved. Warranties and guarantees shall be in conformance with the Contract Documents, Specifications, and Drawings.

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

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

Executed by ENGINEER on: Date: _____

ENGINEER

By: _____

Name: _____

Executed by CONTRACTOR on: Date: _____

CONTRACTOR

By: _____

Name: _____

Executed by the OWNER on: Date: _____

OWNER

By: _____

Name: _____

SECTION 00936
CERTIFICATE OF FINAL COMPLETION

DATE OF ISSUANCE: _____
OWNER: _____
CONTRACTOR: _____
PROJECT: _____
OWNER's Contract No. _____
ENGINEER's Project No. _____

SUBSTANTIAL COMPLETION DATE: _____
FINAL COMPLETION DATE: _____

The CONTRACTOR certifies that the Work and all other requirements have been completed in accordance with the Contract, including, but not limited to:

- Completion of all discrepancies (punch list items) noted at the time of Substantial Completion.
- Submission of "as-built" plans and specifications, shop drawings, and other record documents.
- Completion of all OWNER training.
- Submission of all contractually-required spare parts.
- Submission of all final Operation & Maintenance documents and other closeout deliverables.
- Submission of consent of CONTRACTOR's surety.
- Submission and approval of all remaining change order proposals, claims, and applications for payment.
- Payment of all costs incurred for equipment, material, labor and services against the Project.

The CONTRACTOR further certifies that:

- No liens have been attached against the Project.
- No suits are pending by reason of Work on the Project under the Contract for Construction.
- All Workers' compensation claims are covered by Workers' Compensation Insurance as required by law.
- All insurance required of the CONTRACTOR beyond final payment, if any, is in effect and will not be cancelled or allowed to be expired without notice to the OWNER.
- All public liability claims are adequately covered by insurance and that the CONTRACTOR shall save, protect, defend, indemnify, and hold the OWNER harmless from and against any and all claims which arise as a direct or indirect result of any transaction, event occurrence, or omission related to performance of the Work contemplated under said Contract.

Upon execution below, the Work will be considered complete as of the date noted above. This consideration does not relieve the CONTRACTOR from its post-construction responsibilities, including correction of discrepancies noted during the first year after Substantial Completion (unless a longer time has been specified), warranty issues, latent defects, and other requirements of the Contract for Construction or State law.

Executed by ENGINEER on: Date: _____

ENGINEER

By: _____

Name: _____

Executed by CONTRACTOR on: Date: _____

CONTRACTOR

By: _____

Name: _____

Executed by the OWNER on: Date: _____

OWNER

By: _____

Name: _____

SECTION 01000

PROJECT REQUIREMENTS

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. This Section includes:

- a. Summary of the Work
- b. Coordination
- c. Abbreviations and symbols
- d. Construction schedules
- e. Shop Drawings and product data and samples
- f. Operation and maintenance manuals
- g. Record/As-Built Documents
- h. Quality control
- i. Construction facilities and temporary controls
- j. Materials and equipment
- k. Work Sequence
- l. Operation of existing facilities
- m. Contractor's use of premises
- n. Protection of building construction
- o. Work incidental to construction

2. Related Work specified elsewhere includes:

- a. Manufacturer's Services - Section 01430
- b. Systems Startup - Section 01650

1.02 SUMMARY OF WORK

A. Work Covered by Contract Documents

1. The Work to be performed under this Contract consists of the construction of the Twin Lakes Sanitary Sewer Improvements - Phase 1 project. Perform all Work in accordance with this Contract. Furnish all materials, equipment, tools, and labor which is reasonably and properly inferable and necessary for the proper completion of the Work, whether specifically indicated in this Contract or not.
2. All fees and permits for the permanent construction which are required by controlling agencies or authorities, including fees for the review of Contract Documents prior to construction, will be procured by the Owner. Other licenses or permits for construction facilities of a temporary nature which are necessary for the prosecution

of the work shall be secured and paid for by the Contractor.

B. Contract

1. Construct the Project under a Unit Price Contract.

C. Work Included

1. The Work includes all labor, equipment, and materials necessary to construct Twin Lakes Sanitary Sewer System Improvements, Phase One.
2. In addition, repair, replace, or otherwise settle with Owner, if damage to property or existing facilities occurs, including damage to pavements, utilities, lawns, structures, etc.

D. Related Work by Others

1. The following Work will be constructed by others under separate construction contracts:
 - a. Construction of improvements on the existing wastewater treatment plant site located on 123rd Avenue.
2. Contractor should be aware that this construction Work may be on-going simultaneously with the Work of this Contract, and Contractor shall take all necessary measures to coordinate its activities with the above described Work by others.

E. Restriction of Working Hours

1. Construction activities shall be restricted to Monday through Friday between sunrise to sunset or the hours of 7:00 a.m. and 6:00 p.m. whichever is more restrictive. Absolutely no work will be allowed on weekends or holidays unless prior approval of the Owner has been given.

1.03 COORDINATION

- A. Contractor shall be fully responsible for the coordination of its Work and the Work of its employees, Subcontractors, and Suppliers and to assure compliance with schedules.
- B. The coordination requirements of this Section are in addition to the requirements of Section 00700, General Conditions, and Section 00800, Supplementary Conditions, and Section 01040, Coordination.

1.04 ABBREVIATIONS AND SYMBOLS

A. Referenced Standards

1. Any reference to published specifications or standards of any organization or association shall comply with the requirements of the specification or standard which is current on the date of the Advertisement for Bids. In case of a conflict between the referenced specifications or standards, the one having the more stringent requirements shall govern.
2. In case of conflict between the referenced specifications or standards and the Contract Documents, the Contract Documents shall govern.

B. Abbreviations

1. The following are definitions of abbreviations which may be used this Contract:
 - a. AA - Aluminium Association
 - b. AASHTO - American Association of State Highway and Transportation Officials
 - c. ACI - American Concrete Institute
 - d. ANSI - American National Standard Institute
 - e. ASTM - American Society for Testing and Materials
 - f. AWS - American Welding Society
 - g. AWWA - American Water Works Association
 - h. CRSI - Concrete Reinforcing Steel Institute
 - i. E/A - Engineer and/or Architect
 - j. FS - Federal Specifications
 - k. IBC - International Building Code
 - l. NEC - National Electrical Code
 - m. NECA - National Electrical Contractor's Association
 - n. NEMA - National Electrical Manufacturer's Association
 - o. NSF - National Science Foundation
 - p. OSHA - U.S. Department of Labor, Occupational Safety and Health Administration
 - q. PS - United States Products Standards
 - r. STD.SPEC. - Applicable State Department of Transportation Standard Specifications for Road and Bridge Construction
 - s. SSPC - Structural Steel Painting Council
 - t. UL - Underwriter's Laboratories, Inc.

1.05 CONSTRUCTION SCHEDULES

- A. Submit an overall schedule of operations to the Owner and E/A for approval prior to any construction

operations. The construction schedule is to be updated on a bi-weekly basis. No pay request will be processed until the updated schedule is received. An updated schedule shall be included with each pay request. Inform the E/A of all changes in the schedule.

1.06 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

A. Shop Drawings

1. Shop Drawings are original drawings, prepared by Contractor, a Subcontractor, Supplier, or distributor, which illustrate some portion of the Work; showing fabrication, layout, setting, or erection details.
2. Shop Drawings shall be prepared by a qualified detailer and shall be identified by reference to sheet and detail numbers on the Contract Drawings. Reproductions for submittal shall be full size opaque diazo prints or other print acceptable to the E/A. Reduced size prints will not be reviewed or approved.

B. Product Data

1. Product data are manufacturer's standard schematic drawings and manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data.
2. Standard drawings shall be modified to delete information which is not applicable to the Work and supplemented to provide additional information applicable to the Work.
3. Catalog sheets, brochures, etc., shall be clearly marked to identify pertinent materials, products, or models.

C. Samples

1. Samples are physical examples to illustrate materials, equipment, or workmanship and to establish standards by which Work is to be evaluated.

D. Contractor's Responsibilities

1. Prior to submission, Contractor shall thoroughly check shop drawings, product data, and samples for completeness and for compliance with the Contract Documents and shall verify all quantities, dimensions and field conditions and shall coordinate the shop drawings with the requirements for other related Work.
2. The Contractor's responsibility for errors and omissions in submittals is not relieved by the E/A's review of submittals.

3. Contractor shall notify the E/A, in writing at the time of submission, of deviations in submittals from the requirements of the Contract Documents. Contractor's responsibility for deviations in submittals from the requirements of the Contract Documents is not relieved by the E/A's review of submittals, unless the E/A gives written acceptance of specific deviations.
4. Begin no Work which requires submittals until return of submittals with E/A stamp and initials or signature indicating the submittal has been reviewed.

E. Submission Requirements and E/A Review

1. The E/A will retain four (4) copies of shop drawings and product data. Submit four (4) plus the desired amount of return copies for review. Submit the number of samples indicated in the individual Specification Sections.
2. Shop drawings, product data, and samples shall be submitted by Contractor to the E/A. Submittals shall be properly identified with the name of the Contract, dated, and each lot submitted shall be accompanied by a letter of transmittal referring to the name of the Work and to the Specification page number and/or Contract Drawing number for identification of each item. Submittals for each type of Work shall be numbered consecutively, and the numbering system shall be retained throughout all revisions.
3. Submittals shall bear Contractor's stamp of approval certifying that they have been checked. Submittals without Contractor's initialed or signed certification stamp and submittals which, in the E/A's opinion, are incomplete, contain numerous errors or have not been properly checked, will be returned unchecked by the E/A for resubmission.
4. At the time of each submission, Contractor shall give the E/A specific written notice of each variation that the shop drawings or samples may have from the requirements of the Contract Documents and shall cause a specific notation to be made on each shop drawing submitted of each such variation.
5. The E/A will review submittals with reasonable promptness. The E/A's review of submittals shall not be construed as a complete check, and shall not relieve Contractor from responsibility for complete compliance with the Contract requirements. The E/A's review will be only for conformance with the design concept of the Work and for compliance with the information given in

the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety pre-cautions or programs incident thereto. The review of a separate item as such will not indicate approval of the assembly in which the item functions. No corrections, changes, or deviations indicated on submittals reviewed by the E/A shall be considered as a Change Order.

6. Contractor shall make corrections required by the E/A and shall return the required number of corrected copies of shop drawings for review. Contractor shall direct specific attention in writing to revisions other than the corrections called for by the E/A on previous submittals.
7. In the event a third submittal is required, due to previous submittals of incomplete or incorrect data or not in compliance with the Contract Documents, the Contractor will be charged one-half of the cost incurred by the E/A for the review of the third submittal. The Contractor shall bear the total cost incurred by the E/A for all subsequent reviews. The E/A costs charged to the Contractor will be at the cost plus rate generally charged by the E/A and will be deducted by the Owner from payments due to the Contractor.
8. Distribution of copies of acceptable submittals will be as mutually determined by Contractor, Owner, and E/A on an individual item basis during or following the preconstruction conference.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and Maintenance Manual

1. Contractor shall be responsible for obtaining installation, operation, and maintenance manuals from manufacturers and Suppliers for each item of equipment furnished under the Contract. Submit four copies plus the desired amount of return copies of each complete manual to the E/A within 90 Days after approval of shop drawings, product data, and samples and not later than the date of shipment of each item of equipment to the Work Site. These manuals will be reviewed by the E/A in the same manner as shop drawings and returned for correction and resubmittal if found deficient. Manuals will be used by the E/A in assembling a comprehensive operation and maintenance manual for Owner.

2. Manuals shall be provided for each piece of equipment including individual components and subsystems of complete assemblies. The section of the manual on operation shall describe the function of each component and its relationship to the system of which it is a part. Where several models, options, or styles are described, the manual shall identify the items actually provided.
3. The manual shall contain the following:
 - a. An 8-1/2 x 11-inch typewritten sheet listing the manufacturer's identification, including order number, model, and serial number and location of parts and service centers.
 - b. A separate 8-1/2 x 11-inch typewritten list of recommended stock of parts, including part number and quantity.
 - c. Complete replacement parts list.
 - d. Performance data and rating tables.
 - e. Specific instructions for installation, operation, adjustment and maintenance.
5. Each manual shall be bound in a folder and labeled to identify the contents and the Work to which it applies.
5. In addition to bound copies, submit an electronic copy of each operation and maintenance manual in PDF format.
6. Operation and maintenance manuals specified herein are in addition to any operation, maintenance, or installation instructions required by Contractor to install, test, and startup equipment.

1.08 RECORD/AS-BUILT DOCUMENTS

- A. As the Work progresses, Contractor shall mark on a set of Contract Documents all changes from the Contract Documents.
- B. Mark on the Contract Drawings all changes in direction and location of structure, piping, equipment, electrical, and mechanical Work.
- C. Mark on the Specifications the manufacturer, trade name, catalog, and Supplier of each product actually installed, and mark changes made by Change Order or Field Order.
- D. At the completion of the Work, deliver the record/as-built documents to the E/A, in good condition and free from any extraneous notation.

1.09 QUALITY CONTROL

A. Laboratory Testing Services

1. Except where specified in individual Specification Sections, Contractor shall employ and pay for an independent testing laboratory to perform specified testing services. If Owner's independent testing laboratory is expressly specified to perform testing services initial testing shall be paid for by Owner and additional testing required because of faulty or rejected Work shall be deducted from the Contract Price.
2. If testing is specified to be performed by Owner's testing laboratory, Contractor shall cooperate with Owner's laboratory personnel and provide access to the Work to be tested. Contractor shall notify the laboratory sufficiently in advance of operations to allow scheduling of tests. Contractor shall furnish casual labor and facilities to obtain and handle samples at the Work Site and to store and cure test samples as required.
3. Any testing laboratory utilized by Contractor shall be an independent laboratory acceptable to Owner and the E/A and complying with the latest edition of the "Recommended Requirements for Independent Laboratory Qualification", published by the American Council of Independent Laboratories.
4. Testing laboratories, whether provided by Owner or Contractor, shall promptly notify the E/A and Contractor of irregularities or deficiencies of the Work which are observed during performance of services. Laboratories shall submit two (2) copies of all reports directly to the E/A and two (2) copies to Contractor.

B. Testing Materials

1. Unless otherwise specified, all materials shall be sampled and tested in accordance with the latest published standard methods of ASTM in effect at the time Bidder's Proposals are received. If no ASTM Standards apply, applicable standard methods of the Federal Government or of other recognized agencies shall be used.
2. Test of materials shall be made by a representative of Owner, unless otherwise provided. Testing of equipment shall be the responsibility of Contractor or an authorized manufacturer's representative. All test results shall be furnished to the E/A in writing. Contractor shall provide facilities required to collect and forward samples. Contractor shall furnish the required samples without charge.

3. Contractor shall not make use of or incorporate in the Work, the materials represented by the sample until tests have been made and the material found to be in accordance with the requirements of the Specifications.
4. Materials to be tested and the applicable test procedure shall be as outlined in the individual Sections of these Specifications.

C. Source and Quality of Materials and Equipment

1. The source of materials to be used shall be in accordance with the Contract Documents and as approved by the E/A before delivery. The approval of the source of any material shall continue as long as the material conforms to the Specifications.
2. All material not conforming to the requirements of the Specifications shall be considered as defective and shall be removed from the Work. If in place, faulty materials shall be removed by Contractor at its expense and replaced with acceptable material unless permitted otherwise by Owner. No defective materials which have been subsequently corrected shall be reused until approval has been given.
3. Upon failure of Contractor to comply immediately with any order of the E/A to remove and replace defective material, Owner shall have authority to remove and replace defective materials, and to deduct the cost of removal and replacement from any monies due or to become due to Contractor. Failure to reject any defective materials or Work at the time of installation shall in no way prevent later rejection when such defects are discovered, nor obligate Owner to issue its Final Acceptance.

1.10 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

A. Responsibility

1. All construction facilities and temporary controls remain the property of Contractor establishing them and shall be maintained in a safe and useful condition until removed from the Work Site.

B. Temporary Electric Service

1. Furnish and maintain a complete temporary lighting and power system of the phase and voltage required. Extend to the point of usage for the work of all trades and pay for all power used.

2. Include in the Bid all costs for providing temporary electrical service to the site including, but not limited, to the following:
 - a. Utility company charges for extending temporary service to the site.
 - b. Utility company charges for installing and removing primary switches and fuses, lightning arrestors, transformers, metering and meter rental, poles, lines, etc.
3. Temporary service shall include protective enclosures, branch wiring, outlets, lamps, and grounding as required by NEC and Local Electrical Codes.
4. If temporary wiring interferes with construction, it shall be relocated. Maintain service during all work hours and one-half hour before and after working hours.
5. When permanent electrical power and lighting systems are in operating condition, they may be used for construction purposes provided that Contractor assumes full responsibility for the entire power and lighting systems, replaces all lamps used for temporary lighting, and pays all costs for electrical energy and for operation of the system.
7. When temporary service is no longer needed, remove all temporary electrical facilities from the site.

C. Temporary Heating

1. Contractor shall furnish fuel or power and provide and operate all temporary heating units. Heat shall be provided as necessary to thaw or heat materials, to control humidity, to protect all water-bearing materials against injury by frost or freezing, and to provide heat required for operations outside buildings or until buildings are enclosed and the permanent heating system can be used. Temporary heating units shall be adequately vented and approved devices which will not damage finished areas. Contractor shall also furnish all tarpaulins and temporary enclosures necessary to provide this protection.
2. Contractor shall provide heat at a minimum of 55 degrees F in enclosed and existing buildings or as required or recommended for the normal operation of the existing facilities or construction operations.
3. Contractor shall pay any costs of operating and maintaining the permanent heating system for temporary heat until the project is accepted for use by Owner.

4. No claims shall be made for extra compensation for furnishing temporary heat because of variations from the progress schedule.

D. Temporary Ventilation

1. Contractor shall provide, operate, and furnish power for temporary ventilation required for the proper installation and curing of materials and safety of workmen.

E. Temporary Water

1. The Owner can provide a reasonable amount of water from hydrants designated by Owner at no cost to Contractor. Contractor water use from Owner's water system is required to be metered and Owner will provide meter. If Contractor's water needs exceed that which can be reasonably supplied by Owner, Contractor shall supply any additional water needed at Contractor's expense. The source and quality of water used shall be subject to approval of the Engineer.
2. Contractor shall furnish potable drinking water in suitable dispensers and with cups for use of all employees at the job.
3. Contractor shall provide all temporary piping, hoses, etc., required to transport water to the point of usage.

F. Temporary Sanitary Facilities

1. Provide temporary toilet facilities as required. Maintain these during the entire period of construction under this Contract for the use of all construction personnel on the job. Enough chemical toilets shall be provided to conveniently serve the needs of all personnel. Chemical toilets and their maintenance shall meet the requirements of State and Local Health Regulations and Ordinances.

G. Temporary Pumping and Site Drainage

1. Contractor shall keep the Work Site free from water at all times to permit continuous access and to prevent damage to the Work. All water pumped from trenches shall be discharged into the storm drainage system via an approved portable sediment containment system.

H. Material Hoists and Cranes

1. Provide all material hoists and special rigging and hoisting facilities required for construction. Employ

skilled hoist operators. Provide all necessary guards, signals, safety devices, etc., required for safe hoist operation. The construction and operation of material hoists shall be in accordance with the applicable ANSI Standards, the "Manual Code of Accident Prevention in Construction" of the Associated General Contractors of America, OSHA, and of other Federal, State, and municipal codes or ordinances. Contractor shall prohibit the use of hoists for transporting personnel. Hoists shall be located to avoid risk of damage to completed Work.

I. Temporary Runways, Scaffolding, and Ladders

1. Provide temporary ladders, ramps, and runways as required for performance and inspection of the Work. The above facilities shall be constructed and maintained in accordance with the applicable Federal, State, and Municipal regulations and codes.
2. Furnish, erect, and maintain all scaffolding required for this Work. Scaffolding shall be constructed and maintained in accordance with applicable State and Federal laws and local ordinances. Scaffolding shall be promptly removed after serving its purpose.
3. The structural strength and safety of scaffolding, runways, covers, railings, ladders, stairs, etc., and compliance with law shall be the sole responsibility of Contractor.

J. Fencing of Site

1. Provide and maintain construction area enclosures necessary to assure security of the Work Site. Keep unauthorized people and animals from the Work Site. Doors and gates shall have locks, and keys shall be furnished to the Owner and the E/A.
2. Remove temporary fencing at completion of the Work or when directed by the Owner and/or E/A.

K. Security

1. Contractor shall provide inspection of Work Site area daily and shall take whatever measures are necessary to protect the safety of the public, workmen, and materials, and provide for the security of the Work Site, both day and night.

L. Dust and Mud Control

1. The Contractor shall take all necessary precautions to control dust and mud associated with the work of this Contract.
2. The Contractor shall have available a high-efficiency vacuum assisted mechanical sweeper for pavement cleaning. The Contractor shall clean the pavement of all dirt and debris at the end of each days operations, and at other times as necessary. All streets within the project corridor, including adjacent to side streets, shall be swept as directed by the Engineer.
3. The Contractor shall be responsible for obtaining and paying for water for mechanical sweeping.
4. Dust shall be controlled as often as necessary by the uniform application of a dust control agent. The dust control agent shall be calcium chloride (or approved equal) having a minimum chemical content of 77 percent calcium chloride at an application rate of 3 pounds per square yard of surface covered at locations as directed by the Engineer.
5. If the Contractor does not meet the requirements of controlling dust as determined by the Engineer, the Owner shall make the necessary arrangements to control dust. The cost of such dust control will be deducted from any monies due or to become due to the Contractor.
6. Unless a pay item is included in the Schedule of Prices, the cost for Dust and Mud Control will be considered incidental to the Contract and no additional compensation will be provided.

M. Traffic Control

1. The Contractor shall be responsible for the protection and maintenance of traffic by the proper use of barricades, warning lights, flares, and necessary traffic control and safety devices, and shall conform to Federal, State, and Local regulations regarding their use.
2. All forms of traffic control on public roadways required by the construction operations shall be in accordance with the following:
 - a. 2011 Indiana Manual on Uniform Traffic Control Devices Revisions 1 & 2 & 3 (or latest edition).
 - b. Applicable "Highway Standards" and Details of the governing State Department of Transportation.

3. Unless the Contractor has obtained written permission from the Engineer to temporarily close any street, alley, or other traveled way, keep such traveled way open to traffic on the existing pavement.
4. As a minimum, Contractor shall maintain alternate one-way traffic in opposite directions during working hours. At all other times, provide adequate lane width on existing paved surfaces to maintain two way movement of traffic.
5. Contractor shall ensure all barricades, warning sign, lights, and other traffic control devices are operational 24 hours every day, including weekends and holidays, throughout the time the Contract is in force.
6. Contractor shall provide the name and 24 hour telephone number of the individual in his direct employ who will be responsible for the installation and maintenance of traffic control on this project. This information will be required at the preconstruction meeting.
7. Unless a pay item is included in the Schedule of Prices, the cost for traffic control will be considered incidental to the contract and no additional compensation will be provided.

N. Noise

1. The Contractor shall conduct all his operations so that they will cause the least annoyance to the residents in the vicinity of the work, and shall comply with all applicable local ordinances.
2. Compressors, hoists, and other apparatus shall be equipped with such mechanical devices as may be necessary to minimize noise. Compressors shall be equipped with silencers on intake lines. All gasoline or oil operated equipment shall be equipped with silencers or mufflers or intake and exhaust lines. Storage bins and hoppers shall be lined with material that will deaden the sounds. The operation of dumping rock and of carrying rock away in trucks shall be so conducted as to cause a minimum of noise.

O. Contractor's Field Office and Storage Sheds

1. Contractor shall provide field office and storage sheds as required for the performance of the Work and protection of materials and equipment.

1.11 WORK SEQUENCE

- A. Contractor shall be responsible for sequence of construction.

1.12 OPERATION AND EXISTING FACILITIES

- A. Owner must be able to continue to operate and maintain existing facilities for twenty-four hours a day, seven days a week, during construction of this Work.
- B. Contractor shall coordinate all construction activities with Owner. Work shall be done in accordance with the Owner's Work rules, applicable Agency requirements, and during such hours, Owner may designate.
- C. Certain individual systems or units in existing facilities may be temporarily by-passed or removed from service for connection to the new facilities or for required repairs or renovations. All such by-passes or shut-downs shall be scheduled with Owner at least 48 hours in advance of the actual Work. In no case shall any system or unit in the existing facilities be out of service for more than 24 hours at a time.
- D. Contractor shall cooperate with Owner and the E/A to provide continuous operation of the existing facilities during the construction period.

1.13 CONTRACTOR USE OF PREMISES

A. Lift Station Sites

- 1. Confine operations at the site to areas permitted by applicable laws, ordinances, permits, and by the Contract Documents. Do not unreasonably encumber the site with materials or equipment. Do not load structures with weight that will endanger the structure. Contractor shall assume full responsibility for protection and safekeeping of products stored on the site.

B. Forcemains and Sewers

- 1. Contractor shall confine construction activity to public right-of-ways and/or public utility easements as noted on the Contract Drawings.

C. Contractor Use of Existing Hard Surface Pavement

- 1. Contractor shall make every effort to minimize the scaring, gouging, delaminating, etc., of hard pavement surfaces (i.e. roads, driveways, access drives, etc.). Contractor shall utilize equipment that has either rubber tires; or if the equipment is track mounted, then the

tracks shall have rubber or polyurethane surfaced pads that are specifically designed to be attached to tracks for use on hard pavement surface.

2. Any hard pavement surfaces damaged by contractor's equipment and/or construction activity that are located beyond the pavement restoration payment limits shall be replaced in kind at the contractor's own expense.

1.14 PROTECTION OF BUILDING CONSTRUCTION

- A. Contractor shall provide protection for work in place and shall provide all necessary rigging, cables, etc., necessary to protect his work. No roof areas shall be left opened at any time. Provide necessary water protection. Any work opened during the day shall be closed and be raintight at the end of each work day. Damages due to normal rainfall shall be the responsibility of the Contractor.
- B. Prior to cutting which affects architectural safety, submit written request to the E/A for permission to proceed with cutting.

1.15 WORK INCIDENTAL TO CONSTRUCTION

- A. Work classified as incidental to the construction and included in the general cost of the work as part of the Contract Price shall include, but not necessarily be limited to, the following:
 1. Cutting and patching finished work by others.
 2. Excavation and backfill required to install items furnished under this Contract.
 3. Replacing or repairing damages to work by others due to the construction.
 4. Building in all necessary anchors, supports, etc. To secure component structures.
 5. Miscellaneous support structures required to install items furnished under this contract.
 6. Adjusting heights of installed items to correct for field conditions.
 7. Furring out walls to conceal pipes, structural supports, or to bring surfaces plumb and true.

8. Lowering ceilings and/or dropping soffits to conceal ductwork, plumbing piping, electrical conduit, heating piping, etc.
 9. Leveling existing or new floors to make true and level to receive finished materials.
 10. Cleaning all glass and finished surfaces.
- B. All changes from the plans, necessary to make the work conform to the building as constructed or conform to rules of governmental authorities having jurisdiction N.F.P.A., O.S.H.A., and the local building codes shall be made by the Contractor without extra cost to the Owner.

END OF SECTION

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SECTION 01025

MEASUREMENT AND PAYMENT

1. GENERAL

1.01 MEASUREMENT AND PAYMENT ITEMS

- A. The following Subsections describe the measurement of and payment for the Work to be done under the Unit Price Items listed in the Schedule of Prices. Any and all Work required by the Contract Documents, but not included in the Schedule of Prices, shall be considered incidental and no additional compensation will be provided.

2. ITEMS

2.01 FORCEMAIN INSTALLATION BY CONVENTIONAL OPEN CUT METHOD AND/OR HORIZONTAL DIRECTIONAL DRILLING METHOD

A. Measurement

1. The length of forcemain installed by conventional open cut method and/or horizontal directional drilling method to be paid for under this Unit Price Item shall be measured by the lineal foot along the horizontal projection of the centerline of the complete forcemain, including fittings. If the length of forcemain installation by conventional open cut method and/or horizontal directional drilling method is increased for the benefit of Contractor, it will be at the Contractor's expense.

B. Payment

1. Installation by Conventional Open Cut Method

- a. The unit price for the appropriate subdivision of this item shall include full compensation for furnishing, laying, jointing and testing the pipe and fittings, connections to existing piping, all temporary and permanent plugs, locator wire, earth and pavement excavation, select backfill, dewatering, removal of surplus excavated material off-site, clean up; pot-holing (locating) existing buried utilities; site restoration including trees, bushes, shrubs but not lawn restoration and paving work; joint restraints where required; and pipe bedding as indicated on the Contract Drawings and as specified, including all work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices. Final payment for this item will be for the exact amount of pipe installed and measured as noted in

"A" above. Owner will provide a reasonable amount of water at no charge to the Contractor at all locations for testing purposes. Water is to be drawn at locations designated by Owner. If Contractor's water needs exceed that which can be reasonably supplied by Owner, Contractor shall supply any additional water needed at Contractor's expense.

2. Installation by Horizontal Directional Drilling Method -

- a. The unit price for the appropriate subdivision of this item shall include full compensation for furnishing all labor, materials, tools, bore pits, receiving pits, relief holes and excavations necessary to install and join pipes, install fittings, pipe testing, and connections to existing piping; backfill, additional bonds and equipment necessary for constructing forcemain; pot-holing (locating) existing buried utilities; all temporary and permanent plugs, coated locator wire, earth and pavement excavation, trench backfill and select backfill as applicable, dewatering, and removal of excavated or directionally drilled spoil material off-site; site restoration including trees, bushes, shrubs, lawn restoration and paving work at bore pits, receiving pits, relief holes, pot holes, excavations necessary to install and join pipe and fittings; expose existing utilities as necessary to verify appropriate clearance is maintained; joint restraints where required; pipe bedding as applicable; submittal and approval of Contingency Cleanup plan; cleanup and restoration of all areas due to frac-outs, blowouts or spillage of drilling fluids, bore hole cuttings, etc.; and testing of forcemain and fittings, complete in place, as indicated on the Contract Drawings, and as specified, including all Work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices. Final payment for this item will be for the exact amount of pipe installed and measured as noted in "A" above. Owner will provide water at no charge to the Contractor at all locations for testing purposes. Water is to be drawn at locations designated by Owner. Owner will provide a reasonable amount of water at no charge to the Contractor at all locations for testing purposes. Water is to be drawn at locations designated by Owner. If Contractor's water needs exceed that which can be reasonably supplied by Owner, Contractor shall supply any additional water needed at Contractor's expense.
- b. Deflection of pipe alignment and/or grade from that shown on the Contract Drawings is not acceptable unless Contractor receives prior approval from Engineer. If Contractor is unable to maintain a straight and true

pipe alignment and/or grade as depicted on the Contract Drawings (or alternate alignment/grade submitted to and approved by Engineer prior to pipe installation), then Contractor will be required to excavate and reinstall said pipe in the alignment/grade depicted on the Contract Drawings.

2.02 FORCEMAIN INSTALLATION BY AUGERING

A. Measurement

1. The length of augered forcemain piping to be paid for under this Unit Price Item shall be measured by the lineal foot along the horizontal projection of the centerline of the complete forcemain piping. If the length of augered forcemain piping is increased for the benefit of Contractor, it will be at Contractor's expense.

B. Payment

1. The augered forcemain piping to be paid for under this Unit Price Item shall constitute full compensation for furnishing all labor, materials, tools, excavation, backfill, removal of excess trench spoil off-site to Contractor's disposal facility, fill void between augered hole and pipe, equipment necessary to undertake augering, site restoration including trees, bushes, shrubs, lawn restoration and paving work at bore pits, receiving pits, relief holes, pot holes, excavations necessary to install and join pipe and fittings; expose existing utilities as necessary to verify appropriate clearance is maintained; joint restraints where required; pipe bedding as applicable; as indicated on the Contract Drawings, and as specified, including all Work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Unit Prices.

2.03 BORED AND JACKED CASING FOR FORCEMAIN

A. Measurement

1. The length of bored and jacked casing to be paid for under this Unit Price Item shall be measured by the lineal foot along the horizontal projection of the centerline of the complete bored and jacked casing pipe. If the length of bored and jacked casing is increased for the benefit of Contractor, it will be at Contractor's expense.

B. Payment

1. The bored and jacked casing to be paid for under this Unit Price Item shall constitute full compensation for furnishing all labor, materials, (including carrier pipe as delineated on the Contract Drawings), casing pipe spacers, tools, excavation, backfill, additional bonds and equipment necessary for constructing the boring and jacking, complete in place, as specified, including site restoration including trees, bushes, shrubs, lawn restoration and paving work at bore pits, receiving pits, relief holes, pot holes, excavations necessary to install and join pipe and fittings; expose existing utilities as necessary to verify appropriate clearance is maintained; joint restraints where required; pipe bedding as applicable; and all Work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Unit Prices.

2.04 SANITARY SEWER INSTALLATION BY CONVENTIONAL OPEN CUT METHOD

A. Measurement

1. The length of sewer to be paid for under this Unit Price Item shall be measured by the foot along the horizontal projection of the centerline of the complete sewer, to the centerline of manholes.

B. Payment

1. The Unit Price for this Unit Price Item shall include full compensation for furnishing, laying, jointing, and testing the pipe; sewer cleaning; sewer televising; deflection testing as applicable; all temporary and permanent plugs, earth and roadway excavation, dewatering, bedding and cover (as shown on the Contract Drawings and as specified) and select backfill; cleaning up; tree protection including tree protection fencing; expose existing utilities as necessary to verify appropriate clearance is maintained; site restoration including rough and finish grading but not lawn and roadway surface restoration Work; removal of surplus excavated material off-site, including all Work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices. Payment for this Unit Price Item will be for the exact amount of pipe installed and measured as noted in "A" above.

2.05 AIR AND VACUUM VALVE AND VAULT

A. Measurement

1. The number of air and vacuum valves and vaults to be paid for under this item shall be equal to the actual number of air and vacuum valves and vaults furnished and installed, complete with vaults and appurtenances, as indicated and as specified.

B. Payment

1. The unit price per each shall constitute full compensation for furnishing and installing air and vacuum valves and vaults, complete including vault, steps, frame and hatch, resilient rubber pipe to wall connectors, pipe and fittings; including excavation, bedding, air and vacuum valve; vent piping both in vault and extended to outlet locations depicted on the Contract drawings; back flush valve and hose, drain pipe, ball valves, and associated piping and fittings; dewatering, select backfill, removal of surplus excavated material off-site, and bedding, as indicated on the Contract Drawings and as specified including all work incidental thereto and not specifically included for payment under other Items in the Schedule of Prices.

2.06 PIG LAUNCHER AND PIGGING OF FORCEMAIN

A. Measurement

1. Pig Launcher will not be measured for payment, but will be paid for as a lump sum for the installed Pig Launcher as specified and detailed on the Contract Drawings

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation for furnishing, and installing, Pig Launcher, including, but not limited to, fittings, valves, piping, supports; extended drain line as delineated on the Contract drawings; excavation, select and trench backfill, dewatering; removal of surplus excavated material off-site; as indicated on the Contract Drawings and as specified and all work incidental thereto and not specifically included for payment under other Items in the Bid Form for the successful Pigging of Forcemain as specified and detailed on the Contract Drawings.

2. The Lump Sum Price for this item shall constitute full compensation for startup and performing a successful swab pigging of the forcemain, including temporary pumps, piping, fittings, equipment, water (as necessary) and labor to hydrostatically advance a poly pig from the pig launcher to the forcemain discharge structure, as indicated on the Contract Drawings and as specified, including all work incidental thereto and not specifically included for payment under other Items in the Bid Form.

2.07 SANITARY SEWER MANHOLES

A. Measurement

1. The number of sanitary sewer manhole structures to be paid for under this Unit Price Item shall be equal to the actual number of structures furnished and installed.

B. Payment

1. The Unit Price for this Unit Price Item shall constitute full compensation for furnishing and installing structures, complete with appurtenances, steps, frame and lid, external chimney seals, internal and external coatings, manhole pipe connectors, excavation, dewatering, removal of surplus excavated material off-site, topsoil removal, bedding and backfill as indicated on the Contract Drawings and as specified including all Work incidental thereto and not specifically included for payment under other Unit Price Items.

2.08 BYPASS PUMPING

A. Measurement

1. Bypass pumping will not be measured for payment, but will be paid for as a lump sum for the installation and operation of the bypass pumping system required by the Contractor to complete his Work.

B. Payment

1. The lump sum price for this item shall constitute full compensation for furnishing, installing, operating and maintaining bypass pumping, flushing sewage from existing piping and structures with disposal into sanitary sewer, including any lawn or pavement restoration necessary to facilitate bypass pumping, as specified and/or shown on the Contract Drawings; and as delineated in the Contractor's submittal.

2.09 GRANULAR TRENCH BACKFILL

A. Measurement

1. The length of granular trench backfill to be paid for under the appropriate subdivision of this Unit Price Item shall be measured by the lineal foot along the horizontal projection of the centerline of the completed pipe trench. Granular trench backfill shall be placed to the limits shown on the Contract Drawings or as indicated in the Contract Specifications, from the top of bedding to pavement subgrade, and to the width of trench appropriate for the type of pipe being installed.

B. Payment

1. The Unit Price for the appropriate subdivision of this item shall include full compensation for furnishing and placing granular trench backfill will be made for the quantity determined above at the respective Unit Price in the Schedule of Prices. This Unit Price and payment shall be full compensation for furnishing, hauling, placing, compacting and removing excess material from the Work Site and all else incidental thereto for which separate payment is not provided under other Unit Price Items. Any trench backfill required in excess of the quantity placed and measured as noted in "A" above shall be furnished by Contractor at Contractor's own expense.

2.10 PAVEMENT REMOVAL AND REPLACEMENT - ROADWAY, DRIVEWAYS AND SHOULDERS

A. Measurement

1. All Work to be measured for payment by the lineal foot along the horizontal projection of the centerline of the completed pipe trench for Work involved as specified, including all Work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices.

B. Payment

1. The Unit Price per lineal foot shall include full compensation for all Pavement Removal and Replacement as indicated and specified for quantities determined above. Any Pavement Removal and Replacement required in excess of the quantity placed and measured as noted in "A" above shall be furnished by Contractor at Contractor's own expense.

2.11 CONCRETE SIDEWALK REMOVAL AND REPLACEMENT

A. Measurement

1. All Work to be measured for payment by the lineal foot along the horizontal projection of the centerline of the completed pipe trench for Work involved as specified, including all Work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices.

B. Payment

1. The Unit Price per lineal foot shall include full compensation for all concrete sidewalk removal, excavation, granular bedding, rebar and concrete, furnished and installed as indicated and specified for quantities determined above. Any Concrete Sidewalk Removal and Replacement required in excess of the quantity placed and measured as noted in "A" above shall be furnished by Contractor at Contractor's own expense.

2.12 SOIL EROSION AND SEDIMENTATION CONTROL

A. Measurement

1. Soil Erosion and Sedimentation Control will not be measured for payment, but will be paid for as a lump sum for the soil erosion and sedimentation control installed as detailed in the Contract Documents.

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation for furnishing, installing and maintaining the required soil erosion and sedimentation control system as specified in the Contract Documents, including removal and disposal off-site, and restoration of any areas disturbed by the system.

2.13 PORTABLE SEDIMENT CONTAINMENT SYSTEM

A. Measurement

1. Portable Sediment Containment System will not be measured for payment, but will be paid for as a lump sum for the installed as detailed in the Contract Documents.

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation for furnishing, installing and maintaining an appropriately sized portable sediment containment system as specified in the Contract Documents, including removal and disposal off-site, and restoration of any areas disturbed by the Portable Sediment Containment System.

2.14 TRAFFIC CONTROL

A. Measurement

1. Traffic Control will not be measured for payment, but will be paid for as a lump sum for installing and maintaining traffic control as shown and detailed on the Contract Documents.

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation for installing and maintaining traffic control as specified and shown in the Contract Documents.

2.15 DUST AND MUD CONTROL

A. Measurement

1. Dust and Mud Control will not be measured for payment, but will be paid for as a lump sum for the Dust and Mud Control as shown and detailed in the Contract Documents.

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation to provide all necessary Dust and Mud Control as specified and shown in the Contract Documents.

2.16 LANDSCAPING: SEED INCLUDING 4-INCH MINIMUM TOPSOIL AND EROSION CONTROL BLANKET

A. Measurement

1. All Work to be measured for payment by the lineal foot along the horizontal projection of the centerline of the completed pipe trench for Work involved as specified, including all Work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices.

B. Payment

1. The Unit Price per lineal foot shall include full compensation for furnishing, installing and watering all landscape seed, topsoil and erosion control blanket as indicated and specified for quantities determined above. Any landscape seed, topsoil and erosion control blanket required in excess of the maximum quantity allowed by the Contract Limits as shown on the Contract Drawings shall be by Contractor at Contractor's own expense.
2. Payment of landscape seed, topsoil and erosion control blanket will be limited to those areas disturbed by open-cut construction. Any landscape seed, topsoil and erosion control blanket costs for areas disturbed in association with Horizontal Directional Drilling shall be merged with the Horizontal Directional Drilling Pay Item.
3. Any landscape seed, topsoil and erosion control blanket required excess of the quantity placed and measured as noted in "A" above shall be furnished by Contractor at Contractor's own expense.

2.17 REPAIR OF EXISTING WATERMAIN/FORCEMAIN LEAKS/BREAKS NOT CAUSED BY CONTRACTOR'S NEGLIGENCE

A. Measurement

1. All Work will be measured for payment as shown and detailed in the Contract Documents for Work involved as specified, including all Work incidental thereto and not specifically included for payment under mother unit Price Items in the Schedule of Prices.

B. Payment

1. The Unit Price per each shall constitute full compensation for furnishing all labor, materials (including watermain/forcemain pipe), tools, repair sleeves, locating leak and/or break and excavation of existing underground watermain/forcemain piping, backfill, removal of excess trench spoil off-site to Contractor's disposal facility, temporary barricades, traffic control, and equipment necessary to repair existing watermain/forcemain leaks/breaks not caused by Contractor's negligence, including all Work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices.
2. Contractor shall only be due payment for this Unit Price Item if written approval is obtained from the

Engineer prior to undertaking the Work noted in this Unit Price Item.

2.18 EXISTING SANITARY SERVICES REPAIRED

A. Measurement

1. The number of Existing Sanitary Services Repaired as a result of forcemain installation to be paid for under this Unit Price Item shall be equal to the actual number of Existing Sanitary Services Repaired as furnished and installed, complete with pipe and repair fittings.

B. Payment

1. The unit price per each shall constitute full compensation for furnishing and installing all Existing Sanitary Services Repaired as a result of forcemain installation, complete including earth and pavement excavating, watermain quality piping, watertight connection to existing sanitary services as indicated on the Contract Drawings and as specified including all work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices.

2.19 EXISTING WATER SERVICE REPAIRED

A. Measurement

1. The number of Existing Water Service Repaired as a result of forcemain installation to be paid for under this Unit Price Item shall be equal to the actual number of water service repairs furnished and installed.

B. Payment

1. The Unit Price per each shall constitute full compensation for repairing water service reconnections; earth and pavement excavation and backfill; removal of surplus excavated material off-site; service saddle, corporation stop, copper service, and curb stop and box (as needed), as specified in Contract Documents or as shown on the Contract Drawings, all necessary fittings and materials for reconnection of existing service; granular trench backfill; including all work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices.

2.20 UNDERCUT/STABILIZATION STONE

A. Measurement

1. All Work will be measured for payment per cubic yard, in place, within the contract limits indicated on the Contract Drawings, including all Work incidental thereto and not specifically include for payment under other Unit Price Items in the Schedule of Unit Prices.

B. Payment

1. The Unit Price per cubic yard shall include full compensation for excavation and removal off-site of unsuitable material located below the bedding of the pipe, and furnish, place and compact Undercut/Stabilization Stone, as directed by the Engineer.

2.21 PRECONSTRUCTION DIGITAL VIDEO DISC (DVD) DOCUMENTATION

A. Measurement

1. Preconstruction DVD Documentation will not be measured for payment, but will be paid for as a lump sum for the Preconstruction DVD Documentation as detailed in the Contract Documents.

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation for furnishing Preconstruction DVD documentation, including high resolution color audio-DVS(s) showing all areas affected by construction, submitted to Owner before commencement of construction activity, and all work incidental thereto and not specifically included for payment under other Unit Price Items in the Schedule of Prices.

2.22 RECORD DRAWING INFORMATION

A. Measurement

1. Record Drawing Information will not be measured for payment, but will be paid for as a lump sum for the Record Drawing Information provided.

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation for furnishing Record Drawing Information as specified on the Contract Drawings.

2.23 EXISTING LIFT STATION DEMOLITION, REHABILITATION, NEW VALVE/METER VAULT, AND SITE IMPROVEMENTS (LIFT STATIONS B AND C)

A. Measurement

1. Existing Lift Station Demolition, Rehabilitation, New Valve/Meter Vault, and Site Improvements will not be measured for payment, but will be paid for as a lump sum for the installed Existing Lift Station Demolition, Rehabilitation, New Valve/Meter Vault, and Site Improvements as specified and detailed on the Contract Drawings.

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation for furnishing, and installing, Existing Lift Station Demolition, Rehabilitation, New Valve/Meter Vault, and Site Improvements, including temporary chain link fencing enclosing construction site, demolition of existing controls, piping and internal wet well improvements; new wet well flat top and hatch, valve and flow meter vault; pumps, valves, piping, electrical, controls, generator; excavation, select and trench backfill, compaction testing, dewatering; shoring, sheeting or bracing as necessary; removal of surplus excavated material off-site and/or hauling additional fill material on-site; site clearing and grading; construct temporary and permanent access road and site paving where required; landscape seed, topsoil and erosion control blanket of all areas disturbed by temporary access and the above noted improvements; startup and testing, as indicated on the Contract Drawings and as specified; including all work incidental thereto and not specifically included for payment under other Items in the Bid Form.

2.24 EXISTING LIFT STATION DEMOLITION AND MODIFICATION; AND NEW LIFT STATION AND SITE IMPROVEMENTS (LIFT STATION D)

A. Measurement

1. Existing Lift Station Demolition and Modification; and New Lift Station and Site Improvements will not be measured for payment, but will be paid for as a lump sum for the installed Existing Lift Station Demolition and Modification; and New Lift Station and Site Improvements as specified and detailed on the Contract Drawings.

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation for furnishing, and installing, Existing Lift Station Demolition and Modification; and New Lift Station and Site Improvements, including temporary chain link fencing enclosing construction site, concrete wet well, valve and flow meter vault; pumps, valves, piping, electrical, controls, generator; excavation, select and trench backfill, compaction testing, dewatering; shoring, sheeting or bracing as necessary; removal of surplus excavated material off-site and/or hauling additional fill material on-site; site clearing and grading; construct access road and site paving; landscape seed, topsoil and erosion control blanket of all areas disturbed by these improvements; demolition and modification to existing structures; startup and testing, as indicated on the Contract Drawings and as specified; including all work incidental thereto and not specifically included for payment under other Items in the Bid Form.

1.25 MOBILIZATION

A. Measurement

1. Mobilization will not be measured for payment, but will be paid for as a Lump Sum as detailed in the Contract Documents.

B. Payment

1. The Lump Sum Price for this item shall constitute full compensation for Mobilization including but not limited to all activities and associated cost for transportation of contractor's personnel, equipment and operating supplies to the site; establishment of temporary facilities, and all other site preparation work for the Watermain portion of the project.
2. The amount a Contractor will receive payment for, according to the following schedule, will be limited to six percent of the original contract amount. Should the bid for Mobilization exceed six percent, the amount over six percent will not be paid until 90 percent of the adjusted contract value is earned.
3. Contractor shall only be due payment for Mobilization when the following thresholds are met:
 - a. When 5 percent of the total original contract amount is earned from other bid items, 75 percent of the amount bid for Mobilization, less normal retainage, will be paid.

- b. When 10 percent of the total original contract amount is earned from other bid items, an additional 15 percent of the amount bid for Mobilization, less normal retainage, will be paid.

- b. When 90 percent of the adjusted contract amount for is earned from other bid items, the remaining 10 percent of the amount bid for Mobilization, less normal retainage, will be paid, along with any amount in excess of six percent of the original contract amount.

END OF SECTION

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SECTION 01026

SCHEDULE OF VALUES

1.0 GENERAL

1.01 SECTION INCLUDES

- A. Preparation and submittal of a Schedule of Values for lump sum items on unit price contracts for which the Contractor requests progress payments.

1.02 DEFINITION

- A. The Schedule of Values is an itemized list that establishes the value of each part of the Work for lump sum items. The Schedule of Values is used as the basis for preparing applications for payments. Quantities and unit prices may be included in the schedule.

1.03 PREPARATION

- A. For all lump sum items, subdivide the Schedule of Values into logical portions of the Work, such as major work items.
- B. For lump sum items where testing is required, include a separate item for testing valued at 5 percent of the lump sum amount.
- C. Round off figures for each listed item to the nearest \$100.00 except for the value of one item, if necessary, to make the total of all items in the Schedule of Values equal the Contract Price for the lump sum amount in the Schedule of Unit Prices.
- D. Type the Schedule of Values on 8-1/2-inch by 11-in white bond paper.

1.04 SUBMITTAL

- A. Submit the Schedule of Values at least 30 days prior to submitting the first application for progress payment. Application for payment will not be processed until the Schedule of Values is approved by the Owner.
- B. Revise the Schedule of Values and resubmit for items affected by contract modifications, change orders, and work change directives. After the changes are approved by the Owner, make the submittal at least 30 days prior to submitting the next application for progress payment.

- C. Upon request, support values given with data that will substantiate the amounts shown in the Schedule of Values.

END OF SECTION

SECTION 01040

COORDINATION

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Sequencing and scheduling
- b. Diagrammatic nature of drawings
- c. Provisions for later installation

2. Related work specified elsewhere:

- a. General Conditions - Section 00700
- b. Supplementary Conditions - Section 00800

1.02 SUBMITTALS

- A. Prior to cutting which affects structural safety of the work, submit a written notice to the E/A requesting consent to proceed with cutting and patching.

2. PRODUCTS

2.01 MATERIALS

- A. Materials for replacement of work removed shall comply with the specifications for work to be done. When cutting and patching existing facilities, materials for replacement shall match the existing, unless indicated otherwise.

3. EXECUTION

3.01 SEQUENCING AND SCHEDULING

- A. The Contractor shall sequence and schedule the work in a manner to preclude delays and conflicts between the work of the various trades. Each trade shall keep informed as to the work of other trades on the project and shall execute their work in a manner that will not interfere with the work of other trades.

3.02 DIAGRAMMATIC NATURE OF DRAWINGS

- A. Where layout of work is diagrammatic, such as pipelines, conduits, ductwork, etc., it shall be followed as closely as other work will permit. Changes from diagrams shall

be made as required to conform to the construction requirements.

- B. Before running lines, carefully verify locations, depths and sizes and confirm that lines can be run as contemplated without interfering with other construction. Any deviation shall be referred to the E/A for approval before lines are run. Minor changes in location of equipment, fixtures, piping, etc., from those shown on the drawings, shall be made without extra charge if so directed by the E/A before installation.
- C. Determine the locations and sizes of equipment, fixtures, conduit, ducts, openings, etc., in order that there will be no interference in the installation of the work or delay in the progress of other work. In the event that interferences develop, the E/A's decision regarding relocation of work will be final.
- D. Any changes made necessary through failure to make proper arrangements to avoid interference shall not be considered as Extras. Cooperate with those performing other work in preparation of interference drawings, to the extent that the location of piping, ductwork, etc., with respect to the installations of other trades shall be mutually agreed on by those performing work.

3.03 PROVISIONS FOR LATER INSTALLATION

- A. Where any work cannot be installed as the construction is progressing, provide for boxes, sleeves, inserts, fixtures or devices as necessary to permit installation of the omitted work during later phases of construction. Arrange for chases, holes, other openings in masonry, concrete or other work and provide for subsequent closure after placing equipment. Arrangement for and closure of openings shall be subject to the approval of the E/A and all costs therefore shall be included in the contract price for the work.
- B. The Contractor shall, at no additional expense to the Owner, perform cutting and patching necessary to the completion of the project. Perform cutting and patching in a manner to prevent damage to the structure or previously completed work.
- C. Refinish surfaces as necessary to provide an even finish. Refinish continuous surfaces to the nearest intersection.

END OF SECTION

SECTION 01100

FINAL OPERATIONS AND TESTING

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Piping system testing.
- b. Leakage tests.
- c. Testing equipment.
- d. System testing.

2. Related Work specified elsewhere:

- a. Manufacturer's Services - Section 01430
- b. Materials and Equipment - Section 01600
- c. Systems Start-up - Section 01650
- d. Piping - Division 2
- e. Equipment - Divisions 11 and 15
- f. Electrical Work - Division 16

2. PRODUCTS

2.01 GENERAL

- A. Provide all necessary equipment and instrumentation required for proper completion of testing.

3. EXECUTION

3.01 PIPING SYSTEM TESTING

A. General

1. Contractor shall be required to test all piping systems as indicated on the Drawings and/or as specified herein. Contractor shall provide at his own expense all necessary test pumping equipment, water meters, pressure gauges, and other equipment, materials and facilities required for the proper completion of the work specified herein. Testing procedures and test equipment shall be approved by the E/A. All tests shall be made in the presence of

the E/A. Any preliminary tests, which the Contractor may make without such tests being observed by the E/A regardless of the alleged results, will not be accepted as fulfilling the requirements of these Specifications. Contractor shall notify the E/A and Owner at least 48 hours before any work is to be inspected or tested.

2. If inspection or test shows defects, the piping system(s) shall be repaired and replaced and inspection repeated, until such piping is acceptable to the E/A.
3. Sections of the system may be tested separately, but any defect which may subsequently develop in a section already tested and accepted shall promptly be corrected and that section retested.
4. Prior to testing, thoroughly clean all pipelines by flushing with water or other means to remove all construction debris.
5. Disposal of the water used for testing and flushing shall be subject to the approval of the E/A.
6. The Contractor shall provide water for hydrostatic testing and flushing. The Owner can provide a reasonable amount of water from hydrants designated by Owner at no cost to Contractor. Contractor's water use from Owner's water system is required to be metered and Owner will provide meter. If Contractor's water needs exceed that which can be reasonably supplied by Owner, Contractor shall supply any additional water needed at Contractor's expense. The source and quality of water used shall be subject to approval of the Engineer.
7. All piping shall be tested in accordance with the following test methods, in addition to any test required by local and state codes or building authorities.

3.02 GRAVITY SEWER PIPE TESTING

A. General Requirements

1. All pipe subject to less than 5 psig pressure shall be tested as gravity pipe, unless other special conditions prevail such as conflict with potable water lines or sewers shown to be placed into service as they are constructed.
2. After backfill has been placed, the E/A will visually inspect all gravity flow lines to check alignment and grade. All obstructions shall be removed. Any sewer in

which the direct light of a lamp cannot be viewed in either direction between adjacent manholes shall be considered unsatisfactory, unless the line is designed with horizontal deflections, and shall be repaired by Contractor without additional compensation.

3. Portions of gravity pipe in conflict with potable water lines shall be pressure tested.
4. Contractor shall supply temporary bulkheads required for pipe testing, together with all anchors, braces, and other devices.
5. When leakage occurs in excess of the specified limits, defective pipe or joints shall be located and repaired. Contractor, at its own expense, shall remove and reconstruct as much of the Work as necessary to obtain a sewer test within the allowable leakage limits.
6. All tests shall be performed by Contractor in the presence of the E/A.
7. In order to select the appropriate leakage test method, Contractor shall determine ground water levels by probing or by installing capped nipples at each manhole. The test method selected shall be subject to approval by the E/A.

C. Air Testing of Gravity Pipe

1. Unless otherwise specified or directed by the E/A, the sanitary sewer shall be tested by the air testing method.
2. Testing Method - All wyes, tees and stubs shall be plugged with flexible jointed caps, or acceptable alternate, securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable.
3. Air Testing Method Procedures - The section of sewer to be tested shall have been trench backfilled and cleaned. Pneumatic plugs (having a sealing length equal to or greater than the diameter of the pipe to be tested), placed in both ends of the pipe to be tested and shall be inflated. The sealed sewer pipe shall then be pressurized to four (4) psig above the average back pressure of groundwater over the sewer pipe and the air

pressure allowed to stabilize for at least two minutes. Air pressure testing shall conform to ASTM F-1417, latest edition, Table 2, Time-Pressure Drop Method (copy of Table 2 attached at end of this Section).

D. Infiltration Tests of Gravity Pipe

1. When the ground water level is at least 24-inches above the top of the pipe at the upper end of the pipe, an infiltration test shall be performed by sealing off a length of pipe and measuring depth of flow over a measuring weir, or by pumping the infiltrated water into containers for measurement. The Contractor shall supply required test equipment if pumping is required. Tests shall be conducted for a minimum of four hours or as required to determine the steady state leakage rate. Infiltration leakage shall not exceed 100 gallons per 24 hours, per inch diameter, per mile of sewer.

E. Exfiltration Tests of Gravity Pipe

1. When the ground water level is below the top of the pipe, the pipe shall be tested for leakage by exfiltration.
2. The Contractor shall provide water required for exfiltration testing.
3. The section of sewer to be tested shall be sealed by inserting inflatable rubber bags in the pipes or by other means approved by the Engineer, and then water shall be introduced into a manhole until the section is completely filled. The Contractor shall fill the pipe to the test level prior to the time of exfiltration testing to permit normal absorption into the pipe walls.
4. Throughout the test period of at least four hours, the water level in the upper manhole shall be maintained at least 24-inches above the crown of the upper end of the pipe or at least 24-inches above the ground water table, whichever is higher. The length of pipe tested shall be limited so that the pressure on the centerline of the lower end of the section tested shall not exceed 6 feet of water column. After two hours the drop in water surface shall be measured. The computed leakage shall not exceed 100 gallons per inch diameter, per 24 hours, per mile of sewer.

F. Deflection Testing (Flexible Pipe - PVC/FRP)

1. The Contractor shall provide the necessary tools and equipment and perform the work necessary to test the deflection of all installed sewer no sooner than 30 days after backfilling has been completed. Deflection shall be tested by use of either a mandrel or rigid ball having a diameter equal to 95 percent of the inside diameter of the pipe, and the test shall be performed without using mechanical pulling devices. Wherever the deflection limitation is exceeded, the Contractor shall uncover the pipe, carefully replace compacted embedment and backfill material, and retest for deflection.

G. Gravity Sewer Televising

All gravity sewers shall be televised following deflection testing of the system. Post construction sewer televising shall be in compliance with Section 01220.

H. Lamping

1. Three-fourths (3/4) of the pipe circle shall be observed both vertically and horizontally for lamping.

3.03 SANITARY FORCEMAIN TESTING

A. General

1. All forcemain installed shall pass the hydrostatic pressure test and leakage test as defined herein. The tests shall be conducted in accordance with AWWA C-600 for ductile iron pipe, AWWA C-605 for PVC pipe and ASTM-F2164 for high density polyethylene solid wall pipe as modified herein. The Contractor shall provide, install and remove all necessary temporary caps, thrust restraints, etc., necessary to test the new pipe short of the final connections to the existing system or facilities. Final connections which cannot be included in the hydrostatic test shall be left exposed, if directed by the E/A, for visual inspection for leakage of the joints and mains.
2. The pressure and leakage test for buried piping shall be made after all jointing operations are completed and any concrete reaction blocks, and restraints have been cured at least 7 days. Lines tested before backfill is in place shall be retested after compacted backfill is placed.

3. All costs for locating leaks, repairing leaks and retesting are the responsibility of the Contractor.
4. The filling and hydrostatic pressure testing shall be coordinated with the Owner and the E/A.
5. Contractor shall provide the water for hydrostatic testing and flushing.

B. Hydrostatic Testing

1. Piping shall be slowly filled with water and all air expelled. Care shall be taken that all air valves are installed and open in the section being filled, and that the rate of filling does not exceed the venting capacity of the air valves.
2. Pressure of 150 psi or 150% of the design operating pressure, whichever is greater, as calculated for the lowest elevation point of the forcemain, shall be applied for a minimum of 2 hours. Test pressure shall not exceed the minimum pressure rating for any component of the section being tested.
3. During the pressure test all components of the test which are visible shall be examined for leaks. No visible leakage is allowed regardless of the results of the pressure and the leakage test.

C. Leakage Testing of Ductile Iron Pipe (DIP) and Polyvinyl Chloride (PVC) Pipe System

1. The test pressure shall be maintained for the test period within 5 psi of the test pressure. If repumping is required, the amount of water added to the test section shall be recorded. If the amount of water added to maintain the test pressure exceeds the minimum allowable leakage, the test fails and the section will require retesting.
2. The test section will be accepted only if the leakage determined under the test pressure is less than the allowable leakage. At the conclusion of the test period, the test section shall be returned to the test pressure by repumping. If total amount of water added to the test section exceeds the allowable leakage the test fails and the section shall be retested. Allowable leakage shall be determined by the following formula:

For ductile iron piping (AWWA C-600):

$$L = (S \times D \times \sqrt{P}) / 148,000$$

Where:

- L = allowable leakage (makeup water), in gallons per test hour
- S = length of pipe tested, in feet
- D = nominal diameter of pipe tested, in inches
- P = average test pressure during the hydrostatic test, in psi

For PVC watermain (AWWA C-605):

$$Q = (L \times D \times \sqrt{P}) / 148,000$$

Where:

- Q = allowable leakage (makeup water), in gallons per hour
- L = length of pipe section being tested, in feet
- D = nominal diameter of the pipe, in inches
- P = average test pressure during the hydrostatic test, in psi

- D. Testing of High Density Polyethylene (HDPE) Sold Wall Pipe System.
 - 1. Testing shall conform to ASTM F-2164 except as noted below.
 - 2. The test pressure shall be maintained for the test period. If water must be added to maintain the test pressure, the test fails and the section will required retesting.
 - 3. Leakage Allowance - There is not leakage allowance for a section of heat-fusion joined polyethylene pipe, because properly made heat fused joints do not leak.

3.04 LEAKAGE TESTS FOR WET WELLS

- A. When wet wells, tanks, or concrete structures which are to hold water have been completed, except for waterproofing and backfilling, they shall be tested by filling with water at a rate to require at least 24 hours for filling.
- B. Should leakage become evident at any point, or should the water level be lower as a result of leakage by any amount greater than 1/4-inch in 24-hours, exclusive of evaporation and absorption, leaks shall be repaired by method acceptable to the E/A. The value of loss due to evaporation shall be determined by using a flat metal pan or container of known area and setting in the same conditions (sun, winds, temperature, etc.), and determining the rate of evaporation per square foot.

Reservoirs, basins, tanks or concrete structures shall be retested until satisfactory results are obtained.

3.05 SANITARY SEWER MANHOLE TESTING

A. Vacuum Testing

1. Manholes shall be successfully vacuum tested prior to placing into service. Test shall conform to ASTM C1244, "Standard Test Method for Concrete Sewer Manholes by the Negative Pressure (Vacuum) Test", latest edition.

3.06 TESTING AND ADJUSTING EQUIPMENT AND SYSTEMS

A. Testing and adjusting of major equipment and systems for which manufacturer's services are specified in the individual Specification Sections shall comply with Section 01430. Testing and adjusting of all other equipment shall comply with the requirements specified herein.

B. Testing Equipment

1. Completed items of mechanical equipment shall be given an operational test as specified for each equipment item.
2. Field testing shall be scheduled and coordinated with the E/A and performed in his presence. Unless otherwise indicated, Contractor shall be responsible for and pay for all water, chemicals, electricity, etc., used in testing equipment and systems.

C. System Testing

1. All items including valves and controls shall be given a thorough test. The entire system shall be operated for two days to prove compatibility of equipment and to achieve proper adjustment for operation. Continuously operating motor driven equipment shall be tested for proper levels of operation and output. Valves, pipes, tanks, and other items that are non-operating or occasional-operating shall be tested for ability to meet design criteria.

D. Adjustments

1. When an item of equipment is found to be in conflict with the stated design criteria, an adjustment shall be made

to the item by experienced personnel of Contractor or a manufacturer's representative.

2. If adjustments fail to correct the operation of a piece of equipment, remove the equipment from the Work Site and replace it with a workable replacement that will meet the Specification requirements.

SECTION 01200

PROJECT MEETINGS

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Preconstruction meeting
- b. Progress meetings
- c. Coordination meetings

2. Related work specified elsewhere:

- a. Coordination - Section 01040

1.02 PRECONSTRUCTION MEETING

- A. The Owner and/or E/A will schedule a preconstruction meeting prior to beginning the work. This meeting shall be attended by the E/A, the Contractor, and the Owner. The purpose of the meeting shall be to review shop drawing procedures, establish a construction schedule, and to review other topics that may apply to this project.

1.03 PROGRESS MEETING

- A. The Owner and/or E/A will schedule weekly meetings to review the Contractor's construction progress relative to the Progress Schedule, as outlined in Section 00700, Article 6.04 of the General Conditions.

1.04 COORDINATION MEETINGS

- A. The Contractor shall schedule meetings as required to coordinate all work, insure proper installations in correct locations at appropriate times, and to avoid unnecessary cutting, patching, or other adjustments of completed portions of the work.

END OF SECTION

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SECTION 01210

PRECONSTRUCTION DIGITAL VIDEO DOCUMENTATION

1. GENERAL
- 1.01 DESCRIPTION
 - A. Work under this Section includes preconstruction digital video documentation of all above-ground features in the areas affected by construction.
- 1.02 SUBMITTALS
 - A. Samples and Equipment Data
 1. Submit information on the digital video recording equipment proposed for use on the project.
 2. Submit sample preconstruction digital video documentation from previous projects to demonstrate compliance with the requirements of this specification.
2. PRODUCTS
- 2.01 GENERAL
 - A. All cameras, recorders, accessories, and appurtenances shall be high quality digital video equipment.
3. EXECUTION
- 3.01 GENERAL
 - A. Preconstruction digital video documentation shall consist of a series of high-resolution color audio-video showing all areas affected by construction.
 - B. All features within the construction's zone of influence shall be shown in sufficient detail to document its preconstruction condition. Features to be shown shall include but not be limited to roadways, pavement, curbs, driveways, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, trees, shrubbery, fences, light posts, etc.
 - C. Viewer orientation shall be maintained by 1) audio commentary on the audio track of each digital video to help explain what is being viewed, and 2) constant electronic displays in the picture which indicate the

date of the video and a counter indicating the location of the televising.

- D. The preconstruction digital video documentation shall be completed and copies on USB drive(s) or external hard drive(s) shall be submitted to the Engineer and Owner before commencing with any construction activities.

END OF SECTION

SECTION 01220

POST CONSTRUCTION SEWER TELEVISIONING

1. GENERAL
 - 1.01 DESCRIPTION
 - A. Work under this Section includes post-construction sewer televising documentation of all mainline sanitary sewer piping.
 - 1.02 SUBMITTALS
 - A. Samples and Equipment Data
 1. Submit information on the recording equipment proposed for use on the project.
 2. Submit sample sewer televising from previous projects to demonstrate compliance with the requirements of this specification.
2. PRODUCTS
 - 2.01 GENERAL
 - A. All cameras, recorders, accessories and appurtenances shall be high quality format equipment.
 - B. Televising Equipment
 1. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. The camera lens shall be capable of 360-degree rotation. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Owner; and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.
3. EXECUTION
 - 3.01 PREPARATORY CLEANING
 - A. Provide preparatory cleaning of the sewer section to permit unobstructed passage of the television camera and clean enough for the Owner to discern structural defects,

misalignment, service lateral connections, and points of infiltration.

- B. Perform a light cleaning with High-Velocity Jet or power rodding equipment to flush the entire sewer section, if necessary and as directed by the Engineer, to allow televising.
- C. Perform heavy cleaning, as directed by the Engineer when light cleaning is not effective.
- D. Contractor shall be responsible for paying all costs, deposits, fees, etc., for obtaining water necessary for jetting and cleaning the sewer prior to televising. The Owner can provide a reasonable amount of water from hydrants designated by Owner at no cost to Contractor. Contractor's water use from Owner's water system is required to be metered and Owner will provide meter. If Contractor's water needs exceed that which can be reasonably supplied by Owner, Contractor shall supply any additional water needed at Contractor's expense. The source and quality of water used shall be subject to approval of the Engineer. All costs for providing water shall be considered incidental and no additional compensation will be provided.
- E. Remove debris resulting from the cleaning operation from the downstream manhole of the sewer section. Passing of debris through subsequent sections is not permitted.
- F. Contractor shall properly dispose of debris from the cleaning operation at an approved landfill. All disposal fees shall be the responsibility of the Contractor.

3.02 INTERNAL SEWER TELEVISIONING

- A. Televising Inspection
 - 1. After cleaning, the manhole sections shall be visually inspected by means of color closed-circuit television with audio-video recording system. The inspection will be done one manhole section at a time.
 - 2. Lighting and camera quality shall be suitable to provide a clear, in-focus picture of the entire inside periphery of the sewer pipe for all conditions encountered during the work. Lighting for the camera shall minimize reflective glare.
 - 3. Camera lens must be kept clean and clear; any fogging due to oil, grease, or other water content or debris that obscures the lens shall be cleaned off before proceeding with the recording operation.

4. The camera shall be moved through the line in the direction of the flow, unless otherwise approved by the Engineer and Owner, at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be moved at a speed greater than 30 feet per minute. The camera shall be self-propelled and shall not use cables, winches or T.V. cable to pull the camera.
5. Camera shall stop at each service connection encountered and the camera rotated to give a clear view up the service line. Each service shall be noted verbally on the video and entered into the log.
6. The camera shall be stopped at each defect found and the camera lens rotated to obtain a clear view of the defect. The equipment operator shall record his observations of the defect on the video.
7. The importance of accurate distance measurements is emphasized. Measurement for location of each service or defect shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the Engineer and Owner.

B. Televising Documentation

1. Documentation of the television results shall be as follows:
 - a. The televising documentation shall be completed and copies on USB drive(s) or external hard drive(s) shall be submitted to the Engineer and Owner.
 - b. Television Inspection Logs: Computerized records shall be kept by the Contractor which will clearly show the location in relation to the upstream manhole of each service or defect. Hand written logs will not be accepted.
 - c. Each log shall be identified by upstream and downstream manhole numbers, with the upstream manhole listed first, and shall contain the USB number and index number of the manhole segment video recording. Copies of the logs, for each USB, shall be filed in a 3-ring loose-leaf binder and delivered to the Engineer and Owner upon completion of the Work. The loose leaf binder shall be labeled

with the USB number, sections televised, location and counter positions. In addition, provide inspection logs with data records, observation codes and rating system compatible with and directly importable into **George Butler & Associate's Sewer Master Inventory Software**.

- d. Photographs: Digital photographs of the television picture of problems shall be taken by the Contractor for each service or defect
- e. Audio Video Recordings: The purpose of recording shall be to supply a visual and audio record of each service and problem areas of the lines that may be replayed. Slow motion or stop motion playback features shall be provided. Each USB shall include a typewritten or printed index (hand-written index will be not be accepted) of the sections televised. Index shall identify USB number, section I.D. (Upstream manhole - downstream manhole), start and stop counter positions for each section and the physical location (i.e., street) of each section. The equipment operator's observations during the inspection shall also be included on the USB.
- f. USBs shall be sequentially numbered and an index shall be provided to the Owner at the completion of the work listing each USB number, the manhole segments contained on each and the indexed location of each segment on a USB.

3.03 FINAL ACCEPTANCE

- A. Provide USBs or external hard drives containing televising documentation to Engineer and Owner for review.
- B. Re-televising sewers found to be deficient during initial television inspection, after repairs are completed, for as many times as required to obtain final acceptance.
- C. Re-televising any sewer section where final inspection video image is of insufficient quality as determined by Engineer or Owner.
- D. No additional compensation will be made for any section of sewer that requires re-televising due to the repair of defects in construction or video image of insufficient quality.

3.04 PAYMENT

- A. Unless a pay item for sewer televising is specifically included, the cost for televising all sewer piping shall be included in the pay item for the sewer installation.

END OF SECTION

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SECTION 01430

MANUFACTURER'S SERVICES

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Mechanical start-up services
- b. Process start-up services
- c. Training services

2. Related work specified elsewhere:

- a. Quality Control - Section 01000
- b. System Start-up - Section 01650
- c. Final Operation and Testing - Section 01100
- d. Equipment - Divisions 11, 15, and 16

1.02 DEFINITIONS

A. The following definitions shall apply wherever used herein and elsewhere in the Specifications.

1. Factory Serviceman shall be a person trained by the manufacturer of the equipment and experienced in the installation, maintenance, start-up and operation of the specified equipment.
2. Factory Process Specialist shall be a person trained and experienced in adjusting and optimizing the operation of the specified equipment to assure proper operation of the equipment as a part of the system in which it is installed.
3. Factory Training Specialist shall be a person trained and experienced in the operation and maintenance of the specified equipment and capable of training the Owner's personnel in the operation and maintenance of the equipment and systems.
4. Eight-Hour Working Day shall be a minimum of eight hours of on-site work, exclusive of travel time to and from the project location. Consecutive days include the five work days in a week, exclusive of Saturday and Sunday.

1.03 SUBMITTALS

- A. At the time of submittal of shop drawings and product data, the Contractor shall submit the names and qualifications of the manufacturer's personnel who perform manufacturer's services as specified herein and elsewhere.

2. PRODUCTS - NOT USED

3. EXECUTION

3.01 GENERAL

- A. All manufacturer's services shall be performed in the presence of the E/A and a representative of the Owner.
- B. The Contractor shall be responsible for scheduling and coordinating the manufacturer's site visit with the Owner and the E/A. The Owner and the E/A shall be given a minimum of 10 working days notice prior to the site visit and shall be given a minimum of 3 working days notice of cancellation of a site visit.
- C. Mechanical Start-up Services shall be performed following complete installation of the equipment item or system.
- D. Process Start-up Services shall be performed at the time the equipment item or system is required by the treatment process.
- E. Initial Training Services shall be performed at the time of Process Start-up.
- F. Follow-up Training Services shall be performed at the times requested in writing by the Owner during the period of one year after Substantial Completion of the Project.
- G. The manufacturer's service specified herein are in addition to the guarantee requirements specified in Section 00700, General Conditions, and Section 00800, Supplementary Conditions.

3.02 MECHANICAL START-UP SERVICES

- A. Mechanical start-up services shall consist of checking the installed equipment electrically to insure it has been installed correctly, wired correctly, properly lubricated, and is ready to operate.
- B. Mechanical start-up services shall be performed by a Factory Serviceman and shall consist of a minimum of the

number of consecutive 8-hour working days specified in the individual equipment Specifications.

- C. The Contractor shall be responsible for arranging for or providing, at no additional cost to the Owner, all required equipment, supplies, and services, including power, water, sewage, sludge, air, compressed gases, etc. and the availability of subcontractors and skilled tradesmen as necessary for mechanical start-up services.
- D. Mechanical start-up will not be considered complete until all installation and material difficulties have been corrected. Upon completion of the mechanical start-up services, the manufacturer shall submit to the E/A a letter certifying that the equipment has been properly installed and is ready for process start-up. Process start-up will not be allowed without prior receipt of the above certification.
- E. As part of the above certification letter, the manufacturer shall submit to the Contractor and the E/A written interim operation and maintenance activities required to ensure that the equipment will remain in operating condition between the mechanical start-up service and process start-up. This information is in addition to information submitted to the E/A for preparation of an operation and maintenance manual for the Owner. The Contractor shall be responsible for all interim operation and maintenance activities.

3.03 PROCESS START-UP SERVICES

- A. Process start-up services shall consist of start-up of the equipment at the time required by the treatment process and final adjustment, calibration, etc. required to optimize operation of the equipment. Process start-up shall also consist of the additional services specified in the individual equipment Specifications.
- B. Process start-up services shall be performed by a Factory Process Specialist and shall consist of a minimum of the number of consecutive 8-hour working days specified in the individual equipment specifications.
- C. The Contractor shall be responsible for arranging for or providing, at no additional cost to the Owner, all required equipment, supplies, and services, including power, water, sewage, sludge, air, compressed gases, etc., and the availability of subcontractors and skilled tradesmen as necessary for process start-up services.
- D. Upon completion of the process start-up services, the manufacturer shall submit to the E/A a letter certifying that the equipment is operating properly.

3.04 TRAINING SERVICES

- A. Training services shall consist of the following:
1. Initial instruction of the Owner's personnel in the operation and maintenance of the equipment consisting of the number of consecutive 8-hour working days of classroom and "hands-off" training specified in the individual equipment Specifications.
 2. Follow-up instruction of the Owner's personnel during the first year of operation, consisting of the number of trips and 8-hour working days of training specified in the individual equipment Specifications.
- B. Training shall be performed by a Factory Training Specialist.
- C. All training shall be performed at the Owner's facilities, unless otherwise specified.

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Transportation and handling
- b. Storage and protection
- c. Protection of complete work
- d. Substitution and product options
- e. Manufacturer's experience, cash deposit, or bond

2. Related work specified elsewhere:

- a. Final Operations and Testing - Section 01100
- b. Manufacturer's Services - Section 01430
- c. Systems Start-up - Section 01650

1.02 TRANSPORTATION AND HANDLING

- A. Manufactured materials and products shall be delivered to the Work Site as needed for installation, undamaged, in original packages, containers, or bundles, as packaged by the manufacturer with manufacturer's name, brand, seals, and labels intact.
- B. Materials other than those designated within the Specifications or approved by the E/A shall not be delivered to the Work Site.
- C. Structural steel members and metal fabrications shall be handled to prevent overstress and damage of any kind. Any damaged or misformed members which cannot be satisfactorily repaired at the site shall be returned to the shop for correction or replacement at no additional cost to the Owner.
- D. Inspect all stone delivered to the project prior to and after unloading. Damaged stone shall not be accepted.
- E. Masonry units shall be handled to prevent broken corners and chipped edges. Replace all defective units.
- F. Equipment shall be adequately packaged or crated to preclude damage during shipping and job site handling.

1.03 STORAGE AND HANDLING

- A. Contractor shall be responsible for protection and preservation of all materials until final acceptance of the project. Store all materials in a manner to facilitate inspection and to prevent damage, contamination, or intermixing.
- B. Equipment shall be stored and protected in compliance with the manufacturer's written instructions as submitted with product data specified in Section 01300. Special protective measures shall be used to protect electrical and mechanical equipment prior to permanent installation. Provide temporary platforms elevated to keep equipment out of mud and water. Provide temporary enclosures approved by the E/A for storing equipment to be installed indoors.
- C. Repair any damage resulting from improper storage procedures, including damage caused by condensation or the elements. Equipment damaged by improper storage and protection to the extent that, in the opinion of the E/A, the life or function of the equipment is decreased shall be replaced at no additional expense to the Owner.
- D. Framing lumber and plywood shall be stacked on blocks to avoid contact with ground and to provide for proper ventilation. Cover with non-staining waterproof materials for protection from the elements.
- E. Finish carpentry items and window frames shall be stored under cover in a warm, dry, well ventilated area. Condition wood doors and carpentry items to the prevailing humidity prior to installation.
- F. Structural steel, miscellaneous metal, reinforcement bars, welded wire fabric, and masonry reinforcement materials shall be stored to prevent contact with the ground and from being damaged by its own weight or by other loads. Reinforcement which has become muddy shall be cleaned before use.
- G. Store cementitious materials in weather-tight sheds on elevated floors away from damp surfaces. Prevent freezing.
- H. Store roofing materials (except gravel) within an enclosure providing protection from the elements and from construction operations. Rolls of felt shall be kept dry and stored standing on end on pallets raised above the ground.
- I. Store paint, solvents, and the pretreatment materials in a well ventilated storage and mixing area well apart from

other structures. An approved hand fire extinguisher shall be provided and maintained near each paint storage and mixing area.

- J. Store stone and masonry units to prevent soiling or damage.

1.04 PROTECTION OF COMPLETED WORK

- A. Provide temporary weathertight enclosures to protect work from damage by the elements, including work and materials of subcontractors, and protect finished surfaces to prevent any damage resulting from the work of any trade.
- B. All work in place that is damaged because of inadequate protection shall be replaced or repaired to the satisfaction of the E/A.
- C. Finished surfaces, including factory-finishes, shall be clean and unmarred upon completion; replace items or refinish surfaces which have been damaged due to inadequate protection.
- D. Reinforced non-staining craft building paper and plywood or planking must be laid over all finished floors in traffic areas. Wheelbarrows, if used in finished area, shall have rubber-tired wheels.
- E. Roof surfaces shall not be subjected to traffic nor be used for storage of materials except when necessary and adequate protection is provided.
- F. Contractor shall be responsible for all glass in place until the Owner takes actual occupancy of the building.

1.05 SUBSTITUTIONS AND PRODUCT OPTIONS

- A. The intent of these Specifications is to provide the Owner with a quality facility without discouraging competitive bidding. Substitutions may be submitted and will be evaluated as specified herein.
- B. For products specified by reference standards only, the Contractor may provide any product complying with the specified standard.
- C. For products specified by performance and descriptive methods, without naming manufacturer's products, the Contractor may provide the products of any manufacturer complying with the Contract Documents, subject to the review of product data and concurrence by the E/A as specified herein.

- D. For products specified by naming manufacturer's products followed by the words "or equal", the Contractor may provide any of the named products or may substitute a product by another manufacturer as an equal for the review of product data and concurrence by the E/A as specified herein. If requirements are specified in addition to naming manufacturer's products, any product provided must comply with all of the specified requirements.
- E. If the Contractor wishes to provide a product other than one named in the Specifications, he shall submit sufficient information to the E/A for evaluation and determination of acceptability of the product prior to purchase and delivery of the product. The Contractor is responsible for obtaining information required by the E/A for the evaluation of products. The E/A is responsible for determination of the equality of products, and his decision shall be final, except as otherwise provided by law and funding agency regulations.
- F. For Major Equipment listed in the Bid Form, substitutions will be considered only if proposed as part of the Bid.
- G. For Major Equipment, as listed in the Bid Form, if the proposed equipment is the product of a manufacturer not named in the Specifications, the Contractor shall submit sufficient information for the E/A to perform a complete evaluation, including a cost-effective analysis, of the product. The following information is required, as a minimum:
1. Manufacturer's drawings, specification data, and product literature.
 2. Product data as necessary to determine ability of the equipment to perform as specified.
 3. Detailed operation and maintenance information, including:
 - a. Energy requirements.
 - b. Maintenance schedules and associated costs of maintenance supplies.
 - c. Length of anticipated life for the design service with supporting data.
 - d. Manufacturer's guarantee and information about the nature and location of parts, service crews, and repair facilities.
 4. Detailed list of all items which may require engineering or architectural redesign or changes of any magnitude as a result of the proposed substitution.

H. The substitution requirement of this section are in addition to the requirements of the Section 00700, General Conditions.

END OF SECTION

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SECTION 01650

SYSTEMS START-UP

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Equipment start-up.
- b. System start-up.

2. Related work specified elsewhere:

- a. Final Operations and Testing - Section 01100
- b. Manufacturer's Services - Section 01430
- c. Materials and Equipment - Section 01600
- d. Equipment - Divisions 11, 14 and 15
- e. Piping - Division 15
- f. Electrical Work - Division 16

1.02 SUBMITTALS

- A. Prior to start-up furnish for the E/A's approval, a detailed outline of the proposed sequence of operation, manner of filling and flushing units, source and quality of water to be used, and disposal of wasted water.

2. PRODUCTS - NOT USED

3. EXECUTION

3.01 START-UP

- A. Start-up of major equipment for which manufacturer's start-up services are specified in the individual Specification Sections shall comply with Section 01430. Start-up of all other equipment shall comply with the requirements specified herein.

B. Equipment Startup

1. Before start-up, properly lubricate all bearings and other items which normally require lubrication, and fill each gear case and oil reservoir to the proper operating level, using the equipment manufacturer's recommended lubricant.
2. The Contractor or an authorized Manufacturer's Representative shall be responsible for the start-up, adjustment, preliminary maintenance, and check-out of equipment and instrumentation. All systems shall be carefully checked for conformance with the design criteria.
3. If any equipment or system does not operate properly, the Contractor shall immediately replace or repair components until it operates properly.
4. When the equipment start-up is complete, each manufacturer shall submit a start-up report to the E/A.

C. System Start-up

1. Immediately prior to final acceptance make a final check of all lubrication requirements, and leave all equipment properly lubricated, ready for Owner's use.
2. When the equipment is placed in operation by the Owner, the Contractor shall demonstrate to the Owner's personnel the proper manner of operating the equipment, making adjustments, and maintaining the system.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Clean-up operations.
- b. Closeout submittals.

2. Related work specified elsewhere:

- a. Submittals - Section 01000
- b. Removal of Temporary Facilities - Section 01000

1.02 CLEAN-UP OPERATIONS

A. The entire project site, both inside and outside all buildings, shall be thoroughly cleaned at the completion of the work, or portions thereof, or when directed by the E/A. Clean-up operations shall consist of the removal and legal disposal of all broken concrete, wood scraps, wire, packaging materials, forms, scaffolds, and other objectionable rubble created during construction operations; washing and scrubbing areas which are dirtied by mud, sewage, oil, grease, and dust to a clean and finished appearance; cleaning of spilled mortar, concrete, paint, brickwork, and metalwork; and removal of all temporary manufacturer's labels from and washing of all equipment, windows, and furnishings.

B. Contractor shall be responsible for the removal of excess dust and mud created by the construction project from all sidewalks, streets, and highways as directed by the E/A. Equipment to clean these surfaces shall be subject to approval by the E/A.

1.03 CLOSEOUT SUBMITTALS

A. Upon completion of the project, or portions thereof, Contractor shall transfer to Owner all applicable items accumulated throughout construction. These include but not limited to the following items:

- 1. Service manuals, installation instructions, special tools, and specialties.

2. Spare parts ordered as part of this Contract.
3. Submittal of the Contractor's guarantee.
4. Submittal of manufacturers' guarantees, bonds, and letters of coverage extending beyond the time limitations of the Contractor's guarantee.
5. Delivery of any salvaged or borrowed materials or equipment to the Owner.
6. Record documents of completed facilities.
7. All keys to all doors, gates, and equipment.
8. Waivers of lien.

END OF SECTION

SECTION 02100

SITE PREPARATION

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Protection of bench marks.
- b. Laying out Work.
- c. Protection of trees to remain.
- d. Utilities relocation.
- e. Stripping and storing topsoil.
- f. Disposal of debris.

2. Related Work specified elsewhere:

- a. Piping materials and Installation

1.02 BENCH MARKS AND MONUMENTS

- A. Maintain all bench marks, monuments and other reference points; if destroyed, replacement costs will be deducted from payments due Contractor.

1.03 LAYING OUT WORK

- A. The E/A will establish the permanent base line(s), property lines, easement lines, and permanent bench marks. No right-of-way analysis was performed by the Engineer as part of this project.
- B. Contractor shall stake out the construction, establish lines and levels, temporary bench marks, batterboards, centerlines and reference points for the Work, and verify all dimensions relating to interconnection with existing features. Contractor shall be held responsible for any errors in these lines and levels.
- C. Contractor shall report any inconsistencies in the proposed grades, lines and levels, dimensions and locations to the E/A before commencing the Work.

2. PRODUCTS - NOT USED

3. EXECUTION

3.01 CLEARING AND GRUBBING

- A. All trees, stumps, brush, shrubs, roots and other objectionable material shall be cut, grubbed, removed and disposed of from areas needed from construction structures, pipelines and any other areas to be stripped.
- B. Protect trees or groups of trees, designated by the Engineer to remain, from damage by all construction operations by erecting suitable barriers, or by other approved means. Clearing operations shall be conducted in a manner to prevent falling trees from damaging trees designated to remain.
- C. Areas outside the easements or limits of clearing shall be protected from damage and no equipment or materials shall be stored in these areas.
- D. No stumps, trees, limbs, or brush shall be buried in any fills or embankments.

3.02 PROTECTION OF TREES AND SHRUBS

- A. All existing decorative trees and shrubs are to remain, unless otherwise indicated on the Contract Drawings. Protect branches, trunks, and roots of trees and shrubs that are to remain. Trees to remain in the construction area shall be boxed, fenced or otherwise protected before any work is started; remove boxing when directed by the E/A. Do not permit heavy equipment or stockpiles within branch spread. Remove interfering branches without injury to trucks and cover scars with tree paint.

3.03 RELOCATION OF UTILITIES

- A. Active utilities which do not interfere with the Work shall be supported and protected from damage. After obtaining the E/A's approval, relocate or remove active utilities which will interfere with the Work as indicated. Contractor shall pay for all damage to active utilities and for relocation or removal of all interfering utilities which are ascertainable from Contract Drawings, surveys, or Work Site inspection.
- B. Inactive or abandoned utilities and appurtenant structures encountered shall be filled or removed to avoid interference as directed by the E/A. Exposed ends of abandoned lines shall be plugged or capped in a watertight manner.

3.04 TOPSOIL REMOVAL

- A. All areas to be occupied by proposed improvements and spoil areas shall be stripped of all brush, weeds, grass, roots and other material that will interfere with lawn maintenance.
- B. Remove all loamy, organic topsoil suitable for seeding and planting to whatever depth encountered and store separately from other excavated material. Stockpile in designated areas and provide for proper drainage.
- C. In the event that inadequate space within the Work Site or Work area is available for stock-piling topsoils without interfering with other construction operations, Contractor shall provide space for stock-piling topsoil away from the Work Site at his expense.

3.05 DISPOSAL OF DEBRIS

- A. All debris and refuse from Work Site preparation operations shall be removed to legal off-site disposal areas.
- B. All debris resulting from all construction operations shall become the property of Contractor and shall be removed to legal off-site disposal areas.

3.06 PAYMENT

- A. Unless a pay item is included in the Schedule of Prices, the cost for any and all of the above described work shall be considered incidental to the Contract and no additional compensation will be provided.

END OF SECTION

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SECTION 02151

SHORING, SHEETING AND BRACING

1. GENERAL
- 1.01 DESCRIPTION
 - A. Work Specified Herein and Elsewhere
 1. Work under this Section includes:
 - a. Sheeting, shoring, and bracing necessary for all earthwork.
 2. Related Work specified elsewhere:
 - a. Utilities Trenching, Bedding, and Backfilling - Section 02221
- 1.02 RESPONSIBILITY
 - A. The structural strength and safety of all sheeting, shoring, and bracing shall be the sole responsibility of Contractor. Repair any damage resulting from failure to provide adequate supports at no cost to Owner.
 - B. Provide shoring, bracing and sheeting wherever necessary to retain banks of excavations, prevent cave-in of adjacent ground, prevent displacement of utilities and structures, and to safely protect the public.
2. PRODUCTS - NOT USED
3. EXECUTION
- 3.01 SHEETING, SHORING AND BRACING
 - A. Furnish, install, and maintain, without additional compensation, sheeting, bracing, and shoring support required to keep excavations within the limits provided, to support the sides of the excavation, and to prevent any movement which may damage adjacent pavements or structures, damage or delay the Work, or endanger life and health. Voids outside the support shall be immediately filled and compacted.
 - B. Sheeting, where required, shall be driven below the bottom of excavation so the lowest set of wales and struts are above the bottom of the excavation to allow necessary working room.

- C. The E/A may direct in writing that support in trenches be cut off at any specified elevation.
- D. Contractor may leave in place, to be embedded in the backfill of the excavation, any or all supports for the purpose of preventing injury to persons or property, whether public or private. However, no supports which are within 4-feet of the ground or pavement surface may be left in place without written permission of the E/A. No extra payment will be made for supports left in place at Contractor's option.
- E. All supports not left in place shall be removed in such manner as to avoid endangering the piping, structures, utilities or property, whether public or private. All voids left by the withdrawal of sheeting shall be immediately filled and compacted.
- F. The right of the E/A to order supports left in place shall not be construed as creating an obligation on E/A's part to issue such orders. Failure by the E/A to exercise this right shall not relieve Contractor from total liability for damages to persons or property resulting from the failure of Contractor to leave in place sufficient supports to prevent any caving or moving of the ground adjacent to the excavation.
- G. Any and all OSHA agency fines assessed against the Owner as a result of Contractor actions shall be paid for by the Contractor.

END OF SECTION

SECTION 02215

HORIZONTAL DIRECTIONAL DRILLING

1. GENERAL

1.01 SUMMARY

A. Section Includes

1. Specifications for installation of pipelines by horizontal directional drilling where called for on the Contract Drawings or chosen by Contractor.
2. Work shall include piping connections to existing piping, or to pipes installed by other methods.
3. The Work shall include all testing as required by Section 01100.

B. Products Installed Not Supplied Under this Section

1. Unless otherwise noted on the Contract Drawings, or stated in this Section, all piping shall be furnished under Sections 02616, 02618 and 02619, and installed under this Section of the Work.
2. All necessary joint and coupling materials, including bolts, nuts and gaskets, supports, anchors, blocking, harnesses, and other necessary closing pipe sections and standard or special fittings shall be furnished and installed in accordance with manufacturer's recommendations and/or specified and shown on the Contract Drawings.

1.02 SUBMITTALS

A. Qualifications

1. The Contractor performing the Horizontal Directional Drilling (HDD) shall have five (5) years experience installing the designated HDD piping system. Contractor shall provide work history of completed projects.
2. The Contractor's directional boring machine operator and directional boring machine navigational equipment operator shall have a minimum of three (3) years each of directional boring experience and a minimum of two (2) years each in critical line and grade installations.

B. Pipe Logs

1. The requirements for the necessary pipe location logs are found in detail under Field Quality Control. Submit a written report to Engineer documenting location and depth of pipe.

Submit logs and summary of stresses on pipe during installation.

C. Equipment Data

1. Furnish data on tracking systems that will be used. Data shall include depth and accuracy capabilities of equipment. As a minimum, this data shall include the following:

- a. Verification method for pilot bore location. The Contractor shall provide a means for accurately verifying the location of the pilot bore at certain points throughout the bore.

- b. Verification must be by visible detection or physical measurement along with the use of existing electronic detection. If electronic detection alone is to be used, the manufacturer of the electronic detection equipment must supply a guarantee that the equipment is accurate within 0.1-feet at all points throughout the bore.

D. Drilling Fluids

1. Submit manufacturer's data. Data shall include material specifications, handling procedures, method of mixing, and special precautions.

E. Pipe Design

1. Submit design calculations.

F. Contingency Clean-Up Plan

1. Prior to the commencement of work, Contractor shall provide a contingency plan for ground clean-up and protection of wetlands in the event that drilling fluids, bore hole cuttings, etc., are released to the surface. Include list of appropriate equipment and material that will be available on-site in the event the above corrective action needs to be undertaken.

1.03 REFERENCES

- A. Driscopipe, Inc., "Technical Note No. 41" dated September, 1993, may be used as guideline for HDPE pipe design.
- B. Manufacturer's design information.

2. PRODUCTS

2.01 DRILLING FLUID

- A. Drilling fluid shall be bentonite clay mixture. Contractor may use a polymer additive at Contractor's option. Fluid and additives shall not be hazardous to the environment.

2.02 PIPE

- A. Pipe shall be as specified in Sections 02616, 02618 and 02619.

2.03 CONTRACTOR

- A. Contractor shall verify the pipe DR required based on the proposed installation procedures, and the following analysis:
 - 1. Tensile Pull Load: (Based on pipe weight, pipe friction on the ground, pipe friction in the borehole, flotation loads, and submersion load; tensile load shall be calculated for a minimum of three conditions: when the pipe enters the borehole, midway through insertion, and as the pipe leaves the ream hole). Tensile stress shall not exceed the maximum allowed by the pipe manufacturer.
 - 2. Bending stress on pipe sidewalls during installation.
 - 3. Net longitudinal compressive stress, based on bending stresses.
 - 4. Total longitudinal axial stress from sustained loads.
 - 5. External differential pressure collapse/buckling resistance.
 - 6. Earth load on pipe following installation at maximum depth.
- B. Summarize results in a tabular format including values used for pipe physical properties.
- C. Include sketches to show critical installation dimensions.

- D. The SDR used shall be the lower of that specified by Engineer in Sections 02616, 02618 and 02619, or that required by the above analysis.

3. EXECUTION

3.01 SITE CONDITIONS

- A. Contractor shall examine the site(s) indicated. The limits of surface excavation shall be located at fittings and inter-connections as shown on the Contract Drawings. Contractor shall be responsible for locating the borehole and receiving hole sufficiently back from the limits of excavation to allow connection to the horizontally drilled pipe. Pits shall be of length and width as necessary to install pipes and sized to fit area available for work.

3.02 PROTECTION

- A. Provide all required sediment and erosion control measures to prevent drilling fluid or borehole cuttings from entering adjacent storm drainage ditches or piping, public or private property, wetlands or utilities.

3.03 INSTALLATION

A. Directional Drilling Equipment

- 1. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing and delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

B. Drilling Rig

- 1. The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to guideable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig

shall have a system to monitor and record maximum pullback pressure during pullback operations. The rig shall be grounded during drilling and pullback operations.

C. Drill Head

1. The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

D. Pilot Hole

1. Pilot hole shall establish the horizontal plane of the pipeline. A plot of length versus elevation versus left/right variance will dictate the actual as-built plan and profile of the pipeline. Data feedback and electronic guidance systems and supplemental surface tracking systems shall be used to provide confirmation of position.
2. Pipe elevations are indicated on the Contract Drawings. If approved by the Engineer, pipes may be installed at greater depths if necessary to permit movement of trapped air to air release high points. Pipe may be installed at greater depths to facilitate the installation if the proposed greater depth is reviewed and approved by Engineer before installation. No additional compensation will be allowed for piping or related structures installed at depth greater than specified.

E. Reaming

1. Reaming shall consist of using an appropriate tool to open the pilot hole to a slightly larger diameter than the carrier pipeline. The percentage over size shall depend on soil types, soil stabilities, depth, drilling fluid hydrostatic pressure, etc. Normal oversizing shall be from 120 to 150 percent of the carrier pipe diameter. Drilling fluid shall be forced down the hole to stabilize the hole and to remove soil cuttings.

F. Pull Back

1. Pull back the entire pipeline length in one segment back through the drilling fluid along the reamed hole pathway. Proper pipe handling, cradling, bending minimization, surface force readings, constant insertion velocity, drilling fluid flow circulation/ exit rate, and footage length installed shall be recorded. The pull-back speed shall be within the pipe manufacturer's recommendations.
2. Any bits, drills, reamers, or other tools lost or stuck in the hold shall be removed at Contractor's expense. If

tools cannot be readily removed, Contractor may at Contractor's option abandon the hole. No payment shall be made for any lost equipment, material, or work on abandoned holes.

G. As-Built Drawings

1. As-built drawings shall be submitted by the contractors based upon his pipe log data. As-built drawings shall be certified as to accuracy by the Contractor. **Final payment will be withheld until the Engineer has received legible As-Built drawings.**

H. Drilling Fluid

1. Drilling fluid to be used to facilitate installation of the pipe shall be adjusted within acceptable limits such that ground heaving and subsurface cavity formation through erosion are prevented.

I. Locating and Protecting Existing Utilities

1. Contractor shall take appropriate precautions to prevent damage to existing utilities where they cross either above or below the proposed Horizontal Directionally Drilled pipe. Exposing the existing utility prior to installing the directionally drilled pipe may be necessary to verify appropriate separation is being maintained and that no damage will occur to the existing utility. The cost for locating existing utilities and for making these exploratory excavations is to be included in the Unit Prices for Horizontal Directional Drilling.

J. Relief Holes

1. The contractor shall drill/excavate relief holes to prevent the pressure of the drilling fluid from heaving or in any other way damaging any buried utilities or surface features. The number and frequency of the relief holes shall be in accordance with the manufacturer's recommendations. Damage due to ground heaving caused by the drilling fluid shall be repaired at the Contractor's expense. Relief holes and related restoration shall be incidental to the Work.

K. Number of Set-Ups

1. The alignment shown on the Contract Drawings is intended to be adhered to unless physical obstructions prevent otherwise. The number of setups, length of pipe installation per setup, etc., to achieve the alignment shown on the Contract Drawings is the Contractor's

responsibility. No additional compensation will be provided for the number of setups required to install the pipe according to the Contract Drawings. For multiple setups, the Contractor shall schedule the location of each setup or pit excavation to coincide with planned excavations such as hydrants, valves or changes in alignment. All setups shall be restored at the Contractor's expense unless the Contractor is required to install a pit or other excavation as requested by the Engineer.

L. Deflection of Pipe Grade

1. Deflection of pipe grade is not acceptable unless prior approval is obtained from the Engineer. If Contractor is unable to maintain the HDD installation pipe grade per the Contract Drawings or to the satisfaction of the Engineer, then Contractor will be required to excavate and reinstall said pipe at the grade indicated on the Contract Drawings, or the satisfaction of the Engineer. All costs for this work, including but not limited to, excavation, bedding, backfill and compaction (as appropriate for the locations), pavement and/or lawn restoration, etc. shall be the responsibility of the Contractor, and no additional compensation will be provided.

M. Deflection of Pipe Alignment

1. Deflection of pipe alignment shall be kept to an absolute minimum. If it becomes necessary to deflect the alignment of the pipe installation, Contractor shall receive approval from the Engineer prior to undertaking the work. Where necessary, Contractor shall construct bore holes and receiving holes as necessary to install appropriate mechanical joint fittings. All costs for this work, including, but not limited to, excavation, bedding, backfill and compaction (as appropriate for the location), pavement and/or lawn restoration, etc., shall be the sole responsibility of the Contractor, and no additional compensation will be provided.

3.04 CLEAN-UP AND RESTORATION

A. Clean-Up

1. Spent drilling fluid and bore hole cuttings shall be confined to vicinity of drilling rig. Any drilling fluid which enters the pipe shall be removed by flushing or other suitable means.
2. Contractor shall be responsible for cleanup and restoration, should the borehole blow out due to excessive pressure in the drilling fluid.

3. Provide on-site appropriate size equipment (such as hydro-vac, end loader, dump truck, etc.) to clean-up/remove spent drilling fluid, bore hole cuttings, etc., that are released to the surface at bore hole blowouts, frac-outs, etc. Clean-up/removal of this material shall be undertaken in a timely manner.
4. No additional payment shall be made for cleanup costs required by Owner, Engineer, or regulatory agencies due to release of drilling fluid, bore hole cuttings, etc.

B. Restoration

1. Pits excavated to permit connection of bored pipe shall be backfilled, and disturbed surface shall be restored as described under other Division 2 Section specifications. The cost for pits and related restoration shall be included in the Unit Price for Horizontal Directional Drilling.

3.05 FIELD QUALITY CONTROL

A. Pipe Logs

1. Logs shall be kept giving the horizontal and vertical position of the pipe at 25-foot intervals along the pipe alignment to confirm its conformance to specified depth and line shown on the Contract Drawings. No payment for any length of pipe shall be made without a log accompanying it.

END OF SECTION

SECTION 02216

FORCEMAIN PIGGING

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Poly Pig
- b. Poly Pig Locator Tracking System
- c. Pig Launcher
- d. Poly Pig Retrieval Unit
- e. Forcemain Pigging

2. Related work specified elsewhere:

1.02 SUBMITTALS

A. Shop Drawings

- 1. Submit shop drawings and product data in accordance with Section 01000 illustrating piping specialties and installation details for all items in this Section.

B. Samples

- 1. Submit product samples for approval as directed by the E/A.

C. Forcemain Pigging

- 1. Submit written summary of proposed Forcemain Pigging operation.

2. PRODUCTS

2.01 POLY PIG

- A. Poly pig shall be constructed of blown elastomeric polyurethane with open cell construction and density equal to or suitable for use in the piping system being cleaned. Poly pig configuration shall consist of parabolic nose and concave base, and shall be coated

with resilient surface material that will maintain peripheral seal and effectively clean the piping system without over abrading the interior pipe wall. Poly pig characteristic when in use shall include the ability to navigate through 45 degree (maximum) elbows, or combination of elbows as depicted on the Contract Drawings; bidirectional fittings, full port valves, internal diameter of the specified pipe; reduce its cross-sectional area and restore itself to its original design configuration; be propelled by applications of hydraulic pressure while maintaining its primary function as an internal cleaning device of conduits.

- B. Poly pig shall be provided with a cavity for mounting an electronic poly pig locator/tracking transmitting device.
- C. Furnish poly pigs in sufficient numbers and sizes, of medium density to achieve a simulated "moderate cleaning" of the proposed forcemain. Poly pigs shall have appropriate coatings and configurations as necessary to achieve "moderate cleaning". Moderate cleaning requirements are defined as follows: a forcemain that has been in service for 10 years since last pigging.

2.02 POLY PIG LOCATOR/TRACKING SYSTEM

- A. The Contractor shall maintain on-site for the duration of the Project, and have available for all forcemain pigging, a poly pig locator/tracking system, with the appropriately sized cavity poly pig, for use in the system being cleaned to provide a means of tracking the passage of the pig in the system to locate areas of potential or suspected blockage and to find "lost" pigs and other disparities within the system.
- B. Poly pig locator/tracking system shall consist of an electronic transmitter that is mounted in the cavity of the pig. System shall also include an above ground handheld tracking unit, and all related equipment necessary to determine location of poly pig/transmitter.
- C. Locator/tracking system transmitter shall be detectable at least to the maximum depth of the pipe and depicted on the Contract Drawings, and at least 100 feet horizontally from the tracking unit.
- D. Locator/tracking system shall be appropriate for the diameter of pipe to be pigged.
- E. Locator/tracking system shall be manufactured by CDI, Inc. of Broken Arrow, OK, or approved equal.

2.03 PIG LAUNCHER

- A. Pig launcher shall be as delineated on the Contract Drawings.

2.04 POLY PIG RETRIEVAL UNIT

- A. Poly pig retrieval unit shall consist of a custom-made nylon rope net system secured to the downstream outlet structure or manhole. Retrieval unit shall "capture" poly pig as it "exits" the forcemain at the point where the forcemain discharges into the downstream outlet structure or manhole.

3. EXECUTION

3.01 GENERAL

- A. Install all items in accordance with manufacturer's instructions and approved shop drawings.

3.02 FORCEMAIN PIGGING

- A. Upon installation and successful testing of forcemain, pig launcher and all related appurtenances, the Contractor shall pig the forcemain from the pig launcher to the forcemain discharge structure.
- B. Forcemain pigging shall be performed by Contractor (or Subcontractor) with a minimum of five years' experience in the cleaning and rehabilitation of wastewater forcemains. Experience in the cleaning of other types of piping systems is not acceptable.

Forcemain pigging to be undertaken by Flowmore Services Corp. (P.O. Box 692005-300, Houston, TX 77269-9962; Phone (800) 356-9667), or approved equal.

- C. Provide all supervision, labor, tools, materials, equipment, etc., necessary to clean the forcemain using appropriately sized poly pigs and industry accepted poly pig procedures.
- D. Provide a written summary of proposed forcemain pigging prior to undertaking said work.
- E. Contractor is required to successfully pig the forcemain prior to the Substantial Completion date of this project. This requirement entails launching a poly pig from the pig launcher into the forcemain, then hydrostatically advancing the poly pig through the full length of the forcemain, without a dig-up, to the

retrieval unit located in the forcemain discharge structure.

- F. Contractor shall provide all water or liquid for successfully pigging of the forcemain.
- G. Contractor shall be responsible for obtaining a sufficient supply of water or liquid to pig the forcemain at a velocity appropriate for the size, length and elevation difference of the forcemain.
- H. Contractor may utilize sewage entering Owner's pump stations for pigging purposes. Some sewage for pigging operations may be able to be stored in upstream sanitary sewers for Lift Stations B, C, and D. Contractor to provide additional supplementary liquid as needed.
- I. It is the Contractor's responsibility to verify and provide the appropriate pumps, generator, etc., to successfully pig the forcemain.
- J. No excavation and subsequent restoration should be necessary to perform the required forcemain pigging. However, should the poly pig become frozen or stuck in the forcemain for any reason, it shall be the Contractor's responsibility to either free the poly pig by utilizing alternate pumping arrangements; or locating, excavating and extracting the poly pig, regardless of depth and/or location. No additional compensation will be provided for poly pig extraction, repair/re-assembly of forcemain to original condition, including any required restoration.
- K. The Contractor shall provide a written report upon completion of the cleaning of the forcemain, outlining and detailing information acquired during this work.

END OF SECTION

SECTION 02221

UTILITIES TRENCHING, BEDDING AND BACKFILLING

1. GENERAL

1.01 DESCRIPTION

A. Work Specified herein and Elsewhere

1. Work under this Section includes:

- a. Pavement removal and replacement.
- b. Trenching for piping.
- c. Excavation for valve vaults, and appurtenances.
- d. Bedding, cover, and backfilling.

2. Related Work specified elsewhere:

- a. Final Operation and Testing - Section 01100
- b. Work Site Preparation - Section 02100
- c. Protection of Trees and Shrubs - Section 02110
- d. Shoring, Sheet piling, and Bracing - Section 02151
- e. Compaction Control and Testing - Section 02250
- f. Finish Grading - Section 02260
- g. Dewatering and Drainage - Section 02400
- h. Paving and Surfacing - Section 02500
- i. Manholes, Wet Wells, Valve Vaults and Appurtenances - Section 02601

2. PRODUCTS

2.01 GENERAL

A. All coarse and fine aggregate material noted in these Specifications or on the Contract Drawings shall be provided by a State of Indiana approved Material Producer.

B. It is intended that previously excavated materials conforming to the following requirements be utilized wherever possible for Trench Backfilling Methods 1 and 2 as delineated in Article 3.07, Trench Backfilling, except as noted elsewhere on the Contract Drawings or in the Contract Documents.

2.02 TRENCH OR EXCAVATION BOTTOM STABILIZATION MATERIAL

A. Provide compacted coarse angular granular stabilization material Coarse Aggregate No. 5 (100% crushed), which shall replace the upper 2' - 0" of any undercut.

- B. Provide compacted coarse angular granular stabilization material Coarse Aggregate No. 2 (100% crushed), which shall range in size from 1-inch to 3-inches which shall replace any undercut below the limits noted in "A" above.

2.03 SAND

- A. Sand shall be well graded, organic free, durable, granular material, and shall pass a No. 4 sieve. Not more than 15 percent shall pass a No. 200 sieve.

2.04 PIT RUN GRAVEL

- A. Pit run gravel shall be organic free and shall pass a 3/4-inch sieve.

2.05 GRANULAR MATERIAL

- A. Granular material for pipe bedding shall be well graded, organic and soil free, durable aggregate and shall be Class 1A per ASTM D-2321, Coarse Aggregate No. 5, 100% crushed, not crushed concrete.
- B. Granular material for trench backfill shall be organic and soil free, durable aggregate, Coarse Aggregate No. 53, 100% crushed, not crushed concrete.

2.06 LIMESTONE SCREENING

- A. Screening shall be limestone aggregate complying with the following gradation:

<u>U.S. Standard Sieve Size</u>	<u>Percent Passing by Weight</u>
3/4-inch	100
1/2-inch	94-100
3/8-inch	75-95
No. 4	20-50
No. 16	0-6

3. EXECUTION

3.01 GENERAL CONSTRUCTION REQUIREMENTS

- A. Provide suitable temporary drainage channels for any water that may flow along or across the Work in accordance with Section 02400.
- B. Provide barriers, warning lights and other protective devices at all excavations in accordance with Section 01000.
- C. Sidewalks, roads, streets, and pavements shall not be blocked or obstructed by excavated materials, except as

authorized by the E/A, in which case adequate temporary provisions must be made for satisfactory temporary passage of Owner's operating personnel, pedestrians, and vehicles. Minimize inconvenience to public travel or to tenants occupying adjoining property.

- D. Where necessary to place excavated material adjacent to buildings, erect barriers to keep earth at least 4-feet from such buildings. Earth deposited on lawns shall be promptly and carefully removed for a width one foot beyond the anticipated edge of the excavation. The pavement break shall be sawed to insure a straight joint. Surface replacement shall match existing surfacing except as otherwise indicated on the Contract Drawings or specified in Section 02500. Where open excavation is allowed along or across public roadways, excavation, backfill, and surface replacement shall conform to the requirements of the permits applicable thereto. In no case shall surface replacement edges bear on less than 12-inches of undisturbed soil.
- E. If underground utilities and/or structures not shown on the Contract Drawings are encountered, notify the E/A and do not proceed until instructions are obtained. Notify the E/A if springs or running water are encountered.

3.02 PIPELINE TRENCHING

- A. Excavation of trenches shall not advance more than 50-feet ahead of completed pipe installation except as approved by the E/A.
- B. Excavation in close proximity to existing utilities shall be performed in a manner to prevent damage. Contact representatives of public utilities for assistance in locating buried lines.
- C. All excavations shall be made by open cut unless otherwise indicated. Contractor shall carry trench excavation to depth and dimensions as indicated in the trench detail as shown on the Contract Drawings. Contractor shall maintain excavation in good order and provide barricades and warning lights, as required in Section 01000.

3.03 LOCATING AND PROTECTING EXISTING UTILITIES

- A. Contractor shall take appropriate precautions to prevent damage to existing utilities where they cross either above or below the proposed pipe. Exposing the existing utility prior to installing the proposed pipe may be necessary to verify appropriate separation is being maintained and that no damage will occur to the existing

utility. The cost for locating existing utilities and for making these exploratory excavations is to be included in the Unit Prices for the proposed pipe.

3.04 MINOR STRUCTURAL EXCAVATION

- A. Minor structures are defined as manholes, junction boxes, valve vaults, etc. Do not excavate for any structure until that structure is scheduled for construction. Excavate only to the depth and dimensions necessary for the construction.
- B. The bottom of all excavations shall be undisturbed earth unless otherwise indicated, and shall be approved by the E/A before any subsequent Work is started.
- C. Excavations carried below depths indicated on the Contract Drawings without the previous approval of the E/A shall be filled with lean (2,500 psi) concrete or well-compacted granular fill to the correct level at the expense of Contractor.
- D. Maintain excavations in good order. If the bearing capacity of the foundation soils is reduced because the excavation is allowed to remain open prior to commencing work, the weathered soil shall be removed and replaced with lean (2,500 psi) concrete or well-compacted granular fill at the expense of Contractor.

3.05 STABILIZATION

- A. If portions of the bottom of trenches or excavations consist of material unstable to such a degree that, in the opinion of the E/A it cannot adequately support the pipe or structure, the bottom shall be over-excavated and stabilized with approved coarse angular granular stabilization material (see Article 2.02 of this Section). Depth of stabilization shall be as directed by the E/A. The initial 10 tons of stabilization shall be incidental to the Contract. Compensation will be allowed only for such additional quantities as the E/A shall direct in writing to be placed, and shall be paid for as Extra Work. Unless otherwise directed by the E/A, the maximum payment width for over-excavation and placement of stabilization in trenches shall be the pipe diameter + 36-inches. Any width in excess of the pipe diameter + 36-inches shall be at the Contractor's expense and no extra compensation will be allowed.

3.06 BEDDING AND COVER FOR PIPING

A. General

1. Bedding is defined as the shaped and tamped material which supports piping. Cover is defined as the compacted material which protects and covers piping, and which extends from the top of bedding material to a point above the top of the pipe. Backfill, as specified hereafter, is defined as the material extending above the top of pipe cover to topsoil, paving subgrade, or foundation level.
2. The limits of Bedding and Cover are delineated on the Contract Drawings.

B. Pipe Bedding and Cover

1. Pipe bedding shall consist of over-excavation of the trench bottom and refilling to proper grade with a minimum of 4-inches of tamped Coarse Aggregate No. 5, Class 1A per ASTM D-2321, 100% crushed (not crushed concrete).
2. Following placement of pipe and inspection of joints, tamped crushed Coarse Aggregate No. 5 pipe cover shall be continued upward to a point 1-foot over the top of the pipe for the full trench width unless otherwise shown on the trench details on the Contract Drawings.
3. The cost for the above work shall be included in the contract unit price for the pipe.

3.07 TRENCH BACKFILLING

- A. After bedding and cover have been placed to a level as shown on the Drawings, backfilling procedures shall be in accordance with the following schedule:

<u>Surface Feature</u>	<u>Method</u>
1. Unimproved areas and cropland, (in non-influence areas)	1
2. Lawns, landscaped areas, parkway strips	2
3. Paved surfaces including bituminous concrete, portland cement concrete, and brick paving	3
4. Influence area below existing paved surfaces, foundations, utilities, etc.	4

5. "Influence area" shall be considered the area within lines sloped downward at 45 degrees from the outer edges of paving, foundations, and utility lines.

B. Method 1

1. From the top of the pipe bedding or top of pipe cover (whichever is applicable) to the surface of the ground, backfill consisting of previously excavated soil free of frozen material and large rocks may be deposited by dragline, bulldozer, or other suitable equipment. Depositing in layers or tamping will not be required. Sufficient surplus excavated material shall be neatly mounded over the trench to compensate for settlement.

C. Method 2

1. Previously excavated soil shall be deposited in accordance with Method 1, except backfill shall be deposited in layers and shall be compacted. Refer to Section 02250 for compaction requirements.

D. Method 3

1. Backfill shall be granular material as called for in the Contract Documents. The backfill shall be carefully deposited in uniform lifts, and each lift shall be wetted adequately and compacted, in accordance with Section 02250.
2. In lieu of compaction in layers, granular backfill may be placed in one operation and water jetted. Jetting procedures shall be demonstrated by Contractor and approved by the E/A.

E. Method 4

1. Backfilling shall consist of using Method 3 in the area of influence under the foundation or utility, and above the level to the surface using the backfill method required by the surface features. The area of influence shall be considered the area under a line sloped downward at 45 degrees from the near edge of foundation, roadway or utility. Compaction shall be in compliance with Section 02250.

3.08 MINOR STRUCTURAL BACKFILL

A. General

1. Do not backfill until new concrete has properly cured, coatings have been approved, and any required tests have been accepted.

2. Exercise care during backfilling operations to avoid any puncture, break or other damage to waterproofing systems, if any. Backfill adjacent to waterproofing in the presence of the E/A.
3. Where backfilling is required on both sides of structures, backfill and compact simultaneously on opposite sides in even layers. Other backfilling sequences shall be as specifically noted.

B. Materials

1. Backfill in lawns and landscaped areas shall be previously excavated materials free from cinders, construction debris, vegetation or other extraneous material and suitable for the intended purpose.
2. Backfill in influence areas beneath piping, foundations, and paving shall be approved granular material unless otherwise shown on the Contract Drawings.
3. "Influence area" shall be considered the area within lines sloped downward at 45 degrees from the outer edges of paving, foundations, and utility lines.

C. Compaction

1. Place fills in lift thicknesses and compact in accordance with Section 02250.

3.09 TESTING AND CLEANUP

- A. As sections of piping are completed, conduct tests in accordance with Section 01100.
- B. Provide for testing and cleanup as soon as practicable, so these operations do not lag far behind pipe installation. Perform preliminary cleanup and grading operations immediately after backfilling.
- C. All surfaces shall be finish graded in accordance with Section 02260.
- D. All surplus excavated material shall be disposed of by Contractor at its expense.

END OF SECTION

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SECTION 02223

STRUCTURAL EXCAVATION AND BACKFILL

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Excavation and backfill for structures
- b. Structural fill
- c. Granular bedding and fill under concrete slabs
- d. Disposal of excess excavated material

2. Related Work specified elsewhere:

- a. Site Preparation - Section 02100
- b. Shoring, Sheet piling and Bracing - Section 02151
- c. Utilities Trenching, Minor Structure Excavation, and backfilling - Section 02221
- d. Compaction Control and Testing - Section 02250
- e. Site and Finish Grading - Section 02260
- f. Dewatering and Drainage - Section 02400

1.02 CLASSIFICATION

- A. Excavation will be unclassified regardless of the nature of the materials encountered.

2. PRODUCTS

2.01 STRUCTURAL FILL

- A. Structural fill as indicated on the Contract Drawings shall be Coarse Aggregate No. 53 and Coarse Aggregate No. 5, 100% crushed stone product complying with the Indiana Dept. of Transportation requirements.
- B. Other structural fill may be soils classified CL, ML, SM, SC according to the Unified Soils Classification System, or noncohesive granular soil free of organic matter (as approved by the Engineer).

2.02 IMPERMEABLE FILL

- A. Fill shall be soils classified CL according to the Unified Soils Classification System.

2.03 GRANULAR FILL

- A. Granular fill shall consist primarily of sand and gravel, free from vegetation or other deleterious material. Any coarse aggregate contained in the material shall pass the 1-1/2-inch sieve. Not more than 15% of fines shall pass the No. 200 sieve.

2.04 GRANULAR BEDDING

- A. Granular bedding shall be washed, well-graded, 1-inch size maximum.

2.05 BACKFILL

- A. Backfill may be previously excavated materials free from cinders, construction debris, vegetation, or other extraneous material and suitable for the intended purpose and compaction requirements.

3. EXECUTION

3.01 STRUCTURAL EXCAVATION

- A. Excavate to the depth and dimensions necessary for the construction; maintain excavations in good order; and provide barricades and warning lights as required. If underground utilities and/or structures not shown on the Contract Drawings are encountered, notify the E/A and do not proceed until instructions are obtained. Notify the E/A if springs or running water are encountered.
- B. The bottom of all excavations shall be undisturbed earth, unless otherwise noted, and shall be approved before subsequent work is started.
- C. If the bottom of excavations consists of material unstable to such a degree that, in the opinion of the E/A, it cannot adequately support the structure, over excavate and backfill with well-compacted granular fill or lean (2,500 psi) concrete. Where excavation and backfill below the Limits of Excavation defined on the Contract Drawings is ordered in writing by the E/A, such additional excavation and backfill will be paid for as Extra Work. Where the Limit of Excavation is not defined, the Limit shall be taken as the base of the footing.
- D. Dewatering and drainage are specified in Section 02400.
- E. Do not excavate for any structure until that structure is scheduled for construction. If the bearing capacity of the foundation soils is reduced because the excavation is allowed to remain open prior to commencing work, the weathered soil shall be removed and replaced with lean

(2,500 psi) concrete or compacted granular fill at the expense of Contractor.

- F. Excavations carried below depths indicated on the Contract Drawings without the previous approval of the E/A shall be filled with lean (2,500 psi) concrete or compacted granular fill to the correct elevation at the expense of Contractor.
- G. Side forms on footings will not be required if the soil is stable and square corners and straight sides are maintained until the concrete is placed; otherwise, excavate outside the foundation lines to allow for installation and removal of formwork and for inspection.

3.02 FILLING, BEDDING AND BACKFILLING

A. General

- 1. Obtain the E/A's approval of existing conditions before starting filling operations. Remove all vegetation, formwork, rubbish and other debris. Excavate muddy subgrade. Do not fill on frozen subgrade. The quantity of structural fill or granular fill required beneath concrete slabs and foundations is dependent on the limits of excavation required to install the footings and foundation wall as well as on the extent of any unstable soil requiring removal. Fill limits shall be from undisturbed soil to the necessary lines and grades under all concrete slabs and foundations of buildings, tanks, and miscellaneous structures, and under rigid paving.
- 2. Thickness of lifts and degree of compaction shall conform to the requirements of Section 02250.

B. Structural Fill

- 1. Provide structural fill where indicated on the Contract Drawings to achieve necessary lines and grades under all foundations of buildings, tanks, and miscellaneous structures, and under rigid paving.

C. Impermeable Fill

- 1. Provide impermeable fill where indicated on the Contract Drawings.

D. Granular Fill

- 1. Provide granular fill where indicated on the Contract Drawings to achieve necessary grades under concrete slabs and elsewhere as indicated.

2. Where granular fill is shown on the Contract Drawings as fill behind retaining walls, the granular fill shall extend from the top of the footing to within 2-ft of the proposed grade. The granular fill and the backfill shall be placed in such a manner as to limit mixing of the materials and such that a minimum 2-ft thickness of granular material is maintained.

E. Granular Bedding

1. Provide granular bedding where indicated on the Contract Drawings.

F. Backfilling

1. Do not backfill until new concrete has properly cured, wall coatings have been approved, and any required tests have been accepted.
2. Exercise care during backfilling operations to avoid any puncture, break, or other damage to waterproofing systems. Backfill adjacent to waterproofing in the presence of the E/A.
3. Where backfilling is required on both sides of structures, backfill and compact simultaneously on opposite sides in even layers. Other backfilling sequences shall be as specifically indicated.

3.03 DISPOSAL OF EXCAVATED MATERIAL

- A. Excess excavated material not suitable or required for backfilling or site grading and all materials containing slag, cinders, foundry sand, debris and rubble shall be placed in designated spoil areas and graded to drain. If no spoil areas are provided on the site, the excess material shall be removed from the site and legally disposed.

END OF SECTION

SECTION 02236

PIPE BORING AND JACKING

1. GENERAL

1.01 DESCRIPTION

A. Furnish all labor, equipment, materials, and incidentals required to install the pipe by boring and jacking, at the locations shown on the Contract Drawings. The Work shall also include the jacking equipment, boring machine and all other appurtenances required to properly support all underground excavations as necessary for the safety of the Work and personnel, complete, including mobilization of plant and equipment. The Work shall be in accordance with these Specifications, the Contract Drawings, all requirements and provisions of the permittees, and as proposed by Contractor and acceptable to Engineer. In all cases, Work shall be in accordance with all governmental regulations.

B. The following bored and jacked crossings will be required:

<u>Crossing</u>	<u>Permitter</u>
123 rd Avenue	Lake County IN Highway Department

C. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Pipe boring and jacking.
- b. Casing pipe installation.
- c. Carrier pipe installation.

2. Related Work specified elsewhere:

- a. Shoring, Sheet piling and Bracing - Section 02151
- b. Trenching - Section 02221.
- c. Dewatering and Drainage - Section 02400.
- b. Carrier pipe materials - Section 02610.

1.02 GENERAL CONSTRUCTION REQUIREMENTS

- A. All materials and methods of installation for crossings by boring and jacking shall be subject to Engineer's approval and in accordance with the Contract Drawings, the Specifications, and the requirements of the permit issued by the controlling agency of the facility being crossed. The cost of abiding by the provisions of the permit shall be considered incidental to the Contract Price.
- B. Contractor shall give officials of the controlling agency adequate notice of the anticipated time and duration of the crossing construction.
- C. Crossings involve casing and carrier pipes, as indicated on the Contract Drawings.
- D. Acceptable Method of Construction
 - 1. Pipe jacked in conjunction with a horizontal boring machine located in a boring pit (Bore and Jack).

2. PRODUCTS

2.01 MATERIALS

- A. Casing Pipe
 - 1. Casing pipe shall be Electric-Fusion (Arc) - Welded Steel Pipe conforming to ASTM A139, Grade B, 35,000 PSI, and shall be of the diameter and wall thickness indicated on the Contract Drawings.
 - 2. Steel casing pipe shall be of new manufacture.
- B. Exterior Coating
 - 1. Casing pipe exterior shall include one coat of Coal Tar Epoxy with a minimum total dry thickness of 8 to 10 mils, applied in accordance with the coating manufacturer's recommendations.
- C. Joints
 - 1. Joints in steel casing pipe shall be full circumference butt welded watertight to the previously installed length of casing pipe.

3. EXECUTION

3.01 NOTIFICATION

- A. Prior to starting construction, all required labor, materials, and equipment shall be on-site. Notify all permittees at least 72 hours in advance of working within their right-of-way. The term "Permitter" shall be understood to mean the party, agency, or governmental authority issuing the permits for construction within the right-of-way.

3.02 CASING INSTALLATION

- A. Bored installations shall have a hole diameter which shall not exceed the specified O.D. of the casing pipe (including coating) by more than one-half (1/2) inch. Over-excavation in excess of this limit shall be pressure grouted the entire length of the casing.
- B. Where unstable soil conditions are found to exist such that caving will likely occur, a metal shield or jacking head shall be installed which extends ahead of the casing pipe. This metal shield shall cover a minimum of the upper half of the circumference of the casing pipe, and no soil removal shall take place beyond the shield. Boring operations shall be conducted in such a manner as not to be detrimental to the facility being crossed.
- C. Cavities or voids in excess of the limits specified above, regardless of cause, shall be filled by pressure grouting at no additional cost to Owner.
- D. Steel casing pipe shall be installed at the same slope as the carrier pipe. If no design slope is specified, then the casing pipe shall be installed to achieve the required elevations and/or depth of cover indicated on the Contract Drawings. Any increased cost resulting from the Contractor's use of casing pipe of greater diameter or thickness than what is specified shall be borne solely by the Contractor.
- E. Once boring and jacking operations are started, prevent "freezing" of the casing due to settlement and compaction of surrounding soil during any Work interruptions.

3.03 CARRIER PIPE INSTALLATION

- A. The entire length of casing shall be complete before any carrier pipe is placed therein. Carrier pipe installation shall be ductile iron pipe, conforming to the requirements of Section 02610.B, and as noted on the Contract Documents.

- B. The carrier may be pushed or pulled (depending upon piping material, joint type and method of pipe support) into the casing as pipe lengths are assembled. The carrier shall be supported by Cascade Casing Pipe Spacers to prevent any movement and to attain the specified grade for graded lines. The proposed method of carrier pipe installation shall be approved by Engineer prior to starting the crossing.
- C. Carrier pipe support shall be provided along the entire length of the casing. Support shall consist of Cascade Casing Pipe Spacers. One spacer shall be placed on the spigot end of each length of carrier pipe and at 6-foot (maximum) intervals thereafter.
- D. After the carrier pipe has been installed in the casing pipe, seal the void between both pipes at each end using concrete brick and cement mortar (not brick mortar).
- E. Casing spacers shall be restrained configuration for forcemain installation.

3.04 CLEAN-UP

- A. Following installation, remove all construction and excess excavated materials and debris. Regrade slopes and ditches to match adjacent areas.

END OF SECTION

SECTION 02250

COMPACTION CONTROL AND TESTING

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Placement, compaction control, and field density testing requirements for all earthwork.

2. Related Work specified elsewhere:

a. Utilities trenching, bedding, cover, and back-filling - Section 02221.

b. Topsoil placement and finish grading - Section 02260.

c. Structural excavation and backfill - Section 02223.

1.02 TESTING

A. Tests will be performed by an approved independent soils laboratory to insure adequate density is being obtained. Contractor shall employ and pay for an independent soil testing laboratory. Material samples shall be taken according to the testing schedule outlined in this section and/or directed by the Owner and/or E/A. The Laboratory shall submit test reports to the E/A and Owner.

2. PRODUCTS

2.01 MATERIALS

A. All materials and products are specified elsewhere in Division 2.

3. EXECUTION

3.01 FILL PLACEMENT

A. If fill already placed has loosened as a result of frost action, the fill shall be recompacted prior to placing additional lifts. Compacted material that has been flooded and no longer meets the density specified shall be removed and replaced.

- B. If the in-place surface has dried, sprinkle with water before placing the next lift. The surface of smooth lifts shall be scarified before the next lift is placed.
- C. Where fill is required on both sides of structures, fill and compact simultaneously on opposite sides in even layers. Other filling sequences shall be as specifically indicated on the Contract Drawings.
- D. Fill shall be spread in uniform horizontal lifts. The material shall be thoroughly mixed to insure a uniform moisture content slightly wetter than optimum but not greater than 5 percent above optimum water content as determined by the Standard Proctor Test, ASTM D698.
- E. Where cohesive structural fill is used, the moisture content when compacted shall be within 3 percent of the optimum moisture content. If the fill does not have a natural water content which falls within the acceptable range, Contractor shall mix, dry, or moisten as necessary.
- F. Place and compact each lift over an entire area prior to placing successive lifts, unless otherwise approved by the E/A.
- G. All materials shall be placed in loose lift thicknesses indicated hereafter.

3.02 COMPACTION

- A. General
 - 1. Unless otherwise indicated, the type of equipment and number of passes required to obtain the specified degree of compaction shall be determined at the work site, subject to the approval of the E/A.
 - 2. Provide mechanical compaction for cohesive material and vibratory compaction for granular materials, unless otherwise approved by the E/A. Jetting, flooding, puddling, or vibroflotation methods shall not be used for compaction unless the Contractor receives written approval from the E/A, and if Contractor, at its expense, furnishes test results to confirm the required degree of compaction is being obtained uniformly throughout the entire mass.
 - 3. Noncohesive soils shall be compacted with vibrating roller or equivalent; cohesive soils shall be compacted with sheeps-foot roller, pneumatic tamping, or approved equivalent, unless otherwise indicated.

B. Water Jetting

1. Water jetting shall only be used when approved by the E/A. Methods and procedures shall be subject to approval of the E/A.

C. Topsoil

1. Topsoil, as specified in Section 02260, shall be compacted with a "cultipacker", roller, or approved equivalent equipment weighing 100 to 160 pounds per lineal foot of roller width.

3.03 FILL LIFT THICKNESSES AND COMPACTION DENSITIES

- A. Unless otherwise indicated or approved by the E/A, place fills in the loose lift thicknesses indicated hereafter, except when water jetting, and compact to a dry density not less than the following percentage of maximum dry density, determined by the Standard Proctor Test, ASTM D698, unless otherwise noted.

3.04 TESTING

- A. Contractor shall assist in providing samples for the following field density tests to insure required densities are being obtained:
1. One test for each 10,000 square feet or fraction thereof per lift of general backfilling.
 2. Two tests for each 100 square feet or fraction thereof per lift of structural fill under slabs, foundation, and pavements.
 3. One test for each 250 lineal feet of trench or fraction thereof per lift of utility trench backfill under paved areas.
 4. One test per lift for each other type of fill, if so directed by the E/A.
- B. Tests shall be in accordance with ASTM D1556 or other tests suitable for the material being tested.
- C. Contractor will pay for initial field density tests. Subsequent tests and associated costs necessitated as a result of the initial tests failing to meet specified requirements will also be at the expense of Contractor.
- D. Additional tests shall be taken if the E/A believes the specified compaction has not been achieved. If said tests indicate compaction has not been achieved, the costs for these tests will be paid for by the Contractor.

<u>Type Fill</u>	<u>USAGE</u>	<u>MAX. LIFT THICKNESS</u>	<u>COMPACTION %</u>	<u>ASTM</u>
Trenched Pipe Bedding	Beneath piping	6"	95	D698
Trenched Pipe Cover	Over and/or around piping	6"	95	D698
Utilities Trench Backfill	"Influence area" beneath other piping or utility lines	8"	95	D698
	"Influence area" beneath rigid paving and railroad tracks	6"	95	D698
	"Influence area" beneath non-rigid paving	9"	92	D698
	Adjacent to or under structures	9"	98	D698
	Plant site, lawns and landscaped areas	12"	85	D698
Structural Fill	All locations under major structures	6"	98	D698
	All locations under minor structures (manholes, etc.)	6"	95	D698
Impermeable Fill	All locations	6"	98	D698
Granular Fill	Below concrete slab bedding, foundations, rigid paving, and excavated area adjacent to structures	8"	95	D698
	All other uses	12"	85	D698
Granular Bedding	Beneath concrete slabs	6"	95	D698
Granular Drainage Blanket	Below concrete slabs, paving, or piping	9"	95	D2049
	All other uses	12"	85	D2049
General Site Grading	Fill for abandoned or demolished structures	12"	85	D698
	Fill on other locations not covered herein	12"	85	D698
	Topsoil placement	12"	85	D698

END OF SECTION

"Influence area" shall be considered the area within lines sloped downward at 45 degrees from the outer edges of paving, foundations, and utilities lines.

SECTION 02260

FINISH GRADING

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes topsoil placement and final grading of the Work Site.

B. Related Work specified elsewhere:

- a. Utilities Trenching, Bedding and Backfilling - Section 02221
- b. Compaction control - Section 02250

2. MATERIALS

2.01 TOPSOIL

- A. Topsoil shall be fertile, friable, natural topsoil typical of the area, free from subsoil, stones, plants, roots or other extraneous material and shall not be used while muddy or frozen.
- B. Topsoil shall contain not less than 8% organic matter (AASHTO T194). The topsoil shall consist of either natural topsoils typical of the locality and free from coarse stone aggregate or surface soils stripped from the Work Site and enriched with humus at a rate of 8% by volume. The soil mixture prepared by mixing surface soils and humus shall be free of oil, cinders, coarse stone, and woody root material.

3. EXECUTION

3.01 GENERAL

- A. Provide all topsoil placement and finish grading and filling to achieve the lines and grades indicated on the Contract Drawings. All earthwork shall be done in a manner that provides drainage.

3.02 Topsoil Placement

- A. Place topsoil in all areas of new grading. The compacted subgrade to receive topsoil shall be scarified to a depth of 3 inches. Topsoil shall be spread evenly and compacted to a thickness of not less than 4-inches, and to the

proposed elevations and grades. Grade flush with walks, curbs, and paving.

3.03 FINISH GRADING

- A. All areas of the Work Site including all previously grassed areas that have been disturbed, borrow sites, excavated and filled sections and adjacent transition areas shall be uniformly smooth-graded. Depressions from settlement shall be filled and compacted. Tops of embankments and breaks in grade shall be rounded. All surfaces shall be finished to provide adequate drainage. Finished surfaces shall be reasonably smooth, compacted, free from irregular surface changes and comparable to the smoothness obtained by blade-grader operations.
- B. Slope grades to drain away from structures at a minimum of 1/4-inch per foot for 10-feet.
- C. Finished surfaces adjacent to paved or surfaced areas and within 10-feet of structures shall be within 1-inch of the proposed grade. All other areas shall be within 2-inches of the proposed grade.
- D. Newly graded areas shall be protected from traffic and erosion. All settlement or washing away that may occur from any cause prior to seeding or acceptance shall be repaired and grades re-established to the required elevations and slopes at no additional cost to Owner.
- E. Unless otherwise indicated, all surplus material shall be disposed of by Contractor.

3.04 GUARANTY

- A. In addition to the guaranties specified in Section 00700, General Conditions, comply with the following requirements:
- B. All finished grading work shall be guaranteed by Contractor through one fall through and spring season.

END OF SECTION

SECTION 02270

SOIL EROSION AND SEDIMENT CONTROL

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work Specified under this Section:

- a. Silt Fence Installed by Static Sliced Method (SF)
- b. Storm Inlet (Silt Fence) Protection (SIP)
- c. Triangular Silt Dike (TSD)
- d. Rock Check Dam (RCD)
- e. Curb Bags (CB)
- f. Erosion Control Blanket (ECB)
- g. Portable Sedimentation Containment System
- h. Stabilization of Soil Stockpile and Areas Disturbed by Construction

2. Related Work Specified Elsewhere:

- a. Section 00700 General Conditions
- b. Section 00800 Supplementary Conditions
- c. Section 02280 National Pollutant Discharge Elimination System (NPDES)
- d. Section 02290 Stormwater Pollution Prevention Plan (SWPPP)
- e. Section 02100 Site Preparation
- f. Section 02110 Protection and Care of Trees and Shrubs
- g. Section 02210 Site Rough Grading
- h. Section 02225 Filter Fabric Material
- i. Section 02485 Lawn and Grasses

1.02 REFERENCES

- A. 327 Indiana Administrative Code (IAC) 15-5.
- B. Indiana Stormwater Quality Manual, latest revised.
- C. Indiana Guidance for Construct Plan / Storm Water Pollution Plan Development.
- D. Stormwater Management and Clean Water Regulations Ordinance, Lake County, Indiana, latest edition.
- E. Lake County, Indiana Stormwater Technical Standards Manual, latest revised.
- F. Indiana Drainage Handbook, latest revised.

- G. State of Indiana Department of Transportation Standard Specifications (latest edition).
- H. Standard Specification for Geotextile Specification for Highway Applications (AASHTO M 288, latest edition) by the American Association of State Highway and Transportation Officials, latest edition.

1.03 WORK INCLUDED

- A. Contractor shall comply with all provisions of 327 Indiana Administrative Code (IAC) 15-5.
- B. Provide slope protection and erosion control and prevent soil erosion as shown on the Contract Drawings, as required per the 327 Indiana Administrative Code (IAC) 15-5, as listed in the Stormwater Pollution Prevention Plan (SWPPP), as specified herein, and as needed for a complete and proper installation.
- C. Work shall consist of furnishing, installing, maintaining, and, upon completion of proposed improvements, removal of the temporary soil erosion and sediment control measures as shown on the Contract Drawings or as specified here within. These control measures shall be installed and located as soon as construction will allow or as directed by the Engineer.
- D. Contractor shall inspect all soil erosion and sediment control measures after each rainfall, snowfall, or snowmelt event of at least 0.5 inches or greater in 24 hours. Contractor shall repair any deficiencies or damage.
- E. Accumulated silt or debris shall be removed and relocated as directed by the Engineer. If a soil erosion or sediment control measure is damaged or inadvertently moved during the silt removal process, the Contractor shall immediately replace the control measure after damage occurs.
- F. Contractor is responsible for obtaining approval for all proposed soil erosion and sediment control devices and/or methodologies from appropriate regulatory agency.

1.04 QUALITY ASSURANCE

- A. Contractor shall assign and pay for the services of a Indiana qualified compliance inspector of stormwater (QCIS).

- B. Contractor shall provide adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation and performance of the work of this section.

2. PRODUCTS

2.01 GENERAL

- A. Provide manufacturer's certification that materials meet the minimum specified value.

2.02 SOIL EROSION AND SEDIMENT CONTROL SYSTEMS

A. Silt Fence Installed by Static Sliced Method (SF)

1. Disturbed areas shall, at a minimum, be protected by a filter barrier (including filter fences, which at a minimum, meet the applicable sections of the AASHTO Standard Specification M 288, latest edition, or approved equivalent control measures) to control all off-site site runoff.
2. Silt fence shall be installed by static slice method where shown on the Contract Drawings, or as directed by the Engineer. Alternative installation method(s) shall be considered for use by the Engineer if ground conditions do not allow the use of the static slice installation method. Alternative installation method(s) shall be in accordance with silt fence manufacturer's installation recommendations. Contractor shall obtain Engineer's approval prior to using alternative installation method(s).
3. Material shall be a non-woven, needle-punched fabric with a minimum grab tensile strength of 165 lb, minimum tear strength of 65 lb, minimum elongation of 50%, and a minimum water flow rate of 110 gpm/sq.ft. Filaments shall be dimensionally stable, resistant to delamination, free from chemical treatments or coatings that reduce porosity and permeability, and resistant to ultraviolet radiation.
4. Fabric shall be installed with a minimum of 2.5 feet above the ground, a minimum of 6 inches embedded, and the bottom of the embedded fabric shall achieve a "J" configuration.
5. Support posts shall be 1.2 square inch hardwood posts or U, T, L, or C shape steel posts weighing not less than 1.3 pound per linear foot. Steel posts shall be OSHA safety compliant. Posts shall be a minimum of 5 feet in

length, buried a minimum of 2 feet depth, and shall have a spacing interval of 5 feet (maximum) unless otherwise indicated on the Contract Drawings.

6. Fastener shall meet one of the following materials:
 - a. Cable ties (50 lb strength, minimum).
 - b. Soft wire.
 - c. Staples with a minimum $\frac{1}{2}$ inch head.
7. Contractor shall perform inspection and maintenance in accordance with manufacturer's recommended procedures, as indicated on the Contract Drawings, or as directed by the Engineer.

B. Storm Inlet (Silt Fence) Protection (SIP)

1. Install storm inlet (silt fence) protection where shown on the Contract Drawings, in accordance with manufacturer's recommended installation procedures, per applicable sections of AASHTO Standard Specification M288, latest edition, and as directed by the Engineer.
2. Install using static sliced method or other approved trenching method in accordance with the manufacturer's recommended installation procedures.
3. Installed fabric shall be a minimum of 2.5 feet above the ground, a minimum embedment depth of 6 inches, and the bottom of the embedded fabric shall achieve a "J" configuration.
4. Material shall be a woven monofilament geotechnical fabric with a minimum grab tensile strength of 200 lb, minimum trap tear strength of 75 lb, percent open area of 10%, and a minimum water flow rate of 145 gpm/sq.ft.
5. Support posts, fasteners, inspection, and maintenance shall meet requirements as stated in static sliced silt fence section.

C. Triangular Silt Dike (TSD)

1. Install triangular silt dikes where shown on the Contract Drawings, or as directed by the Engineer, in accordance with manufacturer's recommended installation procedures.
2. Triangular silt dikes shall be used as a continuous line barrier at the toe of slope or right-of-way line to contain sediment or as a ditch barrier placed perpendicular to the flow of water in a defined drainage ditch to minimize erosion and contain sediment.

3. Inner material shall be triangular-shaped urethane foam. Outer cover shall be a woven geotextile fabric placed around the inner material.
4. Silt dike shall be constructed into a triangular-shape, with a minimum center height of 10 inches, equal height and slope of sides, and a minimum base width of 16 - 20 inches. Inner material shall be allowed to extend beyond both sides of the triangle 2 - 3 feet. Standard length of each dike shall be 7 feet unless otherwise indicated on the plans.
5. Attach each dike to the ground as indicated on the installation detail with No. 11 gauge wire staples, a minimum 6 - 8 inches long.
6. Perform inspection and maintenance in accordance with manufacturer's recommended procedures, as indicated on the Contract Drawings, or as directed by the Engineer.

D. Rock Check Dams (RCD)

1. Install check dam where shown on the Contract Drawings, as necessary, or as directed by the Engineer.
2. Rock check dams shall be used to reduce velocity of flowing water in a channel, thereby reducing sediment and the potential for erosion.
3. Material shall be clean, CA-1 rock, no fines. Rock shall be placed by hand or mechanically. Dumping of rock is not acceptable.
4. Dam shall completely span the ditch or swale to prevent washout, with the center section of the dam being lower than the edge section. When using dams in series, the toe of the upstream dam shall be at the same elevation as the top of the downstream dam so to allow small pools to form between each check dam.
5. Perform inspection and maintenance after rain event (1/2-inch in 24 hours), as indicated on the Contract Drawings, or as directed by the Engineer. Replace missing rock that has been displaced. Remove sediment when accumulation reaches 1/3rd the barrier height. Remove check dam and accumulated sediment when check dam is no longer needed.

E. Curb Bags (CB)

1. Install curb bag where shown on Contract Drawings, as necessary, or as directed by the Engineer.

2. Curb and gutter inlet protection unit shall be a sewn geotextile fabric unit enclosing a porous structure in the form of a cylindrical tube placed in front of and extending beyond the inlet opening on both sides and have a geotextile fabric envelope fitted to the individual grate(s) on the street side of the sewn unit for grate(s) to be inserted and to completely enclose the grate(s).
3. Curb bag shall have lifting devices to allow manual inspection of the storm water system.
4. Place the empty curb bag unit over the grate as the grate stands on end. Tuck the enclosure flap inside to completely enclose the grate. Holding the lifting devices, being careful not to damage the sewn fabric unit, insert the grate into its frame, street side edge first, then lower back edge with cylindrical tube into place. The cylindrical tube should be partially blocking the curb hood opening.
5. Contractor shall remove all accumulated sediment and debris from surface and vicinity of unit after each rain event or as directed by Engineer/ Inspector. Dispose of unit no longer in use at an appropriate recycling or solid waste facility.

F. Erosion Control Blanket (ECB)

1. Install erosion control blanket where shown on Contract Drawings or as delineated elsewhere in the Contract Documents, in accordance with manufacturer's recommended installation procedures, and as directed by the Engineer.
2. Immediately after rolling seeded area, place erosion control blanket on slopes steeper than 3 horizontal to 1 vertical.
3. Unless otherwise specified, place erosion control blanket at sides and bottoms of ditches, swales, and areas within 10 feet of catch basins in seeded areas.

G. Portable Sedimentation Containment System

1. Portable sedimentation containment systems shall be used to trap and retain sediment prior to pumping the water to drainage ways, adjoining properties, and rights-of-way below the rock discharge tank and when other sediment trapping practices cannot be installed due to lack of space or other reasons.
2. The portable sedimentation containment system outlined as follows shall be considered an example of the type of

system to be installed; Contractor is responsible for assembling and maintaining a portable sedimentation containment system that traps and retains sediment created by construction activity, and achieves the results noted below:

- a. The area must be stabilized so that it can filter sediment and at the same time withstand the velocity of the discharged water without causing erosion. The system should be located for ease of clean out and disposal of the trapped sediment, and to minimize the interference with construction activities, and/or pedestrian/vehicular traffic.
- b. The discharge chute shall be constructed of 24-inch diameter HDPE corrugated pipe cut in half along its length, or other material suitable for handling the volume of water being discharged into the system. Design to allow for emergency flow over top of the discharge chute.
- c. The length of discharge chute shall be determined by contact time and turbulence required to form flocs (dictated by bench test) and to allow pumped water to flow through the filtering device without over-topping the chute.
- d. The chute shall contain rock baffles. Quantity and spacing of baffles shall be determined as necessary.
- e. Install sediment control geotextile, rock discharge tank, and other system elements as necessary to achieve required water quality being discharged from construction site.
- f. Type and quantity of floc logs shall be selected in accordance with site-specific soil and water conditions, which shall be submitted for testing. Secure floc logs to discharge chute, as necessary.
- g. Install filter fabric, covered with 2 inches of CA-7 or CA-11 aggregate at the downstream end of the discharge chute. Install a rock discharge tank wall consisting of 3-inch rock along the perimeter of the filter fabric, forming a floc collection basin.
- h. Replacement and maintenance of geotextile, floc logs, and other system elements shall be performed in accordance with the manufacturer's recommended procedures, or as necessary to achieve required water quality being discharged from construction site. Once the water level nears the top of the discharge chute, the pump shall be shut off while

the discharge chute drains and additional capacity is made available.

- H. Stabilization of Soil Stockpile and Areas Disturbed by Construction
1. Temporary soil stabilization shall be applied to disturbed areas within seven (7) calendar days from the end of disturbance. If construction activity will resume within fourteen (14) calendar days, then temporary stabilization measures do not need to be applied by the above noted seventh (7th) day.
 2. Temporary soil stabilization measures shall conform with the following (based on the time of year):
 - a. September 1 to October 31 - Apply temporary cover crop or dormant seed at required rate (lb/acre). If dormant seed is applied, erosion control blanket shall be installed concurrently. Erosion control blanket required in areas where slope exceeds 3:1 (H:V).
 - b. November 1 to Earliest time Ground can be worked in spring - Apply erosion control blanket. Return at earliest time ground can be worked in spring and apply permanent stabilization/restoration as required. Dormant seed can be spread (at required rate) but is not required. If dormant seed is spread, permanent stabilization/restoration may be required in spring if ground cover is not sufficient to control erosion.
 - c. Earliest time ground can be worked in Spring to June 15 - Apply cover crop seed at required rate. Erosion control blanket required in areas where slope exceeds 3:1 (H:V).
 - d. June 16 to August 31 - Apply erosion control blanket. Return September 1 and apply cover crop seed at required rate or apply permanent stabilization/restoration as required. Erosion control blanket required in areas where slope exceeds 3:1 (H:V).
 3. Permanent stabilization/restoration shall be applied to disturbed areas within seven (7) days after completion of final grading or end of ground disturbance. Permanent soil stabilization measures shall be applied to channels (including bed and banks) within seven (7) calendar days of the end of final disturbance of the channel

- a. Permanent stabilization/restoration shall be as called for on the Contract Drawings and/or the Specifications.
4. Permanent or temporary vegetation shall not be considered established until sufficient ground cover is mature enough to control erosion.
5. The cost for any and all temporary soil stabilization, including any necessary maintenance of said soil stabilization, shall be considered incidental and no additional compensation will be provided."

END OF SECTION

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SECTION 02280

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM REQUIREMENTS

1. GENERAL

1.01 Contractor Qualification Certification Statement

- A. Prior to performing any portion of Work, the Contractor shall complete the attached Contractor Certification Statement and return the executed form to the Engineer. Contractor is required to comply with all conditions outlined in the attached General NPDES Permit Rule 5 (327 IAC 15-5) during the course of this project.

1.02 National Pollutant Discharge Elimination System (NPDES)/ Erosion and Sediment Control Deficiency Deduction

- A. When the Engineer is notified or determines an erosion and/or sediment control deficiency(s) exists, or the Contractor's activities represents a violation of the Owner's NPDES permits, the Engineer will notify and direct the Contractor to correct the deficiency within a specified time. The specified time, which begins upon notification to the Contractor, will be from 1/2 hour to 1 week based on the urgency of the situation and the nature of the work effort required. The Engineer will be the sole judge.
- B. A deficiency may be any lack of repair, maintenance, or implementation of erosion and/or sediment control devices included in the contract, or any failure to comply with the conditions of the Owner's NPDES permits. A deficiency may also be applied to situations where corrective action is not an option such as the failure to participate in a job site inspection of the project, failure to install required measures prior to initiating earth moving operations, disregard of concrete washout requirements, or other disregard of the NPDES permit.
- C. If the Contractor fails to correct a deficiency within the specified time, a daily monetary deduction will be imposed for each calendar day or portion of a calendar day until the deficiency is corrected to the satisfaction of the Engineer. The calendar day(s) will begin with notification to the Contractor and end with the Engineer's acceptance of the correction. The base value of the daily monetary deduction is \$1,000.00. The value of the deficiency deduction assessed will be determined by multiplying the base value by a Gravity Adjustment Factor provided in Table A; except for failure to participate in a required job site inspection

of the project prior to initiating earthmoving operations which will be based on the total acreage of planned disturbance at the following multipliers: <5 Acres: 1; 5 - 10 Acres: 2; >10 - 25 Acres: 3; >25 Acres: 5. For those deficiencies where corrective action was not an option, the monetary deduction will be immediate and will be valued at one calendar day multiplied by a Gravity Adjustment Factor.

TABLE A				
DEFICIENCY DEDUCTION GRAVITY ADJUSTMENT FACTORS				
Types of Violations	Soil Disturbed and Not Permanently Stabilized at Time of Violation			
	<5 Acres	5 - 10 Acres	>10 - 25 Acres	>25 Acres
Failure to Install or Properly Maintain BMP	0.1 - 0.5	0.2 - 1.0	0.5 - 2.5	1.0 - 5
Careless Destruction of BMP	0.2 - 1	0.5 - 2.5	1.0 - 5	1.0 - 5
Intrusion into Protected Resource	1.0 - 5	1.0 - 5	2.0 - 10	2.0 - 10
Failure to Properly Manage Chemicals, Concrete Washouts or Residuals, Litter or Other Wastes	0.2 - 1	0.2 - 1	0.5 - 2.5	1.0 - 5
Improper Vehicle and Equipment Maintenance, Fueling or Cleaning	0.1 - 0.5	0.2 - 1	0.2 - 1	0.5 - 2.5
Failure to Provide or Update Written or Graphic Plans Required by SWPPP	0.2 - 1	0.5 - 2.5	1.0 - 5	1.0 - 5
Failure to Comply with Other Provisions of the NPDES Permit	0.1 - 0.5	0.2 - 1	0.2 - 1	0.5 - 2.5

NPDES GENERAL PERMIT RULE NO. 5
(327 IAC 15-5)
CONTRACTOR CERTIFICATION STATEMENT

Project Name _____
Project Location _____

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) Rule No. 5 per 327 Indiana Administrative Code (IAC) 15-5 that authorizes the stormwater discharges associated with construction activity from the construction site identified as part of this certification.

Signature _____ Date _____

Print Name _____

Title _____

Company _____

Address _____

Telephone Number _____

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(B) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (for example, Regional Administrators of EPA).

(4) Permit applicants who meet the criteria set forth in this subsection may also utilize agency-approved electronic application mechanisms in lieu of paper NPDES applications.

(h) A person is a duly authorized representative only if:

(1) the authorization is made in writing by a person described under subsection (g);

(2) the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility (a duly authorized representative may thus be either a named individual or any individual occupying a named position); and

(3) the written authorization is submitted to the commissioner.

If an authorization under this subsection is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of this subsection must be submitted to the commissioner prior to or together with any reports, information, or applications to be signed by an authorized representative.

(i) Any person signing a document under this section shall make the following certification:

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

(j) Except for data determined to be confidential under confidentiality rules at 327 IAC 12.1, all reports prepared in accordance with the terms of the applicable general permit rule shall be available for public inspection at the offices of the Indiana department of environmental management and the U.S. Environmental Protection Agency Regional Administrator. As required by the CWA, information contained in the NOI letter and effluent data shall not be considered confidential.

(k) The following are subject to the criminal penalties and provisions of IC 13-30, including criminal fines and imprisonment under IC 13-30-10:

(1) Any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under the applicable general permit rule, including monitoring reports or reports of compliance or noncompliance.

(2) Any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this article.

(Water Pollution Control Division; 327 IAC 15-4-3; filed Aug 31, 1992, 5:00 p.m.: 16 IR 21; errata filed Apr 10, 2006, 2:46 p.m.: 29 IR 2547; filed Oct 9, 2015, 4:07 p.m.: 20151104-IR-327100659FRA; errata filed Dec 30, 2015, 12:37 p.m.: 20160113-IR-327150453ACA)

Rule 5. Storm Water Run-Off Associated with Construction Activity

327 IAC 15-5-1 Purpose

Authority: IC 13-14-8; IC 13-14-9; IC 13-15-1-2; IC 13-15-2-1; IC 13-18-3

Affected: IC 13-11-2; IC 13-18-4

Sec. 1. The purpose of this rule is to establish requirements for storm water discharges from construction activities of one (1) acre or more to protect the public health, existing water uses, and aquatic biota. *(Water Pollution Control Division; 327 IAC 15-5-1; filed Aug 31, 1992, 5:00 p.m.: 16 IR 23; errata, 16 IR 898; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 833; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; filed Oct 9, 2015, 4:07 p.m.: 20151104-IR-327100659FRA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA)*

NPDES GENERAL PERMIT RULE PROGRAM

327 IAC 15-5-2 Applicability of general permit rules

Authority: IC 13-14-8; IC 13-14-9; IC 13-15-1-2; IC 13-15-2-1; IC 13-18-3

Affected: IC 13-11-2; IC 13-18-4; IC 14-34

Sec. 2. (a) The requirements under this rule apply to all persons who:

- (1) do not obtain an individual NPDES permit under 327 IAC 15-2-6;
- (2) meet the general permit rule applicability requirements under 327 IAC 15-2-3; and
- (3) are involved in construction activity, except operations that result in the land disturbance of less than one (1) acre of total land area as determined under subsection (h) and are not part of a larger common plan of development or sale.

(b) The requirements under this rule do not apply to persons who are involved in:

- (1) agricultural land disturbing activities; or
- (2) forest harvesting activities.

(c) The requirements under this rule do not apply to the following activities, provided other applicable permits contain provisions requiring immediate implementation of soil erosion control measures:

- (1) Landfills that have been issued a certification of closure under 329 IAC 10.
- (2) Coal mining activities permitted under IC 14-34.
- (3) Municipal solid waste landfills that are accepting waste pursuant to a permit issued by the department under 329 IAC 10 that contains equivalent storm water requirements, including the expansion of landfill boundaries and construction of new cells either within or outside the original solid waste permit boundary.

(d) The project site owner shall do the following:

(1) Complete and submit:

- (A) an NOI; and
- (B) a construction plan in accordance with section 6 of this rule.

(2) Ensure compliance with this rule during:

- (A) the construction activity; and
- (B) implementation of the construction plan.

(3) Submit a notice of termination letter (NOT) in accordance with section 8 of this rule.

(4) Ensure that all persons engaging in construction activities on a permitted project site comply with the applicable requirements of this rule and the approved construction plan.

(e) For off-site construction activities that provide services (for example, road extensions, sewer, water, and other utilities) to a permitted project site, these off-site activity areas must be considered a part of the permitted project site when the activity is under the control of the project site owner.

(f) For an individual lot where land disturbance is expected to be one (1) acre or more and the lot lies within a project site permitted under this rule, the individual lot owner shall:

- (1) complete his or her own notice of intent letter; and
- (2) ensure that a sufficient construction plan is completed and submitted in accordance with section 6 of this rule.

(g) For an individual lot where the land disturbance is less than one (1) acre and the lot lies within a project site permitted under this rule, the individual lot operator shall comply with:

- (1) the provisions and requirements of the plan developed by the project site owner; and
- (2) section 7.5 of this rule.

A separate notice of intent letter and construction plan are not required to be submitted.

(h) Multi-lot project sites shall be regulated as follows:

(1) A determination of the area of land disturbance shall be calculated by adding the total area of land disturbance for improvements, such as roads, utilities, or common areas, and the expected total disturbance on each individual lot, as determined by the following:

- (A) For a single-family residential project site where the lots are one-half (0.5) acre or more, one-half (0.5) acre of land disturbance must be used as the expected lot disturbance.
- (B) For a single-family residential project site where the lots are less than one-half (0.5) acre in size, the total lot must be calculated as being disturbed.

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(C) For all other types of project sites, such as industrial and commercial project sites, lot disturbance shall be calculated as follows:

(i) Where lots are one (1) acre or greater in size, a minimum of one (1) acre of land disturbance shall be the expected lot disturbance.

(ii) Where the lots are less than one (1) acre in size, the total lot must be calculated as being disturbed.

(2) For purposes of this rule, strip developments:

(A) are considered as one (1) project site; and

(B) must comply with this rule;

unless the total combined disturbance on all individual lots is less than one (1) acre and is not part of a larger common plan of development or sale.

(i) Submittal of a NOI and construction plans is not required for construction activities associated with a single-family residential dwelling disturbing less than five (5) acres when the dwelling is not part of a larger common plan of development or sale. Provisions in section 7(b)(1) through 7(b)(5), 7(b)(10) through 7(b)(17), 7(b)(19), and 7(b)(20) of this rule shall be complied with throughout construction activities and until the areas are permanently stabilized.

(j) The commissioner may waive the permit requirements under this rule for construction activities that disturb less than five (5) acres if the applicant certifies that:

(1) a total maximum daily load (TMDL) for the pollutants of concern from storm water discharges associated with construction activity indicates that controls on construction site discharges are not needed to protect water quality; or

(2) in receiving waters that do not require a TMDL study, an equivalent analysis demonstrates water quality is not threatened by storm water discharges, and it has been determined that allocations for the pollutants of concern from the construction site discharges are not needed to protect water quality based on consideration of existing in-stream concentrations, expected growth in pollutant contributions from all sources, and a margin of safety.

(Water Pollution Control Division; 327 IAC 15-5-2; filed Aug 31, 1992, 5:00 p.m.: 16 IR 23; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 833; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; filed Oct 9, 2015, 4:07 p.m.: 20151104-IR-327100659FRA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA)

327 IAC 15-5-3 General permit rule boundary

Authority: IC 13-14-8; IC 13-14-9; IC 13-15-1-2; IC 13-15-2-1; IC 13-18-3

Affected: IC 13-11-2; IC 13-18-4

Sec. 3. This general permit covers all lands within Indiana. *(Water Pollution Control Division; 327 IAC 15-5-3; filed Aug 31, 1992, 5:00 p.m.: 16 IR 23; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 834; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA)*

327 IAC 15-5-4 Definitions

Authority: IC 13-14-8; IC 13-14-9; IC 13-15-1-2; IC 13-15-2-1; IC 13-18-3

Affected: IC 13-11-2; IC 14-32; IC 14-34

Sec. 4. In addition to the definitions contained in IC 13-11-2, 327 IAC 5, and 327 IAC 15-1-2, the following definitions apply throughout this rule:

(1) "Agricultural conservation practices" means practices that are constructed on agricultural land for the purposes of controlling soil erosion and sedimentation. These practices include grass waterways, sediment basins, terraces, and grade stabilization structures.

(2) "Agricultural land disturbing activity" means tillage, planting, cultivation, or harvesting operations for the production of agricultural or nursery vegetative crops. The term also includes pasture renovation and establishment, the construction of agricultural conservation practices, and the installation and maintenance of agricultural drainage tile. For purposes of this rule, the term does not include land disturbing activities for the construction of agricultural related facilities, such as:

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- (A) barns;
 - (B) buildings to house livestock;
 - (C) roads associated with infrastructure;
 - (D) agricultural waste lagoons and facilities;
 - (E) lakes and ponds;
 - (F) wetlands; and
 - (G) other infrastructure.
- (3) "Construction activity" means land disturbing activities and land disturbing activities associated with the construction of infrastructure and structures. This term does not include routine ditch or road maintenance or minor landscaping projects.
- (4) "Construction plan" means a representation of a project site and all activities associated with the project. The plan includes the location of the project site, buildings and other infrastructure, grading activities, schedules for implementation, and other pertinent information related to the project site. A storm water pollution prevention plan is a part of the construction plan.
- (5) "Construction site access" means a stabilized stone surface at all points of ingress or egress to a project site for the purpose of capturing and detaining sediment carried by tires of vehicles or other equipment entering or exiting the project site.
- (6) "Contractor" or "subcontractor" means an individual or company hired by the project site or individual lot owner, their agent, or the individual lot operator to perform services on the project site.
- (7) "Developer" means:
- (A) any person financially responsible for construction activity; or
 - (B) an owner of property who offers for sale or lease any lots in a subdivision.
- (8) "Erosion" means the detachment and movement of soil, sediment, or rock fragments by water, wind, ice, or gravity.
- (9) "Erosion and sediment control measure" means a practice, or a combination of practices, to control erosion and resulting sedimentation.
- (10) "Erosion and sediment control system" means the use of appropriate erosion and sediment control measures to minimize sedimentation by first reducing or eliminating erosion at the source and then, as necessary, trapping sediment to prevent it from being discharged from or within a project site.
- (11) "Final stabilization" means the establishment of permanent vegetative cover or the application of a permanent non-erosive material to areas where all land disturbing activities have been completed and no additional land disturbing activities are planned under the current permit.
- (12) "Grading" means the cutting and filling of the land surface to a desired slope or elevation.
- (13) "Impervious surface" means surfaces, such as pavement and rooftops, that prevent the infiltration of storm water into the soil.
- (14) "Individual building lot" means a single parcel of land within a multi-parcel development.
- (15) "Individual lot operator" means a contractor or subcontractor working on an individual lot.
- (16) "Individual lot owner" means a person who has financial control of construction activities for an individual lot.
- (17) "Land disturbing activity" means any manmade change of the land surface, including removing vegetative cover that exposes the underlying soil, excavating, filling, transporting, and grading.
- (18) "Larger common plan of development or sale" means a plan, undertaken by a single project site owner or a group of project site owners acting in concert, to offer lots for sale or lease; where such land is contiguous, or is known, designated, purchased or advertised as a common unit or by a common name, such land shall be presumed as being offered for sale or lease as part of a larger common plan. The term also includes phased or other construction activity by a single entity for its own use.
- (19) "Measurable storm event" means a precipitation event that results in a total measured precipitation accumulation equal to, or greater than, one-half (0.5) inch of rainfall.
- (20) "MS4 area" means a land area comprising one (1) or more places that receives coverage under one (1) NPDES storm water permit regulated by 327 IAC 15-13 or 327 IAC 5-4-6(a)(4) and 327 IAC 5-4-6(a)(5).
- (21) "MS4 operator" means the person responsible for development, implementation, or enforcement of the minimum control measures for a designated MS4 area regulated under 327 IAC 15-13.

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- (22) "Municipal separate storm sewer system" or "MS4" has the same meaning set forth at 327 IAC 15-13-5(42).
- (23) "Peak discharge" means the maximum rate of flow during a storm, usually in reference to a specific design storm event.
- (24) "Permanent stabilization" means the establishment, at a uniform density of seventy percent (70%) across the disturbed area, of vegetative cover or permanent non-erosive material that will ensure the resistance of the soil to erosion, sliding, or other movement.
- (25) "Phasing of construction" means sequential development of smaller portions of a large project site, stabilizing each portion before beginning land disturbance on subsequent portions, to minimize exposure of disturbed land to erosion.
- (26) "Project site" means the entire area on which construction activity is to be performed.
- (27) "Project site owner" means the person required to submit the NOI letter under this article and required to comply with the terms of this rule. The term includes a:
- (A) developer; and
 - (B) person who has financial and operational control of construction activities and project plans and specifications, including the ability to make modifications to those plans and specifications.
- (28) "Sediment" means solid material (both mineral and organic) that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface.
- (29) "Sedimentation" means the settling and accumulation of unconsolidated sediment carried by storm water run-off.
- (30) "Soil" means the unconsolidated mineral and organic material on the surface of the earth that serves as the natural medium for the growth of plants.
- (31) "Soil and Water Conservation District" or "SWCD" means a political subdivision established under IC 14-32.
- (32) "Storm water pollution prevention plan" means a plan developed to minimize the impact of storm water pollutants resulting from construction activities.
- (33) "Storm water quality measure" means a practice, or a combination of practices, to control or minimize pollutants associated with storm water run-off.
- (34) "Strip development" means a multi-lot project where building lots front on an existing road.
- (35) "Subdivision" means any land that is divided or proposed to be divided into lots, whether contiguous or subject to zoning requirements, for the purpose of sale or lease as part of a larger common plan of development or sale.
- (36) "Temporary stabilization" means the covering of soil to ensure its resistance to erosion, sliding, or other movement. The term includes vegetative cover, anchored mulch, or other non-erosive material applied at a uniform density of seventy percent (70%) across the disturbed area.
- (37) "Tracking" means the deposition of soil that is transported from one (1) location to another by tires, tracks of vehicles, or other equipment.
- (38) "Trained individual" means an individual who is trained and experienced in the principles of storm water quality, including erosion and sediment control as may be demonstrated by state registration, professional certification, experience, or completion of coursework that enable the individual to make judgments regarding storm water control or treatment and monitoring.

(Water Pollution Control Division; 327 IAC 15-5-4; filed Aug 31, 1992, 5:00 p.m.: 16 IR 23; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 834; errata filed Feb 4, 2004, 1:45 p.m.: 27 IR 2284; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; filed Oct 9, 2015, 4:07 p.m.: 20151104-IR-327100659FRA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA)

327 IAC 15-5-5 NOI requirements

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2; IC 13-18-3; IC 13-18-4
Affected: IC 13-12-3-1; IC 13-18-1

Sec. 5. (a) A complete NOI letter must contain the following:

- (1) Name, mailing address, and location of the project site for which the notification is submitted.
- (2) The project site owner's name, address, telephone number, e-mail address (if available), ownership status as federal, state, public, private, or other entity.
- (3) Contact person (if different than project site owner), person's name, company name, address, e-mail address (if available),

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and telephone number.

(4) A brief description of the construction project, including a statement of the total acreage of the project site. Total acreage claimed in the NOI letter shall be consistent with the acreage covered in the construction plan.

(5) Estimated dates for initiation and completion of construction activities. Within forty-eight (48) hours of the initiation of construction activity, the project site owner must notify the commissioner and the appropriate plan reviewing agency of the actual project start date.

(6) The latitude and longitude of the approximate center of the project site to the nearest fifteen (15) seconds, and the nearest quarter section, township, range, and civil township in which the project site is located.

(7) Total impervious surface area, in square feet, of the final project site including structures, roads, parking lots, and other similar improvements.

(8) The number of acres to be involved in the construction activities.

(9) Proof of publication in a newspaper of general circulation in the affected area that notified the public that a construction activity is to commence, that states, "(Company name, address) is submitting an NOI letter to notify the Indiana Department of Environmental Management of our intent to comply with the requirements under 327 IAC 15-5 to discharge storm water from construction activities for the following project: (name of the construction project, address of the location of the construction project). Run-off from the project site will discharge to (stream(s) receiving the discharge(s)).".

(10) As applicable, a list of all MS4 areas designated under 327 IAC 15-13 within which the project site lies.

(11) A written certification by the operator that:

(A) the storm water quality measures included in the construction plan comply with the requirements under sections 6.5, 7, and 7.5 of this rule and that the storm water pollution prevention plan complies with all applicable federal, state, and local storm water requirements;

(B) the measures required by section 7 of this rule will be implemented in accordance with the storm water pollution prevention plan;

(C) if the projected land disturbance is one (1) acre or more, the applicable soil and water conservation district or other entity designated by the department has been sent a copy of the construction plan for review;

(D) storm water quality measures beyond those specified in the storm water pollution prevention plan will be implemented during the life of the permit if necessary to comply with section 7 of this rule; and

(E) implementation of storm water quality measures will be inspected by trained individuals.

(12) The name of receiving water or, if the discharge is to a municipal separate storm sewer, the name of the municipal operator of the storm sewer and the ultimate receiving water.

(13) The NOI letter must be signed by a person meeting the signatory requirements in 327 IAC 15-4-3(g) and 327 IAC 15-4-3(h).

(14) A notification from the SWCD, or other entity designated by the department as the reviewing agency indicating that the constructions plans comply with this rule. This requirement may be waived if the project site owner has not received notification from the reviewing agency within the time frame specified in 327 IAC 15-5-6(b)(3).

(b) Send NOI letters to:

Indiana Department of Environmental Management
Office of Water Quality
100 North Senate Avenue, Room N1255
Indianapolis, Indiana 46204.

(Water Pollution Control Division; 327 IAC 15-5-5; filed Aug 31, 1992, 5:00 p.m.: 16 IR 24; errata filed Sep 10, 1992, 12:00 p.m.: 16 IR 65; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 836; errata filed Feb 6, 2006, 11:15 a.m.: 29 IR 1938; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; filed Oct 9, 2015, 4:07 p.m.: 20151104-IR-327100659FRA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA)

327 IAC 15-5-6 Submittal of an NOI and construction plans

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2; IC 13-18-3; IC 13-18-4

Affected: IC 13-12-3-1; IC 13-18-1

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Sec. 6. (a) After the project site owner has received notification from the reviewing agency that the construction plans meet the requirements of the rule or the review period outlined in subsection (b)(3) has expired, all NOI letter information required under section 5 of this rule shall be submitted to the commissioner at least forty-eight (48) hours prior to the initiation of land disturbing activities at the site. A copy of the completed NOI letter must also be submitted to all SWCDs, or other entity designated by the department, where the land disturbing activities are to occur. If the NOI letter is determined to be deficient, the project site owner must address the deficient items and submit an amended NOI letter to the commissioner at the address specified in section 5 of this rule.

(b) For a project site where the proposed land disturbance is one (1) acre or more as determined under section 2 of this rule, the following requirements must be met:

(1) A construction plan must be submitted according to the following:

(A) Prior to the initiation of any land disturbing activities.

(B) Sent to the appropriate SWCD or other entity designated by the department for:

(i) review and verification that the plan meets the requirements of the rule; or

(ii) a single coordinated review in accordance with subsection (d)(3) if:

(AA) the construction activity will occur in more than one (1) SWCD; and

(BB) the project site owner has made a request for a single coordinated review.

(2) If the construction plan required by subdivision (1) is determined to be deficient, the SWCD, or other entity designated by the department as the reviewing agency may require modifications, terms, and conditions as necessary to meet the requirements of the rule. The initiation of construction activity following notification by the reviewing agency that the plan does not meet the requirements of the rule is a violation and subject to enforcement action. If notification of a deficient plan is received after the review period outlined in subdivision (3) and following commencement of construction activities, the plans must be modified to meet the requirements of the rule and resubmitted within fourteen (14) days of receipt of the notification of deficient plans.

(3) If the project site owner does not receive notification within twenty-eight (28) days after the plan is received by the reviewing agency stating that the reviewing agency finds the plan is deficient, the project site owner may submit the NOI letter information.

(c) The following apply for a project where construction activity occurs inside a single MS4 area regulated under 327 IAC 15-13:

(1) A copy of the completed NOI letter must be submitted to the appropriate MS4 operators.

(2) The project site owner must comply with all appropriate ordinances and regulations within the MS4 area related to storm water discharges. The MS4 operator ordinance as required by 327 IAC 15-13-15(b) and 327 IAC 15-13-16(b) will be considered to have the same authority as this rule within the regulated MS4 area.

(d) For a project that will occur in more than one (1) jurisdiction, such as an SWCD or regulated MS4 area, the following must be met:

(1) Project site owners of project sites occurring in multiple MS4 areas, but not in nondesignated areas, shall submit the information required in subsection (c) to each appropriate MS4 operator.

(2) Project site owners of project sites occurring in one (1) or more MS4 areas and nondesignated areas shall submit the information required in subsections (a) through (c) to all appropriate MS4 operators, and the SWCD or other entity designated by the department.

(3) Project site owners of project sites occurring in multiple nondesignated areas, but not occurring within an MS4 area, may request a single coordinated review through the IDEM Office of Water Quality at the following address:

100 North Senate Avenue

Room N1255

Indianapolis, Indiana 46204.

(Water Pollution Control Division; 327 IAC 15-5-6; filed Aug 31, 1992, 5:00 p.m.: 16 IR 24; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 837; errata filed Feb 4, 2004, 1:45 p.m.: 27 IR 2284; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; filed Oct 9, 2015, 4:07 p.m.: 20151104-IR-327100659FRA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA)

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327 IAC 15-5-6.5 Requirements for construction plans

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2; IC 13-18-3; IC 13-18-4

Affected: IC 13-12-3-1; IC 13-18-1

Sec. 6.5. (a) For project sites that do not meet the criteria in subsection (b), the project site owner shall develop a set of construction plans. Storm water quality measures included in the plan must achieve the minimum project site requirements specified in section 7 of this rule. The construction plans must include the following:

- (1) Project narrative and supporting documents, including the following information:
 - (A) An index indicating the location, in the construction plans, of all information required by this subsection.
 - (B) Description of the nature and purpose of the project.
 - (C) Legal description of the project site. The description should be to the nearest quarter section, township, and range, and include the civil township.
 - (D) Soil properties, characteristics, limitations, and hazards associated with the project site and the measures that will be integrated into the project to overcome or minimize adverse soil conditions.
 - (E) General construction sequence of how the project site will be built, including phases of construction.
 - (F) Hydrologic Unit Code (14 Digit) available from the United States Geological Survey (USGS).
 - (G) A reduced plat or project site map showing the lot numbers, lot boundaries, and road layout and names. The reduced map must be legible and submitted on a sheet or sheets no larger than eleven (11) inches by seventeen (17) inches for all phases or sections of the project site.
 - (H) Identification of any other state or federal water quality permits that are required for construction activities associated with the owner's project site.
- (2) Vicinity map depicting the project site location in relationship to recognizable local landmarks, towns, and major roads, such as a USGS topographic quadrangle map or county or municipal road map.
- (3) An existing project site layout that must include the following information:
 - (A) Location and name of all wetlands, lakes, and water courses on or adjacent to the project site.
 - (B) Location of all existing structures on the project site.
 - (C) One hundred (100) year floodplains, floodway fringes, and floodways. Please note if none exists.
 - (D) Soil map of the predominant soil types, as determined by the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Soil Survey, or an equivalent publication, or as determined by a soil scientist. A soil legend must be included with the soil map.
 - (E) Identification and delineation of vegetative cover, such as grass, weeds, brush, and trees, on the project site.
 - (F) Land use of all adjacent properties.
 - (G) Existing topography at a contour interval appropriate to indicate drainage patterns.
- (4) Final project site layout, including the following information:
 - (A) Location of all proposed site improvements, including roads, utilities, lot delineation and identification, proposed structures, and common areas.
 - (B) One hundred (100) year floodplains, floodway fringes, and floodways. Please note if none exists.
 - (C) Proposed final topography at a contour interval appropriate to indicate drainage patterns.
- (5) A grading plan, including the following information:
 - (A) Delineation of all proposed land disturbing activities, including off-site activities that will provide services to the project site.
 - (B) Location of all soil stockpiles and borrow areas.
 - (C) Information regarding any off-site borrow, stockpile, or disposal areas that are associated with a project site and under the control of the project site owner.
 - (D) Existing and proposed topographic information.
- (6) A drainage plan, including the following information:
 - (A) An estimate of the peak discharge, based on the ten (10) year storm event, of the project site for both preconstruction and postconstruction conditions.
 - (B) Location, size, and dimensions of all storm water drainage systems, such as culverts, storm sewers, and conveyance

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channels.

(C) Locations where storm water may be directly discharged into ground water, such as abandoned wells or sinkholes. Please note if none exists.

(D) Locations of specific points where storm water discharge will leave the project site.

(E) Name of all receiving waters. If the discharge is to a separate municipal storm sewer, identify the name of the municipal operator and the ultimate receiving water.

(F) Location, size, and dimensions of features, such as permanent retention or detention facilities, including existing or manmade wetlands, used for the purpose of storm water management.

(7) A storm water pollution prevention plan associated with construction activities. The plan must be designed to, at least, meet the requirements of sections 7 and 7.5 of this rule and must include the following:

(A) Location, dimensions, detailed specifications, and construction details of all temporary and permanent storm water quality measures.

(B) Temporary stabilization plans and sequence of implementation.

(C) Permanent stabilization plans and sequence of implementation.

(D) Temporary and permanent stabilization plans shall include the following:

(i) Specifications and application rates for soil amendments and seed mixtures.

(ii) The type and application rate for anchored mulch.

(E) Construction sequence describing the relationship between implementation of storm water quality measures and stages of construction activities.

(F) Self-monitoring program including plan and procedures.

(G) A description of potential pollutant sources associated with the construction activities, that may reasonably be expected to add a significant amount of pollutants to storm water discharges.

(H) Material handling and storage associated with construction activity shall meet the spill prevention and spill response requirements in 327 IAC 2-6.1.

(8) The postconstruction storm water pollution prevention plan. The plan must include the following information:

(A) A description of potential pollutant sources from the proposed land use, that may reasonably be expected to add a significant amount of pollutants to storm water discharges.

(B) Location, dimensions, detailed specifications, and construction details of all postconstruction storm water quality measures.

(C) A description of measures that will be installed to control pollutants in storm water discharges that will occur after construction activities have been completed. Such practices include infiltration of run-off, flow reduction by use of open vegetated swales and natural depressions, buffer strip and riparian zone preservation, filter strip creation, minimization of land disturbance and surface imperviousness, maximization of open space, and storm water retention and detention ponds.

(D) A sequence describing when each postconstruction storm water quality measure will be installed.

(E) Storm water quality measures that will remove or minimize pollutants from storm water run-off.

(F) Storm water quality measures that will be implemented to prevent or minimize adverse impacts to stream and riparian habitat.

(G) A narrative description of the maintenance guidelines for all postconstruction storm water quality measures to facilitate their proper long term function. This narrative description shall be made available to future parties who will assume responsibility for the operation and maintenance of the postconstruction storm water quality measures.

(b) For a single-family residential development consisting of four (4) or fewer lots or a single-family residential strip development where the developer offers for sale or lease without land improvements, and the project is not part of a larger common plan of development or sale, the project site owner shall develop a set of construction plans containing storm water quality measures that achieve the minimum project site requirements specified in section 7 of this rule. The construction plan must include the following:

(1) Project narrative and supporting documents, including the following information:

(A) An index indicating the location, in the construction plans, of all required items in this subsection.

(B) Description of the nature and purpose of the project.

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- (C) Legal description of the project site. The description should be to the nearest quarter section, township, and range, and include the civil township.
 - (D) Soil properties, characteristics, limitations, and hazards associated with the project site and the measures that will be integrated into the project to overcome or minimize adverse soil conditions.
 - (E) Hydrologic Unit Code (14 Digit) available from the United States Geological Survey (USGS).
 - (F) Identification of any other state or federal permits that are required for construction activities associated with the project site owner's project site.
- (2) Vicinity map depicting the project site location in relationship to recognizable local landmarks, towns, and major roads, such as a USGS topographic quadrangle map or county or municipal road map.
- (3) A project site layout that must include the following information:
- (A) Location and name of all wetlands, lakes, and water courses on or adjacent to the project site.
 - (B) Location of all existing structures on the project site (if applicable).
 - (C) One hundred (100) year floodplains, floodway fringes, and floodways. Please note if none exists.
 - (D) Soil map of the predominant soil types, as determined by the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Soil Survey, or an equivalent publication, or as determined by a soil scientist. A soil legend must be included with the soil map.
 - (E) Identification and delineation of vegetative cover, such as grass, weeds, brush, and trees, on the project site.
 - (F) Land use of all adjacent properties.
 - (G) Existing and proposed topography at a contour interval appropriate to indicate drainage patterns.
 - (H) Location of all proposed site improvements, including roads, utilities, lot delineation and identification, and proposed structures.
- (4) A storm water pollution prevention plan associated with construction activities. The plan must be designed to, at least, meet the requirements of sections 7 and 7.5 of this rule and must include the following:
- (A) Delineation of all proposed land disturbing activities, including off-site activities that will provide services to the project site.
 - (B) Location of all soil stockpiles and borrow areas.
 - (C) Location, size, and dimensions of all storm water drainage systems, such as culverts, storm sewers, and conveyance channels.
 - (D) Locations where storm water may be directly discharged into ground water, such as abandoned wells or sinkholes. Please note if none exist.
 - (E) Locations of specific points where storm water discharge will leave the project site.
 - (F) Name of all receiving waters. If the discharge is to a separate municipal storm sewer, identify the name of the municipal operator and the ultimate receiving water.
 - (G) Location, dimensions, detailed specifications, and construction details of all temporary and permanent storm water quality measures.
 - (H) Temporary stabilization plans and sequence of implementation of storm water quality measures.
 - (I) Temporary and permanent stabilization plans shall include the following:
 - (i) Specifications and application rates for soil amendments and seed mixtures.
 - (ii) The type and application rate for anchored mulch.
 - (J) Self-monitoring program plan and procedures.
- (c) The SWCD or other designated entity may upon finding reasonable cause require modification to the construction plan if it is determined that changes are necessary due to site conditions or project design changes. Revised plans, if requested, must be submitted to the appropriate entity within twenty-one (21) calendar days of a request for a modification. (*Water Pollution Control Division; 327 IAC 15-5-6.5; filed Oct 27, 2003, 10:15 a.m.: 27 IR 838; errata filed Feb 4, 2004, 1:45 p.m.: 27 IR 2284; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; filed Oct 9, 2015, 4:07 p.m.: 20151104-IR-327100659FRA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA*)

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327 IAC 15-5-7 General requirements for storm water quality control

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2; IC 13-18-3; IC 13-18-4

Affected: IC 13-12-3-1; IC 13-18-1

Sec. 7. (a) All storm water quality measures and erosion and sediment controls necessary to comply with this rule must be implemented in accordance with the construction plan and sufficient to satisfy subsection (b).

(b) A project site owner shall, at least, meet the following requirements:

(1) Sediment-laden water which otherwise would flow from the project site shall be treated by erosion and sediment control measures appropriate to minimize sedimentation.

(2) Appropriate measures shall be implemented to minimize or eliminate wastes or unused building materials, including garbage, debris, cleaning wastes, wastewater, concrete truck washout, and other substances from being carried from a project site by run-off or wind. Identification of areas where concrete truck washout is permissible must be clearly posted at appropriate areas of the site. Wastes and unused building materials shall be managed and disposed of in accordance with all applicable statutes and regulations.

(3) A stable construction site access shall be provided at all points of construction traffic ingress and egress to the project site.

(4) Public or private roadways shall be kept cleared of accumulated sediment that is a result of run-off or tracking. Bulk clearing of sediment shall not include flushing the area with water. Cleared sediment shall be redistributed or disposed of in a manner that is in accordance with all applicable statutes and regulations.

(5) Storm water run-off leaving a project site must be discharged in a manner that is consistent with applicable state or federal law.

(6) The project site owner shall post a notice near the main entrance of the project site. For linear project sites, such as a pipeline or highway, the notice must be placed in a publicly accessible location near the project field office. The notice must be maintained in a legible condition and contain the following information:

(A) Copy of the completed NOI letter and the NPDES permit number, where applicable.

(B) Name, company name, telephone number, e-mail address (if available), and address of the project site owner or a local contact person.

(C) Location of the construction plan if the project site does not have an on-site location to store the plan.

(7) This permit and posting of the notice under subdivision (6) does not provide the public with any right to trespass on a project site for any reason, nor does it require that the project site owner allow members of the public access to the project site.

(8) The storm water pollution prevention plan shall serve as a guideline for storm water quality, but should not be interpreted to be the only basis for implementation of storm water quality measures for a project site. The project site owner is responsible for implementing, in accordance with this rule, all measures necessary to adequately prevent polluted storm water run-off.

(9) The project site owner shall inform all general contractors, construction management firms, grading or excavating contractors, utility contractors, and the contractors that have primary oversight on individual building lots of the terms and conditions of this rule and the conditions and standards of the storm water pollution prevention plan and the schedule for proposed implementation.

(10) Phasing of construction activities shall be used, where possible, to minimize disturbance of large areas.

(11) Appropriate measures shall be planned and installed as part of an erosion and sediment control system.

(12) All storm water quality measures must be designed and installed under the guidance of a trained individual.

(13) Collected run-off leaving a project site must be either discharged directly into a well-defined, stable receiving channel or diffused and released to adjacent property without causing an erosion or pollutant problem to the adjacent property owner.

(14) Drainage channels and swales must be designed and adequately protected so that their final gradients and resultant velocities will not cause erosion in the receiving channel or at the outlet.

(15) Natural features, including wetlands and sinkholes, shall be protected from pollutants associated with storm water run-off.

(16) Unvegetated areas that are scheduled or likely to be left inactive for fifteen (15) days or more must be temporarily or

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permanently stabilized with measures appropriate for the season to minimize erosion potential. Alternative measures to site stabilization are acceptable if the project site owner or their representative can demonstrate they have implemented erosion and sediment control measures adequate to prevent sediment discharge. Vegetated areas with a density of less than seventy percent (70%) shall be restabilized using appropriate methods to minimize the erosion potential.

(17) During the period of construction activities, all storm water quality measures necessary to meet the requirements of this rule shall be maintained in working order.

(18) A self-monitoring program that includes the following must be implemented:

(A) A trained individual shall perform a written evaluation of the project site:

- (i) by the end of the next business day following each measurable storm event; and
- (ii) at a minimum of one (1) time per week.

(B) The evaluation must:

- (i) address the maintenance of existing storm water quality measures to ensure they are functioning properly; and
- (ii) identify additional measures necessary to remain in compliance with all applicable statutes and rules.

(C) Written evaluation reports must include:

- (i) the name of the individual performing the evaluation;
- (ii) the date of the evaluation;
- (iii) problems identified at the project site; and
- (iv) details of corrective actions recommended and completed.

(D) All evaluation reports for the project site must be made available to the inspecting authority within forty-eight (48) hours of a request.

(19) Proper storage and handling of materials, such as fuels or hazardous wastes, and spill prevention and clean-up measures shall be implemented to minimize the potential for pollutants to contaminate surface or ground water or degrade soil quality.

(20) Final stabilization of a project site is achieved when:

(A) all land disturbing activities have been completed and a uniform (for example, evenly distributed, without large bare areas) perennial vegetative cover with a density of seventy percent (70%) has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures have been employed; and

(B) construction projects on land used for agricultural purposes are returned to its preconstruction agricultural use or disturbed areas, not previously used for agricultural production, such as filter strips and areas that are not being returned to their preconstruction agricultural use, meet the final stabilization requirements in clause (A).

(Water Pollution Control Division; 327 IAC 15-5-7; filed Aug 31, 1992, 5:00 p.m.:16 IR 24; readopted filed Jan 10, 2001, 3:23 p.m.:24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 840; errata filed Feb 4, 2004, 1:45 p.m.: 27 IR 2284; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA)

327 IAC 15-5-7.5 General requirements for individual building lots within a permitted project

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2; IC 13-18-3; IC 13-18-4

Affected: IC 13-12-3-1; IC 13-18-1

Sec. 7.5. (a) All storm water quality measures, including erosion and sediment control, necessary to comply with this rule must be implemented in accordance with the plan and sufficient to satisfy subsection (b).

(b) Provisions for erosion and sediment control on individual building lots regulated under the original permit of a project site owner must include the following requirements:

- (1) The individual lot operator, whether owning the property or acting as the agent of the property owner, shall be responsible for erosion and sediment control requirements associated with activities on individual lots.
- (2) Installation and maintenance of a stable construction site access.
- (3) Installation and maintenance of appropriate perimeter erosion and sediment control measures prior to land disturbance.
- (4) Sediment discharge and tracking from each lot must be minimized throughout the land disturbing activities on the lot

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until permanent stabilization has been achieved.

(5) Clean-up of sediment that is either tracked or washed onto roads. Bulk clearing of sediment shall not include flushing the area with water. Cleared sediment must be redistributed or disposed of in a manner that is in compliance with all applicable statutes and rules.

(6) Adjacent lots disturbed by an individual lot operator must be repaired and stabilized with temporary or permanent surface stabilization.

(7) For individual residential lots, final stabilization meeting the criteria in section 7(b)(20) of this rule will be achieved when the individual lot operator:

(A) completes final stabilization; or

(B) has installed appropriate erosion and sediment control measures for an individual lot prior to occupation of the home by the homeowner and has informed the homeowner of the requirement for, and benefits of, final stabilization.

(Water Pollution Control Division; 327 IAC 15-5-7.5; filed Oct 27, 2003, 10:15 a.m.: 27 IR 843; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA)

327 IAC 15-5-8 Project termination

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2; IC 13-18-3; IC 13-18-4

Affected: IC 13-12-3-1; IC 13-18-1

Sec. 8. (a) The project site owner shall plan an orderly and timely termination of the construction activities, including the implementation of storm water quality measures that are to remain on the project site.

(b) The project site owner shall submit a notice of termination (NOT) letter to the commissioner and a copy to the appropriate SWCD or other designated entity in accordance with the following:

(1) Except as provided in subdivision (2), the project site owner shall submit an NOT letter when the following conditions have been met:

(A) All land disturbing activities, including construction on all building lots, have been completed and the entire site has been stabilized.

(B) All temporary erosion and sediment control measures have been removed.

The NOT letter must contain a verified statement that each of the conditions in this subdivision has been met.

(2) The project site owner may submit an NOT letter to obtain early release from compliance with this rule if the following conditions are met:

(A) The remaining, undeveloped acreage does not exceed five (5) acres, with contiguous areas not to exceed one (1) acre.

(B) A map of the project site, clearly identifying all remaining undeveloped lots, is attached to the NOT letter. The map must be accompanied by a list of names and addresses of individual lot owners or individual lot operators of all undeveloped lots.

(C) All public and common improvements, including infrastructure, have been completed and permanently stabilized and have been transferred to the appropriate local entity.

(D) The remaining acreage does not pose a significant threat to the integrity of the infrastructure, adjacent properties, or water quality.

(E) All permanent storm water quality measures have been implemented and are operational.

(c) Following acceptance of the NOT letter and written approval from the department for early release under subsection (b), the project site owner shall notify all current individual lot owners and all subsequent individual lot owners of the remaining undeveloped acreage and acreage with construction activity that they are responsible for complying with section 7.5 of this rule. The remaining individual lot owners do not need to submit an NOI letter or NOT letter. The notice must contain a verified statement that each of the conditions in subsection (b)(2) have been met. The notice must also inform the individual lot owners of the requirements to:

(1) install and maintain appropriate measures to prevent sediment from leaving the individual building lot; and

(2) maintain all erosion and sediment control measures that are to remain on-site as part of the construction plan.

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(d) The SWCD, other entity designated by the department or a regulated MS4 entity, or the department may inspect the project site to evaluate the adequacy of the remaining storm water quality measures and compliance with the NOT letter requirements. If the inspecting entity finds that the project site owner has sufficiently filed an NOT, letter, the entity shall forward notification to the department. Upon receipt of the verified NOT letter by the department and receipt of written approval from the department, the project site owner shall no longer be responsible for compliance with this rule.

(e) After a verified NOT letter has been submitted for a project site, maintenance of the remaining storm water quality measures shall be the responsibility of the individual lot owner or occupier of the property. (*Water Pollution Control Division; 327 IAC 15-5-8; filed Aug 31, 1992, 5:00 p.m.: 16 IR 25; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 843; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; filed Oct 9, 2015, 4:07 p.m.: 20151104-IR-327100659FRA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA*)

327 IAC 15-5-9 Standard conditions

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2-1; IC 13-18-3; IC 13-18-4

Affected: IC 13-18

Sec. 9. The standard conditions for NPDES general permit rules under 327 IAC 15-4 shall apply to this rule. (*Water Pollution Control Division; 327 IAC 15-5-9; filed Aug 31, 1992, 5:00 p.m.: 16 IR 26; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA*)

327 IAC 15-5-10 Inspection and enforcement

Authority: IC 13-13-5-2; IC 13-15-1-2; IC 13-15-2-1; IC 13-18

Affected: IC 13-14-10; IC 13-15-7; IC 13-18-3; IC 13-18-4; IC 13-30

Sec. 10. (a) The department or its designated representative may inspect any project site involved in construction activities regulated by this rule at reasonable times. The department or its designated representatives may make recommendations to the project site owner or their representative to install appropriate measures beyond those specified in the storm water pollution prevention plan to achieve compliance.

(b) All persons engaging in construction activities on a project site shall be responsible for complying with the storm water pollution prevention plan and the provisions of this rule.

(c) The department shall investigate potential violations of this rule to determine which person may be responsible for the violation. The department shall, if appropriate, consider public records of ownership, building permits issued by local units of government, and other relevant information, which may include site inspections, storm water pollution prevention plans, notices of intent, and other information related to the specific facts and circumstances of the potential violation. Any person causing or contributing to a violation of any provisions of this rule shall be subject to enforcement and penalty under IC 13-14-10, IC 13-15-7, and IC 13-30.

(d) If remaining storm water quality measures are not properly maintained by the person occupying or owning the property, the department may pursue enforcement against that person for correction of deficiencies under 327 IAC 15-1-4.

(e) Construction plans and supporting documentation associated with the quality assurance plan must be made available to the department or its designated representatives within forty-eight (48) hours of such a request. (*Water Pollution Control Division; 327 IAC 15-5-10; filed Aug 31, 1992, 5:00 p.m.: 16 IR 26; filed Mar 23, 2000, 4:15 p.m.: 23 IR 1912; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 844; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA*)

327 IAC 15-5-11 Notification of completion (Repealed)

Sec. 11. (*Repealed by Water Pollution Control Division; filed Oct 27, 2003, 10:15 a.m.: 27 IR 863*)

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327 IAC 15-5-12 Duration of coverage

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2; IC 13-18-3; IC 13-18-4

Affected: IC 13-12-3-1; IC 13-18-1

Sec. 12. (a) A permit issued under this rule is granted by the commissioner for a period of five (5) years from the date coverage commences.

(b) Once the five (5) year permit term duration is reached, a general permit issued under this rule will be considered expired, and, as necessary for construction activity continuation, a new NOI letter would need to be submitted in accordance with subsection (c).

(c) To obtain renewal of coverage under this rule, the information required under sections 5 and 6 of this rule must be submitted to the commissioner ninety (90) days prior to the termination of coverage under this NPDES general permit rule, unless the commissioner determines that a later date is acceptable. Coverage under renewal NOI letters will begin on the date of expiration from the previous five (5) year permit term. (*Water Pollution Control Division; 327 IAC 15-5-12; filed Oct 27, 2003, 10:15 a.m.: 27 IR 844; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA*)

Rule 6. Storm Water Discharges Exposed to Industrial Activity

327 IAC 15-6-1 Purpose

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2; IC 13-18-3; IC 13-18-4

Affected: IC 13-12-3-1; IC 13-18-1

Sec. 1. The purpose of this rule is to establish requirements for storm water discharges exposed to industrial activity that are composed entirely of storm water and allowable nonstorm water to protect the public health, existing water uses, and aquatic biota. (*Water Pollution Control Division; 327 IAC 15-6-1; filed Aug 31, 1992, 5:00 p.m.: 16 IR 26; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518; filed Oct 27, 2003, 10:15 a.m.: 27 IR 845; readopted filed Nov 21, 2007, 1:16 p.m.: 20071219-IR-327070553BFA; readopted filed Jul 29, 2013, 9:21 a.m.: 20130828-IR-327130176BFA; filed Oct 9, 2015, 4:07 p.m.: 20151104-IR-327100659FRA; readopted filed Jun 14, 2019, 1:59 p.m.: 20190710-IR-327190246BFA*)

327 IAC 15-6-2 Applicability of the general permit rule for storm water discharges exposed to industrial activity

Authority: IC 13-14-8; IC 13-15-1-2; IC 13-15-2; IC 13-18-3; IC 13-18-4

Affected: IC 4-21.5; IC 13-12-3-1; IC 13-18-1

Sec. 2. (a) Except as provided in subsections (c) through (j), the requirements under this rule apply to all facilities that meet the following requirements:

- (1) Are not prohibited from regulation under an NPDES general permit rule under 327 IAC 15-2-6.
- (2) Meet the NPDES general permit rule applicability requirements under 327 IAC 15-2-3.
- (3) Have not received a conditional no exposure exclusion from storm water permitting under section 12 of this rule.
- (4) Have a new or existing point source discharge composed entirely of storm water and the following allowable nonstorm water discharges exposed to industrial activity:
 - (A) Discharges from firefighting activities.
 - (B) Fire hydrant flushings.
 - (C) Potable water sources, including waterline flushings.
 - (D) Irrigation drainage.
 - (E) Landscape watering provided all pesticides, herbicides, and fertilizer have been applied in accordance with manufacturer's instructions.
 - (F) Routine external building washdown that does not use detergents.
 - (G) Pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred, unless all spilled material has been removed, and where detergents are not used.

SECTION 02290

STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

THE FOLLOWING SECTION IS TO BE FILLED OUT BY THE ENGINEER WITH INPUT FROM THE SELECTED CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. THE SWPPP CERTIFICATION FORM SHALL BE SIGNED AT THE PRECONSTRUCTION MEETING.

Prior to performing any portion of Work, the Contractor shall complete the attached Contractor Certification Statement and return the executed form to the Engineer. Contractor is required to comply with all conditions outline in the SWPPP during the course of this project.

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**Stormwater Pollution Prevention Plan
Contractor Certification Form**

I certify under penalty of law that I have reviewed and understand the terms and conditions of this SWPPP that identifies potential sources of stormwater pollution and will implement procedures to comply with the terms and conditions of the NPDES general construction permit. I will be responsible for providing a SWPPP Coordinator and an Indiana qualified compliance inspector of stormwater (QCIS) as well as for implementing and maintaining the SWPPP.

Project Name: _____

Signature: _____ Date: _____

Print Name: _____ Title: _____

Name of Company: _____

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1. INTRODUCTION

1.1 Background

Development, implementation, and maintenance of the Stormwater Pollution Prevention Plan (SWPPP) shall provide the framework for reducing soil erosion and minimizing pollutants in stormwater during construction of this project. The SWPPP shall:

- Define the characteristics of the site and the type of construction that will be occurring;
- Describe the site plan for the facility to be constructed;
- Describe the practices that will be implemented to control erosion and the release of pollutants in stormwater (referred to as Best Management Practices or BMPs);
- Create an implementation schedule to ensure that the practices described in this SWPPP are implemented and evaluate the plan's effectiveness in reducing erosion, sediment, and pollutant levels in stormwater discharged from the site; and
- Describe the final stabilization/termination design to minimize erosion and prevent storm water impacts after construction is complete.

1.2 SWPPP Content

This SWPPP includes the following:

- Identification of the SWPPP coordinator with a description of this person's duties;
- Identification of the Indiana qualified compliance inspector of stormwater (QCIS) with a description of this person's duties;
- Description of the existing site conditions including existing land use for the site (i.e., wooded areas, open grassed areas, pavement, buildings, etc.), soil types at the site, as well as the location of surface waters which are located on or next to the site (wetlands, streams, rivers, lakes, ponds, etc.);
- Identification of the body of water(s) that will receive runoff from the construction site, including the ultimate body of water that receives the storm water;
- Identification of drainage areas and potential stormwater contaminants;

- Description of stormwater management controls and various Best Management Practices (BMPs) necessary to reduce erosion, sediment and pollutants in stormwater discharge;
- Description of the facility monitoring plan and how controls will be coordinated with construction activities;
- Description of the implementation schedule and provisions for amendment of the plan.

2.0 CONTACT INFORMATION

2.1 Parties Involved

General Contractor

Company/Organization Name: _____

Name: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Telephone: () _____ Fax: () _____

Email: _____

Owner

Company/Organization Name: _____

Name: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

Email: _____

This SWPPP Template Was Prepared By

RHMG Engineers, Inc. Consulting Engineers
975 Campus Drive
Mundelein, IL 60060
Phone: (847) 362-5959

Fax: (847) 362-0864

This SWPPP Report Was Prepared By

Company/Organization Name: _____

Name: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

Email: _____

2.2 SWPPP Coordinator and Duties

The Contractor shall employ a qualified construction site SWPPP Coordinator for this project.

SWPPP Coordinator

Company/Organization Name: _____

Name: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Telephone: () _____ Fax: () _____

Email: _____

The SWPPP coordinator's duties include the following:

- Implement the SWPPP plan;
- Oversee maintenance practices identified as Best Management Practices (BMPs) in the SWPPP;
- Implement and oversee employee training;
- Identify other potential pollutant sources and add them to the SWPPP;
- Revise the SWPPP to address any changes in construction plans; and

- Notify the Contractor, Owner, and Engineer at the changes to the SWPPP.

2.3 Indiana qualified compliance inspector of stormwater (QCIS) and Duties

The Contractor shall employ an Indiana qualified compliance inspector of stormwater (QCIS) for this project.

Qualified Compliance Inspector of Stormwater (QCIS)

Company/Organization Name: _____

Name: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Telephone: () _____ Fax: () _____

Email: _____

The Qualified Compliance Inspector of Stormwater's duties include the following:

- Conduct or provide for inspection and monitoring activities as detailed in Maintenance/Inspection Procedures;
- Complete Field Observation Reports at least once every seven calendar days and within 24 hours of the end of a storm with rainfall, snowfall, or snowmelt amounts greater than 0.5 inches;
- Complete SWPPP Inspection and Maintenance Report Form when unsatisfactory installation or insufficient maintenance is noted in Field Observation Reports;
- Oversee maintenance practices identified as Best Management Practices (BMPs) in the SWPPP; and
- Identify other potential pollutant sources and work with the SWPPP coordinator to add them to the plan.

3.0 FACILITY DESCRIPTION

3.1 Site Location

Name of Project: _____

Street Address: _____

City: _____ State: _____ Zip: _____ County: _____

Telephone: () _____ Fax: () _____

Email: _____

Section(s): _____

Township(s): _____

Range(s): _____

The total size of construction in acres: _____

Attach area map (Attachment A)
OR

Reference sheet number _____ in Contract Drawings

Include any additional information about project site location
below: _____

3.2 Construction Type

Type of Construction (check all that apply):

- New Watermain Storm Sewer Roadway
 Existing Sanitary Sewer Other: _____

Quantity of Construction (e.g., linear feet of pipe): _____

Contractor and Subcontractors will be onsite from approximately
_____ AM until _____ PM, _____ days a week.

Substantial completion is scheduled for: _____

Final completion is scheduled for: _____

3.3 Existing Site Conditions

Type of Current Site Conditions (check all that apply):

- Residential Industrial Open Space Vacant
 Commercial Agricultural Other: _____

Description of area soils: _____

Receiving waters for surface waters that do not infiltrate into the soils: _____

3.4 Site Plan

Show property boundaries and the proposed location of the construction.

Attach area map (Attachment B)
OR

Reference sheet number(s) _____ in Contract Drawings

4.0 IDENTIFICATION OF POTENTIAL STORMWATER CONTAMINANTS

The purpose of this section is to identify pollutants that could impact stormwater during construction of the facility.

4.1 Significant Material Inventory

Pollutants that result from clearing, grading, excavation, and construction materials and have the potential to be present in stormwater runoff are listed in Table 1. This table includes information regarding material type, chemical and physical description, and the specific regulated stormwater pollutants associated with each material.

4.2 Potential Areas for Stormwater Contamination

The following potential source areas of stormwater contamination have been identified and evaluated (check all that apply):

- | | |
|---|---|
| <input type="checkbox"/> Cleared and graded areas | <input type="checkbox"/> Construction site entrance |
| <input type="checkbox"/> Building construction | <input type="checkbox"/> Pipe construction |
| <input type="checkbox"/> Roadway construction | <input type="checkbox"/> Other(s): |

Table 2 presents site-specific information regarding stormwater pollution potential from each of these areas.

4.3 A Summary of Available Stormwater Sampling Data

- Attach stormwater sampling data (Attachment C)
OR
 No stormwater sampling data is available for the site

Table 1. Potential Construction Site Stormwater Pollutants

(Check all that apply)

	Trade Name Material	Chemical/Physical Description [1]	Stormwater Pollutants [1]	Potential to Attribute to Site Pollution
<input type="checkbox"/>	Pesticides (insecticides, fungicides, herbicides, rodenticides)	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic	Moderate
<input type="checkbox"/>	Fertilizer	Liquid or solid grains	Nitrogen, phosphorous	High
<input type="checkbox"/>	Plaster	White granules or powder	Calcium sulphate, calcium carbonate, sulfuric acid	Moderate
<input type="checkbox"/>	Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates	Moderate
<input type="checkbox"/>	Asphalt	Black solid	Oil, petroleum distillates	High
<input type="checkbox"/>	Concrete	White solid	Limestone, sand	High
<input type="checkbox"/>	Glue, adhesives	White or yellow liquid	Polymers, epoxies	Low
<input type="checkbox"/>	Paints	Various colored liquid	Metal oxides, stoddard solvent, talc, calcium carbonate, arsenic	Moderate
<input type="checkbox"/>	Curing compounds	Creamy white liquid	Naphtha	High
<input type="checkbox"/>	Wastewater from construction equipment washing	Water	Soil, oil & grease, solids	High
<input type="checkbox"/>	Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil	Low
<input type="checkbox"/>	Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE	Moderate
<input type="checkbox"/>	Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes	Moderate
<input type="checkbox"/>	Lubricants	Black/brown oily liquid hydrocarbon	Oil & grease, lead, cadmium	Low

<input type="checkbox"/>	Antifreeze/ coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)	Low
<input type="checkbox"/>	Erosion	Soil Particles	Soil, Sediment	High
<input type="checkbox"/>	Other(s)			

[1] Data obtained from MSDSs when available

Table 2. Locations of Potential Sources of Stormwater Contamination

(Check all that apply)

	Potential Stormwater Contamination Point	Potential Pollutants	Potential Problem
<input type="checkbox"/>	Cleared and graded areas	Soil erosion, fertilizer, pesticides	Erosion of soils from cleared and graded areas
<input type="checkbox"/>	Pipe construction	Asphalt, concrete, paints, gasoline, soil erosion, fertilizer, pesticides, hydraulic oil/fluids, diesel fuel, antifreeze	Accidental spills of paints. Gasoline and diesel fuel spills while fueling construction equipment, and erosion of exposed and stockpiled soils. Asphalt chemicals can be released to storm water if a rain event occurs before curing is complete. Tracking of soil into the road through the construction site entrance.
<input type="checkbox"/>	Construction site entrance	Hydraulic oil, gasoline, antifreeze, soil erosion	Leaking hydraulic oil and antifreeze from clearing and grading. Gasoline and diesel fuel spills while fueling construction equipment, and erosion of exposed and stockpiled soils. Tracking of soil into the road through the construction site entrance.

<input type="checkbox"/>	Building construction	Hydraulic oil, gasoline, antifreeze, soil erosion	Leaking hydraulic oil and antifreeze from clearing and grading. Gasoline and diesel fuel spills while fueling construction equipment, and erosion of exposed and stockpiled soils. Tracking of soil into the road through the construction site entrance.
<input type="checkbox"/>	Roadway construction	Asphalt, concrete, paints, soil erosion, gasoline, hydraulic oil/fluids, diesel fuel, antifreeze	Asphalt chemicals can be released to storm water if a rain event occurs before curing is complete. Accidental spills of paints. Gasoline and diesel fuel spills while fueling construction equipment, and erosion of exposed and stockpiled soils.
<input type="checkbox"/>	Other(s)		

5.0 STORMWATER MANAGEMENT CONTROLS

The purpose of this section is to identify the types of temporary and permanent erosion and sediment controls that shall be used during construction activities. The controls shall provide soil stabilization for disturbed areas and structural controls to divert runoff and remove sediment. This section shall also address control of other potential stormwater pollutant sources such as construction materials (paints, concrete dust, solvents, plaster), waste disposal, control of vehicle traffic, and sanitary waste disposal.

5.1 Temporary and Permanent Erosion Control Practices

A list of best management practices (BMPs) has been developed. A number of the BMPs included in this plan have been developed to serve as post-construction stormwater controls. Refer to Contract Drawings for specific locations. The SWPPP Coordinator shall revise the SWPPP as necessary to add any other BMPs necessary to reduce soil erosion and minimize pollutants in stormwater. Any

revisions to the SWPPP shall be constructed and maintained by the Contractor at no additional cost to the Owner.

To prevent soil from washing away, the following BMPs will be implemented (check all that apply):

- | | | |
|--|---|--|
| <input type="checkbox"/> Silt fence | <input type="checkbox"/> Triangular silt dikes | <input type="checkbox"/> Rock check dams |
| <input type="checkbox"/> Wattles | <input type="checkbox"/> Temporary seeding | <input type="checkbox"/> GeoRidge |
| <input type="checkbox"/> Dewatering bag | <input type="checkbox"/> Sediment traps | <input type="checkbox"/> Gabion baskets |
| <input type="checkbox"/> Floc Logs | <input type="checkbox"/> Anionic Polymer | <input type="checkbox"/> Temporary ECBS |
| <input type="checkbox"/> Coirs | <input type="checkbox"/> Stabilization following construction | |
| <input type="checkbox"/> Curb bags (or similar inlet protection) | | |
| <input type="checkbox"/> Other(s): _____ | | |
-
-

5.2 Construction Practices to Minimize Stormwater Contamination

All waste materials shall be collected and stored in a securely lidded metal dumpster. All trash and construction debris from the site shall be deposited in the dumpster. The dumpster shall be emptied at appropriate intervals. No construction materials shall be buried on-site. All personnel shall be instructed regarding the correct procedure for waste disposal. All sanitary waste shall be collected from portable units at appropriate intervals. Good housekeeping and spill control practices shall be followed during construction to minimize stormwater contamination from petroleum products, fertilizers, paints, concrete, and other similar contaminants. Good housekeeping practices are listed below. To prevent stormwater contamination, the following BMPs shall be implemented:

- Waters that are discharged or redirected offsite shall be treated onsite in a manner to allow the suspended solids to settle out.
- Fertilizers shall be applied only in the minimum amounts recommended by the manufacturer.
- Fertilizers shall be worked into the soil to limit exposure to stormwater.
- All vehicles on site shall be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.
- Petroleum products shall be stored in tightly sealed containers that are clearly labeled.

- Any asphalt substances used onsite shall be applied according to the manufacturer's recommendation.
 - Sanitary waste shall be collected from portable units at appropriate intervals.
 - A covered dumpster shall be used for all waste materials.
 - All paint containers and curing compounds shall be tightly sealed and stored when not in use. Excess paint shall not be discharged to the storm system but shall be properly disposed according to the manufacturer's instructions.
 - All spills shall be cleaned up immediately upon discovery. Spills large enough to reach the storm system will be reported to the National Response Center at 1-800-424-8802.
 - Concrete trucks shall not be allowed to wash out or discharge surplus concrete or drum wash water on the site.
 - A stabilized construction entrance shall be constructed to reduce vehicle tracking of sediments.
 - The paved street adjacent to the site entrance shall be swept daily to remove excess dirt or rock tracked from the site.
 - Dump trucks hauling material from the construction site shall be covered with a tarpaulin.
 - Other(s):
-
-

5.3 Coordination of BMPs with Construction Activities

BMPs shall be coordinated with construction activities so the BMP is in place before construction begins. The following BMPs will be coordinated with construction activities:

- Erosion control BMPs shall be installed prior to general construction activity within an area.
- Clearing and grading shall not occur in an area until it is necessary for construction to proceed.
- The stabilized construction site entrance, silt fence, ditch checks, and other specified erosion control devices

shall be installed before clearing and grading begins, construction commences, and as necessary.

- Once construction activity ceases permanently in an area, that area shall be stabilized with permanent seed and mulch.

After the entire site is stabilized, the accumulated sediment shall be removed. The erosion control BMPs shall not be removed until all construction activities at the site are complete and soils have been stabilized.

5.4 Certification of Compliance with Federal, State, and Local Regulations

The SWPPP shall comply with requirements for stormwater management and erosion and sediment control, as established by the IDEM. This plan shall comply with the requirements of the National Pollutant Discharge Elimination System (NPDES) stormwater program, 327 IAC 15-5 of the Indiana Administrative Code, and the Guidance for Construction Plan/Storm Water Pollution Plan Development (</idem/stomwater/2374.htm>).

6.0 MAINTENANCE/INSPECTION PROCEDURES

6.1 Inspections

Visual inspections of all areas disturbed by construction shall be performed at least once every seven calendar days and within 24 hours of the end of a storm with rainfall, snowfall, or snowmelt amounts greater than 0.5 inches. The Qualified Compliance Inspector of Stormwater shall conduct these inspections.

The inspection shall verify that the BMPs described in Section 5 of this SWPPP are in good condition and are minimizing erosion. The inspection shall also verify that the procedures used to prevent stormwater contamination from construction materials and petroleum products are effective.

In addition to the inspection and maintenance procedures noted on the Contract Drawings and in the Specifications, the following inspection and maintenance practices shall also be used to maintain erosion and sediment controls:

- Built up sediment shall be removed from silt fencing when it has reached one-third the height of the fence.
- Silt fences shall be inspected for proper installation, depth of sediment, tears, to assure fabric is securely attached to the fence posts, and to assure fence posts are firmly in the ground.

- Portable sediment containment systems shall be inspected for proper installation, to see if jute yarn and collection basin are effectively collecting flocs, and for clogging.
- Temporary and permanent seeding shall be inspected for bare spots, washouts, and healthy growth.
- The stabilized construction entrance shall be inspected for sediment tracked on the road, for clean gravel, and to make sure that the culvert beneath the entrance is working and that all traffic uses the stabilized entrance when leaving the site.
- Other(s):

The maintenance inspection report shall be made after each inspection. A copy of the report form to be completed by the SWPPP coordinator is provided in Appendix A of this SWPPP. Completed forms shall be submitted to the Owner and the Engineer. A copy of the completed forms shall also be maintained on-site during the entire construction project. Following construction, the completed forms will be retained at the Owner's office, for a minimum of 1 year.

If construction activities or design modifications are made to the site plan that could impact storm water, this SWPPP shall be amended appropriately. The amended SWPPP shall have a description of the new activities that contribute to the increased pollutant loading and the source control activities that will be implemented.

Appendix A
Inspection Logs

The following is a guide to the **Field Observation Report**. Information in each box is intended to assist the Enforcement Officer and the Qualified Compliance Inspector of Stormwater, or any other observer, in quickly and easily summarizing the conditions of the job site.

WDO Permit # - Reference number attached to any Watershed Development or Stormwater Discharge Permit.

USACE Reference # - The reference number attached to any project that involves the U.S. Army Corps of Engineers. This number is assigned by the Army Corps.

Date/Time of Inspection - The date and time that the inspection occurred.

Observer/QCIS - The name of the person, or qualified compliance inspector of stormwater (QCIS), conducting inspection.

Community - The community the project is located in.

Enforcement Officer (E.O.) - The name and phone/email of the community enforcement officer.

Project Name - The name of the project, often the title of the permitted plans.

Field Contact Information - The name and phone/email of the primary in-the-field contact, typically the Project Manager or Site Superintendent.

Address/Location - A specific street address or nearest intersection of project.

In Attendance - Anyone who accompanies the Observer/QCIS during the inspection.

Weather Conditions - The current weather conditions, i.e. sunny and 52 deg. F.

Reason for Inspection - The reason for the inspection, i.e. 7 calendar day inspection, inspection following a 0.5" or greater rain event, at a particular stage of development, etc.

Disturbed Area - An estimate of the amount of disturbed area

Stage of Construction - The current stage of the project, i.e. pre-construction, clearing, rough grading, infrastructure/utilities, paving, buildings/structures, final stabilization.

Floodplain Impacted - Is there evidence of non-permitted floodplain impact?

Floodway Impacted - Is there evidence of non-permitted floodway impact?

Wetland Impacted - Is there evidence of non-permitted wetland impact?

Violation Observed - Is there a non-compliance violation?

Violation Correction Time - This is a guideline for reasonable expectation of when a violation should be expected to have been corrected. The time frame is directly related to the severity of the violation.

Violation Rating - A 0 to 5 scale to quantify the severity of a violation, with 0 representing No Violation and 5 representing a Critical Violation.

Water Sample Taken - If water samples were taken, a brief description of where, by whom, when, and any other pertinent

information should be included in the text box at the bottom of the Field Observation Report.

Photos Taken - Were photographs of the site or particular elements taken during the site inspection?

Next Site Visit - The date of the next scheduled site inspection.

Follow up Needed - Any necessary follow up, i.e. 24 hr notification of noncompliance, consultant contact, etc.

Copy To - Anyone who needs to receive a copy of the completed Report.

The next 16 sections are for individual Best Management Practices (BMPs) and should each be checked as appropriate. In the event any are found to be unsatisfactory, the inspector may proceed to the BMP specific checklists on the 2nd and 3rd pages to further explain the reason(s) for an unsatisfactory rating.

The remaining box on page one is for general and/or specific comments about the site inspection and the conditions of the site.

The final box is for the Observer/QCIS to sign and date the report.

Field Observation Report

WDO Permit #		USACE Reference #	
Date/Time of Inspection		Observer/QCIS	
Community		Enforcement Officer	
Project Name			
Field Contact Information			
Address/Location			
In Attendance			
Weather Conditions:		Reason for Inspection	<input type="checkbox"/> weekly <input type="checkbox"/> rain <input type="checkbox"/> other
Disturbed Area		Stage of Construction	
Floodplain Impacted	<input type="checkbox"/> Yes <input type="checkbox"/> No	Floodway Impacted	<input type="checkbox"/> Yes <input type="checkbox"/> No
Wetland Impacted	<input type="checkbox"/> Yes <input type="checkbox"/> No	Violation Observed	<input type="checkbox"/> Yes <input type="checkbox"/> No
Violation Correction Time	<input type="checkbox"/> 1 day <input type="checkbox"/> 10 day <input type="checkbox"/> 30 day	Violation Rating	
Water Sample Taken	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	Photos Taken	<input type="checkbox"/> Yes <input type="checkbox"/> No Next Site Visit
Follow up Needed		Copy To:	
Construction Entrance/Pavement	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A	Detention/Sediment Basin Condition	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A
Dewatering Facility	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A	Ditch Checks/Silt Dikes	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A
Dust Control	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A	Inlet Protection	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A
Native Vegetation	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A	Overland Flow/Offsite Drainage Paths	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A
Perforated Riser	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A	Perimeter SE/SC Controls	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A
Restrictor Plate/Structure	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A	Silt Fence	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A
Soil Stockpile Stabilized/Protected	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A	Stabilization Measures	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A
Stormwater System	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A	Wetlands/Waters Protection Measures	<input type="checkbox"/> Satisfactory <input type="checkbox"/> Unsatisfactory <input type="checkbox"/> N/A

<p>Detention Basin – Sediment Basin</p> <ul style="list-style-type: none"> • Is the basin installed? • Is the basin adequately stabilized? • Is there evidence of sufficient coverage of native vegetation? • Is the emergency overflow constructed with the required materials? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Dewatering</p> <ul style="list-style-type: none"> • Is dewatering directly entering a waterway or wetland? • Are dewatering activities conveying sediment laden water? • Are appropriate dewatering BMP's in place and functioning effectively? • If a sediment bag is being used, is it capturing sediment effectively? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Dust Control – sweeping, vacuuming, spraying, etc.</p> <ul style="list-style-type: none"> • Are dust control measures being used as needed? • Is dust observed moving offsite due to wind? • Are roadways being swept or swept and vacuumed when needed? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Inlet Protection – Catch-All basket, filter, silt fence, silt dike, straw bales, gravel dam, etc.</p> <ul style="list-style-type: none"> • Are all storm sewer inlets that are or will be functional during construction protected? • Is the inlet protection installed correctly to protect the entire inlet? • Is the inlet protection being maintained? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Miscellaneous</p> <ul style="list-style-type: none"> • Is there an adequately sized receptacle on site for deposition of construction material debris? • Is there a dedicated, protected area for concrete wash out activities? • Are the permitted plans available on site? The Stormwater Pollution Prevention Plan (SWPPP)? • If polymers are used, are they being used appropriately in an approved manner? • Have any SE/SC measures that are no longer needed been removed? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Overland Flow – Offsite Drainage</p> <ul style="list-style-type: none"> • Are all permitted overland flow routes constructed? • Are all permitted overland flow routes free from obstruction? • Are all permitted overland flow routes stabilized? • Are all pre-construction overland flow routes protected? • Are all pre-construction overland flow routes free from obstruction? • Are all points of offsite drainage (ie. water leaving the site) stabilized? • Are all points of offsite drainage protected from erosion and sedimentation? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Perforated Riser</p> <ul style="list-style-type: none"> • Is the perforated riser installed at the outlet? • Is the perforated riser sized correctly (one pipe size smaller than the outlet pipe)? • Is the perforated riser wrapped in hardware cloth or chicken wire, and filter fabric? • Is the perforated riser adequately mortared in? • Is there an adequate amount of stone at the base of the riser? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Perimeter SE/SC Controls</p> <ul style="list-style-type: none"> • Are all perimeter soil erosion/sediment controls in place and maintained? • Are adjacent wetlands/waters/properties being impacted by SE/SC failures? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>

<p>Restrictor Plate – Restrictor Structure</p> <ul style="list-style-type: none"> Is the restrictor plate or restrictor structure installed? Is the opening(s) or pipe size in the restrictor plate or restrictor structure appropriately sized? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Silt Fence</p> <ul style="list-style-type: none"> Does the silt fence meet the AASHTO 288-00 Standard? Is the silt fence trenched in properly? Is the silt fence backfilled and compacted? Is the silt fence maintained and in good condition? Is silt fence installed in all areas shown on the permitted plans and in all areas necessary? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Site Stabilization</p> <ul style="list-style-type: none"> Have all disturbed areas been stabilized with temporary or permanent measures within 14 days of the end of active hydrologic disturbance? Are stabilization measures effective? Are there areas of disturbance that need additional stabilization measures? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Soil Stockpile</p> <ul style="list-style-type: none"> Is the soil stockpile located in an approved location (ie. not in floodplain or wetland)? Is the soil stockpile adequately stabilized? Is the soil stockpile properly enclosed with silt fence? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Stormwater Management System</p> <ul style="list-style-type: none"> Is the stormwater management system installed and functional, prior to building construction? Are all points of concentrated discharge appropriately installed for energy dissipation? Are all inlets and catch basins adequately protected from sediment conveyance into the system? Is hydrocarbon removal technology in place, functional and maintained where needed? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Temporary Construction Entrance</p> <ul style="list-style-type: none"> Are all ingress and egress points covered by a temporary construction entrance? Is the entrance constructed with 3" coarse aggregate? Has an appropriate geotextile material been installed underneath the stone? Is the entrance appropriately sized, both in width and length? Is the entrance adequately preventing tracking of dirt, mud, and sediment onto roadways? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Triangular Silt Dike</p> <ul style="list-style-type: none"> Are triangular silt dikes installed in all locations shown on the permitted plan set? Are the triangular silt dikes pinned or otherwise secured on the upstream side? Are the triangular silt dikes spaced appropriately, ie. the top of the downstream unit should be at the same elevation as the bottom of the unit immediately upstream? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>
<p>Wetlands and Waters Protection</p> <ul style="list-style-type: none"> Are all delineated wetlands on site protected by 4' IDOT Standard Construction Fencing? Are all adjacent offsite wetlands protected from impact? Are illicit discharges into wetlands or bodies of water being prevented? Are wetland buffers protected? 	<p><input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A</p>

Inspector's Signature _____ Date of Inspection _____

**Stormwater Pollution Prevention Plan
Inspection and Maintenance Report Form**

Perimeter Structural Controls:

Date: _____

Silt Fence

Drainage Area Perimeter	Has Silt Reached 1/3 of Fence Height?	Is Fence Properly Secured?	Is There Evidence of Washout or Overtopping?

Maintenance required for Erosion Control BMPs:

To be performed by: _____ On or before: _____

**Stormwater Pollution Prevention Plan
Amendment Report Form**

Changes required to the pollution prevention plan:

Reasons for changes:

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

Project Name: _____

Signature: _____ Date: _____

Print Name: _____ Title: _____

Name of Company: _____

SECTION 02400

DEWATERING AND DRAINAGE

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Dewatering and drainage for all earthwork.
- b. Geotextile sediment control bags for dewatering and drainage.

2. Related Work specified elsewhere:

- a. Utilities, Trenching, Bedding and Backfilling - Section 02221
- b. Structural Excavation and Backfill - Section 02223

1.02 RESPONSIBILITY

A. Contractor is solely responsible for the design, installation, operation, and subsequent removal of dewatering systems and their safety and conformity with local codes and regulations. All costs for dewatering shall be considered incidental.

B. Contractor is solely responsible for the design, installation, operation, and subsequent removal of geotextile sediment control bags and their safety and conformity with local codes and regulations. All costs for installing, maintaining and disposal of geotextile sediment control bags shall be considered incidental.

2. PRODUCTS

2.01 GEOTEXTILE SEDIMENT CONTROL BAG

A. Geotextile Sediment Control Bag shall be manufactured using a polypropylene non-woven geotextile from SI Geosolutions, then sewn into a bag with a double needle matching using a high strength thread.

B. Each Geotextile Sediment Control Bag shall have a fill spout large enough to accommodate a 4-inch (minimum) discharge hose. Straps are attached to secure the hose and prevent pumped water from escaping without being filtered.

- C. Geotextile Sediment Control Bag seams shall have an average wide width strength per ASTM D-4884.
- D. Geotextile Sediment Control Bag shall be the appropriate size and strength for location/application being used.
- E. Geotextile Sediment Control Bag shall be Dirtbag[®] as manufactured by ACF Environmental, or approved equal.

3. EXECUTION

3.01 DEWATERING AND DRAINAGE

- A. At all times during construction keep excavations free from standing water. Sumps, if required, shall be located outside of load bearing areas so the bearing surfaces will not be disturbed. Water pumped from the excavation shall be discharged to prevent re-entry into the soil strata being dewatered. Water containing silt in suspension shall not be pumped into sewer lines or adjacent streams. The method of disposing of water pumped from the excavation shall be approved by the E/A, prior to actual disposal.
- B. The dewatering system shall take into consideration the construction procedures, the soil type, and the depth of the foundation relative to the groundwater level. The system shall be subject to approval by the E/A.
- C. Operation of the dewatering system shall be continued until the sides of the structure are carried above the natural ground level and the maximum weight of water displaced by the structure is less than 90 percent of the uplift resisting capacity consisting of dead weight of the structure and backfill. Contractor shall submit uplift calculations to the E/A for approval prior to discontinuing dewatering.
- D. Walls shall not be exposed to water pressure before structural Work at the next higher level has properly cured and the cantilever action of walls is eliminated.
- E. Provide a standby system for emergency operation in case of failure of the primary power source or mechanical failure of the system.
- F. All water pumped from trenches shall be discharged into appropriate stormwater conveyance systems through textile sediment control bag, or other approved sediment control system per Section 02270.

3.02 GEOTEXTILE SEDIMENT CONTROL BAG

- A. Install Geotextile Sediment Control Bag on a slope so incoming water flows downhill through bag without creating more erosion. Strap neck of bag tightly to the discharge hose. To increase efficiency of filtration, place the bag on an aggregate of hay bale bed to maximize water flow through the surface area of the bag.
- B. Geotextile Sediment Control Bag is full when it no longer can efficiently filter sediment or allow water to pass at a reasonable rate. Flow rates will vary depending on the size of bag, the type and amount of sediment discharged into bag, the type of ground, rock or other substance under the bag and the degree of the slope on which the bag lies. Use of excessive flow rate or overfilling bag with sediment will cause bag to rupture or failure of hose attachment straps.
- C. Dispose of Geotextile Sediment Control Bag and contents off-site at an appropriate disposal facility.

END OF SECTION

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SECTION 02415

BYPASS PUMPING

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. The Work under this Section includes:

a. Bypass Pumping around sections of Sanitary Sewer designated for rehabilitation.

2. Related Work specified elsewhere:

a. Utilities Trenching, Bedding and Backfilling - Section 02221

1.02 RESPONSIBILITY

A. Contractor is solely responsible for the design, installation, operation, and subsequent removal of Bypass Pumping systems and their safety and conformity with local codes and regulations.

2. PRODUCTS - NOT USED

3. EXECUTION

3.01 BYPASS PUMPING

A. Bypassing of the flow around the sections of pipe designated for rehabilitation shall be made by plugging the line at a point upstream of the proposed work and pumping the flow to a downstream point. Contractor shall maintain continuous sanitary service for all sewer customers.

It shall be the responsibility of the Contractor to plan and execute, where necessary, bypass pumping operations sufficient to avoid causing sewer back-ups to residential and commercial customers, and to avoid illegal discharge onto land or into waterways.

B. Wherever practical, bypass pumping intakes shall be located in existing manholes. The Contractor shall take all necessary precautions to avoid creating surcharged conditions in the sewer collection and transmission systems located upstream from the work zones and shall immediately remedy any condition which, in the opinion of the E/A, is likely to cause sewage back-ups in homes

or businesses. If it is necessary to excavate sump pits adjacent to existing sewer lines or manholes in order to accomplish bypass pumping objectives, the Contractor shall submit excavation plans to the E/A for approval prior to commencing this work. Excavated sump pits shall be considered incidental to the contract, and shall be performed at no additional charge.

- C. Provide ramps for hoses at all street and driveway crossings.
- D. The Contractor shall take all necessary precautions to ensure that in the event of bypass pump system failure, alternate systems are in place to prevent sewer back-up. The Contractor is required at a minimum to provide on-site at all times while bypass operations are in effect, a back-up pumping system of equal or greater pumping capacity than the primary bypass pump system.
- E. A bypass pumping plans shall be submitted for review and approval two weeks prior to the start of construction. As part of this submittal, the Contractor shall list all bypass pumping locations, bypass pipe types, sizes and lengths, bypass pump sizes, alternate bypass pumping plans and pump sound level as stated in dBA. Bypass pumping plan diagrams may be attached. The costs of bypass pumping and backup bypass pumping systems and all related equipment and labor required for bypass pumping shall be included as part of the Contractor's unit price for Bypass Pumping.
- F. The Contractor shall provide written notice to all parties whose service laterals will be out of commission to advise against water usage until the mainline is back in service. Written notices must be approved by E/A prior to publication, and must contain specific information as to when the service disruption will begin and end. No customer shall be deprived of sanitary sewer service for more than six consecutive hours. If service disruption exceeds six hours, the Contractor may, with prior approval by the E/A, excavate the service lateral to facilitate bypass pumping, or may pay for temporary lodging for the affected customer. The Contractor shall assume responsibility for any damage to private property resulting from failure to provide adequate bypass pumping services. Excavation of service laterals for the purpose of bypass pumping, as well as restoration of excavated laterals, shall be considered incidental to the contract, and shall be done at no additional charge.
- G. The Contractor's bypass pumping system shall be capable of conveying the maximum flow in the existing sewer.

END OF SECTION

SECTION 02446

CHAIN LINK TEMPORARY FENCE

1. GENERAL

1.01 SUMMARY

- A. Provide chain link fence system (temporary construction fence) around Lift Stations B, C, and D construction sites and specified herein, and as needed for a complete and proper installation.
- B. Provide one double gate installation with 22-foot minimum clearance or as shown on Drawings. Gates to swing freely open and closed and shall be locked with padlock and chain.
- C. Related Work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
- D. Temporary fence shall be removed after completion of the work by Contractor.

1.02 SUBMITTALS

- A. No submittals are required.

1.03 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen 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 of this Section.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Division 1.

2. PRODUCTS

2.01 DIMENSIONAL DATA

A. General

1. Pipe sizes indicated are commercial pipe sizes.
2. Tube sizes indicated are nominal outside dimensions.
3. H-section sizes indicated are normal flange dimensions.
4. Roll-formed section indicated are the nominal outside dimensions.

2.02 GALVANIZING

- A. Provide galvanized finish on steel framework and appurtenances.

2.03 FABRIC

- A. Provide Number 11 gage, 2-1/4-inch Diamond mesh, 6-feet high.
- B. Provide fabric in one piece widths.

2.04 POSTS, RAILS, AND ASSOCIATED ITEMS

A. Line Posts

1. Provide minimum sizes and weights as follows:
1-5/8-inch diameter steel

B. Gate Posts

1. Provide gate posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
 - a. Material and Dimensions:
Pipe, 2-3/8-inch outside dimension
2. Over 13 feet wide, and up to 18 feet wide: Use 6.625-inch outside diameter pipe.

2.05 POSSIBLE SOURCE

- A. National Rent-A-Fence - 800/352-5675

3. EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General

1. Install posts at a maximum spacing of 10 feet on centers.
2. Either driven posts or post holes are acceptable.

B. Installation Schedule

1. Install fence before start of work.

END OF SECTION

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SECTION 02485

LAWN AND GRASSES

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Fine grading of topsoil
- b. Seeding
- c. Sodding
- d. Care of grass during establishment period

2. Related Work specified elsewhere:

- a. Section 02110 - Protection and Care of Trees and Shrubs
- b. Section 02260 - Finish Grading
- c. Section 02270 - Soil Erosion and Sediment Control
- d. Section 02490 - Trees, Plants, and Ground Cover

1.02 REFERENCES

- A. State of Indiana Department of Transportation Standard Specifications (latest edition) referred to herein as the "STD. SPECS."
- B. Standard Specification for Geotextile Specification for Highway Applications (AASHTO M 288) by the American Association of State Highway and Transportation Officials, latest edition.

1.03 CONFLICTS

- A. In the event of any conflicts between the Contract Documents and Referenced Standard Requirements, the more stringent, higher cost and quality requirement shall be included in the Bid.

1.04 SCOPE OF WORK

- A. All excavations made in turf areas shall be restored to a grass cover by seeding or sodding.
- B. All grade lines shall be restored to their existing pre-construction profile.

- C. A minimum of 4-inches of topsoil shall be placed in all turf areas.

2. PRODUCTS

2.01 TOPSOIL

- A. Topsoil shall be fertile, friable, natural topsoil typical of the area, free from subsoil, stones, plants, roots or other extraneous material and shall not be used while muddy or frozen.
- B. Topsoil shall contain not less than 8% organic matter (AASHTO T194). The topsoil shall consist of either natural topsoils typical of the locality and free from coarse stone aggregate or surface soils stripped from the site and enriched with humus at a rate of 8% by volume. The soil mixture prepared by mixing surface soils and humus shall be free of oil, cinders, coarse stone, and woody root material.

2.02 LIME

- A. Lime shall be agricultural grade dolomitic limestone, ground sufficiently fine so that at least 80 percent will pass through a No. 8 sieve, and it shall contain not less than 80 percent calcium carbonate equivalent. Moisture content at time of delivery shall not exceed 8 percent.

2.03 FERTILIZER

- A. Fertilizer shall be a composition recommended by a local County Agricultural Agent or State Agricultural Extension Service or a preformulated 10-6-4 mixture.

2.04 EROSION CONTROL BLANKET

- A. Erosion control blanket shall be selected for the appropriate application in accordance with the manufacturer's recommendations. Erosion control blanket shall be manufactured by North American Green or approved equal.
- B. Install erosion control blanket in accordance with manufacturer's recommended installation procedures and as directed by Engineer.
- C. Secure blankets to ground with 6-inch or 8-inch wire staples or approved equivalent stakes in accordance with manufacturer's recommended pattern/placement.

2.05 WATER

- A. Water shall be free from oil, acid, alkali, salts, and other harmful substances.

2.06 SEED

- A. Seed shall be Seed Mixture U as specified in the INDOT Standard Specifications.
- B. Seed shall be new crop seed furnished in standard sealed containers bearing seed tags showing purity, germination and weed seed content. Seed which has been wet, moldy or otherwise damaged in transit or storage, shall not be used.

2.07 SOD

- A. Sod shall be either field or nursery grown sod that is native to the locality of the Project. Contractor shall obtain E/A's approval of the source of the sod prior to cutting the sod.
- B. Sod grown on soil high in organic matter, such as peat, will not be acceptable. The consistency of sod shall be such that it will not break, crumble or tear during handling and placing. Sod shall be reasonably free of stones, crab grass, noxious weed, and other objectionable plants or substances injurious to plant growth.
- C. Sod shall have at least 1-inch of soil adhering firmly to the roots and cut in rectangular pieces with the shortest side not less than 12-inches. At the time of cutting sod the grass shall be mowed to a height not less than 2-inches nor more than 4-inches.
- D. Sod cut for more than 48 hours shall not be used without the approval of the E/A.

3. EXECUTION

3.01 REGRADING OF TOPSOIL

- A. Topsoil shall be graded reasonably smooth and level after final settlement. All humps shall be removed and depressions or eroded areas filled in with additional topsoil before proceeding with seeding or sodding.

3.02 PREPARATION FOR SODDING OR SEEDING

- A. Preparation shall not be started until all other site work, and utility work, and finished grading within the areas to be seeded have been completed.

- B. Loosen topsoil by tilling it to a depth of at least 3-inches and smooth out all surface irregularities resulting therefrom. Leave area free of rocks or hard soil clods which will not pass through the tines of a standard garden rake.
- C. At least 7 days before applying fertilizer, spread lime uniformly in sufficient quantity to produce in the soil a pH of 6.5. Work lime thoroughly into topsoil to a depth of 3-inches.
- D. Apply fertilizer uniformly at a rate of 20 pounds per 1,000 square feet. Work fertilizer into soil prior to seeding or sodding.

3.03 SODDING

- A. Provide sod in areas indicated on the Contract Drawings. Sodding shall also be used in ditches and drainage swales and on all embankment slopes steeper than 3 to 1 unless protection is provided against erosion of seeding. At Contractor's option, sodding may be substituted for seeding, but at no additional cost.
- B. Place sod with the edges in close contact and alternate courses staggered. Lightly tamp or roll to eliminate air pockets. On slopes 2 to 1 or steeper, stake sod with not less than 4 stakes per square yard and with a least one stake for each piece of sod. Stakes shall be driven with the flat side parallel to the slope. Do not place sod when the ground surface is frozen or when air temperature may exceed 90 degrees F.
- C. In ditches, the sod shall be placed with the longer dimension perpendicular to the flow of water in the ditch. On slopes, starting at the bottom of the slope, the sod shall be placed with the longer dimension parallel to the contours of the ground.
- D. All exposed edges of sod shall be buried flush with the adjacent turf.
- E. Within 8 hours after placement begin watering and continually keep moist until the sod has firmly knit itself to the topsoil and becomes well established.
- F. With every shipment of sod, the Contractor shall provide to the Engineer a letter of certification from an authorized representative of the nursery stating that the seed mixture used in the sod conforms to the specifications.

3.04 SEEDING

- A. Seed all areas disturbed by construction operations and not receiving sod, and as indicated on Contract Drawings.
- B. Seed shall be sown between September 1 and November 1, or in spring from time ground can be worked until June 15.
- C. Apply seed during favorable climatic conditions. Do not seed in windy weather or when soil is very wet. Sow seed at the rate specified for each seed mixture. Sow seed either mechanically or by broadcasting in two directions at right angles to each other to achieve an even distribution of seed.
- D. After seeding, rake seed lightly into ground and roll with a roller weighing between 100 and 200 pounds per foot of roller width.

3.05 EROSION CONTROL BLANKET

- A. Immediately after rolling seeded areas, place erosion control blanket over all areas that have been seeded. Unless otherwise indicated, also place erosion control blanket at sides and bottom of ditches, swales, and all areas within 10 feet of catch basins in seeded areas.
- B. Apply erosion control in accordance with Section 02270, Soil Erosion and Sediment Control.

3.06 WATERING

A. Sodded Areas

- 1. Within 2 hours after placement begin watering and continually keep moist until the sod has firmly knit itself to the topsoil and becomes well established. Water shall be applied at the rate specified in Section 621.10 of the Standard Specifications.
- 2. During periods exceeding 26°C (80°F) or subnormal rainfall, supplemental watering may be required after the initial and additional waterings and prior to acceptance of the work. Supplemental watering shall be performed when directed by the Engineer. Water shall be applied at the rate specified by the Engineer within 24 hours of notice.

B. Seeded Areas

- 1. Immediately after placing erosion control blanket or mulch, water seeded areas thoroughly with a fine mist

spray. Keep soil thoroughly moist until seeds have sprouted and achieved a growth of 1-inch.

3.07 PROTECTION OF WORK

- A. Protect newly seeded and sodded areas from all traffic by erecting temporary fences and signs. Protect slopes from erosion. Properly and promptly repair all damaged Work when required.

3.08 APPLICATION OF FERTILIZER

- A. Six weeks after completion of seeding or sodding apply granular fertilizer over all areas at the rate of two pounds of nitrogen nutrients per 1,000 square feet of area.

3.09 CLEAN-UP

- A. At the time of final inspection of the Work, but before Final Acceptance, remove from seeded and sodded areas all debris, rubbish, excess materials, tools, and equipment.

3.10 GUARANTY

- A. In addition to the guaranties specified in Section 00700, General Conditions, comply with the following requirements:
- B. All seeding and sodding shall be guaranteed by Contractor to be true to name and in a vigorous growing condition through one growing cycle including one summer and one winter season.
- C. Maintenance for lawns shall begin immediately after seeding or sodding. Provide watering, mowing and replanting and continue as necessary until a close healthy stand of specified grasses is established.

3.11 LAWN REPLACEMENT

- A. Lawn not showing a close uniform stand of healthy specified grasses at the end of the guaranty period shall be replaced and maintained until acceptance. Scattered bare spots, none of which is larger than one square foot, will be allowed up to a maximum of 3% of the total area.

END OF SECTION

SECTION 02500

PAVING AND SURFACE RESTORATION

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. The Work under this Section includes:

- a. Asphalt Paving
- b. Pavement Patching
- c. Asphalt Roadway Replacement
- d. Asphalt Parking Lot Replacement
- e. Asphalt Driveway Replacement
- f. Concrete Driveway, Curb and Gutter, and Sidewalk Replacement
- g. Aggregate Driveway Replacement
- h. Bituminous Surface Removal
- i. Pavement Saw Cutting
- j. Temporary and Permanent Pavement markings

2. Related Work specified elsewhere:

- a. Quality Control and Laboratory Testing - Section 01000
- b. Utilities Trenching, Bedding and Backfilling - Section 02221
- c. Compaction Control and Testing - Section 02250

1.02 SUBMITTALS

A. Certifications

- 1. Submit certifications from plant producing bituminous mixtures that binder course and surface course meet specified standards.

1.03 REFERENCE STANDARDS

- A. Indiana Department of Transportation, Standard Specifications, latest edition, referred to herein as the "STD. SPECS".
- B. All measurement and payment provisions of the "STD. SPECS." are deleted.

1.04 CONFLICTS

- A. In the event of any conflicts between the Contract Documents and Referenced Standard requirements, the more stringent, higher cost and quality requirement shall be included in the Bid.

1.05 PLANT ACCEPTANCE

- A. Bituminous mixtures for paving shall be produced in a plant approved by a recognized public agency.
- B. Prior to placing bituminous mixtures, submit to the E/A for approval the name of the plant proposed for use and the names of approving agencies.

1.07 SAMPLES

- A. At least 15 days prior to beginning work, the Contractor shall submit to the E/A, a sample of any materials requested by the E/A.

2. PRODUCTS

2.01 SUBGRADE MATERIALS

- A. All earthwork is specified elsewhere in Division 2.

2.02 AGGREGATES FOR BASE AND SURFACE COURSES

- A. Coarse aggregates for base and surface courses shall comply with the applicable provisions of "STD. SPECS."

2.03 PRIMER (TACK COAT)

- A. The primer (tack coat) shall comply with the Indiana Department of Transportation "STD. SPECS." Section 406.

2.04 BITUMINOUS CONCRETE MATERIALS

- A. Bituminous material shall comply with the applicable provisions of "STD. SPECS."

- B. Binder course mixture shall be graded and mixed to comply with HMA, PG Binder Course, Type B, PG 64-22, 25% (max.) RAP.
 - C. Surface course mixture shall be graded and mixed to comply with HMA, Surface Course - PG Binder, Type B, PG 64-22, 25% (max.) RAP.
- 2.05 CONCRETE
- A. Concrete pavement shall be Class A, Section 901 air-entrained concrete.
 - B. Concrete curb and gutter shall be Class A, Section 901 air-entrained concrete.
- 2.06 PAVEMENT MARKINGS - THERMOPLASTIC
- A. Thermoplastic pavement markings shall comply with the "STD. SPECS."
3. EXECUTION
- 3.01 SUBGRADE
- A. Preparation of the subgrade for paving shall comply with applicable portions of the "STD. SPECS."
- 3.02 AGGREGATE BASE
- A. Aggregate base course shall comply with the applicable provisions of "STD. SPEC." and shall be the type indicated on the Contract Drawings.
- 3.03 BITUMINOUS CONCRETE PAVING
- A. Prime Coat
 - 1. Apply primer over aggregate base course at the rate of 0.50 to 0.75 gallon per square yard in compliance with "STD. SPECS."
 - 2. Apply Tack Coat over binder course at the rate of 0.05 to 0.08 gallon per square yard in compliance with "STD. SPECS."
 - B. Leveling Binder
 - 1. Leveling Binder (Machine Method) construction shall be the thickness indicated on the Contract Drawings and shall comply with applicable provisions of "STD. SPEC."

C. PG Binder Course

1. PG Binder course construction shall be of the thickness indicated on the Contract Drawings and shall comply with applicable provisions of "STD. SPECS."

D. Surface - PG Binder Course

1. Surface - PG Binder course construction shall be of the thickness indicated on the Contract Drawings and shall comply with applicable provisions of "STD. SPECS."

E. Protection for Bituminous Surfacing

1. Contractor shall protect all completed sections of bituminous paving until the E/A has approved the pavement for traffic.

3.04 CONCRETE PAVEMENT, SIDEWALK AND CURB AND GUTTER

A. Concrete Pavement

1. Concrete pavement construction shall be the thickness indicated on the Contract Drawings and shall comply with the applicable provisions of the "STD. SPEC.". If not indicated on the Contract Drawings, Concrete Pavement Construction shall match the existing concrete pavement cross-section.

B. Concrete Sidewalk

1. Concrete sidewalk construction shall be the thickness indicated on the Contract Drawings and shall comply with the applicable provisions of the "STD. SPEC.". If not indicated on the Contract Drawings, Concrete Sidewalk Construction shall match the existing sidewalk cross-section.

C. Concrete Curb and Gutter

1. Concrete curb and gutter construction shall be to the dimensions indicated on the Contract Drawings; or if not indicated on the Contract Drawings, then shall match the cross-section of existing curb and gutter profile. All work shall comply with the applicable provisions of the "STD. SPEC"

3.05 EXISTING PAVEMENTS AND WALKS REPAIRS AND/OR REPLACEMENT

A. General

1. The Contractor shall restore the original condition of all surfaces disturbed as a result of construction

activities. Contractor shall provide all materials, equipment and labor necessary to complete this Work.

2. Damage to existing pavement or walks beyond the limits of construction shown on the Contract Drawings shall be repaired as directed by the E/A or shall be removed and replaced at no additional cost to the Owner.
3. All repairs and/or replacement of existing pavement shall comply with these specifications and with the applicable provisions of the Standard Specification.

B. Pavement Patching

1. This item shall consist of the removal and replacement of all pavement, base course and sub-base that is destroyed due to construction operations. Edges of replacement surfacing shall bear on at least 12-inches of undisturbed soil.
2. All Work shall be completed in accordance with the "STD. SPECS."
3. Class C patches shall only be constructed adjacent to existing concrete pavement. The patch shall match the existing roadway typical section, but a minimum of eight inches of concrete over six inches of CA-6 shall be used.
4. Class D patches shall only be constructed adjacent to existing asphalt pavement. The patch shall match the existing roadway typical section, but a minimum of 3-inches surface course over nine inches of CA-6 base course shall be used.
5. All excavation necessary for preparation of the subgrade will be considered as incidental to the Unit Price for Pavement Patching.

C. Asphalt Roadway Pavement Replacement

1. This item shall consist of the removal and replacement of all asphalt roadway pavement, base course and sub-base that is destroyed due to construction operations.

D. Asphalt Parking Lot Replacement

1. This item shall consist of the removal and replacement of all asphalt parking lot pavement, base course, and sub-base that is destroyed due to construction operations.

- E. Asphalt Driveway Replacement
1. This item shall consist of the removal and replacement of all asphalt driveway pavement, base course and sub-base that is destroyed due to construction operations.
- F. Concrete Driveway Replacement, Concrete Curb and Gutter Replacement, and Concrete Sidewalk Replacement
1. This item shall consist of the removal and replacement of all concrete driveway pavement, curb and gutter, sidewalk, base course and sub-base that is destroyed due to construction operations.
 2. All concrete shall be mixed and placed according to the Standard Specifications. Expansion joints shall be placed at 50-foot intervals in the replaced sidewalk and curb and gutter. Expansion joints shall also be placed in the pavement and driveway in accordance with the Standard Specifications.
- G. Aggregate Driveway Replacement
1. This item shall consist of the removal and replacement of all aggregate driveways that are destroyed due to construction operations.
- H. Bituminous Surface Removal (Cold Milling) of Existing Pavement
1. This work shall consist of cold milling materials from the existing pavement. The machine for the removal of bituminous surfaces in preparation for subsequent surfacing shall be a self-propelled milling machine.
 2. The existing bituminous surface shall be removed to the depth specified on the plans. The temperature at which the work is performed, the nature and condition of the equipment, and the manner of performing the work shall be such that the milled surface is not torn, gouged, shoved or otherwise damaged by the milling operation. Sufficient cutting passes shall be made so that all irregularities or high spots are eliminated to the satisfaction of the Engineer. The cold milled salvaged aggregate resulting from this operation shall become the property of the Contractor.
 3. Removing the existing bituminous surface to the required depth adjacent to the structures in the pavement surface shall be accomplished in a manner satisfactory to the Engineer using either machine or hand methods.
 4. Clean-Up - After cold milling a traffic lane, the pavement shall be swept by a mechanical broom to prevent recompaction of the cuttings onto the pavement. All

loose material shall be removed from the roadway. Before opening the lane to traffic, it shall be cleaned with a mechanical room to the satisfaction of the Engineer.

I. Pavement Saw Cutting

1. All damaged pavement shall be saw cut full-depth and removed prior to placement of permanent asphalt pavement. Saw cuts shall be as straight as is practicable.
2. The cost for full-depth pavement saw cutting shall be considered incidental to the contract and no additional compensation will be provided.

J. Short Term Pavement Markings

1. Contractor shall furnish, install, maintain and remove short term and temporary pavement markings in accordance with the "STD. SPECS." Appropriate short-term pavement marking shall be installed between all lanes open to traffic prior to lanes being opened to traffic. The short-term pavement markings shall be replaced with permanent pavement markings as soon as possible and in accordance with the "STD. SPECS."

K. Permanent Pavement Markings - Thermoplastic

1. This work shall consist of furnishing and applying extruded thermoplastic pavement marking lines, letters, or symbols of the patterns, sizes and colors as shown on Contract Drawings. A certificate which shows the paint meets all IDEM and EPA regulatory requirements for VOC levels and lead, chromium or other heavy metals from the paint manufacturer shall be provided. All work, materials, etc., shall be in conformance with the "STD. SPECS."
2. Unless a pay item is included in the Schedule of Prices, the cost for furnishing and applying extruded thermoplastic pavement marking lines, letters, or symbols of the patterns, sizes and colors as shown on Contract Drawings will be considered incidental to the contract and no additional compensation will be provided.

END OF SECTION

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SECTION 02601

MANHOLES, WETWELLS, VALVE VAULTS AND APPURTENANCES

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Manhole, Wetwell and Vault construction and accessories.

2. Related work specified elsewhere:

a. Trenching, Minor Structure Excavation, and Back-filling - Section 02221

b. Piping materials and installation - Division 2

c. Microbiologically Induced Corrosion Resistant Concrete - Section 03015

1.02 SUBMITTALS

A. Shop Drawings and Product Data

1. Submit product data of manhole steps, lids and frames, access hatches and pipe to structure wall gaskets for approval in accordance with Division 1.

2. Submit shop drawing of manholes, wetwells and vaults as noted herein.

3. Submit manufacturer's certification of compliance with referenced standards.

1.03 EXISTING CONDITIONS

A. Avoid damage to the existing system. Existing manholes, inlets, and sewers damaged by Contractor shall be repaired to the satisfaction of the E/A at no additional cost.

2. PRODUCTS

2.01 GENERAL

A. Concrete shall have minimum 4,000 psi compressive strength.

- B. Welded wire fabric shall conform to ASTM A185. As a minimum, use 4 x 4 - W4 x W4 welded wire fabric unless structural requirements indicate otherwise.

2.02 SANITARY SEWER MANHOLES

- A. Gravity sewer and drop sewer manholes shall be of the configuration shown on the Contract Drawings for the type of piping material installed.

2.03 SANITARY SEWER MANHOLE BASES

- A. Bases shall be one piece precast base sections consisting of integrally cast slab, bottom ring section and concrete flow channels. Base sections shall have integral paved inverts. The Contractor shall be responsible for determining all invert angles.
- B. Manhole invert channels shall be semi-circular or U-shaped conforming to the inside diameter of the connecting sewer. Where necessary, make gradual changes in size, grade or direction with true curves.
- C. Resilient rubber gasket flexible manhole wall to pipe connectors, manufactured in accordance with ASTM C-923, shall be provided. Press-Seal Gasket Corporation or approved equal.
- D. Bases shall not have "through wall" lift holes on sanitary manholes.

2.04 VALVE VAULT BASES

- A. Bases shall be one piece precast base sections consisting of integrally cast slab and bottom ring section.
- B. Bases shall be constructed to the dimensions shown on the Contract Drawings.
- C. Resilient gasket "pipe-to-manhole connectors", manufactured in accordance with ASTM C-923, shall be provided.

2.05 SANITARY SEWER MANHOLE AND VALVE VAULT RISERS

- A. Risers shall be of the following types, unless otherwise indicated on the Contract Drawings:
 - 1. Precast reinforced concrete riser sections - ASTM C478.
- B. Riser diameter shall be as indicated on the Contract Drawings.

- C. Gaskets for seating precast sections shall be preformed gasket joint strips conforming to Fed. Spec. SS-S-00210, Type I, Rope Form, or Kent Seal Mastic.
- D. Risers shall not have "through wall" lift holes on sanitary sewer manholes.

2.06 SANITARY SEWER MANHOLE CONES AND TOPS

- A. Unless otherwise indicated on the Contract Drawings, cone top sections shall be precast concrete, eccentric type with 24-inch diameter top opening conforming to ASTM C478. Where indicated on the Contract Drawings, provide 8-inch (minimum) thickness flat slab tops with eccentric 24-inch diameter opening, unless otherwise indicated.
- B. Cones shall not have "through wall" lift holes on sanitary manholes.

2.07 VALVE VAULT RISERS AND TOPS

- A. Unless otherwise indicated on the Contract Drawings, risers and tops shall be precast concrete, conforming to the dimensions shown on the Contract Drawings.
- B. Where indicated on the Contract Drawings, (or required due to field conditions), provide flat top slabs to the specified dimensions, with the required openings. Dimensions shall be as shown on the Contract Drawings.

2.08 SANITARY SEWER MANHOLE AND VALVE VAULT FRAMES AND LIDS

- A. Provide nominal 24-inch diameter cast iron valve vault frames and lids, of the types specified below. The frame shall have at least one concealed pick hole. Watertight frames and lids, if indicated on the Drawings, shall have machined bearing surfaces, resilient gaskets, cap screws, and recessed lid lifting devices.
- B. All frames and lids shall be Neenah Foundry or approved equal.
- C. Sanitary sewer manholes shall have frame and cover per Neenah R-1712, with Type "B" lid, concealed pickhole, self-sealing gasket. Manhole lids shall have the words noted on the Contract Drawings imprinted in 2-inch letters on the lid.

2.09 STEPS

- A. Steps shall be in accordance with local, state and federal regulations. Steps shall be of the type required for the method of construction selected and shall be cast in place. Steps shall be 12-inches minimum width and shall be steel reinforced plastic coated. The minimum allowable design live load for steps shall be a single load of 300 lbs. concentrated at the point which will cause maximum stress on the member. The steps shall be provided with a depth ring or plate a minimum of 3-inches from the embedded end of the leg to provide for uniform setting depth of all steps. The embedded end of each leg shall be formed in such a way to provide positive anchoring of the step. Steps shall have non-slip treads which project a minimum of 4-inches from the manhole wall. Treads shall be designed so that the foot cannot slip off the end of the step.

2.10 EXTERNAL MANHOLE CHIMNEY SEALS FOR SANITARY SEWER MANHOLES

- A. External rubber seals used for sealing the joint between the manhole frame and chimney or corbel/cone section, shall be "Cretex Classic" or approved equal.

2.11 ADJUSTING RINGS

- A. All castings shall be raised using wire reinforced precast concrete adjusting rings.

2.12 WETWELL BASES

- A. Bases shall be one piece precast or cast-in-place concrete base section.
- B. Bases shall be constructed to the dimensions shown on the Contract Drawings, or if not delineated on the Contract Drawings, then according to the specified ASTM standard.
- C. Steel reinforcement for Bases shall be as follows:
 - 1. As delineated on the Contract Drawings.
 - 2. If not delineated on the Contract Drawings, then according to the specified ASTM standard. Contractor shall provide shop drawings signed and sealed by a licensed structural engineer verifying steel reinforcement.

2.13 WETWELL RISERS

- A. Risers shall be of the following types, unless otherwise indicated on the Drawings.
 - 1. Wetwell precast reinforced concrete riser sections - ASTM C478.
- B. Riser dimensions shall be as delineated on the Contract Drawings, or if not delineated on the Contract Drawings, then according to the specified ASTM standard.
- C. Gaskets for seating precast sections shall be preformed gasket joint straps conforming to Fed. Spec. SS-S-00210, Type I, Rope Form, or Kent Seal Mastic.
- D. Risers shall not have "through wall" lift holes.
- E. Risers steel reinforcement shall be designed for the designated depth of the structure per the appropriate ASTM standard. Contractor shall provide shop drawings signed and sealed by a licensed structural engineer verifying steel reinforcement and wall thickness.

2.14 WETWELL TOP SLABS

- A. Top slabs shall be one piece precast concrete.
- B. Top slab shall be constructed to the dimensions shown on the Contract Drawings, or if not delineated on the Contract Drawings, then according to the specified ASTM or AASTHO standard.
- C. Steel reinforcement for Top Slabs shall be as follows:
 - 1. As delineated on the Contract Drawings.
 - 2. If not delineated on the Contract Drawings, then according to the appropriate standard as noted on the Contract Drawings. Contractor shall provide shop drawings signed and sealed by a licensed structural engineer verifying steel reinforcement and load requirements, if any.

2.15 MICROBIOLOGICALLY INDUCED CORROSION RESISTANCE CONCRETE ADDITIVE

- A. Wetwell concrete mix shall include a microbiologically induced corrosion resistance additive, as indicated on the Contract Drawings and specified in Section 03015. Mark wet well as constructed with corrosion resistant additive for easy identification in the field.

- B. Concrete mix for new sanitary sewer manholes, indicated on the Drawings, shall include a microbiologically induced corrosion resistance additive, as specified in Section 03015. Mark manholes as constructed with corrosion resistant additive for easy identification in the field.
- 2.16 SANITARY SEWER MANHOLE/VALVE VAULT/WETWELL - EXTERIOR COATING
- A. Outside surface of manhole/valve vault/wetwell bases, risers and cones shall be waterproofed with two coats of coal tar epoxy.
3. EXECUTION
- 3.01 SANITARY SEWER MANHOLE, WETWELL AND VAULT
- A. Precast concrete rings and reinforced concrete sections shall be laid so that the axis of the manhole, wetwell or vault is vertical. Gaskets for riser joints shall be installed in accordance with the manufacturer's recommendations.
 - B. Steps shall be installed in all structures unless otherwise indicated, shall be plumb and easily accessible from top openings, and shall be provided at 12-inches on centers.
 - C. Unless otherwise indicated on the Contract Drawings, set castings at finished grade.
 - E. Concrete masonry block may only be used for repairs or modifications of existing structures or the bottom ring of new structures in existing sewer lines. Masonry shall be laid with shove joints completely filled with Type S (1,800 psi) mortar in accordance with ASTM C270 and C91. Horizontal joints shall not exceed 1/2-inch and vertical joints 1/4-inch on their interior face. Lay all blocks as headers, staggering vertical joints between courses. Strike interior and exterior joints smooth with face of the wall.
- 3.02 CONNECTIONS TO EXISTING MANHOLES AND SEWERS
- A. Connections at existing manholes shall be made in a manner to prevent damaging the structure and shall be watertight where the connection is made. Core drill opening for new sewer and install watertight flexible manhole wall to pipe sleeve conforming to ASTM C-923.
 - B. Provide new manholes at connections to existing sewers and elsewhere where indicated, if any. Before the

existing pipe is broken out, pour concrete bottom to a depth one-half the diameter of the existing sewer.

3.03 LEAKPROOFING

- A. Manholes shall conform to the leakage requirements of Section 01100.

END OF SECTION

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SECTION 02610

POLYVINYL CHLORIDE (PVC) PIPE
AND DUCTILE IRON PIPE AND FITTINGS
(OPEN CUT INSTALLATION)

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Exterior piping and fittings.

2. Related work specified elsewhere:

a. Final Operation and Testing - Section 01100

b. Site Preparation - Section 02100

c. Trenching, Bedding, and Backfilling - Section 02221

d. Dewatering and Drainage - Section 02400

1.02 SUBMITTALS

A. Shop Drawings and Product Data.

1. Submit the following in accordance with Section 01000:

a. Pipe Product data and lay schedules

b. Pipe specialties and installation details

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01000. Exercise care in transporting and handling pipe and fittings in order to avoid damage to materials or coatings. Lifting shall be by hoist or on skids when hand lifting is not feasible. Dropping shall not be permitted. Store pipe as recommended by the manufacturer. Damaged pipe and fittings shall be replaced.

1.04 QUALITY ASSURANCE

A. All Polyvinyl Chloride (PVC) pipe, Ductile Iron Pipe, and mechanical joint ductile-iron fittings to be installed under this Contract may be inspected at the

manufacturing facility and foundry for compliance with these Specifications by Engineer or an independent testing laboratory selected by Owner.

- B. Inspection of the pipe and fittings will also be made by Engineer or other representatives of Owner after delivery. The pipe and fittings shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe and fittings rejected after delivery shall be marked for identification and shall immediately be removed from the job.

2. PRODUCTS

2.01 POLYVINYL CHLORIDE PIPE

A. PVC Pipe

- 1. PVC Pipe shall conform to AWWA C900/C905, DR 18 with push-on joints. PVC pipe to be of recent manufacture. Pipe stored more than six months will not be acceptable. The pipe shall be joined with gaskets, integral bell and spigot type joints conforming to ASTM D-3139. Gaskets shall conform to ASTM F-477.
- 2. The PVC pipe manufacturer shall provide a certified copy of the stress regression test that has been performed on the specific PVC compounding being utilized in the manufacture of his product. This stress regression testing shall have been done in accordance with ASTM D1598 and the manufacturer shall provide a product supplying a minimum Hydrostatic Design Basis (HDB) of 4,000 psi as determined in accordance with ASTM D2837.
- 3. Each length of pipe and each mechanical joint ductile iron fitting shall be marked with the name of the manufacturer, size, and class. All gaskets shall be marked with the name of manufacturer, size, and proper insertion direction.

2.02 DUCTILE IRON PIPE

A. Ductile Iron Pipe

1. Ductile Iron Pipe shall be centrifugally cast in metal or sand-lined molds and shall conform to ANSI A21.51/AWWA C151 latest edition, thickness Class 52.
2. Each length of pipe and each mechanical joint ductile iron fitting shall be marked with the name of the manufacturer, size, and class. All gaskets shall be marked with the name of manufacturer, size, and proper insertion direction.

B. Joints

1. Joints for pipe shall be push-on type conforming to ANSI A21.11/AWWA C111 latest edition.

C. Lubricants

1. Lubricants other than that furnished with the pipe shall not be used.

2.03 MECHANICAL JOINT DUCTILE IRON FITTINGS

A. Mechanical joint fittings for ductile iron pipe and PVC pipe shall be as follows:

1. Ductile Iron Mechanical Joint Fittings in accordance with ANSI A21.10/AWWA C110.
2. Ductile Iron Compact Mechanical Joint Fittings in accordance with ANSI A21.53/AWWA C153.
3. Ductile Iron Fittings shall have the following pressure rating:
 - a. 3-inch through 24-inch shall have a pressure rating of 350 psi.
 - b. 30-inch and larger shall have a minimum pressure rating of 250 psi.

B. Provide and install Type 304 stainless steel tee bolts, nuts and washers (as applicable) on all fittings. The threads of all stainless steel fasteners shall be coated

with marine grade anti-seize/lubricating compound, either shop applied, or field applied.

2.04 COATINGS AND LININGS FOR DUCTILE IRON PIPE AND FITTINGS

- A. Exterior coating shall be a minimum of 4 MIL (dry) thick asphaltic coating in accordance with ANSI/AWWA requirements.
- B. Interior lining shall be standard thickness cement mortar lining with an asphaltic seal coat in accordance with ANSI A21.4/AWWA C104 latest edition.

2.05 POLYETHYLENE ENCASEMENT

- A. All ductile iron pipe and fittings shall be encased with **TWO** polyethylene tubes, one tube inserted inside the other as follows:

- 1. The inner polyethylene tube shall consist of three layers of co-extruded linear low-density polyethylene (LLDPE), fused into a single thickness of not less than 8 mils. The interior surface of the polyethylene tube in contact with the pipe exterior shall be infused with a blend of anti-microbial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.

- 2. The outer polyethylene tube shall be high density, cross laminated (HDCL), 4 mil (min.) thickness, installed over the LLDPE tube.

- B. Each polyethylene tube shall be marked with the manufacturer's name, year of manufacture, film thickness, applicable pipe size range, and other data as required by ANSI A21.5/AWWA C105.

3. EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Before running lines, the Contractor shall carefully verify locations, depth, type of joint needed and size of pipe to which connection is proposed. He shall then assure himself that the lines can be run as contemplated without interfering with footings, walls, other piping, fixtures, etc. Any necessary deviation shall be referred

to the Engineer for final adjustment before lines are run.

- B. All lengths of pipe shall be dimensioned accurately to measurements established at the site, and shall be worked into place without springing or forcing.
- C. The Contractor shall cut all pipe and drill all holes that may be necessary. Cut sections of pipe shall be reamed or filed to remove all burrs. The pipe interior and joints shall be thoroughly cleaned before being installed and kept clean during construction.
- D. Make adequate provision for expansion and contraction of piping.
- E. Pipe embedment and backfilling shall closely follow the installation and jointing of pipe in the trench, to prevent floating of the pipe by water which may enter the trench, and to prevent longitudinal movement caused by thermal expansion or contraction of the pipe. Not more than 50 feet of pipe shall be exposed at any time ahead of the backfilling in any section of trench.
- F. Utmost care shall be exercised in loading, unloading and placing all pipe, fittings, valves, etc., in order to avoid shock and/or damage. Lifting shall be by hoist or skids when handlifting is not feasible. Dropping will not be permitted. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground.
- G. All pipe, fittings or other appurtenances, broken or damaged in transit from the cars, yard or shops to the site where they are to be used, or after they have been delivered to the site, shall be replaced by the Contractor at his own expense.
- H. All pipes and fittings shall be carefully examined for defects, and no pipe or fittings shall be laid which is known to be defective. If any such pipe or special casting shall be discovered to be defective after being laid, it shall be removed and replaced by the Contractor at his own expense.
- I. All changes in direction shall be made with fittings or approved joint deflection. Bending of pipe is prohibited.

3.02 PIPING

- A. All changes in direction shall be made with fittings or approved joint deflection. Bending of pipe is prohibited.
- B. Any transition from one pipe size to another shall be made with a reducing fitting. Reducing bushings are prohibited except where specifically indicated on the Drawings or approved by the E/A.
- C. The locations where the proposed pipe is to connect to the existing system are shown on the Contract Drawings. The Contractor shall physically connect the proposed pipe to the existing system at these locations.

3.03 CONCRETE THRUST BLOCKS

- A. Concrete Thrust Blocks shall be provided at all mechanical joint bends having a deflection of 11-1/4 degrees or greater. Concrete Thrust Blocks shall be as detailed on the Contract Drawings.
- B. Concrete Thrust Blocks shall be concrete having a compressive strength of 3,000 psi at 28 days, unless otherwise noted on the Contract Drawings.
- C. Concrete Thrust Blocks shall be poured against undisturbed earth having a minimum bearing capacity of 2,000 psf.
- D. Concrete Thrust Blocking shall not encase or limit access to mechanical joint fasteners at fittings.

3.04 RESTRAINED JOINTS

- A. Mechanical connectors with restraint capabilities shall be installed at interconnections with existing PVC/DIP mains, mechanical joint bends deflecting 11-1/4 degrees or more, and at all mechanical joint fittings in accordance with the manufacturer's recommendations. Additionally, restraints shall be installed on all mechanical pipeline joints within 25 feet of any bend or fitting in both directions.

- B. Restrained joints shall use full circumference clamping and will only be considered subject to pre-approval by the Owner and Engineer. All fittings shall be specifically designed and pre-approved for use with the pipe material (PVC or DIP) and installed in strict conformance with the manufacturer's instructions.
- C. Provide and install Type 304 stainless steel tee bolts, nuts and washers (as applicable) on all fittings. The threads of all stainless steel fasteners shall be coated with marine grade anti-seize and lubricating compound, either shop applied, or field applied.
- D. Restrained joint system shall be installed in conjunction with concrete thrust blocks unless otherwise noted on the Contract Drawings.

3.05 SEPARATION OF NON-POTABLE AND POTABLE WATER LINES

A. Horizontal Separation

- 1. Whenever possible, any existing or proposed drain or sewer line should be laid at least 10 feet horizontal from any watermain.
- 2. Should local conditions prevail which would prevent a lateral separation of 10 feet, a watermain may be closer than 10 feet to, or in the same trench as a storm or sanitary sewer provided the watermain is in a separate trench or on an undisturbed earth shelf located to one side of the sewer and at such an elevation that the bottom of the watermain is at least 18-inches above the top of the sewer.

B. Vertical Separation

- 1. Whenever watermains must cross house sewers, storm drains, or sanitary sewers, the watermain should be at such an elevation that the bottom of the watermain is 18-inches above the top of the drain or sewer. This vertical separation should be maintained for that portion of the watermain located within 10 feet, horizontally, of any sewer or drain crossed, said 10 feet to be measured as the normal distance from the watermain to the drain or sewer.

2. Where it is necessary for the watermain to pass under a sewer or drain line, the top of the watermain shall be 18-inches below the bottom of the sewer or drain line, and the watermain installed inside a casing pipe. This casing pipe shall extend each side of the crossing until the horizontal distance from the end of the casing to the sewer or drain line is at least 10-feet.
3. In making such crossings, it is preferable to center a length of watermain pipe over the sewer to be crossed so that the joints will be equal distance from the sewer and as remote therefrom as possible. Means to support the larger-sized sewer lines to prevent their settling and breaking the watermain shall also be provided.

C. Exceptions

1. If it is impossible to obtain proper horizontal and/or vertical separation as stipulated in A.1. or B.1., both the watermain and sewer shall be constructed of water main grade pressure pipe for a distance of at least 10 feet on each side of the crossing. Both pipes shall be pressure tested to assure watertightness before backfilling.

3.06 PLUGS

- A. Installed piping systems shall be temporarily plugged at the end of each day's work, or other interruption to progress on a given line. Plugging shall be adequate to prevent entry of small animals or persons into the pipe or the entrance or insertion of deleterious materials.
- B. Standard plugs shall be inserted into all dead-end pipes, tees, or crosses; spigot ends shall be capped.
- C. Where plugging is required because of contract division or phasing for later connection, the ends of such lines shall be equipped with a permanent type plug or blind flange. Installation or removal of such plugging shall be considered incidental to the work.
- D. At locations where existing piping is to be abandoned, the Contractor shall physically disconnect that piping. The abandoned piping shall then be plugged as required at locations shown on the plans.

3.07 LOCATOR WIRE

1. All PVC pipe shall have a continuous 3/16-inch bare cable diameter, 7 x 19 strand core Type 304 stainless steel wire rope, nylon coated installed along with the pipe line. The wire is to be continuous through all vaults, etc. Provide Exothermic (CAD) Welds (or approved equal) at all splices. The nylon coating at the weld shall be repaired per the manufacturer's recommendation and made water tight.

2. Locator wire conductivity shall be tested prior to final payment. Any segment of locator wire that does not provide an adequate signal for locating purpose will not be accepted and will be repaired at the Contractor's expense.

END OF SECTION

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SECTION 02616

DUCTILE IRON PIPE
(HORIZONTAL DIRECTIONAL DRILLED INSTALLATION)

1. GENERAL
- 1.01 DESCRIPTION
 - A. Work Specified Herein and Elsewhere
 1. Work under this Section includes:
 - a. Exterior piping and fittings.
 2. Related work specified elsewhere:
 - a. Final Operation and Testing - Section 01100
 - b. Horizontal Directional Drilling - Section 02215
 - c. Trenching, Bedding, and Backfilling - Section 02221.
- 1.02 SUBMITTALS
 - A. Shop Drawings and Product Data.
 1. Submit the following in accordance with Section 01000:
 - a. Pipe Product data and lay schedules
 - b. Pipe specialties and installation details
- 1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING
 - A. Comply with Section 01000. Exercise care in transporting and handling pipe and fittings in order to avoid damage to materials or coatings. Lifting shall be by hoist or on skids when hand lifting is not feasible. Dropping shall not be permitted. Store pipe as recommended by the manufacturer. Damaged pipe and fittings shall be replaced.
- 1.04 QUALITY ASSURANCE
 - A. All ductile iron pipe and mechanical joint ductile-iron fittings to be installed under this Contract may be inspected at the manufacturing facility and foundry, respectively, for compliance with these Specifications by Engineer or an independent testing laboratory selected by Owner.

- B. Inspection of the pipe and fittings will also be made by Engineer or other representatives of Owner after delivery. The pipe and fittings shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe and fittings rejected after delivery shall be marked for identification and shall immediately be removed from the job.

2. PRODUCTS

2.01 DUCTILE IRON PIPE

A. Ductile Iron Pipe

- 1. Ductile Iron Pipe shall be centrifugally cast in metal or sand-lined molds and shall conform to ANSI A21.51/C151 latest edition, thickness Class 52. See Item 2.01.B for acceptable pipe manufacturers.
- 2. Each length of pipe and each mechanical joint ductile iron fitting shall be marked with the name of the manufacturer, size, and class. All gaskets shall be marked with the name of manufacturer, size, and proper insertion direction.

B. Joints

- 1. Joints for pipe shall be a low profile push-on flexible restrained type. Joint shall provide good distribution of thrust or pulling forces around the bell and barrel, and have a liberal allowable joint deflection with simultaneous joint restraint. Pipe shall be Flex-Ring by American Ductile Iron Pipe Company or TR Flex by U.S. Pipe and Foundry Company.
- 2. Push-on Joints shall incorporate a boltless restraint system that can be used on horizontal directional drilled installations.

C. Lubricants

- 1. Lubricants other than that furnished with the pipe shall not be used.

2.02 MECHANICAL JOINT DUCTILE IRON FITTINGS

A. Mechanical joint fittings for ductile iron pipe shall be as follows:

- 1. Ductile Iron Mechanical Joint Fittings in accordance with ANSI A21.10/AWWA C110.

2. Ductile Iron Compact Mechanical Joint Fittings in accordance with ANSI A21.53/AWWA C153.
3. Ductile Iron Fittings shall have the following pressure rating:
 - a. 3-inch through 24-inch shall have a pressure rating of 350 psi.
 - b. 30-inch and larger shall have a minimum pressure rating of 250 psi.
4. Provide and install Type 304 stainless steel tee bolts, nuts and washers (as applicable) on all fittings. The threads of all stainless steel fasteners shall be coated with marine grade anti-seize/lubricating compound, either shop applied or field applied.

B. Lubricants

1. Lubricants other than that furnished with the fittings shall not be used.

2.03 COATINGS AND LININGS FOR DUCTILE IRON PIPE AND FITTINGS

- A. Exterior coating shall be a minimum of 4 MIL (dry) thick asphaltic coating in accordance with ANSI/AWWA requirements.
- B. Interior lining shall be standard thickness cement mortar lining with an asphaltic seal coat in accordance with ANSI A21.4/AWWA C104 latest edition.

2.04. POLYETHYLENE ENCASEMENT

- A. All ductile iron pipe and fittings shall be encased with TWO polyethylene tubes, one tube inserted inside the other as follows:
 1. The inner polyethylene tube shall consist of three layers of co-extruded linear low density polyethylene (LLDPE), fused into a single thickness of not less than 8 mils. The interior surface of the polyethylene tube in contact with the pipe exterior shall be infused with a blend of anti-microbial biocide to mitigate microbiologically influenced corrosion and a volatile corrosion inhibitor to control galvanic corrosion.
 2. The outer polyethylene tube shall be high density, cross laminated (HDCL), 4 mil (min.) thickness, installed over the LLDPE tube.
- B. Each polyethylene tube shall be marked with the manufacturer's name, year of manufacture, film thick-

ness, applicable pipe size range, and other data as required by ANSI A21.5/AWWA C105.

3. EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. Ductile iron pipe shall be installed by horizontal directional drilling in accordance with Section 02215 and the pipe manufacturers requirements.
 - B. Utmost care shall be exercised in loading, unloading and placing all pipe, fittings, valves, etc., in order to avoid shock and/or damage. Lifting shall be by hoist or skids when handlifting is not feasible. Dropping will not be permitted. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground.
 - C. Any pipe, fittings, or other appurtenances, broken or damaged in transit from the cars, yard or shops to the site where they are to be used, or after they have been delivered to the site, shall be replaced by the Contractor at his own expense.
 - D. All pipes and fittings shall be carefully examined for defects, and no pipe or fittings shall be laid which is known to be defective. If any such pipe or special casting shall be discovered to be defective after being laid, it shall be removed and replaced with a sound casting by the contractor at his own expense.
- B. Pipe Cleaning During Installing Operating
- 1. Should the pipe ends become dirty or dusty during the storage of the pipe, a thorough cleaning of the pipe shall be done just before the joint of pipe is fused and installed. At this time, a visual check shall be made by placing the pipe in an inclined position to assure that all foreign material and dirt is removed from the inside of the pipe. The pipe shall be kept clean during and after installation. At the termination of the pipe installation, the open end of the pipeline shall be closed off by a suitable cover until installation operations are resumed.

3.02 FORCEMAIN PIPING

- A. All changes in direction shall be made with fittings or approved joint deflection. Bending of pipe is prohibited.
- B. Any transition from one pipe size to another shall be made with a reducing fitting. Reducing bushings are prohibited except where specifically indicated on the Drawings or approved by the E/A.

3.03 RESTRAINED JOINTS

- A. Mechanical connectors with restraint capabilities shall be installed at interconnections with existing PVC/DIP mains, mechanical joint bends deflecting 11-1/4 degrees or more, and at all mechanical joint fittings in accordance with the manufacturer's recommendations. Additionally, restraints shall be installed on all mechanical pipeline joints within 25 feet of any bend or fitting in both directions.
- B. Restrained joints shall use full circumference clamping and will only be considered subject to pre-approval by the Village of Wauconda and the E/A. All fittings shall be specifically designed and pre-approved for use with DIP pipe, and installed in strict conformance with the manufacturer's instructions. Restrained joint system for Ductile Iron Pipe shall be Megalugs as manufactured by EBAA Iron Sales, Inc.
- C. Provide and install Type 304 stainless steel tee bolts, nuts and washers (as applicable) on all fittings. The threads of all stainless steel fasteners shall be coated with marine grade anti-seize and lubricating compound, either shop applied or field applied.

3.04 POLYETHYLENE ENCASUREMENT

- A. All polyethylene encasement shall be installed per AWWA C600, and ANSI A21.5/AWWA C105, latest editions. Polyethylene encasement shall prevent contact between the pipe and surrounding backfill and bedding material. Clay, mud and other foreign material on the pipe surface shall be removed prior to the installation of the polyethylene tube. During installation, soil or embedment material shall not be trapped between the pipe and the polyethylene tube.

- B. Polyethylene tube shall be fitted to the contour of the pipe creating a snug, but not tight, encasement with minimum space between the polyethylene and the pipe. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings, and to prevent damage to the polyethylene caused by backfilling operations. Polyethylene tube shall have a one foot overlap on each end with the adjacent tube, and shall be thoroughly sealed with adhesive tape at the joint overlap.

- C. Direct service taps may be made through the polyethylene tube, with any damage to the tube being repaired in accordance with ANSI A21.4/AWWA C105.

END OF SECTION

SECTION 02618

RESTRAINED JOINT PVC PIPE

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Requirements for Restrained Joint PVC Pipe used for sanitary forcemain pressure pipe installed by horizontal directional drilling, or elsewhere where shown on the Drawings.

2. Related work specified elsewhere:

- a. Final Operation and Testing - Section 01100
- b. Horizontal Directional Drilling - Section 02215
- c. Utilities Trenching, Bedding, and Backfilling - Section 02221
- d. Dewatering and Drainage - Section 02400

1.02 REFERENCES

- A. AWWA C900 Standard for PVC Pressure Pipe and Fabricated Fittings, 4" Through 12", for Water Distribution.
- B. ASTM D1784 Standard Specification for Rigid PVC Compounds and Chlorinated PVC Compounds.
- C. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- D. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipes.
- E. Manufacturer's Product Specifications

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01000.
- B. Submit shop drawings showing design of pipe, fittings, couplings, etc. indicating laying dimensions and fabrication.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01000. Exercise care in transporting and handling pipe and fittings in order to avoid damage to materials or coatings. Lifting shall be by hoist or on skids when hand lifting is not feasible. Dropping shall not be permitted. Store pipe as recommended by the manufacturer. Damaged pipe and fittings shall be replaced.

1.05 QUALITY CONTROL

- A. As a basis for acceptance of the product, the manufacturer shall furnish a certificate of conformance to the specifications.

2. PRODUCTS

2.01 RESTRAINED JOINT POLYVINYL CHLORIDE (PVC) PIPE

A. PVC Pipe

1. PVC pipe shall conform to AWWA C900, DR 18 with a push-on restrained joint connection. PVC pipe restraint system to be of recent manufacture. Pipe and restraint system stored more than six months will not be acceptable. The restrained joint pipe system shall also meet all short and long term pressure test requirements of AWWA C900. Gaskets shall conform to ASTM F-477.
2. The PVC pipe manufacturer shall provide a certified copy of the stress regression test that has been performed on the specific PVC compound being utilized in the manufacture of the product. This stress regression testing shall be performed in accordance with ASTM D1598.
3. Each length of pipe shall be marked with the name of the manufacturer, size, class, hydrostatic proof test pressure and manufacturer date. All gaskets shall be marked with the name of manufacturer, size, and proper insertion direction.
4. Pipe shall be made from unplasticized PVC compounds having a minimum cell classification of 1245-B, as defined in ASTM D1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4,000 psi for water at 73.4° F, in accordance with the requirements of ASTM D2837.
5. Restrained joint PVC pipe products shall have been tested and approved by an independent third-party laboratory for continuous use at rated pressures. Copies of Agency approval reports or product listings shall be provided to the Engineer. Products intended for contact with

potable water shall be evaluated, tested and certified for conformance with NSF Standard 61 by an acceptable certifying organization.

6. Nominal outside diameters and wall thicknesses of thrust-restrained pipe shall conform to the requirements of AWWA C900. Thrust-restrained pipe shall be furnished in the sizes shown on the plans, Pressure Class 235 for DR 18. Pipe shall be furnished in standard lengths of 20 feet.
 7. PVC pipe manufacturer approved restrained mechanical joint adapters shall be used to anchor this restrained-joint PVC pipe to ductile iron accessories such as at interconnections, mechanical joint bends and valves. Consult the manufacturer for availability of joint accessories and fittings.
 8. Every pipe and machined coupling shall pass AWWA C900 hydrostatic proof test requirements.
 9. As defined in AWWA C900, pipe shall be homogeneous throughout and free from voids, cracks, inclusions, and other defects, and shall be as uniform as commercially practicable in color, density, and other physical characteristics.
 10. The pipeline shall not be bent to a radius less than that recommended by the manufacturer.
 11. Restrained joint PVC pipe shall be green or green stripe for sanitary application.
- B. Restrained Joint PVC Pipe
1. Restrained Joint PVC Pipe shall be C900/RJIB Certa-Lok PVC Pipe manufactured by NAPCO.

3. EXECUTION

3.01 INSTALLATION

- A. Restrained joint PVC pipe shall be installed by horizontal directional drilling in accordance with Section 02215.
- B. Apply lubricant to the exposed gasket surface and to the pipe (spigot) end, making sure to cover the tapered edge. Use only approved lubricant supplied by manufacturer.
- C. After applying lubricant, assemble Restrained Joint PVC Pipe per manufacturer's requirements.
- D. When making field cuts, use a PVC pipe cutter to ensure a square end. Use a manufacturer approved power routing

tool for field fabrication of the pipe groove for the restrained joint.

E. Restrained Mechanical Joints for PVC Pipe

1. A mechanical connector with restraint capabilities will be required at all mechanical joints. Restrained joints shall use full circumference clamping and will only be considered subject to pre-approval by the Owner. All fittings shall be specifically designed and pre-approved for use with PVC pipe, and installed in strict conformance with the manufacturer's instructions. Megalugs and similar fittings using set screws or drive lugs into the wall of the pipe will not be allowed.
2. Mechanical connectors with restraint capabilities shall be installed at interconnections with existing PVC/DIP mains, mechanical joint bends deflecting 11-1/4 degrees or more, and at all mechanical joint fittings in accordance with the manufacturer's recommendations. Additionally, restraints shall be installed on all mechanical pipeline joints within 25 feet of any bend or fitting in both directions.
3. Provide and install Type 304 stainless steel nuts, tee bolts and washers (as applicable) on all fittings. The threads of all stainless steel fasteners shall be coated with marine grade anti-seize Teflon and lubricating compound, either shop applied or field applied.

F. LOCATOR WIRE

1. All directionally drilled PVC restrained joint pipe shall have a continuous 3/16-inch bare cable diameter, 7 x 19 strand core Type 304 stainless steel wire rope, nylon coated installed along with the pipeline. The wire is to be continuous through all valve vaults, etc. Provide Exothermic (Cad) Welds at all splices. The nylon coating at the weld shall be repaired per the manufacturer's recommendations and made watertight.
2. Locator wire conductivity shall be tested prior to final payment. Any segment of locator wire that does not provide an adequate signal for locating purpose will not be accepted and will be repaired at the Contractor's expense.

3.02 PIPE CLEANING DURING INSTALLING OPERATION

- A. Should the pipe ends become dirty or dusty during the storage of the pipe, a thorough cleaning of the pipe shall be done just before the pipe is joined. At this time, a visual check shall be made by placing the pipe in an inclined position to assure that all foreign

material and dirt is removed from the inside of the pipe. The pipe shall be kept clean during and after installation. At the termination of pipe installation, the open end of the pipeline shall be closed off by a suitable cover until installation operations are resumed.

END OF SECTION

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SECTION 02619

HIGH DENSITY POLYETHYLENE (HDPE)
SOLID WALL PIPE

1. GENERAL

1.01 SECTION INCLUDES

- A. Requirements for High Density Polyethylene (HDPE) pipe used for sanitary forcemain.
- B. Related work specified elsewhere:
 - a. Final Operation and Testing - Section 01100
 - b. Horizontal Directional Drilling - Section 02215
 - c. Utility Trenching, Bedding, and Backfilling - Section 02221

1.02 REFERENCES

- A. AWWA C901 Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2-inch through 3-inch for Water Service.
- B. AWWA C906 Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch, for Water Distribution.
- C. ASTM D618 Specification for Polyethylene Plastics Molding and Extrusion Materials.
- D. ASTM D2657 Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings (which includes Polyethylene Pipe).
- E. ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
- F. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- G. ASTM D3350 Standard Specification for Polyethylene Plastic Pipe and Fittings Material.
- H. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
- I. ASTM F1290 Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings.
- J. ASTM D3261 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

1.03 SUBMITTALS

- A. Submittals shall conform to requirements of Section 01000 - Submittals.
- B. Submit shop drawings showing design of pipe, fittings, electrofusion couplings, buried pipe anchors, etc. indicating laying dimensions and fabrication.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01000. Exercise care in transporting and handling pipe and fittings in order to avoid damage to materials or coatings. Lifting shall be by hoist or on skids when hand lifting is not feasible. Dropping shall not be permitted. Store pipe as recommended by the manufacturer. Damaged pipe and fittings shall be replaced.

1.05 QUALITY CONTROL

- A. As a basis for acceptance of the product, the manufacturer shall furnish a certificate of conformance to the specifications.

2. PRODUCTS

2.01 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

- A. Pipe and fittings shall conform to AWWA C906, water pressure rating 160 psi (min.), DR11. The pipe will be extruded from resin meeting specifications of ASTM D3350. PE4710 material, with a cell classification of PE445474C. Fittings shall be molded from a polyethylene compound having a cell classification equal to or exceeding the cell classification of the pipe supplied under this specification.
- B. Pipe is to be of solid wall construction and shall have DIPS (Ductile Iron Pipe Size) outside dimensions.
- C. Pipe shall be green or green striped pipe for sewer applications. DR rating and cell classification shall be stamped on pipe.
- D. The pipe shall contain no recycle compound except that generated in the Manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, voids, foreign inclusions, or other injurious defects, and shall be nominally identical in color density, melt index and other physical properties throughout.

- E. At all locations where the HDPE pipe connects to a mechanical joint with joint restraint, the HDPE pipe shall be equipped with a stainless-steel pipe stiffener and fits inside the HDPE pipe.

2.02 INSPECTIONS

- A. The Engineer shall be entitled to inspect pipes or witness pipe manufacturing. Such inspection shall in no way relieve the manufacturer of the responsibilities to provide products that comply with the applicable standards within this specification.

2.03 MARKING AND DELIVERY

- A. Each standard and random length of pipe in compliance with this standard shall be clearly marked with the following information:
 - 1. Pipe Size
 - 2. Pipe Class
 - 3. Production Code
 - 4. Material Designation

3. EXECUTION

3.01 INSTALLATION

- A. HDPE pipe shall be installed by horizontal directional drilling in accordance with Section 02215.
- B. Pipe Cleaning During Installing Operation
 - 1. Should the pipe ends become dirty or dusty during the storage of the pipe, a thorough cleaning of the pipe shall be done just before the joint of pipe is fused and installed. At this time, a visual check shall be made by placing the pipe in an inclined position to assure that all foreign material and dirt is removed from the inside of the pipe. The pipe shall be kept clean during and after installation. At the termination of pipe installation, the open end of the pipeline shall be closed off by a suitable cover until installation operations are resumed.
- C. Joining HDPE Pipe
 - 1. Sections of polyethylene pipe shall be joined into continuous lengths on the job site above ground. The joining method shall be the butt heat fusion method (per ASTM D2657) and shall be performed in strict accordance

with the pipe manufacturer's recommendations. Joining shall utilize controlled temperature and pressure to produce a fused leak-free joint. The butt heat fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer, including but not limited to, temperature requirements, alignment, and interfacial fusion pressure. Only personnel certified by pipe manufacturer as fusing technicians shall perform this work.

2. HDPE pipe may also be joined as necessary at or near valves and fittings by using approved electrofusion couplings and electrofusion processor (per ASTM D2657). Electrofusion processor shall be "Friatec", "Central", or approved equal. Only personnel certified by pipe manufacturer shall perform this work.

D. Buried Pipe Anchors for HDPE Pipe

1. The Contractor will be required to install buried pipe anchors for the HDPE piping system when the forcemain connects to existing piping, non-restrained joint piping, or where the forcemain terminates at a dead end. Buried pipe anchors shall be as per the manufacturer and shall consist of an appropriate HDPE restraint anchor securely attached to the forcemain, which shall be adequately encased in concrete at a point in close proximity to the mechanical joint.

E. Restrained Mechanical Joints for HDPE Pipe

1. A mechanical connector with restraint capabilities will be required at all mechanical joints. Restrained joints shall use full circumference clamping and will only be considered subject to pre-approval by the Owner and Engineer. All fittings shall be specifically designed and pre-approved for use with HDPE pipe, and installed in strict conformance with the manufacturer's instructions. Megalugs and similar fittings using set screws or drive lugs into the wall of the pipe will not be allowed. HDPE pipe shall be provided in ductile (cast) iron pipe outside diameter sizes (DIPS).
2. Mechanical connectors with restraint capabilities shall be installed at interconnections with existing PVC/DIP forcemains, mechanical joint bends deflecting 11-1/4 degrees or more, and at all mechanical joint fittings in accordance with the manufacturer's recommendations. Additionally, restraints shall be installed on all mechanical pipeline joints within 25 feet of any bend or fitting in both directions.
3. Transition from HDPE pipe to either PVC or DIP pipe shall be accomplished by use of a HDPE pipe manufacturer

approved mechanical joint adaptor system with restraint capabilities.

4. Provide and install Type 304 stainless steel nuts, tee bolts and washers (as applicable) on all fittings. The threads of all stainless-steel fasteners shall be coated with marine grade anti-seize Teflon and lubricating compound, either shop applied or field applied.

F. LOCATOR WIRE

1. All directionally drilled HDPE forcemain shall have a continuous 3/16-inch bare cable diameter, 7 x 19 strand core Type 304 stainless steel wire rope, nylon coated installed along with the pipeline. The wire is to be continuous through all valve vaults, etc. Provide water-tight compression type splices as necessary.
2. Locator wire conductivity shall be tested prior to final payment. Any segment of locator wire that does not provide an adequate signal for locating purpose will not be accepted and will be repaired at the Contractor's expense.

G. Related Items

1. The following items shall be as per Section 02221 - Trenching, Bedding and Backfilling and/or 02610 - Polyvinyl Chloride (PVC) Pipe and Ductile Iron Pipe and Fittings.
 - a. HDPE pipe installed by open-cut method.
 - b. PVC or DIP pipe used for interconnecting HDPE pipe to valves, fittings, or other existing forcemains.
 - c. Separation of non-potable and potable water lines.

3.02 REMOVAL OF INTERNAL PIPE WALL FUSION BEAD

- A. The bead created by the Fusion Process shall be removed from the interior wall of the pipe as it is assembled. This process is also known as Debeading.
- B. Debeading shall be accomplished by using a debeading tool designed specifically for this task. The debeading tool shall smoothly trim back the fusion bead to be either flush or near flush with the interior wall of the pipe, freely allowing a pipe mandrel to pass. The debeading tool shall not induce slits, gouges or defects into the pipe wall.

- C. Debeading shall occur after the fused joint has had an adequate amount of time to cool.

END OF SECTION

SECTION 02620

VALVES AND WATER SERVICE RECONNECTIONS

1. GENERAL
- 1.01 DESCRIPTION
 - A. Work Specified Herein and Elsewhere
 1. Work under this Section includes:
 - a. Valves
 - b. Valve operators.
 2. Related work specified elsewhere:
 - a. Piping system testing - Section 01100.
 - b. Valve Vaults, and Appurtenances - Section 02601.
 - c. Piping and Fittings - Division 2.
- 1.02 QUALITY ASSURANCE
 - A. Responsibility
 1. The manufacturer shall be responsible for compatibility and the required performance of the products furnished. Wherever possible, finished products shall be delivered as a complete assembly.
 - B. Reduction of Lead in Drinking Water Act Compliance
 1. All Potable Water Distribution materials, devices and components installed on this project shall comply with the Reduction of Lead in Drinking Water Act.
- 1.03 SUBMITTALS
 - A. Shop Drawings and Product Data
 1. Submit shop drawings and product data in compliance with Division 1 for all valves, hydrants and valve operators showing general dimensions, construction details and full descriptive literature. Shop drawings shall indicate valve operator locations.
 - B. Certifications
 1. Valve manufacturer shall furnish certification for all valves 4 inch diameter and larger that each valve has been subjected to a hydrostatic water pressure twice the pressure class and that each valve is free of defects.

C. Special Tools

1. Furnish one set of all special tools necessary for installation, normal maintenance, and adjustment.

D. Operation and Maintenance Manuals

1. Submit operation and maintenance instruction bulletins for all valves, hydrants and valve operators in compliance with Division 1.

2. PRODUCTS

2.01 VALVES AND SPECIAL FITTINGS

A. General

1. The Contractor shall furnish and install, in the appropriate locations as shown on the Plans, all valves and special fittings as specified. Where required for satisfactory operation of valves, valve boxes and other valve appurtenance shall be provided. All valve stems and machinery stuffing boxes shall be packed with material properly selected for the service intended. The Contractor shall maintain all packing until final acceptance of the equipment by the Owner.
2. Valves shall be installed as required for proper control and isolation of sections of systems for maintenance purposes. Manufacturer's name and service and pressure marking shall be cast into the body.
3. Valves shall be constructed for not less than 250 pounds per square inch working pressure (500 lbs. static test pressure, water, oil or gas, non-shock, except as otherwise specified) and shall be so designed and installed that they can be packed under pressure. Shutoff valves shall be resilient wedge gate valves, except where other type valves are specifically indicated or specified.
4. The valve manufacturer shall furnish for each valve a certificate that the valve has been subject to a hydrostatic water pressure test double the pressure class and that each valve is free of defects. After the valves have been installed, they shall be tested for satisfactory operation by the Contractor.
5. Valves shall be operated by wrench unless otherwise designated in the Contract Drawings and/or Specifications. All buried valves shall be supplied with a "T" operating wrench with a socket to fit the valve operator and shall be of sufficient length to easily operate the valve.

6. Valves shall be designed for direct burial in the ground where indicated on the Contract Drawings.

2.02 ECCENTRIC PLUG VALVES

- A. Eccentric plug valve shall have rubber-faced plugs and shall be of eccentric construction so that the opening movement of the valve results in the plug rising off the seat contact rather than sliding from its seat. Valves shall be made of cast iron ASTM A126, Class B. Body seats of valves 3-inch or larger shall have a minimum 1/8-inch welded-in overlay of not less than 90% pure nickel on all surfaces contacting the plug face. Stem bearings shall be sintered, oil impregnated, permanently lubricated, Type 316 stainless steel. Port areas shall be equal to at least 100% of the full pipe area. Valves 4-inch and larger shall have multiple V-type packing with adjustable gland follower. Packing shall be adjustable and capable of being repacked under pressure without the actuator, bonnet or plug being removed from the valve. The valve shall be designed to withstand full operating pressure against the face of the plug without leakage. Valves shall be designed for not less than 150 pounds cold water operating pressure, 8-inch and larger valves shall be gear operated, unless otherwise shown or specified. Gear-operated valves with operating wheel 7-ft or more above the floor shall be provided with stainless steel chains and chain wheels. Valve shall be **PEF 100% Port** type manufactured by **DeZurik** or approved equal.
- B. Eccentric Plug Valves shall be compatible with the pigging of forcemain pipe.

2.03 VALVE EXTENSION STEMS

- A. Extension stems shall be provided for all valves in buried locations and in other locations where indicated on the Drawings.
- B. Extension stems shall be fabricated from solid steel shafting not smaller in diameter than the stem of the valve or from galvanized steel pipe having an internal diameter not smaller than the diameter of the valve stem. Stem couplings shall be both threaded and keyed to the coupled stem and shall be of standard design and construction. Pipe couplings will not be acceptable.
- C. Stems for buried valves shall extend to within 6-inches of the surface of the ground. Each extension stem shall be connected to the valve operator with a suitable universal joint type coupling. All connections shall be pinned. Each extension stem shall be provided with

spacer which will center the stem in a valve box and shall be equipped with a standard AWWA wrench nut as described in AWWA C500.

2.04 VALVE BOXES

- A. All buried valves not in vaults shall be provided with adjustable valve boxes having an inside diameter approximately 5-inches in diameter with a minimum thickness of 3/16-inch and constructed so that the removable cover will not be thrown out by travel over it. Valve boxes shall be of sound, close grained cast iron, free from flaws and defects, built strong and rugged enough to withstand the shock of street traffic.
- B. Valve boxes shall be of sufficient length to operate all valves buried in the ground. Valve boxes shall consist of base, center section, and top section with cover. Contractor shall provide Tyler Valve Box Assembly 664F or equal.
- C. Valve boxes shall incorporate valve box stabilizer to keep valve box upright and in proper position.

2.05 WATER SERVICE RECONNECTION

- A. Contractor shall reconnect existing water services that have been damaged or broken due to Contractors construction activity.
- B. Reconnected services shall consist of copper to copper unions and copper service tube. Copper tubing shall be Type K copper suitable for direct burial. Tubing shall conform to ASTM Specifications B88-58 for seamless copper water tube, and shall be the same size as the existing service. Fittings shall be flared fittings for copper water tubes conforming to ASA B16.26.
- C. Contractor shall provide appropriate connection fittings between new copper tubing and existing water services if they are dissimilar materials. Contractor shall obtain Owner/Engineer approval of fittings prior to installation.

3. EXECUTION

3.01 GENERAL

- A. Make connections between valves and piping as specified in Division 2.

3.02 BURIED VALVES

- A. Buried valves 4-inch diameter and larger shall be set on a foundation of solid concrete or stone not less than 8-inches thick not less than one cubic foot in volume. Foundations shall be set on firmly compacted ground.
- B. The height of the valve and its supporting foundation shall conform to the height of the connecting pipe.

3.03 VALVE OPERATION

- A. Open and close each valve observing full operation prior to installing successive lengths of pipe.

3.04 VALVE AND CURB BOXES

- A. Boxes shall rest on the valve and shall be adjusted so that the cover may be set flush with finish grade. Boxes shall be set to allow equal movement above and below finish grade.
- B. The base of the box shall be centered over the valve, and the top of the base section shall be approximately on line with the nut on top of the valve stem. The entire assembly shall be plumb.

3.05 SERVICE CONNECTIONS

- A. The corporation stops shall be set at right angles to the centerline of the watermain and at approximately an angle of 45 degrees from the top center of the pipe. All taps for service lines shall be a minimum of 5-ft from end of pipes.
- B. The service pipe shall be bent at the corporation stop in the form of a goose neck to provide for differential movement of the service pipe and watermain.
- C. Where the service connection is made under rigid street surfacing, the paving shall be cut only if necessary, to make the connection to the main. The service pipe shall be run to the connection through a hole bored under the paving.
- D. Services under roadways shall be installed using hydraulic ram or other methods approved by the Engineer. The use of self-propelled pneumatic "moles" shall not be allowed.

END OF SECTION

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SECTION 03015

MICROBIOLOGICALLY INDUCED CORROSION RESISTANT CONCRETE

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work Under This Section Includes:

This section includes all labor materials, equipment and related services necessary to provide concrete with microbiologically induced corrosion resistance as indicated on Contract Drawings and specified herein.

2. Related Work Specified Elsewhere:

a. Manholes, Wetwell, Valve Vaults and Appurtenances -
Section 02601.

b. Concrete - Section 03010

1.02 CODES AND STANDARDS

ACI 301 "Specifications for Structural Concrete for Buildings"; ACI 304 "Recommended Practice for Measuring, Mixing, Transportation and Placing Concrete"; ACI 318, "Building Code Requirements for Reinforced Concrete"; comply with applicable provisions except as otherwise indicated.

1.03 QUALITY CONTROL

A. The Contractor shall employ an acceptable testing laboratory to perform materials evaluation, testing and design of concrete mixes.

B. Certificates, signed by concrete producer and Concrete Work Contractor, may be submitted in lieu of material testing when acceptable to the Engineer.

C. If microbiologically induced corrosion resistant concrete is used for precast structures or pipe, the Precaster shall retain two (2) labeled specimens from each production run. One specimen shall be kept by the

Precaster and the other shall be sent to the Liquid Antibacterial Additive Manufacturer.

1. Sampling: ASTM C172
 2. Slump: ASTM C 143, one test for each load at point of discharge.
 3. Air Content: ASTM C 173, one for each set of compressive strength specimens.
 4. Compressive Strength: ASTM C 39, one set for each 50 cu. yds. or fraction thereof of each class of concrete; 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one retained for later testing if required.
 5. When the total quantity of a given class of concrete is less than 50 cu. yds., strength tests may be waived by Engineer if field experience indicates evidence of satisfactory strength.
- D. Test Results will be reported in writing to Engineer, Contractor and concrete producer on same day tests are made.
- E. Manufacturer's Data: Submit manufacturer's product data with installation instructions for proprietary materials including reinforcement and forming accessories, admixtures, joint materials, hardeners, curing materials and others as requested by Engineer.
- F. Laboratory Reports: Submit 2 copies of laboratory test or evaluation reports for concrete materials and mix designs.
2. PRODUCTS
- 2.01 MIX PROPORTIONS AND DESIGN
- A. Proportion mix by either laboratory trial batch or field experience method complying with ACI 301. Concrete shall reach a minimum strength of 4,000 psi after 28 days.
 - B. Submit written report to Engineer for proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mix has been reviewed and is acceptable to Engineer.

- C. Mix design may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mix until submitted to and accepted by Engineer.
- D. Use air-entraining admixture in all concrete, providing not less than 2% nor more than 4% entrained air for all concrete.

2.02 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type as required.
- B. Aggregates: ASTM C 33, except local aggregates of proven durability may be used when acceptable to Engineer.
- C. Water: Clean, drinkable.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Water-Reducing Admixture: ASTM C 494. Only use admixtures which have been tested and accepted in mix designs, unless otherwise acceptable.
- F. Antimicrobial Additive:
 - 1. Liquid Antibacterial Additive shall be an Environmental Protection Agency (EPA) registered material. Contractor shall submit EPA registration number for approval prior to use in the project.
 - 2. Liquid Antibacterial Additive shall render the concrete uninhabitable for bacteria growth.
 - 3. The amount of Liquid Antibacterial Additive added to the concrete mix shall be as recommended by the manufacturer of the Liquid Antibacterial Additive and shall be included in the total water content of the concrete mix design.
 - 4. Liquid Antibacterial Additive shall be added to the concrete mix water to ensure uniform distribution of Liquid Antibacterial Additive throughout the concrete.
 - 5. Manufacturer of Liquid Antibacterial Additive shall have ten or more years of successful microbially induced corrosion resistance in sanitary sewer systems.

6. Liquid Antibacterial Additive shall be manufactured by Con^{mic} Shield® or Engineer-Approved equal.

2.03 STRUCTURE MARKINGS

- A. All structures precast with microbiologically induced corrosion resistant concrete shall be marked on the interior of the structure with Con^{mic} Shield® ID color identifier-indicator or Engineer-Approved equal. The name of the Liquid Antimicrobial Additive shall be clearly and legibly stenciled on the exterior of each structure.

2.04 INSTALLATION REPAIRS

- A. Repairs to precast structures pre- or post-installation including filing joints, lifting holes, annular spaces around pipe and surface defects, shall be completed with antibacterial grout supplied by manufacturer of Liquid Antimicrobial Additive. Antibacterial grout shall be pre-packaged and require no additives, and shall be Con^{mic} Shield® or Engineer-Approved equal.

END OF SECTION

SECTION 03100
CONCRETE FORMWORK

1. GENERAL
- 1.01 RELATED WORK
 - A. Section 03200 - Concrete Reinforcement.
 - B. Section 03300 - Cast-In-Place Concrete.
- 1.02 QUALITY ASSURANCE
 - A. Construct and erect concrete formwork in accordance with ACI 347.
- 1.03 REFERENCE STANDARDS
 - A. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - B. ACI 347 - Recommended Practice for Concrete Formwork.
 - C. PS 1 - Construction and Industrial Plywood.
- 1.04 DELIVERY, STORAGE AND HANDLING
 - A. Deliver, handle and store formwork material to prevent warping or damage detrimental to strength of materials or to surfaces to be formed.
 - B. Ensure formwork surfaces in contact with concrete are not contaminated by foreign matter.
2. PRODUCTS
- 2.01 WOOD FORM MATERIALS
 - A. Exposed Concrete Surfaces: Plywood conforming to PI 1, minimum veneer Grade B-B, tight fitting, and adequately stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.
 - B. Unexposed Concrete Surfaces: Plywood, lumber, tight fitting, adequately stiffened to support weight of concrete without deflection detrimental to structural tolerances.

- C. Nails, Spikes, Lag Bolts, through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while pouring concrete.

2.02 PREFABRICATED FORMS

- A. Steel Type: Matched, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surfaces.
- B. Fiberglass Fabric Reinforced Plastic Forms: Matched, tight fitting and stiffened to support weight of concrete without deflection detrimental to structural tolerance and appearance of finished concrete surfaces.

2.03 ACCESSORIES

- A. Form Ties: Water sealing snap-in removable type of fixed length, free of devices that will leave holes larger than 1-1/4-inch in concrete surface. Embedded portion of tie after removal of end shall terminate not less than 1-inch from the formed face of the concrete.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete or impair bonding or color characteristics or coating intended for use on concrete.
- C. Fillets for Chamfered Corners: Rigid foam plastic, wood, or metal of maximum possible lengths.
- D. Flashing Reglets: 24 Gauge galvanized steel, release tape sealed reglet, bent tab anchors, securable to forms, profile to prevent water from entering behind reglet.
- E. Formed Construction Joints: Galvanized steel, tongue and groove type knock-out holes to receive dowels, ribbed steel spikes with tongue to fit top screened edge.

3. EXECUTION

3.01 WORKMANSHIP

- A. Verify lines, levels and Work Site dimensions for compliance with Contract Drawings before erecting formwork.
- B. Assemble formwork to permit easy dismantling and stripping, ensuring concrete is not damaged during form removal.

- C. Align joints, make watertight to prevent leakage of mortar.
- D. Unless otherwise shown on Contract Drawings, provide 3/4-inch chamfer strips on external corners of beams, expansion joints, columns and walls. Provide 1-1/2-inch chamfer where detailed.
- E. Form chases, slots, openings, drips and recesses as detailed, or required.
- F. Obtain review of Engineer before framing opening in structural joints, beams, or columns which are not detailed on the Contract Drawings.
- G. Provide bracing to ensure stability of formwork. Strengthen forms subject to construction loads.
- H. Check and adjust formwork both horizontally and vertically, during placing of concrete.
- I. Arrange forms to allow stripping without removal of prime shores where required to remain in place.

3.02 INSERTS, EMBEDDED COMPONENTS AND OPENINGS.

- A. Provide formed openings where required for pipe, conduit, sleeves and other Work embedded in or passing through concrete.
- B. Accurately located and set items to be cast directly into concrete.
- C. Provide temporary ports or openings to facilitate cleaning and inspection. Locate openings at bottom of forms so that flushing water will drain out.
- D. Close temporary ports or openings with tight fitting panels flush with the inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

3.03 TOLERANCES

- A. Design, erect and secure forms to following tolerances:
 - 1. Variation from Plumb:
 - a. In the lines and surfaces of columns, piers, walls, and in arises:
 - 1. In any 10-ft of length: 1/4-inch

2. Maximum for the entire length up to 100-ft:
1-inch
- b. For exposed corner columns, control-joint grooves, and other conspicuous lines:
 1. In any 20-ft length: 1/4-inch
 2. Maximum for the entire length up to 100-ft:
1/2-inch
2. Variation from the level or from the grades specified in the contract documents:
 - a. In slab soffits, ceilings, beam soffits and in arises, measured before removal of supporting shores:
 1. In any 10-ft of length: 1/4-inch
 2. In any bay or in any 20-ft length: 3/8-inch
 3. Maximum for the entire length: 3/4-inch
 - b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
 1. In any bay or in 20-ft length: 1/4-inch
 2. Maximum for the entire length: 1/2-inch
3. Variation of the linear building lines from established position in plan and related position of columns, walls, and partitions:
 1. In any bay: 1/2-inch
 2. In 20-ft of length: 1/2-inch
 3. Maximum for the entire length: 1-inch
4. Variation in the sizes and location of sleeves, floor openings, and wall openings: $\pm 1/4$ -inch
5. Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls:
 1. Minus: 1/4-inch
 2. Plus: 1/2-inch

6. Footings for Masonry:

1. Alignment in 10-ft: 1/4-inch
 2. Maximum for entire length: 1/2-inch
 3. Level in 10-ft: 1/4-inch
 4. Maximum for entire length: 1/2-inch
- a. Other footings - variations in dimensions in plan:
1. Minus: 1/2-inch
 2. Plus: 2-inch
- b. Misplacement of eccentricity
1. Two percent of the footing width in the direction of misplacement but not more than 2-inches.
- c. Thickness:
1. Decrease in specified thickness: 5 percent
 2. Increase in specified thickness: No limit

7. Variation in Steps

- a. In a flight of stairs:
1. Rise: $\pm 1/8$ -inch
 2. Tread: $\pm 1/4$ -inch
- b. In consecutive steps:
1. Rise: $\pm 1/16$ -inch
 2. Tread: $\pm 1/8$ -inch

3.04 CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter.
- B. Remove cuttings, shavings and debris from within forms.
- C. Flush completed forms with water to remove remaining foreign matter.

- D. Ensure that water and debris drain to exterior through cleanout ports.

3.05 FORM REMOVAL

- A. Do not remove forms, shores and bracing until concrete has gained sufficient strength to carry its own weight, construction loads and design loads.
- B. Verify strength of concrete by compressive test results.
- C. Remove formwork progressively in accordance with code requirements.
- D. Do not impose shock loads or imbalanced loads on structure.
- E. Re-shore structural members where required due to construction conditions.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

1. GENERAL
- 1.01 RELATED WORK
 - A. Section 03300 - Cast-In Place Concrete.
- 1.02 QUALITY ASSURANCE
 - A. Perform concrete reinforcing Work in accordance with CRSI 63 and 65 and ACI 315 unless specified otherwise in this Section.
 - B. All development and splices of reinforcing steel shall be in accordance with ACI 318. All splices shall be Class B unless otherwise noted.
- 1.03 SOURCE QUALITY CONTROL
 - A. Submit certified copies of mill test report of supplied concrete reinforcing, indicating physical and chemical analysis.
- 1.04 REFERENCE STANDARDS
 - A. ACI 318 - Building Code Requirements for Reinforced Concrete.
 - B. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
 - C. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.
 - D. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
 - E. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
 - F. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
 - G. ACI 315 - Manual of Standard Practice.

1.05 SHOP DRAWINGS

- A. Submit shop drawings in accordance with Section 01000.
- B. Indicate bar sizes, length, spacing, locations, and quantities of reinforcing steel, and wire fabric, bending and cutting schedules, and supporting and spacing devices.

2. PRODUCTS

- A. Reinforcing Steel: Grade 60 deformed billet steel bars, ASTM A615; epoxy coated.
- B. Welded Steel Wire Fabric: Plain type, ASTM A185; plain finish.

2.02 ACCESSORY MATERIAL

- A. Tie Wire: Minimum 15 gauge annealed type, or patented system accepted by Engineer.
- B. Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for strength and support of reinforcing during construction conditions.
- C. Special Chairs, Bolsters, Bar Supports, Spacers (where adjacent to exposed concrete surfaces): Stainless steel type; sized and shaped as required.

2.03 FABRICATION

- A. Fabricate concrete reinforcing in accordance with ACI 315.
- B. Locate reinforcing splices, not indicated on Drawings, at points of minimum stress. Location of splices subject to review by Engineer.
- C. Where indicated, weld reinforcing bars in accordance with AWS D12.1.
- D. Fabricate reinforcing steel to the following tolerances:
 - 1. Sheared Length: ± 1 -inch.
 - 2. Depth of Truss Bar: Plus 0, minus 1/2-inch.
 - 3. Overall dimension of stirrup, ties and spirals: $\pm 1/2$ -inch.
 - 4. All Other Bends: ± 1 -inch.

3. EXECUTION

- A. Place reinforcing supported and secured against displacement. Do not deviate from true alignment.
- B. Before placing concrete, ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings which would reduce bond to concrete.
- C. Place reinforcing steel to the following tolerances:
 - 1. Concrete cover to formed surfaces of slabs: $\pm 1/8$ -inch.
 - 2. Concrete cover to formed surfaces of walls and beams: $\pm 1/4$ -inch
 - 3. Concrete cover to all other surfaces: $\pm 1/4$ -inch.

END OF SECTION

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SECTION 03300

CAST-IN-PLACE CONCRETE

1. GENERAL

1.01 RELATED WORK

- A. Section 03100 - Concrete Formwork.
- B. Section 03200 - Concrete Reinforcement.

1.02 QUALITY ASSURANCE

A. Cast-in place concrete work shall be performed in accordance with ACI 318, unless specified otherwise. Concrete materials and operations will be tested and inspected as the work progresses. Failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the E/A for final acceptance.

B. Testing Agencies

- 1. The required testing services of Articles 1.02C and 1.02E of this section of the specifications shall be performed by the testing agency as designated in accordance with Section 01000 of these specifications. All testing shall be paid for by the Contractor.
- 2. The necessary testing services of Article 1.02G shall be performed by a testing agency acceptable to the E/A at the Contractor's expense.
- 3. All testing agencies shall meet the requirements of ASTM E329.

C. Testing Services

- 1. The following testing services shall be performed by the designated Testing Agency:
 - a. Review and/or check-test the Contractor's proposed materials for compliance with the specifications.
 - b. Review and check-test the Contractor's proposed mixture design when required by the E/A.
 - c. Secure production samples of materials at plants or stockpiles during the course of the work and test for compliance with the specifications.

Tests of cement and aggregates shall be performed to ensure conformance with Specification requirements. Manufacturer's certification that cement materials meet Specification requirements and results of manufacturer's own material tests will be acceptable in lieu of tests by inspection and testing firm. Aggregates testing shall be performed by independent inspection and testing firm, for compliance with ASTM C33, including limits for deleterious substances, grading and physical property requirements.

- d. Conduct strength tests of the concrete during construction in accordance with the following procedures:
1. Secure composite samples in accordance with ASTM C172. Each sample shall be obtained on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.
 2. Mold and cure four specimens from each sample in accordance with ASTM C31. Any deviations from the requirements of this Standard shall be recorded in the test report.
 3. Test specimens in accordance with ASTM C39. Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information. One specimen shall be held should additional testing be required and ordered. The acceptance test results shall be the average of the two specimens tested at 28 days. If one specimen in a test manifests evidence of improper sampling, molding or testing, it shall be discarded and the strength of the remaining cylinder shall be considered the test result. Should both specimens show any of the above defects, the entire test shall be discarded.
 4. Make at least one strength test for each 50 cubic yards or fraction thereof, of each mixture design of concrete placed in any one day.
 5. When the total quantity of concrete with a given mixture design is less than 50 cubic yards, the strength tests may be waived by the E/A if, in his judgment, adequate

evidence of satisfactory strength is provided, such as strength test results for the same kind of concrete supplied on the same day and under comparable conditions to other work or other projects.

- e. Determine slump of the concrete sample for each strength test and whenever consistency of concrete appears to vary, using ASTM C143.
- f. Determine air content of normal weight concrete sample for each strength test in accordance with either ASTM C231, ASTM C173 or ASTM C138.
- g. Determine temperature of concrete sample for each strength test.

D. Additional Services When Required

- 1. The following services shall be performed by the designated agency when required by the E/A:
 - a. Inspect concrete batching, mixing and delivery operations to the extent deemed necessary by the E/A.
 - b. Sample concrete at point of placement and perform required tests.
 - c. Review the manufacturer's report for each shipment of cement and reinforcing steel and conduct laboratory tests or spot checks of the materials as received for compliance with the specifications.
 - d. Other testing or inspection services as required.

E. Other Services as Needed

- 1. The following services shall be performed by the designated agency when necessary:
 - a. Additional testing and inspection required because of changes in materials or proportions requested by the Contractor.
 - b. Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specifications requirements.

F. Duties and Authorities of Designated Test Agency

- 1. Representatives of the agency shall inspect, sample and test the materials and the production of concrete as

required by the E/A. When it appears that any material furnished or work performed by the Contractor fails to fulfill specification requirements, the testing agency shall report any such deficiency to the E/A and the Contractor.

2. The testing agency shall report all test and inspection results to the E/A and Contractor immediately after they are performed. All test reports shall include the exact location in the work at which the batch representing a test was deposited. Reports of strength test shall include detailed information on storage and curing of specimens prior to testing.
3. The testing agency and its representatives are not authorized to revoke, alter, relax, enlarge or release any requirements of the contract documents, nor to approve or accept any portion of the work.

G. Responsibilities and Duties of Contractor

1. The Contractor shall provide the necessary testing services for the following:
 - a. Qualification of proposed materials and the establishment of mixture designs.
 - b. Other testing services needed or required by the Contractor.
 - c. The use of testing services shall in no way relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the contract documents.
 - d. The Contractor shall submit to the E/A the concrete materials and the concrete mix designs from the redi-mix supplier proposed for use for each class of concrete with a written request for acceptance. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. No concrete shall be placed in the work until the Contractor has received such acceptance in writing.
 - e. To facilitate testing and inspection, the Contractor shall:
 1. Furnish any necessary labor to assist the designated testing agency in obtaining and handling samples at the project or other sources for materials.

2. Advise the E/A and the testing agency sufficiently in advance of operations to allow for completion of quality tests and for the assignment of personnel.
3. Provide and maintain for the sole use of the testing agency adequate facilities for safe storage and proper curing of concrete test specimens on the project site for the first 24 hours as required by ASTM C31.
4. Submit copies of mill test reports for shipments of cement and reinforcing steel to the E/A when required.

1.04 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete for Buildings.
- B. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- C. ACI 305 - Recommended Practice for Hot Weather Concreting.
- D. ACI 306 - Recommended Practice for Cold Weather Concreting.
- E. ACI 318 - Building Code Requirements for Reinforced Concrete.
- F. ASTM C33 - Concrete Aggregates.
- G. ASTM C94 - Ready-Mixed Concrete.
- H. ASTM C150 - Portland Cement.
- I. ASTM C171 - Sheet Materials for Curing Concrete.
- J. ASTM C260 - Air Entraining Admixtures for Concrete.
- K. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- L. ASTM C494 - Chemical Admixtures for Concrete.

2. PRODUCTS

2.01 CONCRETE MATERIALS

- A. Cement: Portland Cement, ASTM C150, Type I.
- B. Fine and Coarse Aggregates: ASTM C33.

- C. Water: Clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious material.

2.02 ADMIXTURES

- A. Air Entrainment: ASTM C260.
- B. Chemical: ASTM C494, Type A - Water reducing. Type B - retarding. Type C - accelerating. Type D - water reducing and retarding. Type E - water reducing and accelerating.

2.03 CURING MATERIALS

- A. Curing Compound: Resin based, type; ASTM C309, Type 2 - white pigmented, Class B.
- B. Polyethylene Film: 4 mil. thick, white opaque color, ASTM C171.

2.04 ACCESSORIES

- A. Bonding Agent: Two component modified epoxy resin.
- B. Vapor Barrier: 4 mil. unless otherwise shown on the Drawings. Clear polyethylene film, type recommended for below grade application.
- C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 2 days and 7,000 psi in 28 days.

2.05 CONCRETE MIXES

- A. Mix concrete in accordance with ASTM C94.
- B. Provide concrete of the following strength:
 - 1. Compressive strength (28 day): 4,000 psi.
 - 2. Entrained Air Content: As indicated in ACI 301, Table 3.4.1.
 - 3. Cement Content: Minimum 564 pounds per cubic yard.
 - 4. Water Cement Ratio: Maximum 0.45.
 - 5. Slump: 1-inch minimum, 3-inch maximum for footings and substructure walls; 4-inch maximum for slabs, beams, reinforced walls and columns. Loss of slump in pumping shall not exceed 1-1/2-inch.

- C. Select proportions for normal weight concrete in accordance with ACI 301, 3.8, Method 1.
- D. Use water reducing admixtures only when accepted by Engineer.
- E. Use accelerating admixtures only in cold weather and only when accepted by Engineer. If accepted, use of admixture will not relax cold weather placement requirements. Calcium chloride shall not be used.
- F. Use retarding admixtures only in hot weather and only when accepted by Engineer.
- G. Use air entrained concrete for all concrete exposed to the exterior.

3. EXECUTION

3.01 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304.
- B. Notify Engineer minimum 24 hours prior to commencement of concreting operations.
- C. Ensure anchors, seats, plates and other items to be cast into concrete are placed, held securely and will not cause hardship in placing concrete. Rectify same and proceed with Work.
- D. Maintain records of poured concrete items. Record date, location for pour, quantity, air temperature, and test samples taken.
- E. Ensure reinforcement, inserts, embedded parts, and formed expansion and contraction joints are not disturbed during concrete placement.
- F. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's recommendations.
- G. Pour concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.
- H. Pour floor slabs in checkerboard or saw cut pattern indicated on Contract Drawings. Saw cut control joints within 24 hours after finishing. Use 3/16-inch thick blade, cutting 1/4-inch into depth of slab thickness.

- I. In locations where new concrete is dowelled to existing Work, drill holes in existing concrete, insert steel dowels, and pack solidly with non-shrink grout.
- J. Honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.
- K. Conform to ACI 305 when concreting during hot weather.
- L. Conform to ACI 306 when concreting during cold weather.
- M. Maintain concrete cover around reinforcing in accordance with ACI 3187 or as otherwise indicated on Contract Drawings.
- N. Install vapor barrier under interior slabs on grade. Lap joints minimum 1 foot and seal. Do not disturb or damage vapor barrier while placing concrete reinforcing. If damage does occur, repair areas before placing concrete. Use vapor barrier materials, lapped over damaged areas, minimum 6-inches in all directions and sealed.
- O. Separate slabs-on-grade from vertical surfaces where shown with 1/2-inch thick joint filler. Extend joint filler from bottom of slab to within 1/2-inch of finished slab surface.

3.02 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, excessive hot or cold temperatures, and mechanical injury. Maintain concrete with minimal water loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- B. One slump test and one air test shall be taken for each set of test cylinders taken.
- C. Follow sampling and testing procedures referred in ASTM C94.

END OF SECTION

SECTION 03600

GROUT

1. GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM C33 - Concrete Aggregates
- B. ASTM C150 - Portland Cement
- C. ASTM C827 - Test for Early Volume Change of Cementitious Mixtures

1.02 SUBMITTALS

- A. Submit Product Data as specified in Section 01000. Include Manufacturer's installation instructions.

2. PRODUCTS

2.01 MATERIALS

A. Grout Types

- 1. Type A: Non-shrink, noncatalyzed natural aggregate grout containing specially graded and processed natural fine aggregates, free of gas producing or releasing agents, and free of oxidizing catalysts and inorganic accelerators, including chlorides. Shall pass ASTM C827 and be capable of developing minimum compressive strength of 2,400 psi in 2 days and 7,000 psi in 28 days.
- 2. Type B: Non-shrink, noncatalyzed metallic grout, containing specially graded and processed natural and metallic fine aggregates, especially graded to minimize bleeding. Shall pass ASTM C827.
- 3. Type C: Not used.
- 4. Type D: Sand cement grout - mixed in the proportions of one part Portland cement to two and one-half parts of fine aggregate. For grouting areas having areas greater than 2-inches clearance, where coarse aggregate will not obstruct free passage of the grout, extend

grout by adding 50 pounds of pea gravel per 100 pounds grout material.

- B. Portland Cement: ASTM C150, Type 1
- C. Sand: ASTM C33
- D. Water: Potable
- E. Pea Gravel: ASTM C33, coarse aggregate graded so that at least 90 percent passes 3/8-inch sieve and 90 percent is retained by a No. 4 sieve.

2.03 MIXING

- A. Mix non-shrink grouting materials and water in a mechanical mixer for no less than 3 minutes.
- B. Mix grout as close to the work area as possible and transport the mixture quickly and in a manner that does not permit segregation of materials.
- C. After the grout has been mixed, do not add more water for any reason.

3. EXECUTION

3.01 INSTALLATION

- A. Installation methods and procedures shall be approved by the Engineer before work is begun.
- B. Schedule of Installation
 - 1. Type A: All areas which require precision structural grouting which are exposed to the weather or in contact with water, or as indicated in equipment specifications.
 - 2. Type B: All interior structural grouting, such as base plates, dry equipment, and structural bearings.
 - 3. Type D: All areas where grout is used as filler or leveler.

3.02 FORMWORK

- A. Build strong, tight forms braced so they will not leak or buckle under weight of fluid grout. On placing

side, slate form at 45 degree angle and pour grout from 1/2-inch or more away from base of bedplate and 1-inch or more higher than underside of the plate.

- B. Caulk forms on inside or outside to prevent leakage and loss of head. If sand cement mortar is used for caulking, use only on the outside of forms. Use expanded polystyrene or other means to caulk between foundation or portions of the bedplate and equipment to seal off areas where grout is not desired.

3.03 SURFACE PREPARATION

- A. Remove all defective concrete, laitance, dirt, oil, grease, and other foreign material from concrete surfaces by bushhammering, chipping, or other similar means until a sound clean concrete surface is achieved.
- B. Lightly roughen the concrete, but not enough to interfere with the proper placement of grout.
- C. Cover concrete area with waterproof membrane until ready to grout.
- D. Remove foreign materials from all steel surfaces in contact with grout.
- E. Align, level, and maintain final positioning of all components to be grouted.
- F. Take special precautions during extreme weather conditions and apply according to the manufacturer's written instructions.
- G. Immediately before grouting, remove waterproof membranes and clean any contaminated surfaces.
- H. Saturate all concrete surfaces including bolt holes for 24 hours prior to grouting with clean water; remove excess water and leave none standing.

3.04 PLACING

- A. Place non-shrink grouting material quickly and continuously by the most practical means permissible; pouring, pumping, or under gravity pressure.
- B. Do not use either pneumatic pressure or dry packing methods without written permission of the Engineer.

- C. Apply grout from one side only to avoid entrapping air.
- D. Final installation shall be thoroughly compacted and free of air pockets.
- E. Do not vibrate the placed grout mixture, or allow it to be placed if the area is being vibrated by nearby equipment.
- F. Do not remove leveling shims for at least 48 hours after grout has been placed.
- G. Do not use mixing water above 80°F. Placing of grout shall be at a temperature of 45°-75°F for foundation, bedplate, and grout material. Maintain a temperature of 45°-75°F for 24 hours following installation, thereafter above 40°F until strength exceeds 4,000 psi. Use cold or iced water to extend working time in hot weather or large placements.

3.06 CURING

- A. Cure grout for three days after placing by keeping wet and covering with curing paper or by another approved method.

END OF SECTION

SECTION 03603

EPOXY GROUT

1. GENERAL

1.01 SUMMARY

A. Section Includes:

1. Material for grouting reinforcing bars and anchor bolts into existing concrete, and other uses where noted.

B. Alternatives:

1. CONTRACTOR may use premixed adhesive anchor material such as Sikadur Injection Gel by Sika Corporation or approved equal, rather than using field mixed grout as specified herein.

1.02 SUBMITTALS

A. Product Data:

1. Manufacturer's literature.

B. Submit in accordance with Section 01000.

2. PRODUCTS

2.01 MATERIALS

A. Epoxy:

1. Manufacturers:

- a. Sikadur Hi-Mod, by Sika Corporation.
- b. Five Star Epoxy Grout, by Five Star Products, Inc.
- c. Ceilcote 648, by Master Builders.

B. Sand: Hard, durable, oven dry.

3. EXECUTION

3.01 PREPARATION

- A. Clean contact surfaces of oil, grease, and other foreign matter. Chip away unsound concrete.

3.02 MIXING

- A. Mix components of epoxy compound as directed by manufacturer's instructions immediately before combining liquid with sand.
- B. After binder thoroughly mixed, add sand as recommended by manufacturer.

3.03 PLACING

- A. Place in accordance with manufacturer's written instructions following requirements regarding temperature and pot life.
- B. Provide suitable materials where necessary to retain grout until hardened.

3.04 CURING

- A. Cure as recommended by manufacturer.

END OF SECTION

SECTION 08310

FLOOR ACCESS HATCHES AND ACCESSORIES

1. GENERAL
 - 1.01 DESCRIPTION
 - A. Work includes all labor, material and equipment required to complete all floor access door or hatch work shown on drawings as specified herein.
 - B. Related Work Specified Elsewhere
 1. Division 3 - Concrete
 - 1.02 SUBMITTAL
 - A. Product Data: Submit manufacturers product data for specific unit including installation and operation instructions.
 - B. Shop Drawings: Submit shop drawings with detailed installation instructions specific to application required.
 - 1.03 WARRANTY
 - A. Access Door or Hatch Warranty: Written warranty by manufacturer agreeing to repair or replace work which exhibits defects in material or workmanship. Warranty shall also cover work required to be rectified upon units replacement.
 1. Warranty Period: 18 months from date of substantial completion.
2. PRODUCTS
 - 2.01 ACCEPTABLE MANUFACTURERS
 - A. Halliday Products, Inc., Bilco, or approved equal
 - 2.02 MATERIAL AND FABRICATION
 - A. Floor Access Door or Hatch
 1. Materials - Aluminum door or hatch and frame: stainless steel hinges and hardware.
 2. Door - 1/4-inch aluminum diamond plate reinforced to meet AASHTO specifications H20 traffic loading.

3. Frame - Angle frame fabricated from aluminum extrusion with an integral 1-inch anchor flange.
4. Hinge - Stainless steel hinged, stainless steel pinned, with tamperproof stainless-steel bolts and nuts.
5. Opening Device - Automatic hold open arm with red vinyl grip allows door panel to open to 90 degrees, locking door in open position, and allowing for easy control when closing door panel. Provide stainless steel compression springs to add lift assistance.
6. Latch - Flush aluminum drop handle with staple for padlock.
7. Finish - Mill finish with bituminous coating on exterior of frame.
8. Size - As shown on drawings.

B. Safety Net

1. Material

- a. Netting: Polyester meeting, OSHA Standard 1926.502(c)(4)(i) drop test
- b. Hooks and Hardware: 316 stainless steel

2. Standard of Acceptance

- a. Hatch Safety Net as manufactured by USF Fabrication, Inc. or approved equal

3. Application

- a. Provide safety netting across opening of all hatches or floor doors.

END OF SECTION



SECTION 09900

PAINTING

1. GENERAL

1.01 DESCRIPTION OF WORK

- A. This section includes all labor, materials, equipment and related services to provide coating systems for water and wastewater processing facilities indicated on the drawings or specified herein.
- B. Complete painting of all areas and items shown on drawings and/or specified herein, including, but not limited to:
 - 1. Interior and exterior exposed metal surfaces.
 - 2. Interior exposed galvanized steel and ductile iron piping.
 - 3. Valves, pumps, and metal equipment assemblies.
- C. Coordinate painting specified herein with shop and prime coats on materials specified under other Sections.
- D. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sending devices, motor and fan shafts will not require finish painting, unless otherwise indicated.
- E. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.02 REFERENCES

- A. ANSI/NSF 61 - Drinking Water System Components - Health Effects.

- B. ASTM D 16 - Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
 - C. ASTM D 4263 - Indicating Moisture in Concrete by the Plastic Sheet Method.
 - D. ASTM F 1869 - Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - E. AWWA C 652 - Disinfection of Water-Storage Facilities.
 - F. AWWA D 102 - Painting Steel Water Storage Tanks.
 - G. International Concrete Repair Institute (ICRI) Guideline No. 03732 - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
 - H. SSPC-SP 1 - Solvent Cleaning.
 - I. SSPC-SP 2 - Hand Tool Cleaning.
 - J. SSPC-SP 3 - Power Tool Cleaning.
 - K. SSPC-SP 5/NACE 1 - White Metal Blast Cleaning.
 - L. SSPC-SP 6/NACE 3 - Commercial Blast Cleaning.
 - M. SSPC-SP 10/NACE 2 - Near-White Metal Blast Cleaning.
 - N. SSPC-SP 13/NACE 6 - Surface Preparation of Concrete.
 - O. SSPC-SP 16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals
 - P. NAPF 500-03 Surface Preparation Standard for Ductile Iron Pipe and Cast Ductile Iron Fittings In Exposed Locations Receiving Special External Coatings And/Or Special Internal Linings
- 1.03 DEFINITIONS
- A. Definitions of Painting Terms: ASTM D 16, unless otherwise specified.

- B. Dry Film Thickness (DFT): Thickness of a coat of paint in fully cured state measured in mils (1/1000 inch).

1.04 SUBMITTALS

- A. Comply with Section 01000 - Submittal Procedures.
- B. Product Data: Submit manufacturer's product data for each coating, including generic description, complete technical data, surface preparation, and application instructions.
- C. Color Samples: Submit manufacturer's color samples showing full range of standard colors.
- D. Manufacturer's Quality Assurance: Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.
- E. Applicator's Quality Assurance: Submit list of a minimum of 5 completed projects of similar size and complexity to this Work. Include for each project:
 - 1. Project name and location.
 - 2. Name of owner.
 - 3. Name of contractor.
 - 4. Name of engineer.
 - 5. Name of coating manufacturer.
 - 6. Approximate area of coatings applied.
 - 7. Date of completion.

1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Specialize in manufacture of coatings with a minimum of 10 years successful experience.
 - 2. Able to demonstrate successful performance on comparable projects.
 - 3. Single Source Responsibility: Coatings and coating application accessories shall be products of a single manufacturer.

B. Applicator's Qualifications:

1. Experienced in application of specified coatings for a minimum of 5 years on projects of similar size and complexity to this Work.
2. Applicator's Personnel: Employ persons trained for application of specified coatings.

C. Preapplication Meeting: Convene a preapplication meeting two (2) weeks before start of application of coating systems. Require attendance of parties directly affecting work of this section, including Contractor, Engineer, applicator, and manufacturer's representative. Review the following:

1. Environmental requirements.
2. Protection of surfaces not scheduled to be coated.
3. Surface preparation.
4. Application.
5. Disinfection.
6. Repair.
7. Field quality control.
8. Cleaning.
9. Protection of coating systems.
10. One-year inspection.
11. Coordination with other work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and , with labels clearly identifying:

1. Coating or material name.
2. Manufacturer.
3. Color name and number.
4. Batch or lot number.
5. Date of manufacture.
6. Mixing and thinning instructions.

B. Storage:

1. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.

3. Do not use materials beyond manufacturer's shelf life limits.

C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Weather

1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.

2. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point.

3. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.

4. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.

5. Wind: Do not spray coatings if wind velocity is above manufacturer's limit.

B. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with AWWA D102.

C. Dust and Contaminants

1. Schedule coating work to avoid excessive dust and airborne contaminants.

2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

2. PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers

1. It is the intent of this Specification that Contractor use one paint manufacturer throughout, unless otherwise approved by the E/A.

2. Products shall be manufactured by one of the following:

- a. Tnemec - Tnemec Co., Inc., North Kansas City, Missouri.
- b. PPG - PPG Industries, Inc., Pittsburgh, Pennsylvania.
- c. Sherwin-Williams - The Sherwin-Williams Company, Inc., Cleveland, Ohio
- d. Induron - Induron Coatings, Inc., Birmingham, Alabama

2.02 COATING SYSTEMS FOR STEEL - STRUCTURAL, TANKS, PIPE, AND EQUIPMENT

A. Steel - Structural, Tanks, Pipes, Valves, and Equipment

1. Exterior, Non-Immersion:

Tnemec
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning
Shop Applied and Field Patched Prime Coat: Tnemec Series N69 Hi-Build Epoxoline II, 3.0-4.0 mils DFT.
1 st Coat: Tnemec Series N69 Hi-Build Epoxoline II, 3.0-4.0 mils DFT.
2 nd Coat: Tnemec Series 73 Endura-Shield, 2.0-3.0 mils DFT.
Induron
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning. Surface Profile: 1.5-2.5 mils.
Shop Applied and Field Patched Prime Coat: DF67 Indurazinc applied to achieve 2.5-3.5 mils DFT.
1 st Finish Coat: Perma-Clean II Epoxy applied to achieve 3.0-5.0 mils DFT. Color: Off-White
2 nd Finish Coat: Indurathane 6600 Plus Polyurethane applied to achieve 2.0-3.0 mils DFT. Color: As Selected.
Total System Minimum DFT: 7.5 mils.
PPG
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning
Shop Applied and Field Patched Prime Coat: PPG 4360 Universal Primer at 2.0 mils DFT.
1 st Coat: PPG Pit-thane Ultra Polyurethane Gloss 95 Series at 2.0-3.0 mils DFT.
2 nd Coat: PPG Pit-thane Ultra Polyurethane Gloss

95 Series at 2.0-3.0 mils DFT.
Sherwin Williams
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning
Shop Applied and Field Patched Prime Coat: S-W Macropoxy 646 FC Epoxy, 3.0-4.0 mils DFT.
1 st Coat: S-W Macropoxy 646 Epoxy, 3.0-4.0 mils DFT.
2 nd Coat: S-W Macropoxy 646 Epoxy, 3.0-4.0 mils DFT.

2. Immersion - to include areas frequently wet by condensation, splash, spray or frequent immersion, non-potable water, including valve vault piping and equipment.

Tnemec
Surface Preparation: SSPC-SP10 Near White Metal Blast Cleaning
Shop Applied and Field Patched Prime Coat: Tnemec Series N69 Epoxoline II, 3.0-4.0 mils DFT.
1 st Coat: Tnemec Series N69 Hi-Build Epoxoline II, 4.0-6.0 mils DFT.
2 nd Coat: Tnemec Series N69 Hi-Build Epoxoline II, 4.0-6.0 mils DFT.
Induron
Surface Preparation: SSPC-SP10 Near-White Blast Cleaning. No steel shot or steel grit blast media to be used on surfaces to be placed in immersion service. Surface Profile: Minimum of 2.0 mils.
Finish: Ceramasafe 90 Ceramic Epoxy applied to achieve 15-30 mils DFT. Color: Gray.
Total System Minimum DFT: 15 mils.
PPG
Surface Preparation: SSPC-SP10 Near-White Blast Cleaning.
Shop Applied and Field Patched Prime Coat: PPG Amercoat 370 Epoxy at 3.0-4.0 mils DFT.
1 st Coat: PPG Amerlock 2/400 Epoxy S/G at 3.0-4.0 mils DFT.
2 nd Coat: PPG Amerlock 2/400 Epoxy S/G at 4.0-6.0 mils DFT.

Sherwin Williams
Surface Preparation: SSPC-SP 10 Near White Metal Blast Cleaning.
1 st Coat: S-W Sherglass FF Epoxy, 12.0-16.0 mils DFT.

3. Severe wastewater environments, exposure to H₂S and Microbiological Induced Corrosion, including wet well piping and equipment:

For All Manufacturers
A pinhole free system is required, to insure a pinhole free surface is obtained the contractor is required to perform, or provide the services of an individual qualified to perform High Voltage Discontinuity (spark testing) in accordance with NACE SP0188. Testing shall be done using a Tinkor & Rasor AP/W High Voltage Holiday Tester in the presence of the owner or engineer.
Tnemec
Surface Preparation: SSPC-SP5 White Metal Blast cleaning, a minimum angular profile of 3.0 mils is required.
1 st Coat: Tnemec Series G435 Perma-Glaze, 20.0-25.0 mils DFT.
Induron
Surface Preparation: SSPC-SP5 White Metal Blast cleaning, a minimum angular profile of 3.0 mils is required.
1 st Coat: Ceramasafe 90 Ceramic Epoxy, 20-40 mils DFT.
PPG
Submit comparable system for approval.
Sherwin Williams
Surface Preparation: SSPC-SP 10 Near White Metal Blast cleaning.
1 st Coat: S-W DuraPlate 6000, 40-50 mils DFT.

C. Galvanized and Non-Ferrous Metal

1. Interior

Tnemec
Surface Preparation: SSPC SP-16
1 st Coat: Tnemec Series N69 Hi-Build Epoxoline II, 2.0-3.0 mils DFT.
2 nd Coat: Tnemec Series N69 Hi-Build Epoxoline II, 2.0-3.0 mils DFT.
Induron
Surface Preparation: SSPC-SP1 Solvent Cleaning
Prime Coat: Vinyl Wash Primer applied to achieve 0.3-0.5 mils DFT.
1 st Coat: Perma-Clean II Epoxy applied to achieve 3.0-5.0 mils DFT. Color: As Selected.
2 nd Coat: Perma-Clean II Epoxy applied to achieve 3.0-5.0 mils DFT. Color: As Selected.
Total System Minimum DFT: 6.0 mils.
PPG
Surface Preparation: SSPC SP-16
Prime Coat: PPG Amercoat 370 Epoxy Primer at 3.0-4.0 mils DFT.
1 st Coat: PPG Amerlock 2/400 Epoxy S/G at 4.0-5.0 mils DFT.
2 nd Coat: PPG Amerlock 2/400 Epoxy S/G at 4.0-5.0 mils DFT.
Sherwin Williams
Surface Preparation: SSPC-SP 16
1 st Coat: Macropoxy 646 FC Epoxy, 3.0-6.0 mils DFT
2 nd Coat: Macropoxy 646 FC Epoxy, 3.0-6.0 mils DFT

I. Ductile Iron and Cast Ductile Iron Fittings

1. Exterior

Tnemec
Surface Preparation: Pipe: NAPF 500-03-04 External Pipe Surfaces. Fittings: NAPF 500-03-05 Blast Clean #1
1 st Coat: Tnemec Series N69 Hi-Build Epoxoline II, 4.0-6.0 mils DFT.
2 nd Coat: Tnemec Series N69 Hi-Build Epoxoline II, 4.0-6.0 mils DFT.

3 rd Coat: Tnemec Series 73 Endura-Shield, 2.0-3.0 mils DFT.
Induron
Surface Preparation: Pipe: NAPF 500-03-04 External Pipe Surfaces. Fittings: NAPF 500-03-05
1 st Coat: Perma-Clean II Epoxy, 2.0-3.0 mils DFT.
2 nd Coat: Perma-Clean II Epoxy, 2.0-3.0 mils DFT.
3 rd Coat: Indurathane 6600 Plus Urethane, 2.0-3.0 mils DFT.
PPG
Submit comparable system for approval.
Sherwin Williams
Surface Preparation : Pipe: NAPF 500-03-04 External Pipe Surfaces. Fittings: NAPF 500-03-05
1 st Coat: S-W Macropoxy 646 FC Epoxy, 5.0-10.0 mils DFT.
2 nd Coat: S-W Macropoxy 646 FC Epoxy, 5.0-10.0 mils DFT.
3 rd Coat: S-W Hi-Solids Polyurethane, 3.0-6.0 mils DFT.

2. Interior Exposed and Immersion Service - to include areas frequently wet by condensation, splash, spray or frequent immersion, non-potable water, including valve vault piping and equipment, Non-Potable Water

Tnemec
Surface Preparation: Pipe: NAPF 500-03-04 External Pipe Surfaces. Fittings: NAPF 500-03-05 Blast Clean #1
1 st Coat: Tnemec Series N69 Hi-Build Epoxoline II, 4.0-6.0 mils DFT.
2 nd Coat: Tnemec Series N69 Hi-Build Epoxoline II, 4.0-6.0 mils DFT.
3 rd Coat: Tnemec Series N69 Hi-Build Epoxoline II, 4.0-6.0 mils DFT.
Induron
Surface Preparation : Pipe: NAPF 500-03-04 External Pipe Surfaces. Fittings: NAPF 500-03-05
1 st Coat: Perma-Clean II Epoxy, 4.0-6.0 mils DFT.
2 nd Coat: Perma-Clean II Epoxy, 4.0-6.0 mils DFT.
3 rd Coat: Perma-Clean II Epoxy, 4.0-6.0 mils DFT.
PPG
Submit comparable system for approval.

Sherwin Williams
Surface Preparation: Pipe: NAPF 500-03-04 External Pipe Surfaces. Fittings: NAPF 500-03-05 Blast Clean #1
1 st Coat: S-W Macropoxy 646 FC Epoxy, 4.0-6.0 mils DFT.
2 nd Coat: S-W Macropoxy 646 FC Epoxy, 4.0-6.0 mils DFT.
3 rd Coat: S-W Macropoxy 646 FC Epoxy, 4.0-6.0 mils DFT.

3. Severe wastewater environments, exposure to H₂S and Microbiological Induced Corrosion, including wet well piping:

For All Manufacturers
A pinhole free system is required, to insure a pinhole free surface is obtained the contractor is required to perform, or provide the services of an individual qualified to perform High Voltage Discontinuity (spark testing) in accordance with NACE SP0188. Testing shall be done using a Tinkor & Rasor AP/W High Voltage Holiday Tester in the presence of the owner or engineer.
Tnemec
Surface Preparation: SSPC-SP5 White Metal Blast cleaning, a minimum angular profile of 3.0 mils is required.
1 st Coat: Tnemec Series G435 Perma-Glaze, 20.0-25.0 mils DFT.
Induron
Surface Preparation: SSPC-SP5 White Metal Blast cleaning, a minimum angular profile of 3.0 mils is required.
1 st Coat: Ceramasafe 90 Ceramic Epoxy, 20-40 mils DFT.
PPG
Submit comparable system for approval.
Sherwin Williams
Surface Preparation: SSPC-SP 10 Near White Metal Blast cleaning.
1 st Coat: S-W DuraPlate 6000, 40-50 mils DFT.

2.03 ACCESSORIES

A. Coating Application Accessories

1. Accessories required for application of specified coatings in accordance with manufacturer's instructions, including thinners.
2. Products of coating manufacturer.

3. EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions under which coating systems are to be applied. Notify Engineer of areas or conditions not acceptable. Do not begin surface preparation or application until unacceptable areas or conditions have been corrected.

3.02 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

- A. Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.
- B. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

3.03 SURFACE PREPARATION OF STEEL

- A. Prepare steel surfaces in accordance with manufacturer's instructions.

B. Fabrication Defects

1. Correct steel and fabrication defects revealed by surface preparation.
2. Remove weld spatter and slag.
3. Round sharp edges and corners of welds to a smooth contour.
4. Smooth weld undercuts and recesses.
5. Grind down porous welds to pinhole-free metal.
6. Remove weld flux from surface.

- C. Ensure surfaces are dry.

- D. Immersion or Below Grade Surfaces: Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 10/NACE 2.
 - E. Exterior Exposed or Interior Exposed Surfaces: Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3.
 - F. Severe Exposure: Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 5/NACE 1.
 - G. Marginally Prepared Surfaces (Maintenance): Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with manufacturer's instructions.
 - H. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than 8 hours.
 - I. Shop Primer: Prepare shop primer to receive field coat in accordance with manufacturer's instructions.
- 3.04 SURFACE PREPARATION OF GALVANIZED STEEL AND NONFERROUS METAL
- A. Prepare galvanized steel and nonferrous metal surfaces in accordance with manufacturer's instructions.
 - B. Ensure surfaces are dry.
 - C. Remove Rust from Galvanized Steel
 - 1. Remove white rust from galvanized steel by hand or power brushing.
 - 2. Remove rust from old galvanized steel in accordance with SSPC-SP 2 or SP 3.
 - 3. Do not damage or remove galvanizing.
 - D. Increase mechanical adhesion under moderate to severe conditions, such as exterior exposure or chemical environments, by abrasive blast SSPC SP-16

3.05 SURFACE PREPARATION OF DUCTILE OR CAST IRON

- A. Prepare ductile or cast iron surfaces in accordance with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
- C. Abrasive Blast clean in accordance with NAPF 500-03 Surface Preparation Standard for Ductile Iron Pipe and Cast Ductile Iron Fittings In Exposed Locations Receiving Special External Coatings And/Or Special Internal Linings

3.06 APPLICATION

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Mix and thin coatings, including multi-component materials, in accordance with manufacturer's instructions.
- C. Keep containers closed when not in use to avoid contamination.
- D. Do not use mixed coatings beyond pot life limits.
- E. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.
- F. Uniformly apply coatings at spreading rate required to achieve specified DFT.
- G. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.
- H. Stripe paint with brush critical locations on steel such as welds, corners, and edges using specified primer.

3.07 CLEAN-UP

- A. Upon completion of the work, the Contractor shall remove all paint and varnish spots from the floors, glass, and other surfaces. Contractor shall remove from the premises all rubbish and accumulated materials and shall leave the work in clean, orderly and acceptable condition.

3.08 REPAIR

- A. Materials and Surfaces Not Scheduled to Be Coated: Repair or replace damaged materials and surfaces not scheduled to be coated.
- B. Damaged Coatings: Touch-up or repair damaged coatings. Touch-up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch-up result is visibly different, either in sheen, texture, or color.
- C. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.09 FIELD QUALITY CONTROL

- A. Inspector's Services:
 - 1. Verify coatings and other materials are as specified.
 - 2. Verify surface preparation and application are as specified.
 - 3. Verify DFT of each coat and total DFT of each coating system are as specified using wet film and dry film gauges.
 - 4. Coating Defects: Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.
 - a. Check for holidays on interior steel immersion surfaces using holiday detector.
 - 5. Report:

- a. Submit written reports describing inspections made and actions taken to correct nonconforming work.
- b. Report nonconforming work not corrected.
- c. Submit copies of report to Engineer and Contractor.

B. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.

3.10 PROTECTION OF COATING SYSTEMS

- A. Protect surfaces of coating systems from damage during construction.

3.11 ONE-YEAR INSPECTION

- A. Owner will set date for one-year inspection of coating systems.
- B. Inspection shall be attended by Owner, Contractor, Engineer, and manufacturer's representative.
- C. Repair deficiencies in coating systems as determined by Engineer in accordance with manufacturer's instructions.

END OF SECTION



SECTION 11255

ELECTROMAGNETIC FLOW METERS

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Three Electromagnetic flow meter including flanged sensor for installation in each valve vault, ground rings, and integrally mounted amplifier, as specified herein and as shown on the drawings.

2. Related work specified elsewhere:

a. Pipe and Fittings - Section 15060

b. Electrical Work - Division 16

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers

1. Flow Meter - McCrometer, Inc. Ultra Mag UM06 with Pro Comm Converter

B. Source Quality Control

1. Prior to shipment, the equipment shall be tested at the manufacturer's plant to demonstrate the suitability and accuracy of the equipment as a part of the complete installation.

1.03 SUBMITTALS

A. Shop Drawings and Product Data

1. Submit shop drawings and product data for each of the products of this Section in compliance with Section 01000. Submittal shall include the following:

a. Manufacturer's descriptive data sheets for each of the products of this Section to include all product technical data, dimensions, application information, factory flow test and accuracy data, and installation, calibration and start-up procedures.

- b. Each of the manufacturer's recommended procedures for job site storage, and handling.
- c. A copy of each of the manufacturer's guarantee and information about the nature and location of parts, service crews, and repair facilities.

B. Operation and Maintenance Manuals

- 1. Submit operation and maintenance manuals for each of the products of this Section in compliance with Section 01000.

C. Special Tools

- 1. Provide to the Owner one (1) set of special tools, calibration devices, or instruments required for operation, calibration, and maintenance of each of the products of this Section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Comply with Section 01000 and the manufacturer's written instructions.

2. PRODUCTS

2.01 Electromagnetic Flowmeter

A. General

- 1. The flow meter shall be a flanged, inline, velocity sensing, electromagnetic meter, consisting of a flow detector with a remote mounted microprocessor based signal amplifier and suitable for wastewater applications.
- 2. Manufacturer - McCrometer, Inc. Or approved equal.
- 3. Model - Ultra Mag UM06 with ProComm Converter

B. Specifications

1. Meter Size

- a. Lift Station B: 8-inch
- b. Lift Station C: 6-inch
- c. Lift Station D: 10-inch

2. Flow Range

- a. Lift Station B: 33 - 4,870 gpm

- b. Lift Station C: 19 - 2,660 gpm
- c. Lift Station D: 52 - 7,960 gpm
- 3. Fluid Conductivity: 5.0 $\mu\text{s}/\text{cm}$
- 4. Accuracy: $\pm 0.5\%$. Accuracy shall be verified by calibration in a flow laboratory traceable to the NIST.
- 5. Repeatability: $\pm 0.05\%$ or ± 0.008 ft/s, whichever is greater
- 6. Ambient Temperature: 14 to 140 $^{\circ}\text{F}$
- 7. Meter Enclosure Rating: NEMA 6P
- 8. Meter Electrode Material: Type 316 Stainless Steel, Ti-AISI
- 9. Meter Liner Material: UltraLiner NSF Approved, Fusion Bonded Epoxy
- 10. Pipe Spool Material: 316 Stainless Steel
- 11. Meter Housing Material: Carbon Steel Welded
- 12. Flanges: Steel AWWA Class D Flat Face Flanges (150 psi)
- 13. Ground Rings - 2 ea, Stainless Steel
- 14. AC Power Supply - 120 vac. Power consumption shall not exceed 20 VA.
- 15. Isolated Analog Outputs - 4-20 ma dc
- 16. Unit of Measure - gpm
- 17. Totalization - Programmable/Resettable
- 18. Special Construction: Pot Flow meter junction boxes with silicone to waterproof
- 19. The magnetic flow meter shall be microprocessor-based. It shall indicate, totalize, and transmit flow in full pipes.
- 20. The magnetic flow meter shall utilize DC bi-polar pulsed coil excitation, automatically re-zoning after every cycle.
- 21. The electronics shall be remote mounted. Local indication at the remote mount shall be provided for all meters.

22. The remote mounted signal converter shall retain NEMA-4X ratings. The unit shall be panel mount or if at a meter vault shall be mounted in an individual enclosure outside the meter vault. Case shall be cast aluminum, epoxy coated.
23. The meter shall incorporate Hi-Z circuitry. The preamplifier input impedance shall not be less than 1012 ohms. External ultrasonic electrode cleaners shall not be acceptable.
24. Low flow cutoff shall be adjustable from 0 to 10% of maximum flow.
25. An 8-character alphanumeric display shall indicate user-defined flow units and total flow. All menu advice and commands shall be viewed on this display.
26. Unit shall require no zero-point adjustment.
27. The meter software shall incorporate a password feature preventing inadvertent program changes.
28. All printed circuit boards shall be contained in a plug-in module and be interchangeable for any size without requiring test equipment.
29. The flow meter shall be one direction.
30. Totalized flow and programmed configuration shall be maintained in memory for up to 10 years.
31. Damping shall be selectable over 0-99 seconds.
32. The flow meter manufacture shall have meters of this type in similar flowing mediums for a minimum of five years. Provide documentation.

C. Parts & Service

1. The supplier shall have test facilities, spare parts, and personnel to maintain, instruct, and train owners operating personnel to assure the meter will be maintained throughout the warranty period.

D. Volumetric Testing

1. Volumetric testing of the flow meter shall be performed and approved prior to shipment. The complete meter assembly and signal amplifier shall be wet accuracy tested and calibrated as a unit near minimum, intermediate, and maximum manufacturer's specified flow ranges and accuracies of the meter. A copy of the

certified accuracy test record shall be furnished with the shop drawing submittal.

3. EXECUTION

3.01 INSTALLATION

- A. To optimize meter accuracy and performance, each of the flow detector tubes shall be installed in its respective pipe line in a location that will allow for a minimum upstream straight pipe run equivalent to a minimum of 5 times the pipe diameter, and a minimum downstream straight pipe run equivalent to a minimum of 3 times the pipe diameter.
- B. After the installation of each of the flow meters, each flow metering system shall be subjected to a field running test under actual operating conditions. The field test shall be made by the Contractor in the presence of and as directed by the Engineer. The field test shall demonstrate that the components of each flow metering system, under all conditions of operation:
1. Have not been damaged by transportation or installation.
 2. Have been properly installed.
 3. Have no mechanical defects.
 4. Are in proper alignment.
 5. Have been properly connected and calibrated.
 6. Shall operate as required in conjunction with the pump station control systems.
- C. Any defects in the equipment or failure to meet the requirements of the specifications shall be promptly corrected by the Contractor at no additional cost to the Owner.

3.02 SERVICE

- A. Provide the services of competent factory representatives from each of the flow meter manufacturers to inspect and adjust the finished installation and to instruct the Owner's personnel in the operation and maintenance of the equipment for a period not to exceed one day for each installation.

3.03 WARRANTY

- A. Warrant all parts to be free from defects in materials and workmanship for a period of two years after installation and acceptance.
- B. Furnish replacement parts to the Owners for any items found to be defective within the warranty period.

END OF SECTION



SECTION 11320

SUBMERSIBLE RAW SEWAGE PUMPS

1. GENERAL
 - 1.01 DESCRIPTION
 - A. Work Specified Herein and Elsewhere
 1. Work under this Section includes:
 - a. Submersible electric driven sewage non-clog or grinder centrifugal pumping units and accessories.
 - b. Pump access frames and covers.
 - B. The pumping units supplied under this section shall be supplied by one manufacturer. The agency supplying the pumps shall also furnish the motors, lift station controls, SCADA units, pump access frame and covers and pump appurtenances. The agency supplying the pumps, motors, controls, and appurtenances shall have system responsibility and shall be a one-point source of supply and responsibility.
 - 1.02 RELATED WORK SPECIFIED ELSEWHERE
 - A. Section 01000 - Submittals
 - B. Section 01430 - Manufacturer's services
 - C. Division 15 - Piping, Valving, and Gauges
 - D. Section 16150 - Motors
 - E. Section 16974 - Lift Station Controls
 - F. Section 16972 - Mission SCADA Unit
 - 1.03 SUBMITTALS
 - A. Shop Drawing and Product Data
 1. In compliance with Section 01000, submit shop drawings of all pumps, drivers, level controllers, lift station controls, SCADA units, and other equipment required for a complete pumping system, including:

- a. Manufacturer's specification data and descriptive literature.
- b. Complete data on motor thermal protection.
- c. Performance curves showing capacity in gpm, NPSH, head, and pump horsepower from throughout the pump's performance curve.
- d. Motor efficiencies and power factors at all system operating points as listed for the respective pumping system characteristics.
- e. The following data shall be submitted for each motor:

Manufacturer's designation	Number of phases
Horsepower output	Voltage
Time rating	Load amperes at 1/2, 3/4 and full load
Temperature rise	
RPM at full load	Design letter
Frequency	Service factor
	Code

- f. Manufacturer's recommended procedures for job site storage, handling, installation, and start-up.
- g. Detailed layout of equipment, piping, conduit, controls, hatches, accessories, etc., whenever the Drawings are diagrammatic in nature or the equipment to be provided differs from that indicated on the Drawings.
- h. Anchor bolt layout and details, support and bracket details, and other drawings required for proper installation.
- i. Procedures for proper installation.
- j. Manufacturer's guarantee.
- k. Information about the nature and location of parts, service crews, and repair facilities.
- l. Wiring and control diagrams.

- B. Certified pump tests shall be performed on all pumping units. Submit copies of all testing certifications.

- C. Submit operation and maintenance manuals as specified in Division 1. Include parts lists and troubleshooting guide.

1.04 QUALITY ASSURANCE

A. System Responsibility

1. The Contract Documents are intended to describe all details of a complete equipment installation for the purpose specified; however, the Contractor shall be responsible for all details necessary to properly install, adjust, and place in operation a working system.
2. The supplier of the pumping equipment shall assume responsibility for the proper functioning of the pump, and motor.

B. Source Quality Control

1. Each pump shall be given an operational test of all equipment at the factory to check for excessive vibration, for leaks in seals, and for correct operation of the control system and auxiliary equipment.

C. Shop Test

1. Each pump shall be performance tested as a complete unit. Three (3) copies of certified test reports, including actual test records, shall be submitted and approved by the Engineer prior to shipment of the equipment.
2. The Contractor shall submit the complete pump test procedure, a diagram of the test setup showing location of instruments, a sample of the test stand log sheet, and calibration data of all instruments and measuring devices to be used by the manufacturer to the Engineer, for approval, prior to the pump tests.
3. Each pump shall be tested for performance at the factory to determine the head vs. capacity and shall be certified by a registered professional engineer. Tests of models, prototypes or similar units will not be acceptable.
4. All tests shall be run in accordance with the test code for centrifugal pumps of the Standards of Hydraulic Institute, latest edition.

2. PRODUCTS

2.01 PUMP DESIGN CONDITIONS

1. All pumps will be equipped with variable frequency drives. Pumping/drive units shall be capable of meeting multiple design conditions as described below.
2. Manufacturer shall submit data to demonstrate ability to meet all design conditions.
3. The raw sewage pumps/variable frequency drive units shall be capable of meeting all of the following Phase 1 and Phase 2 design conditions and operating points with one pump out of service:

Lift Station B				
Parameter	Phase 1 Operating Point	Phase 1 (Primed Forcemain Conditions Operating Point)	Phase 2 (Design Condition)	Phase 2 (Primed Forcemain Conditions Operating Point)
Description	Lift Station B pumping alone to new Lift Station D in new forcemain		Lift Station B pumping with Lift Station C in common forcemain to new Lift Station D	
Number of pumps (Including One Standby)	2	2	2	2
Total Pumping Capacity, gpm (With One pump out of Service)	1,000	1,000	1,000	1,000
Rated Capacity Each Pump, gpm	1,000	1,000	1,000	1,000
Rated Total Dynamic Head, feet	57	52	78	73
Maximum Speed, rpm	1,770			
Minimum Shutoff Head, feet	123			
Minimum Overall Pump Guaranteed Efficiency at Rated Head	63%			
Maximum Rated HP of Motor	40 HP (Sized for Phase 2 Conditions)			
Minimum Rated HP of Motor	Pumps shall be non-overloading throughout the full range of the pump curve			
Motor Specifications	460 V, 3 Phase, 60 Hertz, Service Factor 1.15, Class I Division 1 Group D duty			

Minimum Pump Discharge Size	6-inches
Minimum Sphere Diameter	4-inches
Installation Conditions	Existing 6-foot diameter wet well
Manufacturers/Model	Base Bid: Barnes Model 6XSCK Alternate Bid: Flygt Model NP3171 HT3 454 or Equal

Lift Station C			
Parameter	Phase 1 (Operating Point)	Phase 2 (Design Point)	Phase 2 (Primed Forcemain Condition Operating Point)
Description	Lift Station C pumping alone to discharge point on Kingsway Drive at Sunset Drive, continuing with gravity flow to new Lift Station D	Lift Station C pumping with Lift Station B in common forcemain to new Lift Station D	
Number of pumps (Including One Standby)	2	2	2
Total Pumping Capacity, gpm (With One pump out of Service)	700	700	700
Rated Capacity Each Pump, gpm	700	700	700
Rated Total Dynamic Head, feet	63	108	75
Phase 1 Operating Range	During dry weather flow conditions in Phase 1, pump will be operated to maintain a minimum pumping rate of 470 gpm @ 48 ft TDH and will ramp up as necessary to Phase 1 operating point indicated above.		
Maximum Speed, rpm	1,770		
Minimum Shutoff Head, feet	155		
Minimum Overall Pump Guaranteed Efficiency at Rated Head	55%		

Maximum Rated HP of Motor	60 HP (Sized for Phase 2 Conditions)
Minimum Rated HP of Motor	Pumps shall be non-overloading throughout the full range of the pump curve
Motor Specifications	460 V, 3 Phase, 60 Hertz, Service Factor 1.15, Class I Division 1 Group D duty
Minimum Pump Discharge Size	6-inches
Minimum Sphere Diameter	4-inches
Installation Conditions	Existing 8-foot diameter wet well
Manufacturers/Model	Base Bid: Barnes Model 6XSCDK Alternate Bid: Flygt Model NP3202 HT3 460 or Equal

Lift Station D		
Parameter	Phase 1 (Design Point)	Phase 1 (Primed Forcemain Condition Operating Point)
Description	New Lift Station D pumping to WWTP in new forcemain	New Lift Station D pumping to WWTP in new forcemain
Number of pumps (Including One Standby)	3	3
Total Pumping Capacity, gpm (With One pump out of Service)	2,750	2,750
Rated Capacity Each Pump, gpm	1,375	1,375
Rated Total Dynamic Head, feet	70	48
Phase 1 Operating Range	During dry weather flow conditions in Phase 1, one pump will be operated to maintain a minimum pumping rate of 1,440 gpm @ 47 ft TDH and will ramp up as necessary to Phase 1 design point indicated above.	
Maximum Speed, rpm	1770	
Minimum Shutoff Head, feet	129	

Minimum Overall Pump Guaranteed Efficiency at Rated Head	63%
Maximum Rated HP of Motor	50 HP
Minimum Rated HP of Motor	Pumps shall be non-overloading throughout the full range of the pump curve.
Motor Specifications	460 V, 3 Phase, 60 Hertz, Service Factor 1.15, Class I Division 1 Group D duty
Minimum Pump Discharge Size	6-inches
Minimum Sphere Diameter	4-inches
Installation Conditions	New 10-foot diameter wet well
Manufacturers/Model	Base Bid: Barnes Model 6XSCDK Alternate Bid: Flygt Model NP 3171 MT3 433 or Equal

2. The design of the pumps shall be such that the pumping unit will be automatically and firmly connected to the discharge piping when lowered into place by means of two guide rails onto its mating discharge connection which will be permanently installed in the wet well. There shall be no need for personnel to enter the wet well for pump removal, servicing, or reinstallation. The pump and motor assembly shall be easily removable for inspection or servicing requiring no bolts, nuts, or other fastening to be disconnected.

2.02 PUMP CONSTRUCTION

A. Due to ragging conditions, either sewage grinder pumps or Flygt Self-Cleaning N-Pumps are required.

B. Sewage Grinder Pumps

1. Sewage grinder pumps shall be capable of handling raw, unscreened domestic sewage consisting of water, fibrous materials, and solids at heavy consistencies. The pump shall be able to chop/ macerate solids without clogging with chopped solid size not less than 1 inch, and the chopping mechanism shall be an integral part of the pump. Bearings shall be oil-lubricated and designed for 50,000 hours operating at minimum flow.

2. The volute, seal plate, adapter, motor housing and motor housing cap shall be constructed of high quality, ASTM A-48 Class 30 cast iron. Impeller shall be furnished in ASTM A-536 ductile iron with a keyed,

tapered shaft bore. Pump(s) shall be coated with two coats of Axalta™ amido amine modified polymer satin gloss epoxy (or equal) with a total 10 mil minimum thickness in the manufacturer's standard color. All exposed hardware shall be 300 series stainless steel including the lifting bail. Discharge connection shall be a standard 125 pound 6" flange, slotted to accommodate 6" ANSI or 150mm ISO flanges.

3. The pump shaft shall be 416 stainless steel with a tapered impeller fit to reduce rotor imbalance and minimize stress risers associated with stepped shafts. All gaskets shall be of the angular gland compression O-ring type. The impeller shall be a dual vane design with pump out vanes on both sides.
4. The chopping mechanism shall consist of a bladed stationary plate and a rotating blade. Both blades shall be constructed of high quality, ASTM A276 440C stainless steel, heat treated to 56-60 HRC. The rotating blade shall be press-fitted onto the impeller and secured to the impeller by four stainless steel pins. The bladed stationary plate shall be fixed to the volute in eight locations. The bladed stationary plate shall be adjustable to maintain a clearance of 0.001" to 0.008" between the stationary blade and rotating blade. The bladed impeller assembly shall be dynamically balanced to ISO G6.3 specifications. The bladed stationary plate shall be sealed internally against the volute with an O-ring.
5. The chopping mechanism shall consist of dual wear ring system. The rotating blade shall operate as a wear ring for the impeller along the outer diameter of the impeller assembly. The matching volute shall be provided with an external replaceable bronze wear ring at the inlet.
6. The tandem mechanical shaft seals shall be of the single spring design operating in an intermediate oil-filled seal cavity. Pump-out vanes on back side of the impeller shroud shall be large enough to efficiently expel solids away from the seal area. The materials of construction shall be silicon carbide vs. silicon carbide for the pump-end seal and carbon vs. ceramic for the motor-end seal, lapped and polished to a tolerance of one light band, 300 series stainless steel hardware, and Buna-N elastomeric parts. The pump-end seal shall be pinned in place to prevent rotation of the stationary seat and shall seal to the pump housing via an O-ring to maximize heat transfer. Cup mounted seats shall not be considered equal.

7. A moisture sensor detection system consisting of two probes shall be integrated within the oil-filled seal chamber which is isolated from the motor chamber. The leads for the moisture detector and temperature sensors shall be contained within the power cable, except that for 1/0 cables, the sensor leads will be in a separate cable.
8. The rotor and stator assembly shall be of the standard frame design and the stator pressed into the motor housing for mechanical stability. The motor shall be constructed with the windings operating in a sealed environment containing clean dielectric oil. Manufacturer to supply submergence requirements for continuous operation.
9. Motors shall be dielectric oil filled for optimal thermal management and maximum bearing life. The motor windings shall be of Class H, spike-resistant insulation. The motor shall meet the NEMA Design B standard and be Inverter Duty Rated per NEMA MG-1, part 31. Motors shall be designed for Class I Division 1 Group D duty.
10. The pump shaft shall be of 416 stainless steel, keyed and tapered for the matching impeller. The lower bearing shall be of the double row ball type, locked in position to accept radial and axial thrust loads, and the upper bearing of the single ball type for radial loads. Bearings shall operate in an oil bath environment for superior lubrication, cooling and life.
11. The pump motor shall be sized to be non-overloading throughout the entire system operating range. The motor shall be designed for continuous operation with a service factor of 1.15. The motor shall be designed for continuous operation with a service factor of 1.15. The output, torque and speed characteristics of the motor shall be suitable to run the pump without the pump's operating curve exceeding the name plate ratings of the motor with a service factor of 1.15.
12. Three thermal sensors (one per phase) shall be embedded in the end coil of the stator windings, wired in series and used to monitor stator temperatures. This shall be used in conjunction with an external motor overload protection device and wired to the control panel through the single power cable.
13. The pump shall be equipped with a CSA-qualified submersible quick connect power cable constructed in accordance with type W guidelines and shall include the moisture and temperature sensor leads. The cable shall

be of sufficient length to connect from the motor to the junction box without splicing.

14. Pumps shall be standard production models.

C. Self-Cleaning N-Pumps (Xylem/Flygt)

1. Major components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handles shall be made of stainless steel. All exposed nuts and or bolts shall be of stainless-steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating or acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
2. Sealing surfaces shall incorporate metal to metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile rubber O-ring. Fittings will be the result of controlled compression O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.
3. Rectangular cross section gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.
4. The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using a mechanical coupling shall not be acceptable. The shaft shall be stainless steel ASTM A479 S43100-T, Shaft sleeves will not be acceptable.
5. The impeller shall be of Hard-Iron™ (ASTM A-532(Alloy III A) 25% chrome cast iron), dynamically balance, semi-open, multi-vane, back swept, 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 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 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 shall be coated with alkyd resin primer.

6. The pump volute shall be a single piece of gray iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. 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 trash release pathways and sharp edge(s) across which impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of Hard-Iron™ (ASTM A-532(Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.
7. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a two-row angular contact ball bearing. The lower bearing shall be a two-row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.
8. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber, shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion and abrasion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates, returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common

single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

9. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.
10. The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.
11. A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.
12. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a two-row angular contact ball bearing. The lower bearing shall be a two-row angular contact ball bearing to handle the thrust and radial forces. The minimum L10 bearing life shall be 50,000 hours at any usable portion of the pump curve.
13. Pumps shall be standard production models.
14. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method

using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of no less than 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

15. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.
16. The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C. A motor performance chart shall be provided exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics. Motors shall be designed for Class I Division 1 Group D duty.
17. Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.
18. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual

cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. 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 sealed from each other, which shall isolate the stator housing from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered equal. The cable shall be of sufficient length to connect from the motor to the junction box without splicing.

2.03 GUIDE RAIL SYSTEM

- A. To permit quick removal and reinstallation of the pump and motor assembly from the wet well without requiring unbolting or other similar form of disconnection of the pump discharge piping the following components shall be provided:
1. For each pump, a cast iron 90-degree discharge base elbow shall be supplied. The elbow shall have a standard 125 lb. flanged discharge connection. In addition, the elbow shall incorporate mounting sockets for two pump guide rails. Guide rails shall be minimum 2-inch stainless steel pipe.
 2. In addition, an upper stainless-steel guide rail holder bracket shall be provided by the pump supplier for anchoring the top of the pump guide rails. This bracket shall be designed for bolting to the sidewall of the access hatch frame.
 3. Each pump shall be equipped with a sliding guide bracket which shall be bolted to the pump frame in a manner such that when the pump is resting in the fully lowered position on the discharge base elbow a tight fit of these flanges is ensured. 1. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable.
 4. Each pump shall be equipped with a stainless-steel pump lifting chain and chain fastening components. The chain shall be of sufficient length to extend from the top of the structure to the pumps without straining. The chain lifting force shall be located over the center of gravity of the pump and motor assembly. The

stainless-steel lifting chain shall be sized 50 percent greater than the pump weight.

5. A Kellems grips and hook system shall be provided and installed on all pumping units to support pump power and control cables.

2.04 WATERTIGHT PUMP ACCESS DOORS AND FRAMES

- A. Furnish and install a pump access door, frame, and cover, for each lift station wet well. A separate hinged cover shall be provided for each pump. The access door and frame shall be sized by the supplier to permit installation and removal of the pumps. The access hatches and frames shall be by Halliday, Bilco, or approved equal.
- B. The frames and covers above the structure shall be aluminum 2024 ST. The underside of the frames and all parts in contact with concrete shall be coated with a bitumastic coating to prevent corrosion.
- C. The frames and covers shall be complete with stainless steel hinge, stainless steel pins, stainless steel upper guide holders, and level sliding nut rails to attached accessories. Lower guide bar holders shall be integral with the discharge connection. Doors shall be skid proof design.
- D. The frames and covers shall be capable of carrying AASHTO H-20 loads.
- E. Doors shall have automatic hold-open arm for locking door in the 90-degree position and allowing for easy control when closing door panel. Provide stainless steel compression springs for lift assistance.
- F. Doors shall be equipped with aluminum retracting lift handles and equipped with staple for padlock.
- G. All access 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. The system shall be Hatch Safety Net as manufactured by USF Fabrication, Inc. or equal. Polyester safety net shall conform to OSHA Standard 1926.502(c)(4)(i) drop test. Extruded aluminum slide rails shall be constructed of Aluminum Alloy 6061-T6 with ultimate tensile strength of 18 KSI, yield strength of 8 KSI, and a shear strength of 12 KSI. Corner hooks and anchors shall be 316 stainless steel.
- H. Contractor shall verify hatch dimensions will accommodate free installation and removal of pumps on

their guide rails. Hatch dimensions shall be shown/verified on the shop drawings.

3. EXECUTION

3.01 INSTALLATION CHECK

A. After the installation of the pumping units and all appurtenances, each pumping unit will be subjected to a field running test under actual operating conditions. The field tests shall be made by the Contractor in the presence of the Engineer, Equipment Supplier, and Contractor. The field test shall demonstrate that under all conditions of operation each unit:

1. Has not been damaged by transportation or installation.
2. Has been properly installed.
3. Has no mechanical defects.
4. Is in proper alignment.
5. Has been properly connected.
6. Is free of overheating of any parts.
7. Is free of all objectionable vibration.
8. Is free of overloading of any parts.

B. Any defects in the equipment or failure to meet the requirements of the Specifications shall be promptly corrected by the Contractor.

C. Furnish to the Owner, through the Engineer, a written report certifying that equipment:

1. Has been properly installed and lubricated.
2. Is in accurate alignment.

3.02 SPARE PARTS

A. Seller shall furnish the following set of spare parts for each type of pump provided:

1. Two sets of mechanical seals.
2. Two sets of oil fill plug and O-rings.
3. One set of pump and motor bearings for each type provided.

4. One striker plate and slicing blade (chopper pumps only).
5. One set of each additional recommended spare parts as outlined in the manufacturer's operation and maintenance manual.

3.03 MANUFACTURER'S SERVICES

- A. Provide services of an experienced, authorized representative of manufacturer or supplier of equipment to visit site of work and inspect, check, adjust if necessary, and approve equipment installation during startup.
- B. Assure that equipment supplier's representative is present when equipment is placed in operation.
- C. Verify that equipment supplier's representative revisits job site as often as necessary until all trouble is corrected and equipment installation and operation are satisfactory, in opinion of the Engineer.
- D. Provide the services of a competent factory representative to provide 8 hours of on-site training in the operation and maintenance of equipment provided.

3.04 WARRANTY

- A. Warrant all parts to be free from defects in materials and workmanship for a period of 18-months after Substantial Completion.
- B. Furnish replacement parts to the Owner for any items found to be defective within the warranty period.

END OF SECTION

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SECTION 15060

INTERIOR PIPE AND FITTINGS

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

a. Piping and fittings for the wet well and valve vault.

2. Related work specified elsewhere:

- 1 Piping System Testing - Section 01000
- 2 Forcemain and Gravity Sewer - Division 2
- c. Trenching, Bedding and Backfilling - Division 2
- d. Equipment Piping - Divisions 11-15
- e. Piping Specialties - Section 15080
- f. Pipe Hangers and Supports - Section 15080

1.02 SUBMITTALS

A. Shop Drawings and Product Data

1. Submit the following, in accordance with Section 01000:

- a. Detailed layout shop drawings for all pipelines 6-inches and larger.
- b. Details of fittings and couplings for pipe.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01000. Exercise care in transporting and handling pipe and fittings in order to avoid damage to materials or coatings. Lifting shall be by hoist or on skids when hand lifting is not feasible. Dropping shall not be permitted. Store pipe as recommended by the manufacturer. Damaged pipe and fittings shall be replaced.

2. PRODUCTS

2.01 DUCTILE IRON PIPE

A. Ductile Iron Pipe

1. Ductile Iron Pipe shall be centrifugally cast in metal or sand-lined molds and shall conform to ANSI A21.51 or AWWA Class 53 thickness.

B. Flanged Pipe

1. In addition to the above requirements, flanged ductile iron pipe shall conform to ANSI A21.15.

C. Joints

1. Joints for pipe and fittings shall conform to ANSI A21.11. Flanged joints shall conform to ANSI A21.15 with ANSI B16.1, Class 125 flanges. Bolts and nuts shall conform to Type 304 stainless steel. Threads of all stainless steel fasteners shall be coated with anti-seize Teflon coating, either shop applied or field applied.

D. Fittings

1. All cast iron fittings shall be of the type indicated on the Drawings and shall conform to ANSI A21.10 for short body, cast iron fittings 12-inches and less, and AWWA C110 for fittings 14-inches and larger. Joints shall be as specified above. Unless otherwise shown on the drawings, mechanical joint fittings shall be used for exterior piping.

E. Lubricants

1. Lubricants other than that furnished with the pipe shall not be used.

F. Interior Lining

1. Interior lining shall be standard thickness cement mortar lining with an asphaltic seal coat in accordance with ANSI A21.4/AWWA C104 latest edition.

G. Exterior Coating

1. Exterior coating for ductile iron pipe and fittings shall be as follows:
 - a. Buried pipe and fittings shall conform to the requirements of AWWA C151/ANSI A21.51.

- b. Exposed pipe and fittings shall have the standard bituminous coating omitted and shall be shop primed in accordance with Section 09900.

2.02 PVC POLYVINYL CHLORIDE PIPE SCHEDULE 40 AND 80

A. Pipe

- 1. PVC pipe shall be manufactured from PVC 1120 and shall conform to ASTM D1785. Nominal size of pipe shall be as indicated on the Drawings. Pipe and fittings shall be NSF approved for the usage to which they will be applied.

B. Joints

- 1. Joints for PVC pipe shall be solvent weld type

C. Fittings

- 1. Fittings shall be manufactured of the same material as the pipe, shall have the same type of joints and shall conform to ASTM D2467.
- 2. Provide adapters as required to join PVC pipe to pipe, fittings, and equipment of other materials.

D. Solvent Cement

- 1. Solvent cement shall be as recommended by the pipe manufacturer and shall conform to ASTM D2564.

2.03 BOLTS AND GASKETS FOR FLANGED PIPING

- A. All flange connections shall be made up with 1/16" thick BUNA-S9(SER) gaskets per ANSI/AWWA C111/A21.11 and U.S. Standard machine stainless steel bolts with clean cut threads, square heads and cold punched hexagonal nuts. The threads of all stainless steel fasteners shall be coated with anti-seize teflon coating either shop applied or field applied. The gaskets shall fit inside the bolt holes for all lines except where full types are specified.

2.04 ADAPTER FLANGES

- A. Adapter flanges for ductile iron or steel pipe shall be manufactured of high strength ductile iron, ASTM A536, Grade 65-45-12. Flange dimensions and drilling shall be in accordance with ANSI B16.1, 125 lb. pattern for cast iron, and/or ANSI B16.5, 150 lb. pattern for steel. Gaskets shall be BUNA-S (SBR) in accordance with ANSI/AWWA C111/A21.11 and shall be included with the flange. Set screws shall be of AISI 4140, high strength, low alloy steel, 190,000 psi minimum tensile strength,

heat treated and zinc plated for corrosion resistance. Set screws shall be of square-head design and coincide with the manufacturers torque installation requirements for all pipe thicknesses.

- B. Adapter flanges shall be UL listed and FM approved and shall be Uni-Flange™ Series 200/400, as manufactured by Uni-Flange Corporation, or approved equal. Submittal shall be accompanied by notarized factory certification (six original copies) of compliance with the above specification.

3. EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

- A. In general, cutting through floors, walls, and partitions shall be avoided and will be permitted only where absolutely necessary. Structural members shall not be cut except upon approval of the E/A. Where cutting, drilling, and patching of completed construction and finishes is required, patch shall match the undisturbed construction and finish.
- B. All lengths of pipe shall be dimensioned accurately to measurements established at the site, and shall be worked into place without springing or forcing.
- C. The Contractor shall cut all pipe and drill all holes that may be necessary. Cut sections of pipe shall be reamed or filed to remove all burrs. The pipe interior and joints shall be thoroughly cleaned before being installed and kept clean during construction.
- D. All changes in direction shall be made with fittings or approved joint deflection. Bending of pipe, except copper, is prohibited.
- E. Any transition from one pipe size to another shall be made with a reducing fitting. Reducing bushings are prohibited except where specifically indicated on the Drawings or approved by the E/A.
- F. Where practical all exposed pipe shall be run parallel to or at right angles to walls and other exposed pipes except where it is clearly indicated on the Drawings that the piping should be run at some other angle. Care shall be taken to avoid all windows, doors, or other outlets, and not to weaken any portion of the structure.
- G. Make adequate provision for expansion and contraction of piping.

- H. Install unions in all major piping branches and downstream of every valve, within 6-inches of the valve. Provide a union in each 2-in diameter or less of pipe connection to each fixture, device or item of equipment, and elsewhere as required to make up or disconnect piping and flange adaptor for pipe size larger than 2-inch diameter. Install unions or flange adaptor in a position to permit equipment to be removed without disconnecting any piping except unions, or flange adaptors.
- I. Pipe embedment and backfilling shall closely follow the installation and jointing of pipe in the trench, and to prevent longitudinal movement caused by thermal expansion or contraction of the pipe. Not more than 50-ft of pipe shall be exposed at any time ahead of the backfilling in any section of trench.

3.02 PLUGS

- A. Installed piping system shall be temporarily plugged at the end of each day's work, or other interruption to progress on a given line. Plugging shall be adequate to prevent entry of small animals or persons into the pipe or the entrance or insertion of deleterious materials.
- B. Standard plugs shall be inserted into all dead-end pipes, tees, or crosses; spigot ends shall be capped; flanged and mechanical joint ends shall have blind flanges of metal.
- C. Plugs installed for pressure testing shall be blind flanges fully secured and blocked to withstand the test pressure.
- D. Where plugging is required because of contract division or phasing for later connection, the ends of such lines shall be equipped with a permanent type plug or blind flange. Installation or removal of such plugging shall be considered incidental to the work.

3.03 CONCRETE REACTION BLOCKS

- A. Concrete reaction blocks shall be as indicated on the Drawings, or as directed by the E/A. Concrete thrust blocks, shall be provided on pressure piping at all changes in direction. All concrete cradles, anchors, and reaction blocks shall be as specified in Division 3.
- B. Reaction or thrust blocks shall be constructed at all tees, plugs, caps, and at bends deflecting 22-1/2 degrees or more. Thrust blocks shall be installed on any slopes exceeding 10 degrees from horizontal; using one block at least 3 cubic feet in volume for each successive three lengths of pipe on such slope.

- C. Blocks shall be poured between undisturbed soil and fittings. Concrete shall be so placed that pipe joints and fitting joints will be accessible for repair. The dimensions of concrete thrust blocks shall be as indicated on the Drawings, but in no case less than 2 cubic feet in volume.

3.04 DUCTILE IRON PIPE

A. Mechanical Joints

- 1. Pipe with mechanical joints shall be laid according to the manufacturer's specifications. Socket and gasket shall be clean and gasket shall be properly centered before joint is made.

B. Push-On Type Joints

- 1. Any foreign matter in the gasket seat shall be removed, the rubber gasket wiped clean, flexed and placed in the socket. A thin film of lubricant shall be applied to the surface of the gasket which will come in contact with entering plain end pipe. Joint assembly shall then be completed by forcing the plain end of the entering pipe past the gasket until it makes contact with the bottom of the socket.

C. Flanged Joints

- 1. Care shall be taken in bolting flanged joints that there is not restraint on the opposite end of the piece which would prevent pressure from being evenly and uniformly applied upon the gasket. The pipe or fitting must be free to move in any direction while bolting. Bolts shall be gradually tightened, each in turn, at a uniform rate of gasket compression around the entire flange.

3.05 SOLVENT CEMENT JOINTS FOR PLASTIC PIPE

- A. Bevel the pipe end and remove all burrs before making joint. Clean both pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40 degrees F nor in wet conditions.

- B. Apply complete coating of primer to the outside surface of the pipe end and to the mating inside surface of the socket. Apply a liberal coat of solvent cement to the pipe and socket. Immediately after application of cement, insert the pipe to the full depth of the socket while rotating the pipe or fitting 1/4 turn to evenly spread the cement. Hold joint together for a minimum of 10 to 15 second to insure pipe does not back out of socket. Immediately after joining, wipe all excess

cement from the pipe and fittings leaving only a small bead of cement around the circumference of the joint. The joint shall be allowed to set for a minimum one-half hour before handling.

- C. Due to the explosive hazard, the following safety precautions shall be observed in conjunction with the use of solvent weld plastic pipe:
1. Air shall be permitted to circulate through the pipeline to permit solvent vapor to escape.
 2. When flushing or filling pipelines, admit water slowly to prevent compression of the gases within pipe.

END OF SECTION

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SECTION 15080

INTERIOR PIPING SPECIALTIES

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Pipe guides
- b. Pipe unions
- c. Bolts and gaskets for flanged piping
- d. "Y" - Strainers
- e. Pipe sleeves
- f. Surface plates for pipes
- g. Hangers and supports for piping

2. Related work specified elsewhere:

- a. Piping and Valves - Sections 15060 and 15100

1.02 SUBMITTALS

A. Shop Drawings

1. Submit shop drawings and product data in accordance with Section 01000 illustrating piping specialties and installation details for all items in this Section.

B. Samples

1. Submit product samples for approval as directed by the E/A.

2. PRODUCTS

2.01 PIPE GUIDES

- A. All pipes having flexible connectors shall be guided with pipe alignment guides in accordance with the joint manufacturer's recommendations. Guides shall be so designed that there will be no wear on the pipe. Guides shall also be designed so as to prevent any pipe movement in any direction except along the axis of the pipe run. Also provide guides on vertical pipes in shafts where required.

- B. Where necessary to secure piping so as to control direction of expansion, provide pipe anchors. Anchors shall be constructed of steel, shall be such as to prevent pipe movement in any direction, shall be securely attached to the pipe and to the building structure, and shall have sufficient strength to withstand the stress that the anchor will be subjected to by the pipe movement.

2.02 PIPE UNIONS

- A. Unions for galvanized steel pipe shall match the pipe.

2.03 BOLTS AND GASKETS FOR FLANGED PIPING

- A. All flange connections shall be made up with 1/16-inch thick BUNA-S9(SER) gaskets per ANSI/AWWA C111/A21.11 and U.S. Standard machine stainless steel bolts with clean cut threads, square heads and cold punched hexagonal nuts. The threads of all stainless-steel fasteners shall be coated with anti-seize Teflon coating either shop applied or field applied. The gaskets shall fit inside of bolt holes for all lines except where full types are specified.

2.04 "Y" - STRAINERS

- A. "Y" - Strainers shall be self-cleaning type for water service. Screen perforations shall be no greater than 1/8-inch diameter.

2.05 PIPE SLEEVES

- A. Where pipes pass through interior partition walls pipe sleeves shall be 16 gauge galvanized iron, 1-inch larger than O.D. of bare pipe.
- B. Where pipes pass through intermediate floors, beams, footings, and exterior walls above grade, provide sleeves of Schedule 40 black steel pipe, 1/2-inch larger than O.D. of the bare pipe. Ends of the sleeve shall be cut square and reamed smooth. Sleeves 3-inches and larger shall have steel anchor lugs welded to the pipe for embedment into masonry and concrete.
- C. Exposed surfaces of steel sleeves shall be bituminous coated.

2.06 SURFACE PLATES FOR PIPES

- A. Surface plates shall be provided for all exposed bare or insulated pipes passing through ceilings, floors, and walls, except that in furred chases, mechanical equipment rooms, and janitor's rooms, plates will not be required. Plates shall be provided for riser clamps and hanger rods that extend through finished ceilings. For covered pipes or ducts, provide plates of size to encircle covering.

- B. Wherever possible, floor and wall plates for pipes shall be pressed steel, chromium plated, split plates, held to pipe with set screw.

2.07 HANGERS AND SUPPORTS

A. General

1. Provide hangers and supports for piping, valves, and equipment to prevent sagging or lateral movement.
2. Stress shall not be placed on equipment flanges or couplings by secondary supports and hangers.
3. Unless otherwise indicated, hangers and supports shall be in accordance with the "Insulation Protector and Pipe Hanger Schedule" and manufactured by Crawford, Elcen, Unistrut, Power-Strut, Grinnel, U.S. Gypsum, or equal.

B. Hangers and Supports for Piping

1. Vertical piping shall be supported with friction clamps anchored to the structure, or by full size pipe extended to a base at the floor.
2. All exposed piping along walls and buried piping 4-inches and smaller within 1-ft horizontal distance of a structural wall shall be supported by return line hooks, offset type, or wrought straps.
3. Piping shall be free to move when it expands or contracts except where fixed anchors are indicated on the drawings. Where adequate hanger rod swing length cannot be provided, or where pipe movement based on expansion of 1-inch per 100-ft for each 100 degrees F change in temperature exceeds 1/2-inch, provide approved roller supports.

3. EXECUTION

3.01 GENERAL

- A. Install all items in accordance with manufacturer's instructions and approved shop drawings.

3.02 PIPE SLEEVES

- A. Obtain the E/A's permission before installing a sleeve in any structural member.
- B. Unless otherwise coated, apply a coat of rust inhibitive primer to all bare metal before installation.

- C. All sleeves shall be securely bedded in the building construction, with ends flush with finished surface except top end of floor sleeves shall project 1/2-inch above finished floor lines. All vertical sleeves shall be installed plumb and horizontal sleeves shall be level. Sleeves shall be accurately located and maintained in position until surrounding construction is complete.
- D. Where pipes pass through interior partition walls and suspended ceilings, fill the space between the pipe and sleeve with fiberglass insulation.
- E. Where pipes pass through intermediate floors, beams, footings and exterior walls above grade, caulk between the pipe and sleeve with asbestos rope caulk or with oakum and mastic.
- F. Where pipes pass through below grade walls, slabs or grade and floors, caulk the space between the pipe and sleeve with lead wool or install a modular wall seal.

3.03 HANGERS AND SUPPORTS

- A. Any excess hanger rod shall be cut off and rough ends filled smooth. Hanger rod shall be primed in accordance with Section 09900 before installation. Two nuts shall be provided (one for locking purposes) on all hanger rods and supports.
- B. All supports shall be securely fastened.
- C. Spacing of hangers and supports for horizontal piping, unless otherwise indicated shall not exceed the following:

<u>Pipe Size</u>	<u>Hanger Spacing</u>	
	<u>Metal Pipe</u>	<u>Plastic Pipe</u>
<1"	5'-6"	3'-0"
>1"- <6"	5'-6" plus 2'-0" per inch of pipe dia. over 1" dia.	3'-0" plus 1'-0" per inch of pipe dia. over 1" dia.
>6"	15'-0"	8'-0"

END OF SECTION



SECTION 15100

INTERIOR VALVES

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes:

- a. Valves.
- b. Valve operators, stems and boxes.

2. Related work specified elsewhere:

- a. Valve Identification - Division 1.
- b. Piping System Testing - Division 1.
- c. Piping Specialties - Section 15080.
- d. Piping and Fitting - Section 15060.

1.02 QUALITY ASSURANCE

A. Responsibility

- 1. The valve manufacturer shall be responsible for compatibility and the required performance of valves and operators. Wherever possible, valves and operators shall be delivered as a complete assembly.

1.03 SUBMITTALS

A. Shop Drawings and Product Data

- 1. Submit shop drawings and product data in compliance with Division 1 for all valves and valve operators showing general dimensions, construction details and full descriptive literature. Shop drawings shall indicate valve operator locations.

B. Certifications

- 1. Valve manufacturer shall furnish certification for all valves 6 inch diameter and larger that each valve has been subjected to a hydrostatic water pressure twice the pressure class and that each valve is free of defects.

C. Special Tools

1. Furnish one set of all special tools necessary for installation, normal maintenance, and adjustment.

D. Operation and Maintenance Manuals

1. Submit operation and maintenance instruction bulletins for all valves and valve operators in compliance with Division 1.

2. PRODUCTS

2.01 GENERAL

- A. All valves shall be of standard manufacture and of highest quality materials and workmanship.
- B. It is the intent of these Specifications that all valves of a particular type shall be the product of one manufacturer regularly engaged in the continuous production of that size and type of valve.
- C. Valves shall be suitable for safe working pressure as required in each application. Manufacturer's name, service, and pressure marking shall be cast into the body.
- D. Unless otherwise indicated or specified, all valves two inches and smaller shall be all brass or bronze; valves over two inches shall be iron body, fully bronze or bronze mounted.
- E. Unless otherwise indicated or specified all valves shall be constructed and rated for minimum 125 psi operating pressure.
- F. Where required for satisfactory operation of valves, provide valve operators, extension stems, stem guides, cast iron valve boxes, and other valve appurtenances. Extension stems shall be complete with guide bearings, wrench nut, and tee handle wrench. All machinery stuffing boxes shall be packed with material selected for the service intended. Maintain all packing until final acceptance by the Owner.
- G. Valves shall be installed in all pipe ahead of fixtures, appliances and equipment not furnished with stops, and elsewhere as required for proper control and isolation of sections of systems for maintenance purposes.

2.02 BALL VALVES

A. PVC Ball Valves

1. Valves shall be used on PVC pipe system where shown on the drawings.
2. Valves shall be suitable for a working pressure of not less than 150 psig.
3. Valves shall be hand lever operated unless otherwise noted on the drawings.
4. Valves shall have union type end connections unless otherwise called for in the valve schedule or as shown on the drawings.
5. Valves shall be of the full area open type unless otherwise called for in the valve schedule.
6. Valves shall be as manufactured by Hayward Manufacturing Company, Inc., Celanese Piping Systems, Inc.; or equal.
7. Valves shall be designed for use intended.

B. Stainless Steel Ball Valves

1. Valves shall be used on pipe system where shown on the drawings.
2. Valves shall be suitable for a working pressure of not less than 150 psig.
3. Valves shall be hand lever operated unless otherwise noted on the drawings.
4. Valves shall have union type end connections unless otherwise called for in the valve schedule or as shown on the drawings.
5. Valves shall be of the full port open type unless otherwise called for in the valve schedule.
6. Valves shall be designed for use intended.

2.03 CHECK VALVES

A. Flanged swing valves (3-inches and larger)

1. Check valves for 3-inch or larger sewage pump discharge shall have an unobstructed path of flow, and shall be of the swing type, with outside lever and adjustable weight.

2. Valves shall be suitable for horizontal or vertical installation as required.
 3. The disc shall swing entirely clear of the path of flow when in the open position.
 4. The body and the gate or disc of the valve shall be made of high strength cast iron and both shall have bronze seating rings.
 5. The gate and all internal working parts shall be easily removable through the top of the valve after the cover is removed.
 6. 3-inch to 12-inch valves shall be suitable for working water pressure of 175 psi, and 14-inch and larger valves shall be suitable for working water pressure of 150 psi.
 7. The valves shall be furnished with ANSI Class 125 flanged ends.
- B. Threaded and soldered swing check valves (2-1/2-inches and smaller)
1. Check valves 2-1/2-inches or smaller, in water, sludge, or other liquid piping shall be bronze regrinding horizontal swing check valve.
 2. The valve shall have a screwed cap and shall be of the y-pattern.
 3. The valve shall be designed so that the seats may be reground by removing cap and rotating disc assembly with screw driver.
 4. All internal parts shall be made readily accessible and shall be quickly replaced in the field.
 5. The valve shall have a hinge bumper capable of preventing the disc from sticking in the open position.
 6. The valves shall have an arrow cast on the body to indicate the direction of flow.
 7. The valves shall be suitable for working water pressure of not less than 125 psi.

- C. Lift Check Valves (1-1/2-inch and smaller)
 - 1. Valves shall be suitable for a working water pressure of 150 psi and shall be designed for service in pipe lines carrying gas, steam, water, oil and similar fluids.
 - 2. Valves shall have a cast iron body, ASTM A-126, Class A.
 - 3. Valves shall have screwed end connections, and shall have a bronze cap screwed into the body.
 - 4. Valves shall have a body seat ring and disc of Monel.
- D. PVC Check Valves
 - 1. Valves shall be of ball type, and shall be used where indicated on PVC pipe system.
 - 2. Valves shall be as manufactured by Hayward Manufacturing Company, Inc.; Celanese Piping Systems, Inc.; or equal.
 - 3. Valves shall have a union type end connection.
 - 4. Valves shall be placed in vertical piping whenever possible; and other position shall be subject to the approval of the Engineer.
- F. All valves shall be suitable for the service and pressures encountered.

2.04 NON-POTABLE WATER VALVES (2-1/2-INCH AND SMALLER)

- A. Rated for 125 lbs. pressure, all bronze, suitable for service as shown on plans.
- B. Hose end gate valves shall be 1-1/2-inch with chain attached cap, hose coupling screw threads, manufactured by Lunkenheimer No. 366, Powell No. 502, or equal.
- C. Interior hose bibbs shall be angle type, 1-1/2-inch hose coupling screw thread, bronze four arm indexed handle, manufactured by Wade, Josam, or equal.

2.05 ECCENTRIC PLUG VALVES

- A. Eccentric plug valve shall have rubber-faced plugs and shall be of eccentric construction so that the opening movement of the valve results in the plug rising off the seat contact rather than sliding from its seat. Valves shall be made of cast iron ASTM A126, Class B. Body seats of valves 3-inch or larger shall have a minimum 1/8-inch welded-in overlay of not less than 90% pure nickel on all surfaces contacting the plug face. Stem bearings shall be sintered, oil impregnated, permanently

lubricated, Type 316 stainless steel. Port areas shall be equal to at least 80% of the full pipe area. Valves 4-inch and larger shall have multiple V-type packing with adjustable gland follower. Packing shall be adjustable and capable of being repacked under pressure without the actuator, bonnet or plug being removed from the valve. The valve shall be designed to withstand full operating pressure against the face of the plug without leakage. Valves shall be designed for not less than 150 pounds cold water operating pressure, 8-inch and larger valves shall be gear operated, unless otherwise shown or specified. Gear-operated valves with operating wheel 7-ft or more above the floor shall be provided with stainless steel chains and chain wheels. Valve shall be manufactured by DeZurik or approved equal.

2.06 AIR / VACUUM RELEASE VALVES

- A. Air / vacuum release valves shall be designed to operate while pressurized allowing entrained air in sewage forcemain to escape through the air release orifice. After entrained air escapes through the air release orifice, the valve orifice shall be closed by a Buna-N needle mounted on a compound lever mechanism, and shall be ASTM A240 stainless steel. The valve shall also provide vacuum relief to allow air into the system through the orifice.
- B. The internal linkage shall be fitted with a stem, having a ASTM A240 stainless steel float. The float shall hang inside the valve body slightly above the inlet and below the lever mechanism, maintaining an air gap between the mechanism and the waste.
- C. Wash water hose shall have quick disconnect coupling to connect to ball valve.
- D. Body and cover shall be cast iron conforming to ASTM A48 Class 30.
- E. Valves shall be 2-inch diameter or as recommended by the manufacturer and shall be manufactured by ARI or approved equal.

2.07 VALVE OPERATORS AND ACCESSORIES

- A. Operator mounting arrangements and handwheel or chainwheel positions shall be as shown on the drawings or as approved by the Engineer.

B. Manual Operators

1. Unless otherwise shown on the drawings or indicated in the specifications, manual operators shall open the valve when rotated in a counterclockwise direction and shall close the valve when rotated in a clockwise direction.
2. Handwheels shall have a maximum diameter of 24-inches.
3. Wrench nuts shall meet requirements of the AWWA C500.
4. Lever operators shall be designed to produce the required torque with a maximum pull of 40 lbs and shall have at least 5 intermediate locking positions between fully open and fully closed.

C. Valves for throttling service shall be equipped with an infinitely variable locking device or a totally enclosed geared operator.

D. Gearing

1. All manually operated valves 8-inch and larger in size shall be gear operated.
2. Gears shall be accurately formed and smooth running, with bronze pinion shaft operating in bronze or permanently sealed antifriction bearings. Gear teeth shall be machine cut.
3. Gear ratios shall be not less than 2:1 for valves 24-inches and smaller; 3:1 for 30 and 36-inch valves and 4:1 for valves larger than 36-inches.
4. Geared valves shall be equipped with cut tooth ASTM A27, Grade U60-30 steel gears.
5. Gear cases shall be provided for all geared valves. In buried services, the case shall totally enclose the gearing and stuffing box. Exposed valves shall have the extended type case to allow repacking of the stuffing box without detaching the gear case.
6. All geared valves shall be equipped with indicators conforming to AWWA C500.

2.08 INSTALLATION

A. Install and adjust valves in accordance with manufacturer's instructions.

3. EXECUTION

3.01 GENERAL

- A. Make connections between valves and piping as specified in Section 15060.

3.02 EXPOSED VALVES

- A. Exposed valves shall be installed in a vertical position where possible. Unless otherwise indicated or directed by the E/A, valve stems shall never be below a horizontal position.

3.03 VALVE OPERATION

- A. Open and close each valve observing full operation prior to installing successive lengths of pipe.

END OF SECTION



SECTION 15170

GAUGES

1. GENERAL

1.01 DESCRIPTION

A. Work Specified Herein and Elsewhere

1. Work under this Section includes pressure gauges
2. Related work specified elsewhere:
 - a. Pipe and Fittings - Section 15060

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers

1. Unless otherwise indicated, the products of this Section shall be manufactured by Ashcroft, Marsh, or Wilka.

B. Source Quality Control

1. Prior to shipment, the equipment shall be tested at the manufacturer's plant to demonstrate the suitability and accuracy of the equipment as a part of the complete installation.

1.03 SUBMITTALS

A. Shop Drawings and Product Data

1. Submit shop drawings and product data for the product data for the products of this Section in compliance with Division 1. Submittal shall include the following:
 - a. Manufacturer's recommended procedures for job site storage, handling, and installation.
 - b. A copy of the proposed manufacturer's guarantee and information about the nature and location of parts, service crews, and repair facilities.

B. Operation and Maintenance Manuals

1. Submit operation and maintenance manuals for the equipment in compliance with Section 01000.

C. Special Tools

1. Provide to the Owner one (1) set of special tools, calibration devices, or instruments required for operation, calibration and maintenance of the equipment. It is the intent of this specification to provide only one set of tools required for similar equipment.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Comply with Division 1 and the manufacturer's written instructions.

2. PRODUCTS

2.01 PRESSURE GAUGES

A. General

1. Gauges shall be provided where shown on drawings.

B. Gauges

1. Gauge cases shall be of the open front design constructed of aluminum alloy, stainless steel, or fiberglass reinforced polypropylene. Cases shall be supplied with rubber blow-out discs to relieve excessive case pressure build-up.
2. The pressure sensing device shall be bronze or stainless-steel Bourdon Tube. The movement shall be stainless steel rotary geared type capable of withstanding severe vibration and pulsation.
3. Dials shall be aluminum with black markings on a white background. A baked-on acrylic coating shall be applied over the markings. Dial size shall be 4-1/2-inches. Micrometer pointers shall be capable of adjustment without removal from the shaft. Gauge windows shall be gasketed to protect the internal mechanisms from weather, dust and fumes. Gauges shall be provided with an overload stop to protect against extreme over pressure.
4. Gauge accuracy shall be $\pm 1\%$ of span.
5. A brass lever handle cock shall be provided for each gauge allowing isolation of the gauge and all auxiliary equipment. Whenever wall mounting of the gauge is called for, the connecting pipe shall be 1/2-inch rigid copper tubing or galvanized steel pipe.
6. The gauge shall be able to measure water pressure within the range 0 to 100 psi or as shown on the drawings and shall be filled with mineral oil.

7. Gauges shall be provided with stop valves and pressure pulsation snubbers to protect the gauge from shock damage caused by pressure pulsation, surges, and fluctuations.

3. EXECUTION

3.01 GENERAL

- A. Install gauges where indicated on the drawings or specified. The Contractor shall completely install and test each item.

END OF SECTION

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SECTION 16000

ELECTRICAL - GENERAL

1. GENERAL

1.01 NOTICE

- A. The General Conditions, Special Conditions and all other herein bound documents are part of these specifications and of the Contract. Submission of Proposal implies that the bidder is fully conversant with all requirements of all above mentioned documents.

1.02 SUMMARY

- A. The work in this section consists of furnishing material, accessories, equipment, tools, transportation services, labor and performing all operations required to completely execute the Electrical Work for this project, all as indicated on the drawings, approved shop drawings, and as herein specified, provide all Electrical Work in this section in place complete.
- B. Included in this section is all Electrical Work for power, controls, underground cables, conduits, wiring and appurtenances for installation to limits shown on drawings and herein specified.

1.03 REGULATIONS, STANDARDS AND CODES

- A. All equipment, apparatus, and systems shall be fabricated and installed in complete accordance with the following applicable regulations, standards, and codes:
1. ASTM American Society of Testing Materials
 2. IEEE Institute of Electrical and Electronic Engineers
 3. NBFU National Bureau of Fire Underwriters
 4. NEC National Electric Code
 5. NEMA National Electric Manufacturers Association
 6. UL Underwriters Laboratories, Inc.
 7. IDEM Indiana Department of Environmental Management

8. OSHA Occupational Safety and Health Act
9. State Department of Public Safety
10. Local Utility Company

- B. Reference to Standards shall mean and intend the latest edition adopted, published and revised at the time of invitation to submit proposals.
- C. Give all required notices when inspections are required by State or Local Authorities.

1.04 SYSTEM DESCRIPTION

- A. Project shall encompass three locations. Electric improvements shall be provided for the Project as shown on the drawings and describe in the specifications.

1.05 SUBMITTALS

- A. Follow procedures as outlined in Section 01000.
- B. Shop Drawings: Where required, submit for Engineer's acceptance, three (3) sets of complete shop drawings, including equipment brochures and data sheets, catalog sheets and all other pertinent data covering Electrical Work for this project.
- C. Materials List:
 1. Within 15 days after award of Contract, and before any electrical materials are delivered to the job site, submit to the Engineer a complete list of all materials and equipment proposed to be furnished and installed under this section.
 2. This shall in no way be construed as permitting substitution except as provided by these Specifications.

1.06 CLOSEOUT SUBMITTALS

- A. Follow procedures as outlined in Section 01700.
- B. Record Drawings:
 1. During progress of the work, maintain an accurate record of the installation of the electrical

system, locating each circuit precisely by dimension.

2. Upon completion of the electrical installation, transfer all record data to blue line prints of the original drawings.

1.07 QUALITY ASSURANCE

- A. All work included in this contract shall comply with all Federal and State Laws, rules and regulations. The Contractor shall pay for and furnish to Engineer, all required certificates of inspection and approval as required.
- B. Obtain and pay for all permits required for the execution of the work under this contract, and arrange for all tests and inspections of the work required by the authorities having jurisdiction, and pay for all costs thereof. Deliver certificates of all such permits and inspections to the Engineer.

1.08 FIELD MEASUREMENTS

- A. It shall be the responsibility of the Contractor to examine the drawings and specifications and visit the site and become familiar with the conditions and limitations applying to the Electrical Work. By the act of having submitted a bid, the Contractor will be deemed to have made such an examination and to have made allowance, therefore, in his contract.
- B. The information given herein and on the drawings is as exact as could be secured, but its extreme accuracy is not guaranteed. The Contractor must, therefore, examine the location carefully and verify all measurements, distances, levels, etc., before starting work. If any discrepancies occur between drawings and actual conditions, the Contractor shall notify the Engineer before starting the work.

1.09 COORDINATION

- A. The contractor shall coordinate construction and installation work with other construction trades in order to complete the specified work. If a condition arises that reveals a conflict between necessary construction and installation requirements, the onsite

project representative shall be informed and if possible a field modification may be worked out. Prior to putting the modification into effect, the Engineer shall be informed of the situation so that it may be reviewed and accepted.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Protection: Use all means necessary to protect the work and materials of this Section before, during and after installation and to protect the work and materials of all other trades.
- B. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Engineer shall be sufficient cause for the rejection of the particular piece of apparatus in question.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

2. PRODUCTS

2.01 MATERIALS

- A. The work in this section further consists of furnishing all materials, accessories, equipment, tools, transportation services, labor and performing all operations required to completely execute the Electrical work for this project. The equipment to be furnished shall consist of but not necessarily be limited to the following items. The Contractor will be required to determine for himself the actual quantities and items involved. The General Contractor is ultimately responsible for furnishing and installing a complete and working system, in the opinion of the Engineers, the General Contractor may elect to have the electrical subcontractor furnish and install the following items indicated below and only make connections and/or install the other items indicated.

B. AT EACH LIFT STATION

1. Furnish/Install the following as shown on plans or in Section 13000:

- a. 1 Lot Electrical Service
- b. 1 - Lot Pump Control Panel
- c. 1 - Surge Protection device
- d. 1 - NEMA 4 X Junction Box
- e. 1 - Lot Wire and Conduit
- f. 1 - Level Transducer
- g. 1 - Lot Float Switches
- h. 1 - Flow Meter
- i. 1 - Concrete pad
- j. 1 - Generator & ATS
- k. 1 - Mission 850 dialer

Instructions to the operators as required

2. Provide connections to install the following:

- a. 1 - Lot Pumps
- b. 1 - Pump Control Panel
- c. 1 - Electrical Service
- d. 1 - Generator & ATS
- e. 1 - Sump Pump
- f. 1 - Level Transducer
- g. 1 - Float System
- h. 1 - Flow Meter

3. EXECUTION - Not Used

END OF SECTION

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SECTION 16010

ELECTRICAL - TESTING

PART 1 GENERAL

1.01 SUMMARY

- A. Testing of electrical components and systems:
 - 1. Insulation resistance test.
 - 2. Grounding electrode test.
 - 3. Continuity test.
 - 4. Voltage test.
 - 5. Phase relationship verification.
- B. Test reports.
- C. Correction of defective components or systems.
- D. Retest of correct components, systems.

1.02 RELATED SECTIONS

- A. Specified elsewhere:
 - 1. 01000 - Project Requirements.
 - 2. 01700 - Contract Closeout.
 - 3. 16123 - Building Wire and Cable.
 - 4. 16060 - Grounding.

1.03 SUBMITTALS

- A. Follow procedures as outlined in Section 01000.
- B. Test Reports: Submit 6 typewritten copies of all test reports to the Engineer.
 - 1. Type each test report on 8.5"x 11" paper. Include:
 - a. RHMG Project Number.

- b. Project title and location.
 - c. Test performed.
 - d. Date performed.
 - e. Test equipment used.
 - f. Electrical Contractor's name, address and telephone number.
 - g. Testing firm's name, address and telephone number, if other than Electrical Contractor.
 - h. Name(s) and title(s) of person(s):
 - 1) Performing test.
 - 2) Observing test.
 - i. Statement verifying each test.
 - j. Nameplate data from each motor and equipment item tested.
 - k. Test results.
 - l. Retest results after correction of defective components, systems.
2. For each copy, assemble all test reports and bind them in a folder. Label each folder, "Electrical Test Reports" and include RHMG Project Number, Title and Location.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Furnish all equipment, manpower and labor to perform specified testing.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ensure that all electrical work is complete and ready for testing.

- B. Disconnect all devices or equipment that might be damaged by application of test voltages, voltage of reversed phase sequence or other test procedures.
- C. Test all equipment as previously listed.

3.02 TESTING

- A. Conduct tests and adjust equipment to verify compliance with specified performance.

3.03 INSULATION RESISTANCE TESTS

- A. General: Test equipment furnished by Contractor, equal to "Megger" as manufactured by James Biddle Company, 500-1000 VDC range.
- B. Resistance Measured: Line-to-ground.
- C. Procedure: Disconnect all solid-state equipment before making cable tests.
- D. Cable Tests: Test 600 V conductors used for power, lighting, and control circuits.
- E. Equipment Tests:
 - 1. Motors, 480 VAC: Tested at 1000 VDC range.
 - 2. Motors, 120 VAC: Tested at 500 VDC range.
 - 3. 480 VAC MCC Buses: Tested at 1000 VDC range.
 - 4. 480 VAC Transformers: Tested at 500 VDC range.
 - 5. Minimum insulation for motors shall be calculated using the following formula.
 - a. $2 \times \text{Rated KV} \times 1 \text{ Megohm} + 1 \text{ Megohm}$

3.04 VOLTAGE LEVEL TESTS

- A. Tests: Performed after all equipment is installed and connected.
- B. Points: Test voltage at each end of each circuit and including:
 - 1. Service entrance at main disconnect.

2. Secondary terminals all step down transformers.
 3. Terminals of all motors.
- C. Load Conditions: No-load and full-load, insofar as practical.
- D. Test Report: As specified in 1.03. A.

3.05 CONTINUITY AND PHASE RELATIONSHIP TESTS

- A. Continuity Check: All receptacles and control circuits.
- B. Phase Relationship: All equipment for proper rotation.
- C. Test Report: Written statement of performance of these tests.

3.06 GROUNDING ELECTRODE TEST

- A. Measure and record ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Maximum acceptable resistance: 10 ohms. When resistance exceeds 10 ohms, drive and bond another ground rod, two ground rod lengths away and repeat test.

3.07 FIBER OPTIC CABLE TEST

- A. Tests performed after fusing and connectorization.
- B. Test each fiber for fiber loss.
- C. Test Report: as specified in 1.03A.

3.08 CORRECTION OF DEFECTS

- A. When tests disclose any unsatisfactory workmanship or equipment furnished under this Contract, correct defects and retest. Repeat tests until satisfactory results are obtained.
- B. When any wiring or equipment is damaged by tests, repair or replace such wiring or equipment. Test repaired items to ensure satisfactory operation.

END OF SECTION



SECTION 16060

GROUNDING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rod electrodes.
2. Wire.
3. Mechanical connectors.
4. Exothermic connections.

1.02 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

1.03 SYSTEM DESCRIPTION

A. Grounding systems use the following elements as grounding electrodes:

1. Rod electrode.

1.04 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 25 ohms maximum.

1.05 QUALITY ASSURANCE

- A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

1.06 COORDINATION

- A. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 PRODUCTS

2.01 ROD ELECTRODES

- A. Product Description:
 - 1. Material: Copper-clad steel.
 - 2. Diameter: 3/4 inch.
 - 3. Length: 10 feet.

2.02 WIRE

- A. Material: Stranded copper.
- B. Grounding Electrode Conductor: Copper conductor. Minimum 4/0 or as shown on the drawings.
- C. Bonding Conductor: Copper conductor. Size in accordance with NEC, Article 250-95.

2.03 CONNECTORS

- A. Mechanical Connection: Use UL approved ground clamps.
- B. Exothermic Connections.
 - 1. Manufacturers:
 - a. Cadweld.
 - b. Thermoweld.
 - 2. Use molds and cartridges in accordance with equipment manufacturer's recommendations for size of cable and rods installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify final backfill and compaction has been completed before driving rod electrodes.

3.02 PREPARATION

- A. Remove surface contaminants at connection points.

3.03 INSTALLATION

- A. Install in accordance with IEEE 142. Install rod electrodes at locations as indicated on Drawings.
- B. Install grounding and bonding conductors concealed from view.

3.04 FIELD QUALITY CONTROL

- A. Ground Rod Earth Resistance:

- 1. Either fall of potential or clamp on method acceptable. Use AEMC 4500 or 3731 respectively. Unit calibration shall be tested prior to test.
- 2. Equipment: Furnished by Contractor.
- 3. If the resistance measurement is greater than 25 ohms, then a second ground rod shall be installed.

- B. Test Report:

- 1. Typewritten, listing equipment used, person performing tests, date tested, circuit or equipment tested, and test results.
- 2. Quantity: Submit three bound sets of test report.

END OF SECTION

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SECTION 16110

UNDERGROUND DUCTBANKS, MANHOLES AND HANDHOLES

PART 1 GENERAL

1.01 RELATED WORK

- A. Section 02223 - Structural Excavation & Backfill.
- B. Section 03010 - Concrete.
- C. Section 16060 - Grounding.

1.02 QUALITY ASSURANCE

- A. All materials, sizes, and capacities shall conform to the requirements of the National Electrical Safety Code, the National Electrical Code, and prevailing state and local codes.
- B. All materials shall be UL labeled.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code (NEC).
- B. ANSI C2 - National Electrical Safety Code.
- C. ANSI/SCTE 77-2013 - Underground Enclosures.

1.04 SUBMITTALS

- A. Make submittals as specified in Section 01000.
- B. Materials to be Submitted:
 - 1. Manufacturer's standard published catalog sheets and descriptive bulletins.
 - 2. Manufacturer's standard published installation instructions for conduits, fittings, and supports.
 - 3. Dimensional layouts and physical construction drawings for all manholes and handholes.

- C. Markings: Manhole and handhole submittals shall be marked with the equipment tag as shown on the drawings.

PART 2 PRODUCTS

2.01 ELECTRICAL POWER DISTRIBUTION SYSTEM

- A. Conduits: Type EB polyvinyl chloride (PVC) including fittings, long sweep radius bends, and end bells. Provide conduit adapters to connect PVC conduit to rigid steel conduit where conduits penetrate building walls or as shown on the drawings. Provide end bells on conduits entering manholes and handholes. Service entrance conduits and conduits below roadways shall be Schedule 40 PVC.
- B. Supports: Plastic spacers to provide 2 inch separation minimum, placed 8 feet on center maximum. Provide base and intermediate units in accordance with conduit manufacturer's recommendations to effect ductbank configurations as shown on the drawings.
- C. Seals: Install seals at all spare conduit end bells within manholes and handholes. All conduit joints and fittings shall be chemically bonded using manufacturer's approved joint cement. Joints at couplings shall be made watertight with an approved compound and tape.
- D. Encasement:
 - 1. General: As shown on the drawings. Reinforcement and minimum encasement dimensions as shown on the drawings.
 - 2. Concrete: See Section 03300 - Concrete. Pre-mixed concrete shall be used. Troweled-on or painted-on finishes shall not be allowed.
 - 3. Reinforcement and Grounding: As shown on the drawings and as specified in Section 16060 - Grounding.
 - 4. To prevent floating, ductbanks shall be tied down before pouring concrete using galvanized steel anchors and wire.

5. Concrete shall not be poured until the ductbank and trenching have been approved by the Engineer.
6. Mechanical vibrators shall not be used for construction of ductbanks.
7. Each section of ductbank shall be poured complete in one operation. If such construction is not feasible, construction joints will be permitted, subject to the approval of the Engineer.

E. Manholes:

1. General: Provide reinforced cast-in-place concrete manholes as shown on the drawings. Provide water stops at all construction joints.
2. Pulling Irons: Opposite each duct entrance and beneath manhole cover, as shown on drawings. Pulling irons shall be 7/8-inch diameter x 9 inches long.
3. Stubs: Provide stubs for future duct extensions as shown on the drawings. Cap ends of stubs.
4. Covers: As specified in Section 02601 - Manholes, Valve Vaults & Appurtenances.
5. Grounding: In accordance with Section 16060 - Grounding, and as shown on the drawings.
6. Manholes shall have solid bottoms without drains.

F. Handholes:

1. General: Provide reinforced pre-cast polymer handholes as shown on the drawings.
2. Handholes shall be Quazite Pre-cast Polymer Concrete enclosures or equal. They shall be a minimum of 24" x 36" x 36". They shall be Tier 8 rated.
3. Grounding: In accordance with Section 16060 - Grounding, and as shown on the drawings.
4. Handholes shall be placed on 6" clean stone.

2.02 INSTRUMENTATION AND COMMUNICATIONS SYSTEM

- A. Conduits: Type EB PVC conduits, fittings, and end bells. Provide conduit adapters to connect PVC conduit to rigid galvanized steel conduits where ductbank passes through building walls or where shown on the drawings. Provide end bells on conduits entering handholes.
- B. Support: Plastic spacers, as specified in Section 2.01.B.
- C. Seals: As specified in Section 2.01.C.
- D. Encasement: As specified in Section 2.01.D.
- E. Handholes: As shown on the drawings.

PART 3 EXECUTION

3.01 TRENCHING, BACKFILLING, AND COMPACTING

- A. Follow requirements in Section 02223.
- B. Slope trenches uniformly between terminations to provide good ductbanks drainage; no pockets shall be permitted in ductruns. Slope trenches so as to drain ductruns away from building entrances toward manhole or handhole.

3.02 TESTING

- A. After construction of ductbank is complete, the Contractor shall pull mandrel through each duct. Mandrel shall be 1/4-inch smaller than inside diameter of duct. If obstructions are encountered or if evidence of water pockets in ducts is found, remove and reconstruct section of ductbank affected.

END OF SECTION



SECTION 16123

BUILDING WIRE AND CABLE (600 V CLASS)

PART 1 GENERAL

1.01 RELATED WORK

1.02 QUALITY ASSURANCE

- A. All materials, sizes, and capacities shall conform to the requirements of the National Electric Code and prevailing state and local codes.
- B. All materials shall be UL labeled.

1.03 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code (NEC).

1.04 SUBMITTALS

- A. Make submittals as specified in Section 01000.
- B. Materials to be submitted:
 1. Manufacturer's standard published catalog sheets and descriptive bulletins for each type used.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. Single Conductor Assembly:
 1. Conductor Material: Soft drawn annealed copper. Wire sizes No. 8 AWG and larger shall be stranded. Wire sizes smaller than No. 10 AWG shall be solid conductor, except for control conductors, which shall be stranded.
 2. Insulation: 600 V class minimum, color-coded in accordance with NEC and an established color-coding scheme throughout the project, marked to give grade of insulation, size, and manufacturer's name.

- a. Type: PVC thermoplastic insulation Type THWN-2, as manufactured by Anaconda, Okonite, or equivalent.

B. Multiple Conductor Cable Assemblies:

1. Conductor Material: Soft drawn annealed copper. Maximum conductor size shall be No. 8 AWG, stranded.
2. Insulation and Jackets: 20 mils polyethylene plus 10 mils PVC thermoplastic on each conductor, filler, binder tape, overall PVC thermoplastic jacket. Number of conductors as shown on the drawings.
3. Manufacturers: Okonite P-30, Anaconda Type 20-10, or equivalent.

C. Terminations:

1. Conductors No. 10 AWG or Smaller: Binding head screw terminals or solderless compression type insulated connectors.
2. 600 V Cables No. 8 AWG and Larger: Solderless pressure type lugs with set screw and taped insulation.

D. Splices:

1. Instrument and Control Wiring: Not permitted unless approved by the Engineer.
2. Conductors No. 10 AWG and Smaller: Pre-insulated twist type with spring insert as manufactured by Ideal Industries "Wingnut", ITT-Holub Industries "Hi-Grip", or equal.
3. Conductors No. 8 AWG and Larger: Solderless compression type with set screw and taped insulation.

E. Taped Insulation:

1. Install as specified for splices and terminations above.

2. Use filler compound at sharp or irregular edges to provide smooth surface before taping.
 3. Construction: 3/4-inch wide electrical tape, half-lapped, minimum two layers. Cover with 3/4-inch wide PVC electrical tape, half-lapped, minimum one layer.
- F. M.I. Cable:
1. Copper conductor, size and number as shown on the drawings.
 2. Install in accordance with the manufacturer's instructions with manufacturer's field assistance.
 3. Manufacturer: BICC Cables.
- G. Tray Cable:
1. Application: Power and Control cables.
 2. Conductor Material: Soft drawn annealed copper. Conductors #8 or smaller shall be stranded.
 3. Insulation and Jackets: Listed by UL as type TC. XHHW insulation with a thermoplastic PVC overall jacket. Number of conductors as shown on drawings. Suitable for installation in plenum areas.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All wires and cables shall be delivered in full coils or reels and shall be properly tagged and protected against injury. Provide covered storage space at the job site to protect the wire and cable from moisture and heat prior to installation.
- B. All raceways shall be cleaned and free of dirt and debris prior to installation of wire and cable.
- C. Use proper pulling rigs and reel assemblies to minimize pulling tensions and damage to insulation. Use pulling grips on all power cable.

- D. Lubrication: Powered soapstone or commercial wire lubricant. Soapsuds solutions shall not be used.
- E. All control conductors shall be identified at each end with wire numbers as shown on the instrument schematics and control diagrams using PVC wire marking sleeves as manufactured by Brady, Electrovert or equal.

3.02 FIELD TESTING AND ADJUSTMENT

- A. Test Reports: Six copies, typewritten, listing equipment used, persons performing tests, date of testing, equipment or circuit tested, and test results. All copies bound.
- B. Insulation Resistance Tests:
 - 1. General: Test equipment furnished by Contractor, equal to "Megger" as manufactured by James Biddle Company, 500-1000 VDC range.
 - 2. Resistance Measured: Line-to-ground.
 - 3. Procedure: Disconnect all solid-state equipment before making cable tests.
 - 4. Cable Tests: Test 600 V conductors used for power, lighting, and control circuits.
 - 5. Equipment Tests:
 - a. Motors, 480 VAC: Minimum 1 megohm, tested at 1000 VDC range.
 - b. Motors, 120 VAC: Minimum 1 megohm, tested at 500 VDC range.
 - c. 480 VAC MCC Buses: Minimum 1 megohm, tested at 1000 VDC range.
 - d. 480 VAC Transformers: Minimum 1 megohm, tested at 500 VDC range.
 - 6. Voltage Level Tests:
 - a. Tests: Performed after all equipment is installed and connected.

- b. Points: Test voltage at each end of each circuit.
 - c. Load Conditions: No-load and full-load, insofar as practical.
 - d. Test Report: As specified in 3.02.A.
7. Continuity and Phase Relationship Tests:
- a. Continuity Check: All receptacles and control circuits.
 - b. Phase Relationship: All equipment for proper rotation.
 - c. Test Report: Written statement of performance of these tests.
8. Correction of Defects:
- a. Repair or replacement of all equipment that fails to meet testing requirements and retest.

END OF SECTION

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SECTION 16124

INSTRUMENTATION CABLE

PART 1 GENERAL

1.01 SCOPE

- A. Furnish and install conductors and cable assemblies and field terminations for the instrumentation and process system as shown on the drawings and as specified.
- B. All materials shall be UL labeled.

1.02 REFERENCE STANDARDS

- A. NEC - Article 725.

1.03 SUBMITTALS

- A. Make submittals as specified in Section 01000.
- B. Materials to be submitted:
 - 1. Manufacturer's standard published catalog sheets and descriptive bulletins.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. General:
 - 1. Instrument cable shall be individual or multiple pair cable appropriate to the system used, and in accordance with the equipment manufacturer's recommendations.
 - 2. All instrument cables shall be color coded throughout the project. Cable manufacturer's standard color grouping may be used.
 - 3. Each cable and the individual conductors shall be identified with wire numbers as shown on the instrument schematics and control diagrams using

PVC wire marking sleeves as manufactured by Brady, Electrovert or equal.

B. Instrument Cable:

1. Construction: Two-conductor No. 18 AWG stranded copper, PVC insulation, aluminum-polyester, aluminum mylar taped shield, or braided copper shield and tinned copper drain wire, PVC overall jacket, 300 V working class. Belden Model 9318 or equivalent.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Cables shall be delivered in full reels or boxes and shall be properly tagged and protected against injury.
- B. Use proper pulling rigs and reel assemblies to minimize pulling tensions and damage to insulation.
- C. Lubrication: Commercial wire lubricants only. Soapsuds solutions shall not be used.

3.02 TERMINATIONS

- A. Depending on equipment supplied, use insulated crimped terminals for conductors and shield drains on screw type terminals and stripped conductor ends on box type terminals. All conductors shall be terminated in strict accordance with the equipment manufacturer's recommendations.
- B. Shields shall not be connected to analog instrument transmitters in the field. Shield shall be grounded at the receiver or analog controller within the building control panel.
- C. All instrument cable installations shall be continuous runs without any intermediate junction points.

END OF SECTION



SECTION 16128

RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SCOPE

- A. Furnish and install all conduits, cable troughs, wireway and miscellaneous materials required to provide the complete raceway systems as shown on the drawings and as specified.

1.02 RELATED WORK

- A. Section 16129 - Boxes for Electrical Systems.

1.03 QUALITY ASSURANCE

- A. All materials, equipment sizes, and capacities shall conform to the requirements of the National Electric Code, the National Electrical Manufacturers Association, prevailing state and local electric codes, and to applicable regulations of the local electrical utility. All materials and equipment must be UL labeled.

1.04 REFERENCE STANDARDS

- A. NFPA 70 - National Electric Code (NEC).
- B. Materials to be submitted:
 1. Manufacturer's standard published catalog sheets and descriptive bulletins.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. Rigid Metallic Conduit (RMC):
 1. General: Standard trade sizes, ¾-inch minimum or as shown on the drawings.

2. Material: Heavy rigid threaded type, mild steel hot dipped galvanized, inside surface enamel coated or lacquered.
3. Field Cutting and Threading: Use appropriate power saws or threading machines and cutting lubricants. Cut ends and threads shall have burrs removed and shall be painted with zinc chromate protective coating.
4. Fittings: Galvanized, standard threaded, as manufactured by OZ Gedney, Appleton, or equivalent.
5. Expansion Fittings: Install wherever conduit crosses a building or construction expansion joint. Fittings shall be OZ type EX with Bonding Jumper BJ, Appleton XJB, or equivalent.
6. Uses: All exposed and embedded conduits.

B. Electrical Metallic Tubing (EMT):

1. General: Standard trade sizes, 3/4-inch minimum except as noted.
2. Material: Steel, zinc coated exterior, interior surface enamel coated.
3. Field Cutting and Bending: Use appropriate hand tools, remove burrs. Bends shall not reduce the effective cross-sectional area.
4. Fittings: Compression type with plastic inserts.
5. Uses: For lighting or receptacle circuits in dry areas only.

C. Flexible Liquid Tight Conduit (OT):

1. General: Standard trade sizes, 3/4-inch minimum, bearing UL label.
2. Material: Steel, galvanized, with liquid tight polyvinyl chloride cover, with continuous copper ground built into assembly.

3. Fittings: Compression type with plastic insert designed for liquidtight conduit.
 4. Uses: As defined by NEC Article 351, between motors or other vibration producing equipment and rigid conduit or junction box.
- D. Plastic Conduit: (PVC):
1. Material: Smoothwall polyvinyl chloride conduit and fittings in accordance with ASTM FS12.
 2. Joints: By solvent cement (weld) process.
 3. Uses: Encased in concrete, type EB and direct burial type DB.
- E. Liquidtight Flexible Metal Conduit: (LFMC):
1. General: Standard trade sizes, ¾-inch minimum, bearing UL label.
 2. Material: Circular cross section having an outer liquidtight, non-metallic, sunlight-resistant jacket over an inner flexible metal core.
 3. Fittings: Compression type with plastic insert designed for liquidtight conduit.
 4. Uses: As defined by NEC Article 351, between motors or other vibration producing equipment and rigid conduit or junction box.

PART 3 EXECUTION

3.01 CONDUIT INSTALLATION

- A. General: Install in accordance with requirements of NEC and recognized standards of good practice.
- B. Location: As shown on the drawings. Actual routing to be field verified and coordinated with other work prior to installation.
- C. Sleeves: Set sleeves in concrete during construction, before concrete pour begins. Sleeves shall be galvanized sheet pipe, securely fastened in position.

Sleeves through exterior walls shall be filled with oakum after conduit installation, and then sealed with poly-sulfide sealant to form a watertight seal.

- D. Embedded Conduit: Set before concrete pour begins. Use long radius bends. Conduits in structural slabs shall have minimum 2-inch cover.
- E. Bends: Not more than equivalent of three 90-degree bends between pulling points.
- F. Supports: Provide at each elbow and at end of run terminating in box or cabinet. Fasteners spaced maximum of 7 feet horizontal, 8 feet vertical.
- G. Conduit clamps shall be malleable iron one-hole straps, beam clamps, or approved device with necessary bolts and expansion shields.
- H. Trapeze hangers may be used for parallel runs of conduit, except where installation would impede overhead crane and hoist travel. Install two-hole clamps at each end of each run, and pipe clamps every intermediate hanger for each conduit. Hangers are not detailed on the drawings, but are to be fabricated from 0.055 inch thick steel channel, Unistrut P-2000, Kindorf B-900, or equal, all-thread rod and fasteners, and must be adequate to support combined weight of conduit, conductors, and hangers.
- I. Conduit Ends:
 - 1. Cap spare conduits, label as spare.
 - 2. Cap ends during construction to prevent entrance of foreign materials.
 - 3. Terminate conduits at panels, equipment and boxes with double locknuts and insulating bushings.
 - 4. Stub ups shall extend 6 inches minimum above curb or floor line. Conduit terminations in trench walls shall be flush. Terminate with insulating bushing or appropriate fitting.

END OF SECTION



SECTION 16129

BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SCOPE

- A. Furnish and install all electrical pull boxes, junction boxes, and outlet boxes as required and as shown on the drawings, and as specified.

1.02 RELATED WORK

- A. Section 16140 - Wiring Devices.

1.03 QUALITY ASSURANCE

- A. All materials, sizes, and capacities shall conform to the requirements of the National Electrical Code, the National Electrical Manufacturers Association, and prevailing state and local electrical codes.
- B. Where possible, the materials must bear UL label.

1.04 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code (NEC).
- B. UL 50 - Electrical Cabinets and Boxes.
- C. UL 514 - Electrical Outlet Boxes and Fittings.

1.05 SUBMITTALS

- A. Make submittals as specified in Section 01000.
- B. Material to be submitted:
 - 1. Fabricated Boxes: Dimensional outline and physical arrangement drawings, listing openings, materials of construction and fasteners.
 - 2. Junction and Outlet Boxes: Manufacturer's standard published catalog sheets and descriptive bulletins.

C. Markings:

1. Fabricated Boxes: Submittals shall be marked with equipment numbers and plant area location as shown on the drawings.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Fabricated Pull and Junction Boxes:

1. Materials: Code gage galvanized sheet steel, welded seams, hot dipped after fabrication. Covers shall be secured with stainless steel threaded screws. All boxes shall have gasketed covers.
2. Drainage: Pull boxes installed at building walls to terminated underground conduit entrances shall have a minimum $\frac{3}{4}$ -inch galvanized pipe drain installed in the bottom of the box, extending to the floor or nearest drain.
3. Support: Independent of conduits, by means of bolts and self-drilling concrete expansion anchors as required to support weight of box and conductors.

B. Junction and Outlet Boxes:

1. Materials: Galvanized steel or cast aluminum in accordance with UL 50 for junction boxes, UL 514 for outlet boxes. Covers attached with round head machine screws.
2. Size: Cubic volume in accordance with requirements of NEC.
3. Outlet Boxes: Standard patterns suitable for specific requirements of each outlet.
4. Flush mounted wall outlet boxes shall not be less than 4-inch square box with suitable raised cover.

5. Exposed surface mounted outlet boxes shall be Type FD Series as manufactured by Appleton, Crouse-Hinds, or equivalent.
6. Where more than two devices are indicated at a single location and at the same elevation, multiple gang outlet boxes shall be installed.
7. Outlet boxes installed outdoors or exposed to moisture shall be cast aluminum or malleable iron with threaded openings and neoprene gasketed covers.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Where additional pull boxes are required by code or to facilitate installation beyond those shown on the drawings, such shall be furnished and installed at locations approved by the Engineer, at no additional cost.
- B. All boxes shall be set plumb and square, and securely fastened in place.
- C. Coordinate locations of pull and junction boxes with work of other trades prior to installation to assure adequate working clearances and accessibility after final installation is completed.
- D. After conductors and devices are installed, install and tighten covers, gaskets, and fastening screws as required.

END OF SECTION

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SECTION 16140

WIRING DEVICES

PART 1 GENERAL

1.01 RELATED WORK

- A. Section 16060 - Grounding.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electric Code (NEC).

1.03 SUBMITTALS

- A. Make submittals as specified in Section 01000.
- B. Materials to be submitted:
 - 1. Manufacturer's standard published catalog sheets and descriptive bulletins.
 - 2. Physical dimensions, mounting details for surface mounted devices.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. General: Furnish as scheduled or shown on the drawings.
- B. Toggle Switch:
 - 1. Rating: 125 VAC, 20A, commercial grade.
 - 2. Color: Ivory.
 - 3. Plate: Brushed aluminum indoors, NEMA 4 outdoors and in wet locations.
 - 4. Mounting Height: 4.5 feet above finished floor.
 - 5. Number of Poles: As shown on the drawings.
 - 6. Manufacturer: General Electric, Leviton, Hubbell, Russell & Stohl or equivalent.

C. Receptacles:

1. Rating: 125 VAC, 20 A, specification grade except as noted.
2. Configuration: NEMA 5-15R, parallel blade, grounding, except as noted on drawings.
3. Color: Ivory.
4. Plate: Duplex, ivory indoors, gasketed aluminum with dual spring covers indoors in damp locations, and weatherproof while in use in wet locations.
5. Connect wiring device grounds in accordance with NEC, Article 250.
6. Manufacturer: General Electric, Leviton, Hubbell, Russell & Stohl or equivalent.
7. Mounting Height: 1.5 feet above finished floor, 48" above finished floor in areas below grade, or as shown on the drawings.

D. Ground Fault Receptacles:

1. Location: Exterior receptacles, receptacles in pump station levels below grade, all wet areas, above metal floors or grating, or as shown on the drawings.
2. Type: Differential ground fault, 120 VAC, NEMA 5-15R, with integral test and reset functions.
3. Sensitivity: 5 ma.
4. Manufacturer: General Electric, Leviton, Hubbell, or equivalent.

E. Special Purpose Outlets:

1. Size and configuration as shown on the drawings.
2. Rating: 250 VAC class, current capacity as shown on the drawings.
3. Manufacturer: General Electric, Leviton, Hubbell, Russell & Stohl or equivalent.

PART 3 EXECUTION

3.01 INSTALLATION

A. Wall Switches:

1. Not more than one switch shall be installed in a single gang position.
2. Switch outlets shall be adjacent to lock side door as applicable.
3. Multiple switches shall be installed with a single wall plate.
4. Recess in drywall areas. Surface mounted in Plant processing areas unless otherwise noted.

B. Receptacles:

1. Recess in drywall areas. Surface mounted in Plant processing areas, unless otherwise noted.
2. Install separate grounding conductor from lighting panelboard to receptacle outlets in conduit with branch circuit conductors.
3. Bond receptacle grounding screw to outlet box, if receptacle is not self-bonding type.

C. Mounting and Location:

1. Approximately as shown on the drawings.
2. Verify exact location by checking drawings and equipment layout shop drawings.

END OF SECTION

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SECTION 16236

STATIONARY STANDBY ENGINE GENERATOR SET

PART 1 GENERAL

1.01 SCOPE

- A. Furnish and/or install a complete engine/generator system as shown on the plans and specified herein. System is to consist of an engine, generator and automatic transfer switch.

1.02 QUALITY ASSURANCE

- A. All materials, equipment sizes, and capacities shall conform to the requirements of the NEC, the National Electric Manufacturers Association, and to applicable regulations of the local electrical utility.
- B. All materials and equipment must be UL labeled.

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with specifications.
- B. Submit full technical data, service and parts facilities complete with manufacturer's published data.
- C. Submit engine data with shop drawings. This must include exhaust emissions data sheets.
 - 1. Submit manufacturer's installation instructions.
- D. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data.
- E. Submit test readings made after installation.

PART 2 CONSTRUCTION

2.01 MATERIALS, SPECIFICATIONS AND COMPONENTS

- A. The generating set shall be rated for standby service with a minimum rating of 125 KW, 3Phase, 4-Wire, 480/277 Volts at 60 Hertz and shall BE CAPABLE OF SINGLE STEP

LOAD PICKUP OF 100% nameplate kW and power factor with a maximum voltage dip of 20% as measured on an oscilloscope. (Supplier shall be responsible for sizing unit above minimum requirement based upon performance requirements). Generator set final running load shall not be less than 30% of rated load. Generating set shall have a MINIMUM capability of 50 SkW and 75 SkVA, at a MAXIMUM voltage dip of 20% and MAXIMUM frequency dip of 10%.

- B. The standby generator shall be guaranteed to start and run the following loads in the following steps. A generator sizing report shall be submitted to verify sizing.

At Lift Station B

1. Step #1:
 - a. Three Phase:
 - 1) (1) - 40 HP, VFD Start
 - b. Single Phase:
 - 1) (Lot) - 5kW Lighting/Receptacle
2. Step #2:
 - a. Three Phase:
 - 1) (1) - 40 HP, VFD Start

At Lift Station C

1. Step #1:
 - a. Three Phase:
 - 1) (1) - 60 HP, VFD Start
 - b. Single Phase:
 - 1) (Lot) - 5kW Lighting/Receptacle
3. Step #2:
 - a. Three Phase:

- 1) (1) - 60 HP, VFD Start

At Lift Station D

1. Step #1:
 - a. Three Phase:
 - 1) (1) - 50 HP, VFD Start
 - b. Single Phase:
 - 1) (Lot) - 5kW Lighting/Receptacle
2. Step #2:
 - a. Three Phase:
 - 1) (1) - 50 HP, VFD Start

C. The systems shall be a package of new and current equipment consisting of:

1. A natural gas engine driven electric generating set to provide standby power.
2. An engine start-stop control system mounted on the generating set.
3. A bottom mounted double walled fuel tank.
4. An automatic transfer switch to provide automatic starting and stopping of the engine and switching of the load.
5. Mounted accessories as specified.

D. Engine

1. The engine shall be natural gas fueled, 4-cycle, water cooled with mounted radiator, fan and water pump. Intake and exhaust valves shall be heat resisting alloy steel, free rotating. Exhaust valve seat inserts shall be provided. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have coolant and oil filters with replaceable elements and lube oil cooler. Engine speed shall

be governed by an electronic governor to maintain alternator frequency within 5 percent from no-load to full-load alternator output. The engine shall have a 24 (or 12)-volt battery charging DC alternator with a solid state voltage regulator. Remote 2-wire starting shall be by a solenoid shift, electric starter.

2. The engine will meet the applicable EPA NSPS rule for stationary reciprocating compression ignition engines. Additionally, the engine shall comply with the State Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with applicable EPA emissions standards per ISO 8178 - D2 Emissions Cycle at specified kW / BHP rating. Utilization of the "Transition Program for Equipment Manufacturers" (also known as "Flex Credits") to achieve EPA certification is not acceptable. Exhaust emissions data sheet and Certificate of Compliance must be submitted with shop drawing submittals. At a minimum, the following information should be shown on these sheets:
 - a. Emission rates of HC, NO_x, CO and PM.
 - b. Exhaust gas flow rate (ACFM) and temperature.
 - c. Fuel consumption rate (ft³/hr).
 - d. Engine power rating (BHP) at test intervals.
3. The generating set shall contain a complete engine start/stop control, which starts engine on closing contact and stops engine on opening contact. A cranking limiter shall be provided to open the starting circuit in approximately 45 to 90 seconds if the engine is not started within that time. Engine control modules must be solid state plug-in type for high reliability and easy service. The engine controls shall also include a 3-position selector switch with the following positions: RUN/STOP/REMOTE. High engine temperature, low oil pressure and overspeed shutdown with individual signal lights and alarm terminals to be provided.

4. The engine shall have the following additional equipment:
 - a. Thermostat controlled Single phase, 120 VAC water jacket heater (sized by manufacturer).

E. Alternator

1. The alternator shall be a brushless, 4pole revolving field type with PMG exciter and solid-state voltage regulator. The stator shall be directly connected to the engine flywheel housing, and the rotor shall be driven through a semiflexible driving flange to insure permanent alignment. The three phase, broad range alternator shall withstand a high potential test of 1500 volts, 60 hertz, to ground for one minute per NEMA MG1.22.51. Complete thermal evaluation of all electric parts must include actual measurement by thermocouples to all internal generator and exciter hot spot temperatures. No position measured any place in the windings may exceed the temperature rise limits of NEMA for the particular type of insulation system used. These tests must be performed on a representative generator and prime mover combination.
2. Frequency regulation shall not exceed 3 hertz from no load to rated load. Voltage regulation shall be within plus or minus 2 percent of rated voltage, from no load to full load. The maximum sustained RMS voltage dip shall be less than 10 percent of rated voltage when full 3phase load and rated power factor is applied to the alternator, as measured by the optical recorder method line to line. Recovery to stable operation shall occur within 1 second. Stable or steady operation is defined as operation with terminal voltage remaining constant within plus or minus 1 percent of rated voltage. The maximum voltage dip as measured by an oscilloscope shall be 20% when starting the listed loads or a load equal to 1.5 x the rated KVA at 0.8 powerfactor, whichever is greater. The digital genset controller shall provide a minimum of plus or minus 5 percent voltage adjustment from rated value. The rating of the prime mover shall be such that any overloads that occur during motor

starting, even though they may exceed the steadystate capability of the prime mover, shall not cause stalling.

3. Vibration isolators shall be provided for installation beneath electric plant skid and mounting surface and shall be properly anchored to mounting surface.
 4. An anti-condensation heater shall be provided in the alternator.
- F. Controls - Generator Set Mounted: 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. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.
1. Functional Requirements - The following functionality shall be integral to the control panel:
 - a. LCD display with text based alarm/event descriptions.
 - b. Audible horn for alarm and shutdown with horn silence switch.
 - c. Standard ISO labeling.
 - d. Remote start/stop control.
 - e. Local run/off/auto control integral to system microprocessor.
 - f. Cool down timer.
 - g. Speed adjust.
 - h. Lamp test.
 - i. Push button emergency stop button.

- j. Voltage adjust.
 - k. Voltage regulator V/Hz slope - adjustable.
2. Digital Inputs and Outputs - The Generator set controller shall have the following input/output contact points.
- a. Remote Emergency Stop Input.
 - b. Engine "Ready to Load" status output.
 - c. Common warning alarm output.
 - d. Common shutdown alarm output.
 - e. "Not in auto" output.
3. Digital Monitoring Capabilities - The controls shall provide the following digital readouts for the engine and generator. All readings shall be indicated in either metric or English units.
- a. Engine
 - 1) Engine oil pressure.
 - 2) Engine oil temperature.
 - 3) Engine coolant temperature.
 - 4) Engine RPM.
 - 5) Battery volts.
 - 6) Number of hours of operation.
 - 7) Number of start attempts.
 - 8) Fuel consumption rate (ft^3/hr) or totalized fuel consumption (ft^3).
 - b. Generator
 - 1) Generator AC volts (Line to Line, Line to Neutral and Avg).
 - 2) Generator AC current (Avg and Per Phase).

- 3) Generator AC Frequency.
 - 4) Generator kW (Total and Per Phase).
 - 5) Generator kVA (Total and Per Phase).
 - 6) Generator kVAR (Total and Per Phase).
 - 7) Power Factor (Avg and Per Phase).
 - 8) Total kW-hr.
 - 9) Total kVAR-hr.
 - 10) % of maximum kW.
 - 11) % of maximum kVA.
 - 12) % of maximum kVAR.
4. Protective Functions - The control shall monitor and provide alarm indication and subsequent shutdown for the following conditions. All alarms and shutdowns shall be accompanied by a time, date, and engine hour stamp that are stored by the control panel.
- a. Engine
 - 1) Low oil pressure alarm/shutdown.
 - 2) High coolant temperature alarm/shutdown.
 - 3) Loss of coolant shutdown.
 - 4) Overspeed shutdown.
 - 5) Overcrank shutdown.
 - 6) Low coolant level alarm.
 - 7) Low fuel pressure alarm.
 - 8) Emergency stop depressed shutdown.
 - 9) Low coolant temperature alarm.
 - 10) Low battery voltage alarm.

- 11) High battery voltage alarm.
- 12) Control switch not in auto position alarm.

b. Generator

- 1) Over Voltage.
- 2) Under Voltage.
- 3) Over Frequency.
- 4) Under Frequency.
- 5) Overcurrent and Short Circuit.
- 6) Single and Three Phase Fault Regulation (min. 300% rated current for no more than 10 seconds).

G. Fuel System

1. The entire fuel system for each engine-generator set shall conform to the requirements of NFPA 30 and NFPA 37 and contain the following elements.
2. A Natural Gas service shall be provided and sized for the generator requirements. The gas service shall meet all local codes

H. Housing: Weather protective housing over unit shall be provided with hinged access doors. The enclosure shall reduce sound levels while running at full load below 50 dBA measured at 7 meters from the engine under free field conditions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. Doors shall be on each side and on the generator end. (Depending upon the housing design, removable access panels on the sides may be acceptable). The unit shall have complete weather protection when providing standby power or when connected in standby mode.

I. Generator Set Main Circuit Breaker: Set mounted and wired, UL listed, 100% rated, molded case type with an

electronic trip unit, 3 pole, 600 volts. Breaker should be sized to allow full load capability of the genset. Submittals shall demonstrate that the circuit breaker provides proper protection for the alternator by a comparison of the trip characteristics of the breaker with the thermal damage characteristic of the alternator. Field circuit breakers shall not be acceptable for generator overcurrent protection.

- J. Starting Batteries: Starting batteries shall consist of at least one (1) 225 ampere hour 12 volt heavy duty lead acid batteries. The batteries shall be supplied with a battery rack and cables, which shall be installed inside the generator enclosure.
- K. Battery Charger: The batteries shall be furnished with minimum 12 amp battery charger installed in the enclosure. 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 charger shall have an adjustable float setting that shall be current limiting, and include an ammeter. Charger to operate on 120VAC, single phase.
- L. Automatic Transfer Switch
 - 1. General: The automatic transfer switch shall be furnished by the manufacturer of the emergency AC power generator so as to maintain system compatibility and local service responsibility for the complete emergency power system. The manufacturer shall furnish schematic and wiring diagrams for the particular automatic transfer switch and a typical interconnection wiring diagram for the entire standby system.
 - 2. Type: The transfer switch shall be 225 amp, 3 pole, solid neutral type transfer switch, for operation on a 480/277 Delta system.
 - 3. Rating and Performance: The automatic transfer switch shall be rated at 225 amps for continuous operation in ambient temperatures of 25 F (32 C) to +125 F (51.5 C). The transfer switch shall be rated

for all classes of load, both inductive and noninductive, at 480 volts. The automatic transfer switch shall be designed, built, and tested to close on an inrush current up to and including 20 times the continuous rating of the switch without welding or excessive burning of the contacts. The transfer switch shall be capable of switching loads up to and including its interrupting current capacity and capable of enduring 6000 cycles of operation, at rated current, at a rate of 6 cycles per minute, without failure. One cycle shall consist of one complete opening and closing of both sets of contacts on an inrush current ten times the continuous rating of the switch.

4. Construction

- a. The automatic transfer switch shall have main contacts of high-pressure design providing continuous operation, long life and resistance to burning, pitting and welding. The contact mechanism shall be of vertical construction and shall operate on a single shaft. The stationary contacts shall be of silver cadmium oxide while the movable contacts shall be of tungsten alloy. The transfer mechanism shall be mechanically held on both sides. An interlocking steel beam shall positively prevent contact closure in both positions so that both sources cannot supply the load simultaneously. The transfer switch shall have individual fully enclosed arc chutes to provide rapid arc quenching by the deion principle without cross arcing. A sturdy transparent safety enclosure shall surround areas of arcing and mechanical hazard. It shall have terminal lugs for either copper or aluminum conductors along with a neutral bar and a ground bar. Manual operators shall be provided and be capable of being switched manually while under load. The transfer switch shall have 4 N.C. & 4 N.O. auxiliary contacts rated 6 amp, 120 volt AC; 3 amp, 240 volt AC.
- b. Control accessory panel to avoid shock hazard while adjusting control functions but will

swing out, exposing the wiring to facilitate servicing. Indicating lamps and meters shall be set in a front-mounted panel to be visible without opening doors.

- c. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.
5. Equipment & Operation: Automatic Transfer Switch, with Solid State Controller shall have the following features. The controller's sensing and logic shall be provided by a single built-in microprocessor for maximum reliability, minimum maintenance, and the ability to communicate serially through an optional serial communication module.
- a. Monitor each ungrounded line to sense a decrease of voltage below a set point, or a loss of voltage on any phase of the normal or emergency power source. (Adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).
 - b. Monitor each ungrounded line to sense an increase of voltage above a set point. (Adjustable for dropout over a range of 105-135% of normal voltage, and pickup at 95-99% of dropout voltage level).
 - c. Signal the engin-generator set to start in the event of a power interruption. A solid-state time delay start (adjustable from 0.5 to 90 seconds) shall delay this signal to avoid nuisance startups on momentary voltage dips or power outages.
 - d. Transfer the load to the engin-generator after it reaches proper voltage and frequency. A time delay transfer (adjustable from 0.5 to 10 seconds) shall delay this transfer to allow the engin-generator to stabilize.

- e. Retransfer the load to the source after normal power restoration. A time-delay retransfer (adjustable from 1.0 to 30 minutes) shall delay this transfer to avoid short-term normal power restoration.
- f. Provide an automatic retransfer time-delay bypass to retransfer the load from the generating set to the normal source if the generating set output interrupts after normal source restores voltage.
- g. Signal the enginegenerator to stop after load re-transfer to normal source. A solid-state time-delay stop (adjustable from 0.5 to 5 minutes) shall permit engine to run unloaded to cool down before shutdown.
- h. Provide a test switch to simulate an interruption of power from the normal source.
- i. Provide an exerciser clock to automatically start the generating set at regular intervals and allow it to run for a preset time period, such as 30 minutes per week.
- j. Provide a with loadwithout load selection to program the test or exercise function as follows:
 - 1) "Without Load", the generating set runs unloaded.
 - 2) "With Load", the automatic transfer switch transfer load to generating set, after time delay, the same as it would for a normal source interruption.
- k. Provide a remote Emergency Stop "mushroom head" type push button mounted in the transfer switch enclosure.
- l. Provide a control disconnect plug to electrically disconnect the control section from the transfer switch for maintenance service during normal operation.

6. Mounting: The automatic transfer switch shall be mounted as shown on the drawings.
7. Enclosure: The transfer switch shall be mounted in a NEMA 3R enclosure with a key lockable handle. Control accessories and instrumentation shall be mounted on the front of the panel to avoid shock hazard while adjusting control functions, but will swing out exposing the wiring to facilitate servicing.

M. Manufacturers

1. Engine/generator shall be as manufactured by Kohler, Cummins, Caterpillar or Engineer-approved equal.
2. The transfer switch shall be supplied by the Engine/generator manufacturer or Engineer approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General: Electrical contractor shall install the complete electrical generating system including all in accordance with manufacturer's recommendations and make corrections as required. Contractor shall provide owner's operating personnel with detailed operation and maintenance manuals including complete parts lists. Manuals shall include engine manufacturer's complete engine manual as well as alternator and genset controller operation instructions. Five (5) sets shall be provided.
- B. Service: Supplier of electric plant and associated items shall have permanent service facilities in this trade area (100 miles radius). The facilities shall comprise a permanent force of factory trained, service personnel on 24 hour call, experienced in servicing this type of equipment, providing warranty and/or routine maintenance service to afford the Owner maximum protection. Service contracts shall also be available.
- C. Warranty: Standby electric generating system components, complete electric plant (engine and alternator)

instrument panel shall be warranted by the manufacturer against defective materials and factory workmanship for a period of five (5) years or 1500 hours, whichever occurs first. Such defective parts shall be repaired or replaced at manufacturer's option, free of charge, for this period; associated labor shall be provided free of charge for a period of two (2) years with travel time and mileage free of charge for the first one (1) year of operation. The warranty period shall commence when the standby power system is first placed into service. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents must be provided.

- D. Check Out and Start Up: Supplier of electric generating plant and associated items covered herein shall provide factory-trained technicians to check out the completed installation and to perform initial startup of the system.
- E. Submittals: Provide five (5) complete sets of Engineering Submittals for approval, prior to production release, showing all components, in addition to engine generator and automatic load transfer control. Submittals shall include complete system interconnection wiring diagrams, Manufacturer's Published Warranty Form, EPA compliance statements and exhaust emissions data sheets indicating compliance with these specifications.
- F. This system shall be built, tested as a system, and shipped by the manufacturer of the electric plant so there is one source of supply and responsibility. The performance of this specific generating set shall be factory tested and certified by the manufacturer. These reports shall be provided to the engineer as soon as available, and shall include results of the following tests: Single step load pickup, transient and steady state governing, safety shutdown device testing, transient and steady state voltage regulation, and the unit's full rated power.
- G. Field Test: The unit as installed shall be tested to verify that the unit performs as specified. Testing shall include a building load test; measuring KW, power-factor, and voltage dip. The motor starting inrush and voltage dip shall be verified by starting the equipment as specified and recording the KVA and voltage

dip. Field test shall be performed by a factory-trained technician and witnessed by the Engineer and supplying contractor. If unit fails to perform as specified, the contractor and supplier shall make the necessary modifications to bring the unit into compliance. After the modifications have been performed, the unit shall be retested as outlined previously.

END OF SECTION



SECTION 16289

SURGE PROTECTIVE DEVICE (FORMERLY TVSS)

PART 1 GENERAL

1.01 APPLICABILITY

- A. This section describes the materials and installation requirements for Surge Protective Devices (SPDs), formerly TVSS, for the protection of AC electrical circuits.

1.02 REFERENCE STANDARDS

- A. Underwriters Laboratories: UL 1449 and UL 1283.
- B. ANSI/IEEE C62.41.1-2002, C62.41.2-2002, C62.45-2002.
- C. National Electrical Code: Article 285.

1.03 QUALITY ASSURANCE

- A. SPD shall bear the UL Mark and shall be listed to most recent editions of UL 1449 and UL 1283. "Manufactured in accordance with" is not equivalent to UL listing and does not meet the intent of this specification.

1.04 SUBMITTALS

- A. Submittals shall include UL 1449 Listing documentation verifying:
 - 1. Short Circuit Current Rating (SCCR).
 - 2. Voltage Protection Ratings (VPRs) for all modes.
 - 3. Maximum Continuous Operating Voltage Rating (MCOV).
 - 4. I-nominal rating (I-n).
 - 5. Type 1 Device Listing.
- B. Submittals shall include shop drawings including manufacturer installation instruction manual and line drawings detailing dimensions and weight of enclosure, internal wiring diagram illustrating all modes of

protection in each type of SPD required, wiring diagram showing all field connections and manufacturer's recommended wire and breaker sizes.

- C. Minimum of five (5) year warranty.

PART 2 PRODUCTS

2.01 MAIN SERVICE PANEL SPD GENERAL REQUIREMENTS

- A. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.
- B. SPD shall be UL labeled as Type 1 (verifiable at UL.com), intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
- C. SPD shall be UL labeled with 20kA I-nominal (I-n) (verifiable at UL.com) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.
- D. Minimum surge current capability (single pulse rated) per phase shall be:
 - 1. Service Entrance or Transfer Switch: 200kA
 - 2. Distribution panelboards & MCC: 150kA
 - 3. Branch panelboards: 80kA
- E. SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.

F. UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

<u>System Voltage</u>	<u>L-N</u>	<u>L-G</u>	<u>L-L</u>	<u>N-G</u>
208Y/120	700V	700V	1200V	700V
480Y/277	1200V	1200V	1800V	1200V

(Mode VPRs verifiable at UL.com. Numerically lower is allowed/preferred; old-style Suppressed Voltage Ratings (SVRs shall not be submitted, nor evaluated due to outdated, less strenuous testing).

G. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

<u>System Voltage</u>	<u>Allowable System Voltage Fluctuation (%)</u>	<u>MCOV</u>
208Y/120	25%	150V
480Y/277	15%	320V

H. SPD shall have UL 1283 EMI/RFI filtering with minimum attenuation of -50dB at 100 kHz.

I. SPD shall include visual LEP diagnostics including a minimum of one green LED indicator per phase, and one red service LED. SPD shall include an audible alarm with on/off silence function and diagnostic test function (excluding branch).

J. OPTIONS

1. SPD shall be provided with 1 set of NO/NC dry contacts.
2. SPD shall be provided with surge event counter with backup power source.

PART 3 EXECUTION

3.01 INSTALLATION OF SUPPRESSORS

A. SPD shall be installed per manufacturer's installation instructions with lead lengths as short (less than

24") and straight as possible. Gently twist conductors together.

- B. Installer may reasonably arrange breaker locations to ensure short and straightest possible leads to SPDs.
- C. SPD shall be installed on the load side of the main service disconnect.
- D. Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers per NEC.

END OF SECTION



SECTION 16411

ENCLOSED SWITCHES

PART 1 GENERAL

1.01 RELATED WORK

- A. Section 09900 - Painting

1.02 QUALITY ASSURANCE

- A. All materials, equipment, sizes, and capacities shall conform to the requirements of the National Electrical Code and prevailing state and local codes.
- B. All materials shall be UL labeled.

1.03 SUBMITTALS

- A. Make submittals as specified in Section 01000.
- B. Materials to be submitted:
 - 1. Manufacturer's standard published catalog sheets and descriptive bulletins, marked to indicate accessories being furnished.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. Safety Switches:
 - 1. Construction: Heavy duty type, HP rated, single throw, quick-make/quick-break. Switch shall be padlockable in OFF position. Switch shall have defeatable door locks preventing the cover from being opened with the switch in the ON position.
 - 2. Enclosure: Indoors, NEMA 1. Outdoors, or wet locations, NEMA 3R, (or as shown on the drawings).
 - 3. Manufacturers: Eaton, Square D, GE or equal.
- B. Push-Button and Selector Switch Stations:

1. General: Stations located remotely from the motor starter or control center shall be heavy duty, oiltight, and shall be of the same manufacturer as the motor control center.
 2. Construction: Indoors - heavy duty, oiltight, outdoors and wet locations - NEMA 4, cast enclosure, with rubber boots over push-button and selector switch operators. Push-button stations shall be equipped with locking device on the OFF position.
 3. Rating: 720 VA make, 720 VA break, 120-600 VAC. Silver contacts, double break, on all control units.
- C. Manual Motor Starters - Single Phase Only:
1. Construction: Single-pole with integral thermal overload protection, HP rated at 120 VAC. Switches shall be melting alloy type.
 2. Enclosures: NEMA I if indoor, 3R if outdoor or wet location cast enclosure.
 3. Manufacturers: Eaton, Square D, GE or equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide mounting accessories and hardware as required.
- B. Connect devices as shown on the drawings and in accordance with equipment manufacturer's recommendations.
- C. Provide and install flash and shock hazard warning labels.

END OF SECTION



SECTION 16421

ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. NFPA 70 - National Electric Code (NEC).

1.02 SUBMITTALS

- A. Make submittals as specified in Section 01000.
- B. Materials to be submitted:
 - 1. Manufacturer's standard published catalog sheets and descriptive bulletins.
 - 2. Physical dimension, installation, and mounting details.
 - 3. Manufacturer's standard published installation and maintenance instructions.
- C. Marking: Each submittal shall be marked with the equipment number of the device being served and plant location as shown on the drawings.

PART 2 PRODUCTS

2.01 MATERIAL AND COMPONENTS

- A. Type: FVNR, across line starting, rated 600 VAC, 3 phase, 60 Hz.
- B. Size: Minimum NEMA Size 0. Size in accordance with NEC, Article 430.
- C. Construction:
 - 1. Disconnect, motor overload and running protection, starter contactor, control transformer, and auxiliary contacts shall be mounted in integral NEMA 1 enclosure for dry

location, and in NEMA 4X enclosure in outdoor locations, or as shown on the drawings.

2. MCBs: Quick-Make, Quick-Break, size as shown on the drawings, operating handle through door. Interrupting rating - 25,000A symmetrical, minimum.
 3. Starters shall be rated 600 VAC, with solid state overload relay in each phase leg. Coil shall be rated 120 VAC.
 4. Control voltage shall be 120 VAC. When service voltage is 240 volts, 3Ø, 3W or greater, then a 120 volt control transformer shall be provided. Control transformer shall be sized to handle the load with a 10% overload and shall have a capacity of at least 300 VA with primary fuse protection.
 5. Operating handle shall be padlockable in the OFF position.
 6. Cover mounted controls shall include green running LED pilot light, reset, and H-O-A selector switch with a spare contact for Auto position indication to the control system as shown on the drawings.
 7. The disconnect shall have auxiliary contacts to operate in tandem with the disconnect switch. These contacts shall be for the purpose of disconnecting power to the motor controls when the disconnect for the motor is open.
 8. The motor overload shall have auxiliary contacts for trip indication.
- D. Terminations: Suitable for copper conductors, lugs suitable for wire sizes as shown on the drawings.
- E. The control circuitry shall include an undervoltage, phase loss and phase sequence relay which shall prevent motor operation in the event the voltage level is insufficient, a phase is lost or of the wrong rotation. This relay shall include a two (2) second time delay to prevent nuisance shutdowns.

1. The voltage level and phase rotation shall be at an acceptable level for a predetermined time before allowing the motor to start, (provide Adjustable Time Delay, adjustable between 10 & 60 seconds).
2. A warning light shall be illuminated to indicate when insufficient voltage is present for motor starting.
3. A single undervoltage relay in conjunction with a latching relay shall provide low voltage protection.

F. Manufacturers: Square D, Eaton, Rockwell Automation, GE, or equal.

2.02 REQUIRED ACCESSORIES TO MAINTAIN OPERATION

- A. The following list of required accessories shall be provided with the motor starters:
 1. 3 - Feeder protection fuses each sized used
 2. 2 - Each control power fuse
 3. 3 - Each size of overload used
 4. 1 - Motor starter coil of each size used
 5. 10 - LED pilot lamps
- B. The accessories provided shall be installed in the cabinet.

EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NEC and equipment manufacturer recommendations.
- B. Provide heater elements sized on motor nameplate full load current.
- C. Provide and install flash and shock hazard warning labels.

END OF SECTION

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SECTION 16915

FIELD ANALOG COMPONENTS

PART 1 GENERAL

1.01 RELATED WORK

- A. Section 16124 - Instrumentation Cable
- B. Section 16974 - Control Panel
- C. Section 11255 - Magnetic Flow Meters

1.02 SUBMITTALS

- A. Make submittals as specified in Section 01000 and Section 01700.
- B. Materials to be submitted:
 - 1. Manufacturer's standard published catalog sheets and descriptive bulletins.
 - 2. Physical dimensions, mounting details, and electrical connection details for each instrument.
 - 3. Schedule of proposed name tags, scales, and ranges for each instrument.
 - 4. Manufacturer's standard published installation, operation, and maintenance instructions.
- C. Marking: Each submittal shall be identified with the equipment number and plant location as shown on the drawings.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. General: Furnish, install, calibrate, and place in operation all electric and electronic instrumentation as shown on the drawings and as specified. Field mounted units shall include primary elements; transmitters; power and signal wiring and connections;

instrument mounting and support hardware; and instrument environmental enclosures as applicable and as shown on the drawings and as indicated in the specifications. Additional analog instrumentation such as receivers, recorders, controllers, totalizers, and back-of-panel instruments shall be furnished and factory installed in analog panels as specified.

B. Meters and recorders:

1. Supplier of meters and supplier of recorders shall be coordinated so that their signals are compatible.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Instrument and Device Connections: All equipment connections shall be made in accordance with the equipment manufacturer's recommendations. Shields on instrument cables shall be ungrounded at the transmitter and shall be grounded at the receiver termination only. Conductors left spare for future connection shall be trimmed to within 12 inches of the cable assembly and taped. All conductors shall be identified at each end with wire numbers as shown on the instrument schematics and control diagrams using PVC wire marking sleeves as manufactured by Brady, Electrovert, or equal.
- B. Installation and Calibration: After installation and connection of field instrumentation and control devices have been completed, the Contractor shall provide the services of factory-trained personnel to check, adjust and calibrate all instruments and devices to be operating parameters as shown in the schedules and as required in the loop of functional requirements. After calibration of each component, the factory representative shall calibrate and adjust the entire loop to achieve the performance as required by the systems integrator.
- C. The Contractor shall furnish to the Engineer a written certification of calibration performance check for each instrument and loop.

- D. Contractor shall be responsible for installing instrumentation in areas providing easy access. If a measuring element must be installed in a vault, system electronics shall be mounted above ground on strut a minimum of 36" above grade. Contractor shall also consider traffic areas and provide adequate protection and support.

END OF SECTION

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