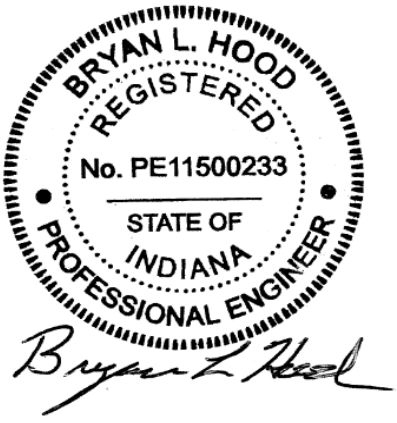
PROJECT MANUAL

City of Greenfield Utilities
Waterview Lift Station Relocation Project

June 2024

Prepared By:



American Structurepoint, Inc.
116 E. Berry Street, Suite 1515
Fort Wayne, IN 46815
Tel: 317-547-5580

AMERICAN STRUCTUREPOINT INC.

CONTRACT DOCUMENTS

FOR

WATERVIEW LIFT STATION RELOCATION PROJECT

Department of Engineering
City of Greenfield

Guy Titus.....Mayor
Nicholas Dezelan.....Wastewater Utility Manager

DIVISION 33 - UTILITIES

NOTICE TO BIDDERS
City of Greenfield

Department: **Department of Engineering**
10 S. State Street
Greenfield, Indiana 46140

Project/Work: **Waterview Lift Station Relocation Project**

Notice is hereby given that the City of Greenfield will receive sealed bids for the above described "Project/Work" at Clerk-Treasurer's Office, 10 S. State Street, Greenfield, Indiana, until 9:30 a.m. prevailing local time, 10 S. State Street, on **July 9, 2024** and commencing as soon as practicable thereafter on the same date such bids will be publicly opened. No late Bids will be accepted.

A Bid Bond or certified check in an amount not less than five percent (5%) of the amount bid must be submitted with each Bid. A one hundred percent (100%) Performance and Payment Bond will also be required of the successful Bidder.

The Work consists of, but is not necessarily limited to the following:

The abandonment of the existing Waterview lift station and the construction of a new 1,100 gpm duplex lift station and related site work, installation of approximately 976 feet of 12" force main, 2,049 feet of 12" & 18" sanitary sewers, abandonment of an existing 10" sanitary sewer, reconnection of 17 residential sewer laterals and replacement of approximately 3,630 sy of concrete streets with asphalt, curbs, ADA ramps and related work.

Contract Documents for the Project/Work have been assembled into one or more bound Project Manuals which, together with Drawings, may be examined at the Clerk-Treasurer's Office or the Department of Engineering at 10 S. State Street, Greenfield, Indiana 46140.

Electronic copies of the Drawings and Project Manuals will be available on the City of Greenfield website at https://www.greenfieldin.org/government/engineering. Bidders will be responsible to contact the Clerk-Treasurers office to be added to the plan-holders list if downloading electronic contract documents.

Bidders shall assure that they have obtained complete sets of drawings and Contract Documents and shall assume the risk of any errors or omissions in Bids prepared in reliance on incomplete sets of drawings and Contract Documents.

A pre-bid conference will be held at **2:00 p.m. (local time) on June 12, 2024**, at the Richard J. Pasco Council Chambers, 10 South State Street, Greenfield, Indiana to familiarize Bidders with this project.

For accommodations needed by persons with disabilities to attend the public bid opening meeting, please call (317) 477-4320.

The City of Greenfield reserves the right to reject any or all bids or to waive any informalities and to accept the bid which it deems most favorable to the interests of the City after all bids have been examined and canvassed.

INSTRUCTIONS TO BIDDERS
City of Greenfield

Department ("Owner"):	**Department of Engineering** **10 S. State Street** **Greenfield, Indiana 46140**
Project/Work:	**Waterview Lift Station Relocation Project**
Owner's Representative:	**American Structurepoint** **116 E. Berry Street, Suite 1515** **Fort Wayne, IN 46802**
Engineer:	**Bryan Hood, PE** **bhood@structurepoint.com** **260-417-6312**
	Sam Sutter, PE **ssutter@structurepoint.com** **260-373-0600**

1. GENERAL

1.1 Submission of a Bid shall constitute an unconditional agreement and acknowledgment by the Bidder to be bound by all terms and conditions set forth herein and in any of the documents assembled or referred to in the bound Project Manual of which these Instructions to Bidders are a part.

1.2 Sample forms are included in the Project Manual to acquaint Bidders with the form and provisions of various Bid Documents and other documentation required by the Contract Documents to be executed, completed and submitted by some or all Bidders, either as part of a Bid Submission or after the Bid Date. Such sample forms are not to be detached from the Project Manual or filled out or executed. Separate copies of such forms and any other required documentation prescribed by the Contract Documents have been or will be furnished separately by the Owner and must be obtained directly from the City.

1.3 Instructions and requirements printed on any sample form included in the Project Manual or any form not so included but required to be completed, signed or furnished by a Bidder as part of a Bid Submission or after receipt and opening of Bids shall be deemed requirements established by these Instructions to Bidders to the same extent as if fully restated herein.

1.4 By submitting bid the Bidder agrees the bid proposal and price(s) contained herein shall be valid for ninety (90) days from bid opening.

2. DEFINITIONS

The following definitions shall apply to these Instructions to Bidders (ITB):

2.1 Bidder - Any person or entity who submits a Bid.

2.2 Bid - A written proposal submitted by a Bidder as part of the form prescribed herein offering to perform and complete the Work and to fulfill all other requirements of the Contract Documents for one or more specified prices.

2.3 Bid Documents - All documents and completed forms required to be submitted by a Bidder with and as integral parts of a Bid Submission, whether or not included as sample forms assembled in the Project Manual of which these Instructions to Bidders are a part. Such Bid Documents are listed and more fully described in ITB Section 5.3 hereof.

2.4 Bid Date - The date when Bids are to be received, opened and publicly read aloud as established by the Notice to Bidders as may be modified by Addenda.

2.5 Bid Submission - All documents presented by a Bidder for receipt and opening on the Bid Date.

2.6 Contract Documents - The Agreement and any exhibits thereto, Addenda (which pertain to the Contract Documents), Instructions to Bidders, Advertisement, Notice to Bidders, Bidder's Bid (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice of Award), Notice to Proceed, the Bonds, the General Conditions, the Additional Requirements Section, any supplemental or special conditions, the Specifications and the Drawings, as the same are more specifically identified in the Agreement.

2.7 E-Verify Program - An electronic verification of work authorization program of the Illegal Immigration Reform and Immigration Responsibility Act of 1996 (P.L. 104-208), Division C, Title IV, s.403(a), as amended, operated by the United States Department of Homeland Security or successor work authorization program designated by the United States Department of Homeland Security or other federal agency authorized to verify the work authorization status of newly hired employees under the Immigration Reform and control Act of 1986 (P.L. 99-603).

2.8 Owner - The City of Greenfield acting by and through the Department or other agency designated above.

2.9 Project Manual - The bound set of documents, sample forms, and Contract Documents (excluding plans and Addenda) approved by the Owner for the Work and/or Project described in the Notice to Bidders and of which these Instructions to Bidders are a part.

In all other respects, terms used herein shall have the meanings as stated in the General Conditions or other Contract Documents.

3. EXAMINATION OF SITE AND DOCUMENTS

3.1 Before the Bid Date, all Bidders shall carefully and thoroughly examine and inspect the entire site of the proposed Work and adjacent premises and the various means of approach and access thereto by means of a site inspection visit, and make all necessary investigations to inform themselves thoroughly as to the facilities necessary for delivering, placing and operating the necessary construction equipment, and for delivering and handling materials at the site, and shall inform themselves thoroughly as to any and all actual or potential difficulties, hindrances, delays and constraints involved in the commencement, prosecution and completion of the proposed Work in accordance with the requirements of the Contract Documents.

3.2 It shall be the sole responsibility of Bidders to make borings, test pits and to conduct such other investigations at or near the site of the proposed Work as they deem necessary to determine the character, location, and amount of materials to be encountered or other subsurface conditions which could affect the manner, cost or time required to perform the Work.

3.3 Bidders shall carefully and thoroughly examine the plans, specifications and other Contract and/or Project Manual Documents and shall assume the full risk of their own judgments as to the nature, quality and amount of the whole of the Work to be done, and for the price bid must assume all risk of any and all variances or errors in any computation or statement of amounts or quantities necessary to complete the Work in strict compliance with the Contract Documents.

3.4 Elevations of the existing ground surface or structures at the site of the Work as shown on the plans are believed to be reasonably correct but are not guaranteed to be absolutely so and are presented only as an approximation. Bidders shall satisfy themselves as to the correctness of all elevations.

3.5 Information stated or depicted on plans concerning the location, dimensions, depth and other characteristics of underground structures and utilities is given only as general information and shall not be construed or relied upon by Bidders as a representation or assurance that such structures or utilities will be found or encountered as plotted, or that such information is complete or accurate. Bidders, therefore, shall satisfy themselves by such means as they may deem proper as to the location of all structures and utilities that may be encountered in construction of the Work and shall bear the risk of the number, type, location, dimensions and depth of all structures and utilities thus encountered.

3.6 The City of Greenfield Standard General Conditions for Construction Contracts, August 2018, is incorporated by reference as part of this bid. Copy of General Conditions are available at https://www.greenfieldin.org/government/engineering.

4. CLARIFICATIONS AND ADDENDA

4.1 If a Bidder finds conflicts, errors, discrepancies or ambiguities in the Contract Documents or any sample form, or if the Bidder is in doubt as to the intended meaning of any portion or provision therein, the Bidder shall at once give written notice thereof to the Owner's Representative, at least seven (7) consecutive calendar days prior to the Bid Date. No Bidder shall be allowed any extra compensation or time extension by reason of any conflict, error, discrepancy or ambiguity of which the Bidder had actual knowledge or reasonably should have known and which he/she failed to report within the period and in the manner required by these Instructions to Bidders.

4.2 No material changes, clarifications or interpretations of the Contract Documents will be issued except by written or graphic Addenda mailed or delivered to record holders of Contract Documents not less than three (3) days prior to the Bid Date. All such Addenda must be acknowledged by the Bidder and will become a part of the Contract Documents. The Owner will not be responsible for or bound by any oral or written interpretations or clarifications of the Contract Documents which anyone presumes to make on its behalf, except by an Addendum issued in accordance with this Section.

5. BID SUBMISSION

5.1 All Bid Documents shall be placed within a sealed envelope which shall be plainly labeled on the outside with the name and address of the Bidder, Project name and number (if applicable) and Due Date. If forwarded by mail, the sealed envelope must be enclosed in another envelope addressed to: City of Greenfield, Clerk-Treasurer, 10 S. State Street, Greenfield, Indiana 46140.

5.2 All Bid Documents as herein prescribed must be submitted with and as integral parts of each Bid Submission and shall be subject to all requirements of the Contract Documents, including

drawings and these Instructions to Bidders. Bid Documents must be properly filled in and completed in every material respect and without interlineations, excisions, special conditions, qualifications or exceptions. Each Bid Document requiring a signature shall be signed by an individual duly authorized to execute such document on Bidder's behalf. A bid executed by a corporation, joint venture, or other entity with an assumed name shall have the legal and correct name thereof followed by the word "by" and the signature and title of the officer or other person authorized to sign for it.

5.3 The Bid Documents to be thus submitted by each Bidder shall consist of all the following (5.3.1, 5.3.2, 5.3.3):

.1 Bidder's Itemized Proposal and Declarations. A sample of this form is included in the Project Manual and must be utilized by all Bidders. Such document includes and consists of the following constituent "Parts":

"Part 1 - Bidder Information"
"Part 2 - Proposal (Bid)"
"Part 3 - Contract Items and Unit Prices"
"Part 4 - Contract Documents and Addenda"
"Part 5 - Exceptions"
"Part 6 - Nepotism Disclosure Form"
"Part 7 - Additional Declarations, including certification required by IC 5-22-16.5"
"Part 8 - Drug Testing"
"Part 9 - Non-Collusion Affidavit"
"Part 10 - E-Verify Affidavit"
"Part 11 - Signatures"

.2 Bid Security in the form of a Bid Bond or Certified Check in an amount not less than five percent (5%) of the bid price. Such Bid Security shall serve as security to insure the execution of the Agreement and the furnishing of other required documents by the successful Bidder, including Performance and Payment Bonds. A sample Bid Bond form is included in the Project Manual and such form, or such other form as may be approved in advance by Owner, shall be utilized if such a bond is furnished as Bid Security. A Bid Bond shall be executed by a surety company licensed to transact such business in the State of Indiana and qualified as a surety under the underwriting limitations on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the U.S. Treasury Department Circular No. 570; the Bidder shall also furnish as part of the Bid Submission a signed power of attorney establishing the authority of the person executing such Bid Bond on behalf of the surety. Bid Security shall be held until the Contract is executed with the successful Bidder. In the event that all bids are rejected, the Bid Security of all Bidders will be returned upon request. No "Annual" bid bonds, cash deposits or cashiers' checks will be accepted.

.3 Contractor's Bid for Public Work (State Form 96). Such form is included in this Project Manual on pages BID-10 to BID-15 and shall be used in consideration of a Bidder's ability to perform its obligations under the terms of the contract Documents and in determining other material factors bearing upon a Bidder's responsibility. If Bid is under $150,000 either of these forms may be submitted as a Post-Bid submittal under Section 6, Post Bid Requirements.

5.4 Bids may be withdrawn in person by a Bidder during normal hours of business prior to the time fixed for opening of Bids. In the event of a valid withdrawal of a Bid, the Bid Security of the withdrawing Bidder will be returned promptly. No Bid may be withdrawn after opening of Bids has commenced except after expiration of such period following the Bid Date as specifically provided by law, plus any extension thereof as provided elsewhere in these Instructions to Bidders. Bidder's failure to provide all completed documentation as required in ITB Section 5.3 may result in Bid being deemed non-responsive.

6. POST-BID REQUIREMENTS

Within five (5) business days of notification by Owner, the apparent lowest responsive Bidder will be required to submit additional documents and satisfy additional requirements as conditions to such Bidder being found by the Owner to be a responsible Bidder, as follows:

6.1 Proof of Insurability. The Bidder shall furnish: (1) proof of insurance showing existing coverage in accordance with the terms and amounts stated in the General Conditions, or (2) a letter or statement certifying that, in the event that the bid is awarded by the Owner, an insurance company will provide the required coverage to the Bidder submitting the bid. Such proof of insurance or the letter/statement shall be issued by a financially responsible insurance company authorized to do business in the State of Indiana.

6.2 Surety Letter of Intent. The Bidder shall furnish a written statement or letter from a Surety company licensed to transact such business in the State of Indiana and qualified as a surety under the underwriting limitations on the current list of "Surety Companies Acceptable on Federal Bonds" as published in U.S. Treasury Department Circular No. 570, which assures the Owner that, in the event the Bid is accepted and a contract is awarded by Owner, said Surety will execute and deliver both a Performance Bond and Payment Bond as required by the Contract Documents.

6.3 Joint Venture Agreement. If the Bidder is a joint venture, partnership or other combination of two or more persons or entities, the Bidder shall submit a copy of the joint venture or other agreement by which such joint venture, partnership or other association has been formed, executed by all such participating persons or entities. If the Bid is signed by less than all parties that comprise the Bidder, suitable written evidence of the authority of such signing party to bind all such parties must also be furnished.

6.4 Subcontractor/Supplier List. The Bidder shall submit all subcontactors and suppliers that will be used on the project, as required (POST-BID-1).

6.5 Manufacturers List. The Bidder shall submit a complete list of all equipment and supplies that are listed in the Manufacturer's List (POST-BID-2).

6.6 E-Verify Documentation. - The Bidder shall submit verification that it is enrolled in and participating in the E-Verify program (POST-BID-3).

7. BID EVALUATION AND AWARD

7.1 A**ward of the Contract will be made to the lowest, responsive and responsible Bidder, where the Bid is reasonable and does not exceed the funds available for the project.** The Owner reserves the right to reject all Bids and may waive or allow a Bidder to correct errors,

omissions or other irregularities in Bid Documents that are found not to have afforded the Bidder a substantial competitive advantage over other Bidders.

7.2 The Owner shall have the right to reject any Bid if investigation of the Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations and complete the Work. Any or all Bids will be rejected if there is reason to believe that collusion exists among Bidders.

7.3 For unit price Contract Items, estimated quantities and unit prices will serve as the basis for determining the proposed price of each Bid. Patent math errors in statements of Bid prices or totals may be corrected by the Owner or Engineer, in which case the corrected amounts will be used for the purpose of Bid evaluation, comparison and other award considerations. However, neither the Owner nor the Engineer shall be required to discover or correct any error or omission in a Bid and the Bidder shall assume the risk of and be bound to the consequences of any such error or omission.

7.4 The Owner may, at its sole option, award the Contract to a Bidder on a conditional basis to afford the Bidder additional time and opportunity to submit required documents or to fulfill other requirements. In such case, the Owner will furnish to the Bidder a notice of conditional award which will establish (i) the additional conditions to be fulfilled for the award to become effective, and (ii) the time limit within which such conditions shall be satisfied. If the Bidder fails to satisfy the conditions in the manner and within the time specified in such notice, the Owner may declare such Bidder to be non-responsible and award the Contract, conditionally or unconditionally, to another Bidder. Time limitations governing the Owner's award of the Contract shall be extended for such additional period as may be required to effectuate the conditional award procedure set forth in this sub-section, and no Bid may be withdrawn during such period of extension.

8. CONTRACT EXECUTION; SUBMITTALS

8.1 Within five (5) business days after the award notice, the successful Bidder shall sign and deliver at least three (3) counterparts of the Agreement, utilizing the form thereof included in the Project Manual and make delivery thereof to the Owner, along with other documents as prescribed by the Contract Documents. After execution and delivery of the Agreement and other required documents, and acceptance thereof by the Owner, the Bid Security furnished by each Bidder will be returned to the respective Bidders upon request.

8.2 If the Bidder fails or neglects to execute and deliver the Agreement and other required documents as prescribed by the preceding sub-section, the Bidder shall be deemed to have repudiated the Contract and thereupon the award shall be null and void; and the Bid Security provided by the Bidder shall be forfeited to and retained by the Owner as liquidated damages for such failure of the Bidder to execute the Contract, it being understood and agreed that the character and amount of actual damages sustained by the Owner cannot reliably be ascertained and measured and that the amount of the Bid Security is intended as a reasonable prospective estimate of such actual damages.

8.3 Concurrently with the execution and delivery of the Agreement to the Owner, or within such other period as the Owner may prescribe, the successful Bidder (Contractor) shall submit the following as conditions to the Bidder's right to proceed with and receive payment for any Work:

.1 Proof of all required insurance coverage, a one hundred percent (100%) Performance Bond and a one hundred percent (100%) Payment Bond as prescribed by the General Conditions or other Contract Documents. Such bonds shall be executed utilizing the

sample forms included in the Project Manual or alternative forms approved in advance by the Owner. Indemnification clauses between successful Bidder and the Surety shall not be binding upon the Owner;

.2 The preliminary schedules required by Paragraph 2.7 of the General Conditions;

.3 Other Post-Bid submittals required by the Contract Documents.

9. LIQUIDATED DAMAGES

9.1 The Contract Documents provide for the payment of liquidated damages in the event of unexcused failure by the Contractor to complete the Work within the time required by the Contract Documents. **Such liquidated damages are to be assessed and recovered at the rate of $500 per day for delay in achieving the Substantial Completion date of August 1, 2025, and at the rate of $1000 per day for delay in achieving the Final Completion date of September 5, 2025.**

9.2 The per diem rate(s) of liquidated damages established by the preceding sub-section have been determined and are intended as reasonable prospective estimate(s) of the type and amount of actual damages which the Owner may sustain in the event of such delay(s). Submission of a Bid shall constitute an unconditional acknowledgment and agreement by the Bidder that such liquidated damages are fair and reasonable and do not and will not constitute a penalty, and that such liquidated damages may be assessed and recovered by the Owner as against the successful Bidder/Contractor and its Surety in lieu of actual damages for delayed completion.

10. CHANGE ORDERS

10.1 During the course of the Work, should the Owner or Bidder determine that additional work which was foreseeable is required, such work shall not be automatically awarded through change orders. However, the Owner reserves the right to award additional work which was foreseeable to the original Bidder where doing so is in the best interest of the Owner. All such awards are and will remain subject to necessary approvals.

END OF INSTRUCTIONS TO BIDDERS

PART 1
BIDDER'S ITEMIZED PROPOSAL
AND DECLARATIONS
City of Greenfield

Instructions to Bidders:

This form shall be utilized by all Bidders. Except as otherwise specifically provided, all Parts shall be fully and accurately filled in and completed and notarized.

Project: Waterview Lift Station Relocation

Proposal For Construction of: **The abandonment of the existing Waterview lift station and the construction of a new 1,100 gpm duplex lift station and related site work, installation of approximately 976 feet of 12" force main, 2,049 feet of 12" & 18" sanitary sewers, abandonment of an existing 10" sanitary sewer, reconnection of 17 residential sewer laterals and replacement of approximately 3,630 sy of concrete streets with asphalt, curbs, ADA ramps and related work.**

Date: _____

To: **City of Greenfield, Department of Engineering**
10 S. State Street, Greenfield, Indiana 46140

PART 1

BIDDER INFORMATION
(Print)

1.1 Bidder Name: _____

1.2 Bidder Address: Street Address: _____
City: _____ State: _____ Zip: _____
Phone #: ( ) _____ Fax #: ( ) _____

1.3 Former Business names of Bidder: _____

1.4 Bidder is a/an *[mark one]*:
___ Individual ___ Partnership ___ Indiana Corporation
___ Foreign (Out of State) Corporation
___ Joint Venture
Other: _____

PART 2
PROPOSAL (BID)

2.1 The undersigned Bidder proposes to furnish all necessary labor, machinery, tools, apparatus, materials, equipment, service and other necessary supplies, and to perform and fulfill all obligations incident thereto in strict accordance with and within the time(s) provided by the terms and conditions of the Contract Documents for the above described Work and Project, including any and all addenda thereto, for the total lump sum as noted below.

2.2 By submitting bid the Bidder agrees the bid proposal and price(s) contained herein shall be valid for ninety (90) days from bid opening.

PART 3
CONTRACT ITEMS AND UNIT PRICES

Bid Item	Work Item Number	Description	Quantity	Unit	Unit Price	Item Total
001	01 11 21-A	MOBILIZATION AND DEMOBILIZATION	1	LS		
002	01 11 21-B	CONSTRUCTION CONTINGENCY	1	LS	$50,000.00	$50,000
003	01 71 16-A	VIDEO DOCUMENTATION OF CONDITIONS	1	LS		
004	01 55 26-A	MAINTENANCE AND PROTECTION OF TRAFFIC	1	LS		
005	33 05 13.16-F	ABANDON EXISTING PUMP STATION	1	LS		
006	01 11 21-C	PLUG EXISTING 6" PIPE AT MANHOLE NEAR KIRKPATRICK PL.	1	LS		
007	33 32 19-A	REGIONAL PUMP STATION AND RELATED APPURTENANCES	1	LS		
008	33 05 38.16-A	12" FORCE MAIN, HDPE, DR 11 (Open Cut)	274	LF		
009	33 05 38.16-A	12" FORCE MAIN, HDPE, DR 11 (Directionally Drilled)	702	LF		
010	33 05 38.16-B	8" GRAVITY SEWER, HDPE, DR 11 (Directionally Drilled)	95	LF		
011	33 31 11-B	18" PVC, SDR 35, SANITARY SEWER	1,732	LF		
012	33 31 11-C	12" PVC, SDR 35, SANITARY SEWER	317	LF		
013	33 31 11-D	8" PVC, SDR 35, SANITARY SEWER	76	LF		
014	33 31 11-E	6" SEWER LATERALS	700	LF		
015	33 31 11-F	CLEANOUTS	20	EA		
016	33 05 34.13-A	12" RCP, STORM SEWER	51	LF		
017	33 49 13-A	STORM PIPE, REMOVE (ALL SIZES)	50	LF		
018	33 49 13-B	DRAIN TILE REPAIR (Assumed Quantity)	5	EA		
019	33 49 13-C	CASTING, INLET, ADJUST TO GRADE	5	EA		
020	33 49 13-D	STORM SEWER INLET WITH CASTING	3	EA		
021	33 49 13-D	48" STORM SEWER MANHOLE	1	EA		
022	33 05 13.16-A	48" SANITARY MANHOLES	13	EA		
023	33 05 13.16-B	MANHOLE REMOVAL/ABANDONMENT	6	EA		
024	33 05 13.16-C	INLET, REMOVE	3	EA		
025	33 05 13.16-D	SEWER CONNECTION TO EXISTING MANHOLE	5	LS		

026	33 05 13-E	FORCE MAIN CONNECTION TO MANHOLE	1	LS		
027	31 23 17-A	STONE DRIVE REPAIR, 8" Depth	600	SY		
028	31 23 17-B	COMPACTED AGGREGATE, NO. 53 / 73	2,300	CY		
029	31 23 17-C	FLOWABLE FILL FOR PIPE ABANDONMENT	25	CY		
030	32 12 16-A	COMMON EXCAVATION (ASPHALT PAVEMENT)	396	CY		
031	32 16 23-A	PAVEMENT REMOVAL (CONCRETE PAVEMENT)	3,630	SY		
032	32 16 23-B	CURB RAMP, CONCRETE	20	SY		
033	32 16 23-C	CURB AND GUTTER, ROLL CURB	2,156	LF		
034	32 16 23-D	CURB AND GUTTER, REMOVE	2,156	LF		
035	32 16 23-E	SIDEWALK, CONCRETE	125	SY		
036	32 16 23-F	SIDEWALK, CONCRETE, REMOVE	145	SY		
037	32 12 16-B	ASPHALT SURFACE	282	TON		
038	32 12 16-B	ASPHALT INTERMEDIATE	520	TON		
039	32 12 16-B	ASPHALT BASE	1,045	TON		
040	32 12 16-C	MILLING, ASPHALT, 1 1/2 IN.	263	SY		
041	32 92 19-A	SEEDING AND RESTORATION	1	LS		
042	01 57 13-A	EROSION CONTROL	1	LS		

A. Total of Base Bid Items (in words):	*(In figures)*
	$

PART 4
CONTRACT DOCUMENTS AND ADDENDA

4.1 The Bidder agrees to be bound by the terms and provisions of all Contract Documents as defined in the General Conditions and incorporates such Contract Documents herein by reference

4.2 The Bidder acknowledges receipt of the following addenda:

Addendum Number	Date
_____	_____
_____	_____
_____	_____
_____	_____

PART 5
EXCEPTIONS

Instructions to Bidders:

5.1 The Bidder shall fully state each exception taken to the Specifications or other Contract Documents in Section 5.3 of this Part.

5.2 Bidder is cautioned that any exception taken by Bidder and deemed by Owner to be a material qualification or variance from the terms of the Contract Documents may result in this Bid being rejected as non-responsive.

5.3 Exceptions:

_____

_____

_____

_____

_____

_____

PART 6
NEPOTISM DISCLOSURE

Contractor: _____

Project: _____

For purposes of compliance with Indiana Code Chap. 36-1-21, please specify below whether Contractor (individual), or a person who wholly or partially owns Contractor (business), is a relative, as that term is defined by Indiana Code § 36-1-21-3, of either the Mayor of Greenfield, Indiana, or a member of the City Council of Greenfield, Indiana.

☐ Contractor (individual) or Contractor (business) does NOT have a relative who is either the Mayor of Greenfield, Indiana or a member of the City of Greenfield, Indiana.

☐ Contractor (individual) or Contractor (business) DOES have a relative who is either the Mayor of Greenfield, Indiana or member of the City Council of Greenfield, Indiana (must specify all relatives below):

_____

☐ Mayor Chuck Fewell

☐ City Councilor [please specify name of Councilor(s)]

_____

Name of Authorized Representative (Printed)

_____

Signature of Authorized Representative:

_____

Date: _____

PART 7
ADDITIONAL DECLARATIONS

7.1 Bidder certifies for itself and all its subcontractors compliance with existing laws of the City of Greenfield, the State of Indiana and the United States regarding (a) prohibition of discrimination in employment practices on the basis of race, sex, disability, religion, national origin, disabled veteran status and Vietnam-era veteran status.

7.2 Bidder certifies that it has thoroughly examined the site of the Work and informed itself fully regarding all conditions under which it will be obligated to operate and that in any way affect the Work, and knows, understands and accepts the existing conditions. Bidder further certifies that it has thoroughly reviewed the Contract Documents, including all Addenda, and has had the opportunity to ask questions and obtain interpretations or clarifications concerning Contract Documents.

7.3 Hiring Practices. The Bidder shall, upon request of the Owner, make available its policies, practices and standards for the hiring of applicants, except as prohibited under Indiana Code section 22-2-17-3, to the extent such information is related to the provision of services under this Bid.

7.4 Bidder Qualifications. Bidder certifies to Owner the following:

.1 That Bidder is eligible to work in the State of Indiana;

.2 That Bidder's labor force participates in apprenticeship or training programs approved by and registered with the United States Department of Labor's Office of Apprenticeship, or its successor organization;

3. That Bidder has implemented an employee drug testing plan that meets, or exceeds, the requirements set forth in IC 36-1-12-24;

.4 That Bidder will utilize project managers and superintendents with sufficient relevant management experience to complete bidder's scope of work;

.5 That Bidder and its management personnel possess any and all professional trade licenses required by law for any trade or specialty area in which Bidder is seeking a contract award, and said licensures have not been suspended or revoked within the previous five (5) years;

.6 That Bidder is utilizing a surety company which is on the United States Department of Treasury's listing of approved sureties; and

.7 For contracts estimated to be over $300,000.00, that Bidder and sub-contractors expected to be awarded at least $300,000 for the project are qualified under IC 4-13.6-4 or IC 8-23-10.

Violation of this certification shall constitute a material breach of the contract to result from this Bid, and upon such a violation Owner may terminate the contract. In addition, upon a violation of this certification, Owner shall report such violation to the City Legal Department who may, at its discretion, debar the Bidder from eligibility for future city purchasing, bids, contracts, quotes and/or projects.

PART 8
DRUG PROGRAM

8.1 Pursuant to IC 4-13-18-5, the Bidder must submit with the Bid a written plan for a program to test the Bidder's employees for drugs. A contractor that is subject to a collective bargaining agreement that establishes an employee drug testing program shall only submit a copy of the relevant part of the collective bargaining agreement establishing the program. Failure to submit a written plan for an employee drug testing program, or relevant parts of a collective bargaining agreement establishing an employee drug testing program shall result in the Bid being rejected as non-responsive.

8.2 Attach a copy of your drug testing program or the relevant parts of your collective bargaining agreement establishing a drug testing program to this page.

PART 9
NON-COLLUSION AFFIDAVIT

The individual person(s) executing this Proposal, being first duly sworn, depose(s) and state(s) that the Bidder has not directly or indirectly entered into a combination, collusion, undertaking or agreement with any other bidder or person (i) relative to the price(s) proposed herein or to be bid by another person, or (ii) to prevent any person from bidding, or (iii) to induce a person to refrain from bidding; and furthermore, this Bid Proposal is made and submitted without reference to any other bids and without agreement, understanding or combination, either directly or indirectly, with any persons with reference to such bidding in any way or manner whatsoever.

PART 10
E-VERIFY PROGRAM

Pursuant to Indiana Code 22-5-1.7-11.1, the contractor awarded the Bid is required to enroll in and verify the work eligibility status of all its newly hired employees through the E-Verify program. The contractor who is awarded the Bid is not required to verify the work eligibility status of all its newly hired employees through the E-Verify program if the E-Verify program no longer exists.

The individual person(s) executing this Proposal, being first duly sworn, depose(s) and state(s) that the Bidder does not knowingly employ an unauthorized alien. The undersigned further affirms that, prior to entering into an agreement for this Bid, the undersigned business entity will enroll in and agrees to verify the work eligibility status of all its newly hired employees through the E-Verify program.

PART 11
SIGNATURES

[Signature by or on behalf of the Bidder in the spaces provided below shall constitute execution of each and every Part of this Itemized Proposal and Declarations document. SIGNATURE MUST BE PROPERLY NOTARIZED.]

Written Signature: _____

Printed Name: _____

Title: _____

Important - Notary Signature and Seal Required in the Space Below

STATE OF _____

SS:

COUNTY OF _____

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

My commission expires: _____ (Signed) _____

Residing in _____ County, State of _____

CONTRACTOR'S BID FOR PUBLIC WORK – FORM 96

State Form 52414 (R2 / 2-13) / Form 96 (Revised 2013)
Prescribed by State Board of Accounts

PART I
(To be completed for all bids. Please type or print)

Date *(month, day, year):* _____

1. Governmental Unit (Owner): **City of Greenfield, Indiana**
2. County: **Hancock**
3. Bidder (Firm): _____

   Address: _____

   City/State/ZIP code: _____
4. Telephone Number: _____
5. Agent of Bidder *(if applicable):* _____

Pursuant to notices given, the undersigned offers to furnish labor and/or material necessary to complete the public works project of _____

(Governmental Unit) in accordance with plans and specifications prepared by _____

_____ and dated _____ for the sum of

_____ $_____

The undersigned further agrees to furnish a bond or certified check with this bid for an amount specified in the notice of the letting. If alternative bids apply, the undersigned submits a proposal for each in accordance with the notice. Any addendums attached will be specifically referenced at the applicable page.

If additional units of material included in the contract are needed, the cost of units must be the same as that shown in the original contract if accepted by the governmental unit. If the bid is to be awarded on a unit basis, the itemization of the units shall be shown on a separate attachment.

The contractor and his subcontractors, if any, shall not discriminate against or intimidate any employee, or applicant for employment, to be employed in the performance of this contract, with respect to any matter directly or indirectly related to employment because of race, religion, color, sex, national origin or ancestry. Breach of this covenant may be regarded as a material breach of the contract.

CERTIFICATION OF USE OF UNITED STATES STEEL PRODUCTS
(If applicable)

I, the undersigned bidder or agent as a contractor on a public works project, understand my statutory obligation to use steel products made in the United States (I.C. 5-16-8-2). I hereby certify that I and all subcontractors employed by me for this project will use U.S. steel products on this project if awarded. I understand that violations hereunder may result in forfeiture of contractual payments.

ACCEPTANCE

The above bid is accepted this _____ day of _____, 20___, subject to the following conditions: _____

_____

Contracting Authority Members:

_____ _____

_____ _____

_____ _____

PART II
(For projects of $150,000 or more - IC 36-1-12-4)

Governmental Unit: **City of Greenfield, Indiana**

Bidder (Firm): _____

Date *(month, day, year):* _____

These statements to be submitted under oath by each bidder with and as a part of his bid. Attach additional pages for each section as needed.

SECTION I EXPERIENCE QUESTIONNAIRE

1. What public works projects has your organization completed for the period of one (1) year prior to the date of the current bid?

Contract Amount	Class of Work	Completion Date	Name and Address of Owner

2. What public works projects are now in process of construction by your organization?

Contract Amount	Class of Work	Expected Completion Date	Name and Address of Owner

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

4. List references from private firms for which you have performed work.

SECTION II PLAN AND EQUIPMENT QUESTIONNAIRE

1. Explain your plan or layout for performing proposed work. *(Examples could include a narrative of when you could begin work, complete the project, number of workers, etc. and any other information which you believe would enable the governmental unit to consider your bid.)*

2. Please list the names and addresses of all subcontractors *(i.e. persons or firms outside your own firm who have performed part of the work)* that you have used on public works projects during the past five (5) years along with a brief description of the work done by each subcontractor.

3. If you intend to sublet any portion of the work, state the name and address of each subcontractor, equipment to be used by the subcontractor, and whether you will require a bond. However, if you are unable to currently provide a listing, please understand a listing must be provided prior to contract approval. Until the completion of the proposed project, you are under a continuing obligation to immediately notify the governmental unit in the event that you subsequently determine that you will use a subcontractor on the proposed project.

4. What equipment do you have available to use for the proposed project? Any equipment to be used by subcontractors may also be required to be listed by the governmental unit.

5. Have you entered into contracts or received offers for all materials which substantiate the prices used in preparing your proposal? If not, please explain the rationale used which would corroborate the prices listed.

SECTION III CONTRACTOR'S FINANCIAL STATEMENT

Attachment of bidder's financial statement is mandatory. Any bid submitted without said financial statement as required by statute shall thereby be rendered invalid. The financial statement provided hereunder to the governing body awarding the contract must be specific enough in detail so that said governing body can make a proper determination of the bidder's capability for completing the project if awarded.

SECTION IV CONTRACTOR'S NON - COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to include anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such sale.

SECTION V OATH AND AFFIRMATION

I HEREBY AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING BID FOR PUBLIC WORKS ARE TRUE AND CORRECT.

Dated at _____ this _____ day of _____, 20____

_____
(Name of Organization)

By _____

_____
(Title of Person Signing)

ACKNOWLEDGEMENT

STATE OF _____)
) SS
COUNTY OF _____)

Before me, a Notary Public, personally appeared the above-named _____ and swore that the statements contained in the foregoing document are true and correct.

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

_____
*Notary Publ*ic

My Commission Expires: _____

County of Residence: _____

Part of State Form 52414 (R2 / 2-13) / Form 96 (Revised 2013)

BID OF

_____
(Contractor)

_____
(Address)

_____

FOR

PUBLIC WORKS PROJECTS

OF

_____

_____

_____

Filed _____, _____

Action taken _____

_____

POST-BID SUBMITTAL
SUBCONTRACTOR/SUPPLIER PARTICIPATION

A. SUBCONTRACTORS AND SUPPLIERS LIST

Instructions to Bidders: The Bidder shall submit a completed Subcontractor/Supplier list (see below) as required in ITB 6.4.

The Bidder shall enter the names, the type of work to be done, and the price, in the Subcontractors/Suppliers List for each subcontractor/supplier that the Bidder proposes to use for any part of the Work for the Project at an agreed price of $_____ or greater, as part of the total amount bid as stated above in Part 2.

Only one subcontractor/supplier shall be listed for each line. Upon award of a contract, the named subcontractors/suppliers shall be employed to perform the work, unless changes are specifically authorized by the Owner. Failure to furnish all information requested may render the bid non-responsive if it is determined that such omission materially affords the Bidder a substantial advantage over other Bidders.

Except as otherwise specifically stated by the Bidder in this Part, omission of any names of subcontractors/suppliers herein shall constitute an affirmative representation and statement that the Bidder proposes to use its own work force for that portion of the Work

Bidder's attention is directed to paragraphs 6.8, 6.9, and 6.11 of the City of Greenfield Standard General Conditions for Construction Contracts as they relate to use of subcontractors/suppliers.

Subcontractor Name	Work	Price
		$
		$
		$
		$
		$
		$

Supplier Name	Work	Price
		$
		$
		$
		$
		$
		$

(please duplicate and use this form, if additional sheets are necessary)

POST-BID SUBMITTAL
MANUFACTURERS LIST

Instructions to Bidders:

The Bidder shall enter, in the spaces provided below, the name of the manufacturer for ALL material and equipment listed below, to be incorporated into the Work.

Failure to furnish all information for each listed material or equipment item(s) may render the bid non-responsive.

Preliminary acceptance of equipment listed by the manufacturer's name shall not in any way constitute a waiver of the Drawing and Specification requirements covering such equipment. Acceptance will be based on full conformity with the Drawings and Specifications covering the equipment.

The information submitted on this Post-Bid-2 page does not alleviate the Bidder from submitting the required Subcontractor/Supplier Information on the Post-Bid-1 page.

Material/Equipment Item	Manufacturer
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

POST BID SUBMITTAL
E-VERIFY DOCUMENTATION
SEE ITB SECTION 6.6

Pursuant to Indiana Code 22-5-1.7-11.1 the Contractor shall provide documentation that it has enrolled and is participating in the E-Verify program. Contractor is required to submit proof from the E-Verify Program that it is currently enrolled in the Program. An example of confirmation is the confirmation e-mail received from E-Verify that the Contractor has successfully enrolled in E-Verify.

BID BOND
City of Greenfield

Instructions to Bidders

Bidders may use this form or other form containing the same material conditions and provisions as approved in advance by Owner/Obligee.

Bidder/Surety must attach a signed, certified and effective dated copy of the Power of Attorney or Attorney-In-Fact establishing the authority of the person(s) signing this Bid Bond on behalf of the Surety.

Surety company executing this bond shall appear on the most current list of "Surety Companies Acceptable on Federal Bonds" as specified in the U.S. Treasury Department Circular 570, as amended, and be authorized to transact business in the State of Indiana.

KNOW ALL MEN BY THESE PRESENTS, that the undersigned

"Bidder": _____

and

"Surety": [Name] _____
[Address] _____
_____,

a corporation chartered and existing under the laws of the State of _____, and authorized to do business in the State of Indiana,

are held and firmly bound unto the City of Greenfield, Indiana ("Owner/Obligee") in the full and just sum equal to five percent (5%) of the price stated in the Bid Proposal described below, including accepted alternates, if any, to be paid upon demand of the Owner/Obligee, together with interest at the maximum legal rate from date of demand and any attorney fees and court costs incurred by Owner/Obligee to enforce this instrument, to which payment well and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally and firmly by these presents.

WHEREAS, the Owner/Obligee has solicited bids for certain Work for or in furtherance of construction of public improvements described generally as:

Waterview Lift Station Relocation Project

pursuant to plans, specifications and other "Contract Documents" included as parts of and designated by such solicitation; and

WHEREAS, the Bidder has submitted to the Owner/Obligee a Bid Proposal to perform such Work.

NOW THEREFORE: The conditions of this obligation are such that if the Bid Proposal be accepted, with or without conditions, the Bidder shall within such time thereafter as prescribed by the Contract Documents (i) fulfill all conditions of such award that remain to be fulfilled, (ii) execute a Contract in accordance with the Bid Proposal and in the form and manner required by the Contract Documents, and (iii) thereafter provide all bonds, and other documentation required by the Contract Documents to be delivered to Owner/Obligee prior to commencing Work, including without limitation a sufficient and satisfactory Performance Bond and Payment Bond payable to Owner/Obligee, each in an amount of one hundred percent (100%) of the total Contract price as awarded and in form and with surety satisfactory to said Owner/Obligee, then this obligation to be void; otherwise to be and remain in full force and virtue in law, and the Surety shall, upon failure of the Bidder to comply with any or all of the foregoing requirements within the time specified above and as prescribed by the Contract Documents, immediate pay to the Owner/Obligee, upon demand, the amount hereof, in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

IN TESTIMONY THEREOF, the Bidder and Surety have caused this instrument to be duly signed and sealed this _____ day of _____, 20_____.

This Bid Bond shall bind the undersigned Surety whether or not also signed by the Bidder.

"Bidder"	"Surety"
By: _____	By: _____
Printed: _____	Printed: _____

WARRANTY BOND
City of Greenfield

Instructions:

Successful Bidder must use this form or other form containing the same material conditions and provisions as approved in advance by Owner.

Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute bond.

Surety company executing this bond shall appear on the most current list of "Surety Companies Acceptable on Federal Bonds" as specified in the U.S. Treasury Department Circular 570, as amended, and be authorized to transact business in the State of Indiana.

KNOW ALL MEN BY THESE PRESENTS: that

"Contractor": _____

and

"Surety": [name] _____
[Address] _____
_____

a corporation chartered and existing under the laws of the State of_____, and authorized to do business in the State of Indiana,

are held and firmly bound unto the City of Greenfield, Indiana hereinafter called Owner/Obligee, in the penal sum of _____ Dollars, ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, together with interest at the maximum legal rate from date of demand and any attorney fees and court costs incurred by Owner/Obligee to enforce this instrument, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has entered into a certain Agreement with the Owner/Obligee, dated as of the _____ day of _____, 20 ____, by which Contractor has agreed to perform and furnish certain Work for or in furtherance of construction of public improvements described generally as

Waterview Lift Station Relocation Project

which Agreement, and the "Contract Documents" as referred to therein, are hereby incorporated herein by reference;

WHEREAS, Contractor has installed and completed and met all improvements, installations and requirements applicable to the above described Work, but said improvements and installations have not yet been accepted for public maintenance; and

WHEREAS, the Owner/Obligee requires a guarantee from the Contractor against defective materials and workmanship in connection with such maintenance.

NOW, THEREFORE, Contractor warrants the workmanship and all materials used in the construction, installation and completion of said Work, including all improvements and installations thereof, to be of good quality and constructed and completed in a workmanlike manner in accordance with the Agreement and Contract Documents and all local, state and federal laws, ordinances, rules, standards and regulations applicable to said Work;

FURTHERMORE, the conditions of the Surety's obligation hereunder are such that if Contractor at his own expense, for a period of 3 years, commencing on the date of Substantial Completion, shall make all repairs or replacements thereto which may become necessary by reason of improper or defective workmanship or materials, or any failure thereof to conform to the provisions of the Agreement or Contract Documents, then Surety's obligation is to be null and void; otherwise such obligation shall remain in full force and effect. Any repairs or replacements made under this Bond shall in like manner be subject to the terms and conditions hereof.

Contractor and Surety covenant that all action required by law to be taken by them to authorize the execution and delivery of this bond have been previously been taken, that the officers whose signatures appear below have been fully empowered to execute and deliver this instrument and that once executed and delivered, it shall represent the lawful and binding obligation of the parties.

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

CONTRACTOR: _____
[name]

By: _____ _____
[signature] [printed name]

ATTEST: _____, Secretary
[signature]

SURETY: _____
[name]

By:_____, Attorney-in-Fact
[signature]

_____ _____
[printed name] [address]

PAYMENT BOND
City of Greenfield

Instructions:

Successful Bidder must use this form or other form containing the same material conditions and provisions as approved in advance by Owner.

Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute bond.

Surety company executing this bond shall appear on the most current list of "Surety Companies Acceptable on Federal Bonds" as specified in the U.S. Treasury Department Circular 570, as amended, and be authorized to transact business in the State of Indiana.

KNOW ALL MEN BY THESE PRESENTS: that

"Contractor": _____

and

"Surety": [name] _____
[Address] _____
_____

a corporation chartered and existing under the laws of the State of_____, and authorized to do business in the State of Indiana,

are held and firmly bound unto the City of Greenfield, Indiana hereinafter called Owner/Obligee, in the penal sum of _____ Dollars, ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, plus interest at the maximum legal rate from date of demand and any attorney fees and court costs incurred by Owner/Obligee to enforce this instrument, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has entered into a certain Agreement with the Owner/Obligee, dated as of the _____ day of _____, 20 ____, by which Contractor has agreed to perform and furnish certain Work for or in furtherance of construction of public improvements described generally as

Waterview Lift Station Relocation Project

which Agreement, and the "Contract Documents" as referred to therein, are hereby incorporated herein by reference.

NOW, THEREFORE, the conditions of this obligation are such that if the Contractor shall promptly make payments of all amounts due to all Claimants, then this obligation shall be void; otherwise to remain in full force and effect. "Claimant" shall mean any subcontractor, material supplier or other person, firm, or corporation furnishing materials or equipment for or performing labor or services in the prosecution of the Work provided for in such Agreement, including lubricants, oil, gasoline, coal and coke, repairs on machinery, and tools, whether consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees:

1. that no defect or irregularity in the contract or in the proceedings preliminary to the letting of the contract will operate to release or discharge Surety.

2. that no change, omission, extension of time, alteration or addition to the terms of the Agreement, Contract Documents or to any Work to be furnished thereunder, and no delay by the Owner/Obligee in enforcement of the Agreement or this Bond shall in any way affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Agreement, Contract Documents or to the Work.

3. that no final settlement between the Owner/Obligee and the Contractor shall abridge any right of the Owner/Obligee hereunder as to any claim that may remain unsatisfied.

4. that this Payment Bond and Surety shall not be released until one (1) year after the Owner/Obligee's final settlement with the Contractor.

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

CONTRACTOR: _____
[name]

By: _____ _____
[signature] [printed name]

ATTEST: _____, Secretary
[signature]

SURETY: _____
[name]

By:_____, Attorney-in-Fact
[signature]

_____ _____
[printed name] [address]

PERFORMANCE BOND
City of Greenfield

Instructions:

Successful Bidder must use this form or other form containing the same material conditions and provisions as approved in advance by Owner.

Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute bond.

Surety company executing this bond shall appear on the most current list of "Surety Companies Acceptable on Federal Bonds" as specified in the U.S. Treasury Department Circular 570, as amended, and be authorized to transact business in the State of Indiana.

KNOW ALL MEN BY THESE PRESENTS: that

"Contractor": _____

and

"Surety": [name] _____
[Address] _____
_____

a corporation chartered and existing under the laws of the State of _____, and authorized to do business in the State of Indiana,

are held and firmly bound unto the City of Greenfield, Indiana hereinafter called Owner/Obligee, in the penal sum of _____ Dollars, ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, together with interest at the maximum legal rate from date of demand and any attorney fees and court costs incurred by Owner/Obligee to enforce this instrument, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has entered into a certain Agreement with the Owner/Obligee, dated as of the _____ day of _____, 20 ____, by which Contractor has agreed to perform and furnish certain Work for or in furtherance of construction of public improvements described generally as

Waterview Lift Station Relocation Project

which Agreement, and the "Contract Documents" as referred to therein, are hereby incorporated herein by reference;

NOW, THEREFORE, the conditions of this obligation are such that if the Contractor shall well, truly and faithfully perform his duties, all the undertakings, covenants, terms and conditions of said Agreement whether during the original term thereof, and any extensions thereof which may be granted by the Owner/Obligee, with or without notice to the Surety and during any period of guaranty or warranty provided therein or arising thereunder, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner/Obligee from all costs and damages which he may suffer by reason of failure to do so, and shall reimburse and repay the

Owner/Obligee all outlay and expense which the Owner/Obligee may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees:

1. that no defect or irregularity in the contract or in the proceedings preliminary to the letting of the contract will operate to release or discharge Surety.

2. that no change, omission, extension of time, alteration or addition to the terms of the Agreement, Contract Documents or to any Work to be furnished thereunder, and no delay by the Owner/Obligee in enforcement of the Agreement or this Bond shall in any way affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Agreement, Contract Documents or to the Work.

3. that no final settlement between the Owner/Obligee and the Contractor shall abridge any right of the Owner/Obligee hereunder as to any claim that may remain unsatisfied.

4. that this Performance Bond and Surety shall not be released until one (1) year after the Owner /Obligee's final settlement with the Contractor.

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

CONTRACTOR: _____
[name]

By: _____ _____
[signature] [printed name]

ATTEST: _____, Secretary
[signature]

SURETY: _____
[name]

By:_____, Attorney-in-Fact
[signature]

_____ _____
[printed name] [address]

AGREEMENT
City of Greenfield

THIS AGREEMENT is made and entered into as of the _____ day of _____, 20_____.

by and between

"OWNER": City of Greenfield, Indiana, by and through its Board of Public Works
10 S. State Street, Greenfield, Indiana 46140

and

"CONTRACTOR":

concerning the following:

"PROJECT": Waterview Lift Station Relocation Project

The abandonment of the existing Waterview lift station and the construction of a new 1,100 gpm duplex lift station and related site work, installation of approximately 976 feet of 12" force main, 2,049 feet of 12" & 18" sanitary sewers, abandonment of an existing 10" sanitary sewer, reconnection of 17 residential sewer laterals and replacement of approximately 3,630 sy of concrete streets with asphalt, curbs, ADA ramps and related work.

"ENGINEER": **American Structurepoint Inc.**

RECITALS:

A. The OWNER has heretofore caused to be prepared certain plans, specifications and other "Contract Documents" as hereinafter listed pertaining to the above described Project and Work, and the CONTRACTOR has filed Proposal to furnish said labor, tools, material, equipment, services, and perform said Work upon the terms and for the price(s) therein fully stated and set forth;

B. The said Contract Documents accurately and fully describe the terms and conditions upon which the CONTRACTOR is willing to furnish the labor, tools, material, equipment, services, and perform the Work called for by the Contract Documents and in the manner and time and for the price(s) set forth herein.

THE OWNER AND CONTRACTOR AGREE AS FOLLOWS:

1. Contract Documents

1.1 This Agreement consists of the following Contract Documents all of which are as fully a part of this Agreement as if set out verbatim herein or attached hereto and the same do in all particulars become the Agreement between the parties hereto in all matters and things set forth herein and described:

.1 This Agreement;

.2 All Addenda issued prior to receipt of Bids, whether or not receipt thereof has been acknowledged by CONTRACTOR in its Bid;

.3 Special Conditions;

.4 General Conditions;

.5 CONTRACTOR's Itemized Proposal and Declarations;

.6 Technical Specifications;

.7 Plans;

.8 City Standards and Specifications;

.9 Additional Requirements Section of the Bid Documents (change order forms, Indiana Code 5-16-13, etc.);

.10 Instructions to Bidders;

.11 Advertisement or Notice to Bidders; and

.12 Performance, Payment and Warranty Bonds.

1.2 In resolving conflicts, errors, discrepancies and disputes concerning the nature, character, scope or extent of Work to be performed or furnished by the CONTRACTOR, or other rights and obligations of the OWNER and CONTRACTOR, arising from or prescribed by one or more of the Contract Documents, the following rules shall govern:

.1 A requirement occurring in one Contract Document is as binding as though occurring in all Contract Documents;

.2 Calculated dimensions shall govern over scaled dimensions;

.3. The Contract Documents shall be given precedence in the order listed in Paragraph 1.1 above; and

4. In documents of equal priority, if any such conflict, error, discrepancy or dispute cannot be resolved or reconciled by application of the rules stated in Subparagraphs 1.2.1 through 1.2.3, then the provision expressing the greater quantity, quality, or scope of work, or imposing the greater obligation upon the CONTRACTOR or affording the greater right or remedy to the OWNER shall govern, without regard to the party who drafted such provision.

2. Contract Price

2.1 The CONTRACTOR shall, in strict conformity with the Contract Documents, furnish all labor, tools, materials, equipment, services, assume and fulfill all obligations and perform all Work required to construct, complete, and make ready for use by the OWNER for the lump sum of _____ Dollars ($_____).

2.2 The above stated Contract Sum will be paid to the CONTRACTOR in the manner and at such times as set forth in the Contract Documents.

3. Contract Time

3.1 It is hereby understood and mutually agreed, by and between the CONTRACTOR and OWNER, that the date of commencement and the time for completion of the Work as specified in the Contract Documents are ESSENTIAL CONDITIONS of this Agreement.

3.2 The CONTRACTOR agrees that the Work shall be commenced no later than the date indicated in the Notice to Proceed and that the Work shall be prosecuted regularly, diligently and uninterruptedly at such a rate of progress as will insure **Substantial Completion on or before March 1, 2025, and Final Completion on or before September 5, 2025**.

3.3 The CONTRACTOR agrees that **Substantial Completion (for portion of gravity main through the fairgounds) shall be complete by February 17, 2025. This area must be returned to use no later than March 1, 2025.**

3.4 The CONTRACTOR and OWNER acknowledge and agree that the time allotted by this Agreement for the performance and completion of the Work is reasonable and takes into account any and all risks and adverse conditions assumed by CONTRACTOR hereunder.

[REST OF PAGE INTENTIONALLY LEFT BLANK]

4. Liquidated Damages

The CONTRACTOR and OWNER recognize and contemplate that unexcused failure by the CONTRACTOR to complete the Work within the Contract Time will cause the OWNER and the Public to suffer financial losses or inconvenience the full and exact extent and character of which cannot be measured as a basis for recovery by the OWNER of actual damages, and that liquidated damages as prescribed in the Contract Documents represent a fair, reasonable and appropriate estimate thereof. Accordingly, the CONTRACTOR agrees that such liquidated damages may be assessed and recovered by the OWNER, as against CONTRACTOR and its Surety, in the event of delayed completion and without the OWNER being required to present any evidence of the amount or character of actual damages sustained by reason thereof. **Such liquidated damages shall be assessed and recovered at the rate of $500 per day for delay in achieving Substantial Completion and at the rate of $1000 per day in achieving Final Completion of the Work.**

6. Effective Date

This Agreement shall be deemed effective as of the date and year first above written notwithstanding the date on which this Agreement has been executed by the respective parties or their representatives as stated below.

[REST OF PAGE INTENTIONALLY LEFT BLANK]

"CONTRACTOR" SIGNATURE:

IN TESTIMONY THEREOF, the CONTRACTOR has hereunder set his hand this _____ day of _____, 20____.

Firm Name _____

Address _____

Telephone No. _____ Fax No. _____

By:_____
Signature

Printed: _____

Title: _____

"OWNER" SIGNATURES:

IN WITNESS WHEREOF, the OWNER does hereby accept the foregoing Agreement, and has herewith set his/her hand this _____ day of _____, 20____.

For and on behalf of the City of Greenfield by its Board of Public Works.

_____
Chuck Fewell, Mayor,

_____ _____
Kelly McClarnon, Member Larry J. Breese, Member

_____ _____
Katherine N. Locke, Member Glenna Shelby, Member

ATTEST:

_____
Lori Elmore, Clerk Treasurer

Date: _____

ADDITIONAL REQUIREMENTS

TABLE OF CONTENTS

Following are specimen forms proposed to be used for the issuance of change orders, field orders, and work directive changes. Procedure for the development, submittal and processing of these forms will be discussed during the preconstruction conference.

CITY OF GREENFIELD

OWNER: CITY OF GREENFIELD

FIELD ORDER NUMBER: _____
DATE: _____
PROJECT NAME: _____
PROJECT NO: _____

You are hereby directed to execute promptly this Field Order which interprets the Contract Documents or orders minor changes in the Work without change in Contract Sum or Contract Time.

If you consider that a change in Contract Sum or Contract Time is required, please submit your itemized proposal to the Engineer immediately and before proceeding with this Work. If your proposal is found to be satisfactory and in proper order, this Field Order will in that event be superseded by a Change Order.

Description:

Attachments:

PROJECT MANAGER:

By:_____

Date: _____

CITY OF GREENFIELD

TO:

WORK DIRECTIVE CHANGE NO. _____
DATE: _____
PROJECT NAME: _____
PROJECT NO.: _____

Specification Reference: _____

Drawing Reference: _____

DESCRIPTION OF WORK COVERED BY THIS DIRECTIVE CHANGE:

REASON FOR THIS ORDER:

AUTHORIZATION:
THIS WORK DIRECTIVE CHANGE AUTHORIZES THE WORK TO BE COMPLETED AS OUTLINED. A Contract Change Order in the amount of $_____ will be issued to you in the near future to cover this Work Directive Change.

PROJECT COMPLETION DATE: ADD/DEDUCT/UNCHANGED _____ DAYS.

By: _____ By: _____
Project Manager City Engineer

CITY OF GREENFIELD

TO:

REQUEST FOR PROPOSAL NO.: _____
DATE: _____
PROJECT NAME: _____
PROJECT NO.: _____

Specification Reference: _____

Drawing Reference: _____ Drawing Date: _____

Identification of Attachments: _____

Please submit within fifteen calendar days of this request date a proposal showing increase, decrease or no change in contract price and/or contract time. Proposal shall be accompanied by four (4) copies of breakdown showing quantities, cost of material, equipment, labor, overhead, profit and basis for the additional time if any.

DESCRIPTION OF PROPOSED CHANGE COVERED BY THIS REQUEST:

REASON FOR CHANGE:

SPECIAL INSTRUCTIONS:

THIS REQUEST DOES NOT AUTHORIZE YOU TO PROCEED WITH THE ABOVE WORK NOR STOP PREVIOUSLY SCHEDULED WORK. Upon approval a Contract Change Order and a Notice to Proceed will be issued.

Please state in your proposal the effect the acceptance of this REQUEST will have on the project completion, if accepted within ___ days of proposal due date.

YOUR PROPOSAL DUE DATE:_____

By: _____ _____
Project Manager Date

CITY OF GREENFIELD

TO:

CONTRACT CHANGE REQUEST NO.: _____
DATE: _____
PROJECT NAME: _____

FROM: _____

IT IS REQUESTED THAT A CONTRACT CHANGE BE MADE TO THE ABOVE REFERENCED CONTRACT.

1. SCOPE OF WORK (USE ADDITIONAL PAGES IF REQUIRED. ALSO LIST OTHER CONTRACTS INVOLVED.)
   _____
   _____

2. REASON FOR CHANGE:
   _____
   _____

3. APPROXIMATE COST CHANGE TO CONTRACT PRICE: _____

4. WILL THE CONTRACT NEED ADDITIONAL CONTRACT TIME TO COMPLETE THE CHANGE IN WORK SCOPE? _____ -YES _____ -NO _____ -(CALENDAR DAYS)

5. WILL THE CONTRACTOR NEED ADDITIONAL PERSONNEL TO COMPLETE THE CHANGE IN WORK SCOPE? _____ -YES _____ -NO

   IF NO, TRADE(S):_____

   NO. OF PERSONNEL: _____

   DURATION: _____

6. IDENTIFICATION OF ATTACHMENTS:
   _____
   _____

DATE:_____ DATE:_____

PREPARED BY: _____ REVIEWED BY: _____
Project Manager

Comments and Recommendation:

_____

CITY OF GREENFIELD

TO:

CONTRACT CHANGE ORDER NO.: _____
DATE: _____
PROJECT NAME:_____
ORIGINAL CITY P.O. NO.: _____

I. You are directed to make the following changes in this contract:

ITEM	AMOUNT	SCHEDULED ADJUSTMENT (+) OR (-) DAYS

II. The following referenced documents further describe the changes outlined in Paragraph I, and are to be considered a part of this Change Order:
R.F.P.: _____ W.D.C.: _____

The changes result in the following adjustment of Contract Price and Contract Time:

Contract Sum prior to this Change Order $_____
Contract Sum will be increased/decreased by this Change Order $_____
New Contract Sum including this Change Order $_____
Contract Time Prior to this Change Order _____ Substantial Completion Date
_____ Final Completion Date
Net increased/decreased resulting from this Change Order ____ Days
Current Contract Time including this Change Order _____ Substantial Completion Date
_____ Final Completion Date

This Change Order is for full and final settlement of all direct, indirect, impact costs and time extension incurred at any time resulting from the performance of the changed work.

The Above Changes Are Recommended:	The Above Changes Are Accepted:	Approved:
_____	_____	_____
Engineer	Contractor	Owner
_____	_____	_____
Address	Address	Address
_____	_____	_____
City/State/Zip	City/State/Zip	City/State/Zip
By_____	By_____	By_____
Phone_____	Phone_____	Phone_____
Date_____	Date_____	Date_____

INDIANA CODE (IC) ADDITIONAL REQUIREMENTS

I. IC 5-16-13

1. The definitions in IC 5-16-3 are incorporated by reference into this Section.

2. In accordance with IC 5-16-13-9, the Bidder, as a "Tier 1 contractor" (as defined in IC 5-16-3-4), if awarded a contract for the Work contemplated by this Bid must contribute:
   (a) Work performed by the tier 1 contractor's employees;
   (b) Materials supplied directly by the tier 1 contractor;
   (c) Services supplied directly by the tier 1 contractor's employees; or
   (d) Any combination of subdivisions (a) through (d);
   at least fifteen percent (15%) of the tier 1 contractor's total contract price as determined at the time the contract is awarded.

   NOTE: In accordance with Subsection 6.8.1 of the City of Greenfield Standard General Conditions for Construction Contracts (August 2018), the successful Bidder is required to perform with its own organization Work amounting to **not less than thirty percent (30%)** of the original or revised contract amount, whichever is less.

3. In accordance with IC 5-16-13-10, if awarded a contract for the Work contemplated by this Bid, the Bidder, as a "Tier 1 contractor", and each "Tier 2 contractor" and "Tier 3 contractor" (as defined in IC 5-16-3-4 (i.e., subcontractors and sub-subcontractors)) employed to perform Work on the Project must maintain general liability insurance in at least the following amounts:
   (a) For the each occurrence limit, one million dollars ($1,000,000).
   (b) For the general aggregate limit, two million dollars ($2,000,000).

   NOTE: The successful Bidder, its subcontractors and sub-subcontractors, are required to maintain all insurance coverage as provided for in Article 5 of the City of Greenfield Standard General Conditions for Construction Contracts (August 2018).

4. In accordance with IC 5-16-13-11, if awarded a contract for the Work contemplated by this Bid, the Bidder as a "Tier 1 contractor" and each "Tier 2 contractor" and "Tier 3 contractor" employed to perform Work on the Project:
   (a) Shall submit, before Work begins, the E-Verify case verification number for each individual who is required to be verified under IC 22-5-1.7. An individual who is required to be verified under IC 22-5-1.7 whose final case result is final non-confirmation may not be employed on the Project.
   (b) May not pay cash to any individual employed by the contractor for Work done by the individual on the Project.
   (c) Must be in compliance with the federal Fair Labor Standards Act of 1938, as amended (29 U.S.C. 201-209) and IC 22-2-2-1 through IC 22-2-2-8.
   (d) Must be in compliance with IC 22-3-5-1 and IC 22-3-7-34.
   (e) Must be in compliance with IC 22-4-1 through IC 22-4-39.5.
   (f) Must be in compliance with IC 4-13-18-1 through IC 4-13-18-7.
   (g) Must comply with IC 5-16-13-12, if applicable.

5. In accordance with IC 5-16-13-12, if awarded a contract for the Work contemplated by this Bid, the Bidder as a "Tier 1 contractor" and each "Tier 2 contractor" employed to perform Work on the Project, if they employ fifty (50) or more journeymen:

(a) Must provide access to a training program applicable to the tasks to be performed in the normal course of the employee's employment with the contractor.
(b) Shall participate in an apprenticeship training program that meets the standards established by the United States Department of Labor, Bureau of Apprenticeship and Training.
(c) May comply with this section through any of the following:
(1) An apprenticeship program.
(2) A program offered by Ivy Tech Community College of Indiana.
(3) A program offered by Vincennes University.
(4) A program established by or for the contractor.
(5) A program offered by an entity sponsored by the United States Department of Labor, Bureau of Apprenticeship and Training.
(6) A program that results in the award of an industry recognized portable certification.

6. In accordance with IC 5-16-13-13, if awarded a contract for the Work contemplated by this Bid, the payroll and related records of the Bidder as a "Tier 1 contractor" and each "Tier 2 contractor" and "Tier 3 contractor" employed to perform Work on the Project, must be:
(a) Preserved by the contractor for a period of three (3) years after completion of the Project Work; and
(b) Open to inspection by the Indiana Department of Workforce Development (DWD).

In accordance with IC 5-16-13-14, if the City of Greenfield suspects a misclassification of one (1) or more workers by a contractor in any contractor tier working on the Project may request in writing that DWD investigate the suspected worker misclassification, and in so doing shall provide to DWD any information or records that the City has concerning the misclassification. DWD may investigate such a request, and if it finds information or records that support a finding that worker misclassification has occurred, DWD may refer the matter to the appropriate agency or official for further action.

7. In accordance with IC 5-16-13-15, if the City of Greenfield reasonably suspects the Bidder awarded a contract for the Work contemplated by this Bid or any "Tier 2 contractor" and "Tier 3 contractor" employed to perform Work on the Project has violated a provision of IC 5-16-13, the City is required to do one (1) of the following:
(a) If the suspected violation concerns or is related to any of the following provisions, the City shall refer the matter to the appropriate agency as follows:
(1) For a suspected violation of IC 5-16-13-11(1) (E-Verify), the Indiana Department of Labor.
(2) For a suspected violation of IC 5-16-13-11(3) (the federal FLSA or state minimum wage law), the Indiana Department of Labor.
(3) For a suspected violation of IC 5-16-13-11(4) (worker's compensation or occupational diseases), the Worker's Compensation Board of Indiana.
(4) For a suspected violation of IC 5-16-13-11(5) (unemployment insurance), the Department of Workforce Development.
(b) If the suspected violation concerns a provision of IC 5-16-13 other than a provision listed in subdivision (a), the City shall require the contractor to remedy the violation not later than thirty (30) days after the City notifies the contractor of the violation in accordance with IC 5-16-13-15(b)(2). During the thirty (30) day period, the contractor may continue to work on the Project; however, if the contractor fails to remedy the violation within the thirty (30) day period, the City shall find the contractor not responsible and shall determine the length of time the contractor is considered not responsible by the City based on the severity of the violation. The period during which a contractor is considered not responsible:
(1) May not exceed forty-eight (48) months; and

(2) Begins on the date of substantial completion of the Project.

A finding by the City that a contractor is not responsible under this section may not be used by another public agency in making a determination as to whether the contractor is responsible for purposes of that public agency's award of a public works contract to that contractor.

II. IC 4-13-18 (A response to "Part 11—Drug Testing" of the "Bidder's Itemized Proposal and Declarations" fulfills this requirement)

1. IC 4-13-18 applies if the Bid is one hundred fifty thousand dollars ($150,000) or more.

2. The definitions in IC 4-13-18 are incorporated by reference into this Section.

3. In accordance with IC 4-13-18-5, the Bidder must submit with the Bid a written plan for a program to test the Bidder's employees for drugs. A contractor that is subject to a collective bargaining agreement that establishes an employee drug testing program shall only submit a copy of the relevant part of the collective bargaining agreement establishing the program. Failure to submit a written plan for an employee drug testing program, or relevant parts of a collective bargaining agreement establishing an employee drug testing program shall result in the Bid being rejected as non-responsive.

4. The Bidder's employee drug testing program must satisfy all of the following requirements:
   (a) In accordance with IC 4-13-18-4, if the Bidder's employee drug testing program is established by a collective bargaining agreement it shall include the following:
      (1) Provides for the random testing of the contractor's employees.
      (2) Contains a five (5) drug panel that tests for the following substances:
         (A) amphetamines;
         (B) cocaine;
         (C) opiates (2000 ng/ml);
         (D) PCP;
         (E) THC
      (3) Imposes disciplinary measures on an employee who fails a drug test which includes at a minimum all of the following:
         (A) the employee is subject to suspension or immediate termination;
         (B) the employee is not eligible for reinstatement until the employee tests negative on a five (5) panel test certified by a medical review officer;
         (C) the employee is subject to unscheduled sporadic testing for at least one (1) year after reinstatement; and
         (D) the employee successfully completes a rehabilitation program recommended by a substance abuse professional if the employee fails more than one (1) drug test.
   (b) In accordance with IC 4-13-18-5, if the Bidder has its own employee drug testing program (which is not included as part of a collective bargaining unit), the Bidder's program shall include the following:
      (1) Subject each of the contractor's employees to a drug test at least one (1) time each year.
      (2) Provide for random employee testing, with at least two percent (2%) of the contractor's employees randomly selected each month for testing.
      (3) Contain at least a five (5) drug panel that tests for:
         (A) amphetamines;
         (B) cocaine;
         (C) opiates (2000 ng/ml);
         (D) PCP;
         (E) THC.

(4) Impose progressive discipline on an employee who fails a drug test with at least the following progression:
(A) after the first positive test, an employee must be:
(i) suspended from work for 30 days;
(ii) directed to a program of treatment or rehabilitation; and
(iii) subject to unannounced drug testing for one (1) year from the day the employee returns to work.
(B) after a second positive test, an employee must be:
(i) suspended from work for 90 days;
(ii) directed to a program of treatment or rehabilitation; and
(iii) subject to unannounced drug testing for one (1) year from the day the employee returns to work.
(C) after a third or subsequent positive test, an employee must be:
(i) suspended from work for one (1) year;
(ii) directed to a program of treatment or rehabilitation; and
(iii) subject to unannounced drug testing for one (1) year from the day the employee returns to work.

The program may require dismissal of the employee after any positive drug test or other discipline more severe than described above. An employer complies with the requirement to direct an employee to a program of treatment or rehabilitation if the employer either advised the employee of any such program covered by employer-provided insurance, or, if the employer's insurance does not provide insurance coverage, the employer advises the employee of agencies that provide such programs.

5. In accordance with IC 4-13-18-7, if awarded a contract for the Project, the Bidder must implement the employee drug testing program as described in the plan or collective bargaining agreement. The City of Greenfield shall cancel the contract with the successful Bidder if it:
(a) Fails to implement its employee drug testing program during the term of the contract;
(b) Fails to provide information regarding implementation of the employee drug testing program at the request of the City; or
(c) Provides the City with false information regarding the contractor's employee drug testing program.

III. IC 8-23-10 or IC 4-13.6-4

1. The requirements of this Section III are effective for Bids awarded by the City of Greenfield **after December 31, 2016**.

2. The definitions in IC 5-16-3 are incorporated by reference into this Section.

3. In accordance with IC 8-23-10-0.5, if the total amount of the contract awarded under this Bid is **three hundred thousand dollars ($300,000) or more** and the Project is for the construction, improvement, alteration, repair, or maintenance of a road (as defined by IC 8-23-1-23), highway, street, or alley, then the Bidder, as a "Tier 1 contractor" (as defined in IC 5-16-3-4), and each "Tier 2 contractor" and "Tier 3 contractor" (as defined in IC 5-16-3-4 (i.e., subcontractors and sub-subcontractors)) employed to perform Work on the Project must be qualified by the Indiana Department of Transportation under IC 8-23-10 before performing any Work on the Project.

4. In accordance with IC 4-13.6-4-2.5, if the total amount of the contract awarded under this Bid is **three hundred thousand dollars ($300,000) or more** and the Project is for any work other than for the construction, improvement, alteration, repair, or maintenance of a road (as defined by IC

SECTION 01 10 00 - SUMMARY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Contract description.
   2. Work by Owner or other Work at the Site.
   3. Contractor's Use of Site.
   4. Work Sequence
   5. Specification conventions.

1.2 CONTRACT DESCRIPTION

A. Work includes the abandonment of the existing Waterview lift station and the construction of a new 1,100 gpm duplex lift station and related site work, installation of approximately 976 feet of 12” force main, 2,049 feet of 12” & 18” sanitary sewers, abandonment of an existing 10” sanitary sewer, reconnection of 17 residential sewer laterals and replacement of approximately 3,630 sy of concrete streets with asphalt, curbs, ADA ramps and related work

B. Perform Work of Contract under unit price Contract with Owner according to General Conditions of Contract.

C. The City design standards and specifications can be found on the City’s website: https://www.greenfieldin.org/

1.3 WORK BY OWNER OR OTHERS

A. Work is at various locations throughout City. If Contractor encounters other Work or Contractors on a Site, the Contractor should coordinate with other Contractor.

B. If Owner-awarded contracts interfere with each other due to work being performed at the same time or at the same Site, Owner will determine the sequence of work under all contracts according to "Work Sequence" and "Contractor's Use of Site” Articles in this Section.

C. Coordinate Work with utilities of Owner and public or private agencies.

D. Work under this Contract includes:

   1. Work as indicated on Drawings.

1.4 CONTRACTOR'S USE OF SITE

A. Time Restrictions for Performing Work: Any work performed on or near a business or homeowner’s property shall be coordinated with the business owner or homeowner.

B. All construction activities within the Hancock County 4-H fairgrounds shall be limit to August 1st thru March 1st. All areas of construction shall be open to pedestrian traffic and 4-H activities without any restrictions to the site by March 1st.

1.5 WORK SEQUENCE

A. Construction Plan: Before start of construction, submit electronic copy of construction plan regarding access to Work, use of Site, and utility outages for acceptance by Owner. After acceptance of plan, construction operations shall comply with accepted plan unless deviations are accepted by Owner in writing.

1.6 SPECIFICATION CONVENTIONS

A. These Specifications are written in imperative mode and streamlined form. This imperative language is directed to the Contractor unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 11 21- MISCELLANEOUS WORK ITEMS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
1. Contractor shall provide and maintain methods, equipment, and temporary construction as required to perform the items outlined in this Section.

1.2 MEASUREMENT AND PAYMENT

A. **Item 001: Mobilization and Demobilization**
1. Payment for Mobilization and Demobilization shall be on a lump sum price.
2. The lump sum price bid for this item shall not be more than 5 percent of the total of all other bid items included in the Work.
3. For the purpose of payment, the pay quantity for the mobilization portion of Mobilization and Demobilization will be limited to 60 percent of the total amount bid for this Work Item, which will be included in the first partial payment estimate.
4. The balance of the amount bid shall be considered as demobilization and will be paid for when all work is completed on the job and final clean-up is completed.
5. No additional payment will be made for demobilization and remobilization, initiated by the Contractor, due to shutdowns, suspensions of the Work, or for other mobilization activities.

B. **Item 002: Construction Contingency**
1. The Contractor shall furnish all labor, materials, and equipment necessary to perform the additional miscellaneous work as directed by the Owner. This is Work not shown or specified on the drawings or specifications, but which is subsequently identified by the Owner as being necessary to complete the project.
2. Payment for Construction Contingency shall be made on a lump sum basis.
3. At the completion of the Contract, all remaining funds for this Item will be deducted from the final contract price by means of a Change Order.

C. **Item 006: Plug Existing 6” Pipe at Manhole near Kirkpatrick Pl**
1. The payment quantity shall be the number of plugs actually completed and installed.
2. Payment under this item shall be a lump sum regardless of plug/cap size.
3. This price shall include all cost associated with: removal of surface improvements, excavation, disposal of excavated material, temporary sheeting, shoring, or bracing; dewatering, furnishing and placing Class A concrete for the bulkhead.; furnishing, placing and compacting required backfill; and placing required surfacing.

1.3 MOBILIZATION AND DEMOBILIZATION

A. The lump sum price listed on the submitted Basis of Bid Form for Mobilization and Demobilization shall include all costs to complete all Work necessary for, but not limited to, furnishing bonds, acquiring insurance, acquiring permits, preparing schedules, delivering submittals, construction staking, performance of construction preparatory operations, coordination and administration, notifications of other utilities, agencies or individuals associated with the Work, all supervision, labor, equipment and materials necessary for the movement of personnel, equipment, and materials to and from the project Site, the establishment of all other facilities necessary to the performance of Work and testing where not otherwise specified.

B. Such lump sum price shall also include the cost of maintaining secure storage and work areas, including the security of personnel, open trenches, equipment, and materials.

1.4 CONSTRUCTION CONTINGENCY

A. When Work is required under this Item, the Owner or authorized representative will request a proposal for Work from the Contractor.

B. Contractor shall prepare proposal for Work including, but not limited to, cost estimate, scheduled, impacts to overall project schedule, and subcontractors.

C. No Work shall be performed under this Item without the direct authorization to proceed from the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 11 21

SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contingency allowances.

B. Schedule of Values.

C. Application for Payment.

D. Change procedures.

E. Defect assessment.

F. Unit prices.

1.2 CONTINGENCY ALLOWANCES

A. Contingency allowances are for unforeseen Work or Work requested by the Owner. The Contractor shall carry out the Work only after approval by the Owner.

B. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead, and profit will be included in Change Orders authorizing expenditure of funds from this contingency allowance.

C. Funds will be drawn from contingency allowance only by Change Order upon approval by the Owner.

D. At closeout of Contract, funds remaining in contingency allowance will be credited to Owner by Change Order.

1.3 SCHEDULE OF VALUES

A. The Unit Prices submitted as the Bid and incorporated into the Agreement shall serve as the Schedule of Values.

1.4 APPLICATION FOR PAYMENT

A. Submit three copies of each Application for Payment on EJCDC C-620 - Contractor's Application for Payment.

B. Content and Format: Use Schedule of Values for listing items in Application for Payment.

C. Submit updated construction schedule with each Application for Payment.

D. Payment Period: Submit at intervals stipulated in the Agreement.

E. Submit submittals with transmittal letter as specified in Section 01 33 00 - Submittal Procedures.

F. Submit three copies of all waivers requested by Owner.

G. Substantiating Data: When Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
   1. Record Documents as specified in Section 01 70 00 - Execution and Closeout Requirements, for review by Owner, which will be returned to Contractor.
   2. Affidavits attesting to off-Site stored products.
   3. Construction Progress Schedule, revised and current as specified in Section 01 33 00 - Submittal Procedures.

1.5 CHANGE PROCEDURES

A. Submittals: Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Engineer of any error, inconsistency, omission, or apparent discrepancy.

C. Requests for Interpretation (RFI) and Clarifications: Allot time in construction scheduling for liaison with Engineer; establish procedures for handling queries and clarifications.
   1. Use an approved RFI form for requesting interpretations.
   2. Engineer may respond with a direct answer on the Request for Interpretation form EJCDC C-942 - Field Order, or Proposal Request.

D. Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on EJCDC C-942.

E. Owner may issue Request for Proposal (RFP) including a detailed description of proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change. Contractor will prepare and submit estimate within 7 days to the Owner for review and approval.

F. Stipulated Sum/Price Change Order: Based on Request for Proposal and Contractor's fixed price quotation.

G. Unit Price Change Order: For Contract unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of that which are not predetermined, execute Work under **Work Directive Change**. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.

H. Work Directive Change: Owner may issue directive and signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

I. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Owner will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.

J. Maintain detailed records of Work done on time and material basis. Provide full information required for evaluation of proposed changes and to substantiate costs for changes in the Work.

K. Document each quotation for change in Project Cost or Time with sufficient data to allow evaluation of quotation.

L. Change Order Forms: EJCDC C-941 - Change Order.

M. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.

N. Correlation of Contractor Submittals:
1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
2. Promptly revise Progress Schedules to reflect change in Contract Time, revise subschedules to adjust times for other items of Work affected by the change, and resubmit.
3. Promptly enter changes in Record Documents.

1.6 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements at no cost to the Owner.

B. If, in the opinion of Engineer, it is not practical to remove and replace the Work, Engineer will direct appropriate remedy or adjust payment.

C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Owner.

D. Defective Work will be partially repaired according to instructions of Owner, and unit sum/price will be adjusted to new sum/price at discretion of Owner.

E. Individual Specification Sections may modify these options or may identify specific formula or percentage sum/price reduction.

F. Authority of Owner to assess defects and identify payment adjustments is final.

G. Nonpayment for Rejected Products: Payment will not be made for rejected products for any of the following reasons:
1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from transporting vehicle.
4. Products placed beyond lines and levels of the required Work.

5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected products.

1.7 UNIT PRICES

A. Authority: Measurement methods are delineated in individual Specification Sections.

B. Measurement methods delineated in individual Specification Sections complement criteria of this Section. In event of conflict, requirements of individual Specification Section govern.

C. Take measurements and compute quantities. Engineer will verify measurements and quantities.

D. Unit Quantities: Quantities and measurements indicated on Bid Form are for Contract purposes only. Actual quantities provided shall determine payment.
   1. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at contracted unit sum/prices.
   2. When actual Work requires 25 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim a Contract Price adjustment.

E. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application, or installation of item of the Work; overhead and profit.

F. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.

G. Measurement of Quantities:
   1. Weigh Scales: Inspected, tested, and certified by applicable State of Indiana weights and measures department within past year.
   2. Platform Scales: Of sufficient size and capacity to accommodate conveying vehicle.
   3. Metering Devices: Inspected, tested, and certified by applicable State of Indiana department within past year.
   4. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel, or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
   5. Measurement by Volume: Measured by cubic dimension using mean length, width, and height or thickness.
   6. Measurement by Area: Measured by square dimension using mean length and width or radius.
   7. Linear Measurement: Measured by linear dimension, at item centerline or mean chord.
   8. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed item or unit of the Work.

H. Unit Price Schedule:
   1. Item 001: Mobilization / Demobilization; Section 01 11 21.

   2. Item 002: Construction Contingency; Section 01 11 21.

3. **Item 003: Video Documentation of Conditions; Section 01 71 16.**
4. **Item 004: Maintenance and Protection of Traffic; Section 01 55 26.**
5. **Item 005: Abandon Existing Pump Station; Section 33 05 13.16**
6. **Item 006: Plug Existing 6-Inch Pipe at Manhole Near Kirkpatrick Pl.; Section 01 11 21**
7. **Item 007: Regional Pump Station and Related Appurtenances; Section 33 32 19.**
8. **Item 008: 12-Inch Force Main, HDPE, DR 11 (Open Cut); Section 33 05 38.16.**
9. **Item 009: 12-Inch Force Main, HDPE, DR 11 (Directionally Drilled); Section 33 05 38.16.**
10. **Item 010: 8-Inch Gravity Sewer, HDPE, DR 11 (Directionally Drilled); Section 33 05 38.16.**
11. **Item 011: 18-Inch PVC, SDR 35, Sanitary Sewer; Section 33 31 11**
12. **Item 012: 12-Inch PVC, SDR 35, Sanitary Sewer; Section 33 31 11.**
13. **Item 013: 8-Inch PVC, SDR 35, Sanitary Sewer; Section 33 31 11.**
14. **Item 014: 6-Inch Sewer Laterals; Section 33 31 11.**
15. **Item 015: Cleanouts; Section 33 31 11**
16. **Item 016: 12-Inch RCP, Storm Sewer; Section 33 05 34.13**
17. **Item 017: Storm Pipe Removal (All Sizes); Section 33 49 13**
18. **Item 018: Drain Tile Repair (Assumed Quantity); Section 33 49 13**
19. **Item 019: Casting, Inlet, Adjust to Grade; Section 33 49 13**
20. **Item 020: Storm Sewer Inlet with Casting; Section 33 49 13**
21. **Item 021: 48-Inch Storm Sewer Manhole; Section 33 49 13**
22. **Item 022: 48-Inch Sanitary Manholes; Section 33 05 13.16**
23. **Item 023: Manhole Removal; Section 33 05 13.16**
24. **Item 024: Inlet, Remove; Section 33 05 13.16**
25. **Item 025: Sewer Connection to Existing Manhole; Section 33 05 13.16**

26. **Item 026: Force Main Connection to Manhole; Section 33 05 13.16**
27. **Item 027: Stone Drive Repair, 8-Inch Depth; Section 31 23 17.**
28. **Item 028: Compacted Aggregate, NO. 53/73; Section 31 23 17.**
29. **Item 029: Flowable Fill for Pipe Abandonment; Section 31 23 17.**
30. **Item 030: Common Excavation (Asphalt Pavement); Section 32 12 16**
31. **Item 031: Pavement Removal (Concrete Pavement); Section 32 16 23**
32. **Item 032: Curb Ramp, Concrete; Section 32 16 23**
33. **Item 033: Curb and Gutter, Roll Curb; Section 32 16 23**
34. **Item 034: Curb and Gutter, Remove; Section 32 16 23**
35. **Item 035: Sidewalk, Concrete; Section 32 16 23**
36. **Item 036: Sidewalk, Concrete, Remove; Section 32 16 23**
37. **Item 037: Asphalt Surface; Section 32 12 16**
38. **Item 038: Asphalt Intermediate; Section 32 12 16**
39. **Item 039: Asphalt Base; Section 32 12 16**
40. **Item 040: Milling, Asphalt, 1 1/2 Inch; Section 32 12 16**
41. **Item 041: Seeding and Restoration; Section 32 92 19**
42. **Item 042: Erosion Control; Section 01 57 13**

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and Project conditions.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Closeout meeting.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify that utility requirements and characteristics of operating equipment are compatible with utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.

C. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.

D. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.

E. After Owner's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

1.3 PRECONSTRUCTION MEETING

A. Engineer will schedule and preside over meeting after Notice of Award.

B. Attendance Required: Engineer, Owner, Resident Project Representative, major Subcontractors, and Contractor.

C. Minimum Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.

4. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule.
5. Designation of personnel representing parties in Contract, and Engineer.
6. Communication procedures.
7. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Critical Work sequencing.
10. Scheduling activities of Geotechnical Engineer.

D. Contractor: Record minutes and distribute copies to participants within two days after meeting, to Engineer, Owner, and those affected by decisions made.

1.4 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum bi-monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, and Engineer, Owner, as appropriate to agenda topics for each meeting.

D. Minimum Agenda:
1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems impeding planned progress.
5. Review of submittal schedule and status of submittals.
6. Review of off-Site fabrication and delivery schedules.
7. Maintenance of Progress Schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on Progress Schedule and coordination.
13. Other business relating to Work.

E. Contractor: Record minutes and distribute copies to participants within two days after meeting, to Engineer, Owner, and those affected by decisions made.

1.5 CLOSEOUT MEETING

A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.

B. Attendance Required: Contractor, major Subcontractors, Engineer, Owner, and others appropriate to agenda.

C. Notify Engineer four days in advance of meeting date.

D. Minimum Agenda:
   1. Start-up of facilities and systems.
   2. Operations and maintenance manuals.
   3. Testing, adjusting, and balancing.
   4. System demonstration and observation.
   5. Operation and maintenance instructions for Owner's personnel.
   6. Contractor's inspection of Work.
   7. Contractor's preparation of an initial "punch list."
   8. Procedure to request Engineer inspection to determine date of Substantial Completion.
   9. Completion time for correcting deficiencies.
   10. Inspections by authorities having jurisdiction.
   11. Certificate of Occupancy and transfer of insurance responsibilities.
   12. Partial release of retainage.
   13. Final cleaning.
   14. Preparation for final inspection.
   15. Closeout Submittals:
      a. Project record documents.
      b. Operating and maintenance documents.
      c. Operating and maintenance materials.
      d. Affidavits.
   16. Final Application for Payment.
   17. Contractor's demobilization of Site.
   18. Maintenance.

E. Contractor: Record minutes and distribute copies to participants within two days after meeting, to Engineer, Owner, and those affected by decisions made.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION – Not Used

END OF SECTION

SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Bar chart schedules.

C. Review and evaluation.

D. Updating schedules.

E. Distribution.

1.2 SUBMITTALS

A. Schedule Updates:
   1. Overall percent complete, projected and actual.
   2. Completion progress by listed activity and sub-activity, to within five working days prior to submittal.
   3. Changes in Work scope and activities modified since submittal.
   4. Delays in submittals or resubmittals, deliveries, or Work.
   5. Adjusted or modified sequences of Work.
   6. Other identifiable changes.
   7. Revised projections of progress and completion.

B. Narrative Progress Report:
   1. Submit with each monthly submission of Progress Schedule.
   2. Summary of Work completed during the past period between reports.
   3. Work planned during the next period.
   4. Explanation of differences between summary of Work completed and Work planned in previously submitted report.
   5. Current and anticipated delaying factors and estimated impact on other activities and completion milestones.
   6. Corrective action taken or proposed.

1.3 BAR CHART SCHEDULES

A. Format: Bar chart Schedule, to include at least:
   1. Identification and listing in chronological order of those activities reasonably required to complete the Work, including:

      a. Subcontract Work.
      b. Major equipment design, fabrication, factory testing, and delivery dates including required lead times.
      c. Move-in and other preliminary activities.
      d. Equipment and equipment system test and startup activities.
      e. Project closeout and cleanup.

f. Work sequences, constraints, and milestones.

2. Listings identified by Specification Section number.
3. Identification of the following:

a. Horizontal time frame by year, month, and week.
b. Duration, early start, and completion for each activity and sub-activity.
c. Critical activities and Project float.
d. Sub-schedules to further define critical portions of Work.

1.4 REVIEW AND EVALUATION

A. Participate in joint review and evaluation of schedules with Engineer at each submittal.

B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.

C. After review, revise schedules incorporating results of review, and resubmit within 10 days.

1.5 UPDATING SCHEDULES

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update schedules to depict current status of Work.

C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

D. Upon approval of a Change Order, include the change in the next schedule submittal.

E. Indicate changes required to maintain Date of Total Completion.

F. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect.

1.6 DISTRIBUTION

A. Following joint review, distribute copies of updated schedules to Contractor's Project site file, to Subcontractors, suppliers, Engineer, and Owner.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Definitions.

B. Submittal procedures.

C. Construction progress schedules.

D. Proposed product list.

E. Product data.

F. Shop Drawings.

G. Other submittals.

H. Certificates.

I. Manufacturer's instructions.

J. Construction photographs.

K. Contractor review.

L. Engineer review.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with Engineer-accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.

D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.

E. Schedule submittals to expedite Project and submit electronic submittals via email as PDF electronic files. Coordinate submission of related items.

F. For each submittal for review, allow 7 days excluding delivery time to and from Contractor.

G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

H. Allow space on submittals for Contractor and Engineer review stamps.

I. When revised for resubmission, identify changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

K. Submittals not requested will not be recognized nor processed.

L. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Comply with Section 01 32 16 - Construction Progress Schedule

1.5 PROPOSED PRODUCT LIST

A. Within 5 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.

B. Submit electronic submittals via email as PDF electronic files.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.
   1. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

1.7 SHOP DRAWINGS

A. Shop Drawings: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
   1. Include signed and sealed calculations to support design.
   2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
   3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Submit electronic submittals via email as PDF electronic files.

E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.8 OTHER SUBMITTALS

A. Closeout Submittals: Comply with Section 01 70 00 - Execution and Closeout Requirements.

1.9 CERTIFICATES

A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

1.10 MANUFACTURER'S INSTRUCTIONS

A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.

B. Submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Engineer in quantities specified for Product Data.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.11 CONSTRUCTION PHOTOGRAPHS

A. Provide photographs of Site and construction throughout progress of Work produced by photographer acceptable to Engineer.

B. Once monthly submit photographs.

C. Take a minimum of two Site photographs from different directions and one from both upstream and downstream manholes indicating relative progress of the Work. Additionally, take at least 4 photographs of each partial replacement and photographs at least every 30 linear feet of pipe replacement.

D. Take photographs as evidence of existing Project conditions as follows:
   1. Sewer Replacement: document site conditions before breaking ground. Also photograph segments before and after replacement.

E. Digital Images: Deliver complete set of digital image electronic files on USB flash drive to Owner with Project record documents. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as sensor, uncropped.
   1. Digital Images: Uncompressed TIFF format, produced by digital camera with minimum sensor size of 4.0 megapixels, and image resolution of not less than 1024 by 768 pixels.
   2. Date and Time: Include date and time in filename for each image.
   3. Labels: Name the photographs with the manhole ID number as shown on the Contract Documents.

1.12 CONTRACTOR REVIEW

A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer

B. Contractor: Responsible for:
   1. Determination and verification of materials including manufacturer's catalog numbers.
   2. Determination and verification of field measurements and field construction criteria.
   3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
   4. Determination of accuracy and completeness of dimensions and quantities.
   5. Confirmation and coordination of dimensions and field conditions at Site.
   6. Construction means, techniques, sequences, and procedures.
   7. Safety precautions.
   8. Coordination and performance of Work of all trades.

C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.

D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

1.13 ENGINEER REVIEW

A. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 15 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.

B. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.

C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.

D. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order or Work Change Directive.

E. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities:
   1. Temporary electricity.
   2. Temporary lighting for construction purposes.
   3. Temporary water service.
   4. Temporary sanitary facilities.

B. Construction Facilities:
   1. Field offices and sheds.
   2. Vehicular access.
   3. Parking.
   4. Progress cleaning and waste removal.
   5. Traffic regulation.
   6. Fire-prevention facilities.

C. Temporary Controls:
   1. Security.
   2. Water control.
   3. Dust control.
   4. Erosion and sediment control.
   5. Pollution control.

D. Removal of utilities, facilities, and controls.

1.2 REFERENCES

A. ASTM International:
   1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   3. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.3 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from utility source as needed for construction operation.

B. Complement existing power service capacity and characteristics as required for construction operations.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations.

B. Permanent building lighting shall not be used during construction.

1.5 TEMPORARY WATER SERVICE

A. Greenfield Utilities will provide the Contractor with a temporary hydrant meter and there will be no associated fees or charges. The provided meter shall be used for all connections and water use associated with the Project.

B. Greenfield Utilities shall select the hydrants for use during construction.

1.6 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization.

1.7 FIELD OFFICES AND STAGING AREA

A. These spaces may be used for field offices and / or for lay down:
   1. In available right-of-way within project site.

1.8 VEHICULAR ACCESS

A. Contractor shall utilize existing right-of-way and utility easements to access manholes. Any disturbed areas shall be restored back to original or better condition.

B. Temporary access roads: Locate as approved by Owner.

C. Extend and relocate vehicular access as Work progress requires and provide detours as necessary for unimpeded traffic flow.

D. Provide means of removing mud from vehicle wheels before entering streets.

1.9 PARKING

A. Locate as approved by Engineer.

B. Use of existing on-Site streets and driveways used for construction traffic is permitted. Tracked vehicles are not allowed on paved areas.

C. Use of existing parking facilities used by construction personnel is permitted.

D. Maintenance:
   1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.

2. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

E. Removal, Repair:
   1. Remove temporary materials and construction at Substantial Completion.
   2. Repair existing facilities damaged by use, to original condition.

F. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.10 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, before enclosing spaces.

C. Broom and vacuum clean interior areas before starting surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from Site and dispose of off-Site.

1.11 TRAFFIC REGULATION

A. Maintenance of traffic shall be the sole responsibility of the Contractor.

B. Traffic Control Conditions
   1. Keep work areas open to pedestrian and vehicular traffic to maximum extent practical.
      a. Unless otherwise directed or permitted by the Engineer, schedule the Work to maintain two-way traffic at all times. If two-way traffic cannot be maintained at any point during construction, provide minimum of two uniformed flaggers or two CONTRACTOR employees with suitable training, orange vest, paddleboards and any other required or needed items.
      b. Provide at least one access to all residences and businesses at all times during construction. Notify property owners at least 48 hours in advance of any construction that will impact or change their access, even if it is temporary.
   2. Provide minimum of 7-day notice before implementation of traffic restrictions.
   3. Provide safe passage to vehicular and pedestrian traffic at all times when traffic is allowed.
   4. Provide continuous access for emergency vehicles.

C. Signs, Signals, and Devices:
   1. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
      a. Use traffic cones to channel traffic into the appropriated lane channel with resurfacing roadways with three or more lanes.
   2. Flag Person Equipment: As required by authorities having jurisdiction.

D. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes. Use flaggers for the restriction of lanes on roadways with two or more lanes.

E. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

F. Haul Routes:
   1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.

G. Milled Surfaces:
   1. A milled surface shall not be left open to traffic longer than five calendar days for mainline pavement and ten days for approaches. If the milled surface is not overlaid after five calendar days for mainline pavement and ten calendar days for approaches, a $200.00 per calendar day per street shall be assessed as liquidated damages, not as a penalty, but as damages sustained for each calendar day that the milled area remains left open to traffic.

H. Maintaining Traffic During Winter Months:
   1. Except as otherwise expressly provided in the contract, existing OWNER-maintained roads and other public roads and streets within the limits of the contract shall be kept open to two-way traffic between the dates of December 1 and April 1.

   2. Where the surface on an existing road or street is disturbed, and the entire depth of the new surface is not completed prior to December 1, two-way traffic shall be maintained between the above dates on the partially completed new surface or on a temporary surface satisfactory for two-way traffic. Such surfaces shall be maintained between the above dates with no additional payment. Precautions shall be taken to prevent unnecessary damage to partially completed surfaces. All portions which become damaged shall be repaired with no additional payment.

   3. Public roads, commercial and private drives, and mailbox approaches which are disturbed, and on which the surfacing has not been completed, shall be maintained in a condition satisfactory for use during the time Work is suspended.

   4. Where such approaches have been constructed to grade and drainage structures installed, the approaches shall be surfaced with the compacted aggregate, size No. 53, to a depth as directed. Such surfacing material, which is incorporated in the finished Work, will be paid for at the contract unit price. The following season, the surfacing on the approaches shall be completed to the compacted depth shown on the plans by the addition of the surfacing material specified in the contract. During suspension of the Work where such approaches have not been constructed to grade, a satisfactory temporary surface shall be provided with no additional payment.

I. Removal:
   1. Remove equipment and devices when no longer required.
   2. Repair damage caused by installation.

1.12 FIRE-PREVENTION FACILITIES

A. Prohibit smoking within buildings under construction and demolition. Designate area on Site where smoking is permitted. Provide approved ashtrays in designated smoking areas.

B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.
   1. Provide minimum of one fire extinguisher in every construction trailer and storage shed.

1.13 BARRIERS

A. Tree and Plant Protection: Preserve and protect existing trees and plants designated to remain.
   1. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
   2. Replace trees and plants damaged by construction operations.

B. Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.

1.14 SECURITY

A. Security will not be provided by Owner.

B. Contractor shall be responsible for loss or injury to persons or property where Work is involved, and shall provide security and take precautionary measures to protect Contractor's and Owner's interests.

C. Provide and maintain temporary fencing of design and type needed to prevent entry onto Site by public.

1.15 WATER CONTROL

A. Grade Site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.

B. Protect Site from puddles or running water.

1.16 DUST CONTROL

A. Execute Work by methods that minimize raising dust from construction operations.

B. Provide positive means to prevent airborne dust from dispersing into atmosphere.

C. While a slight misting is acceptable to prevent dust from becoming airborne, ensure dust control measures do not flush dirt and dust into the area storm sewers.

1.17 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.

1.18 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.

B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials before Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary Work.

C. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 51 00 – BYPASS PUMPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes bypass pumping required to maintain operation of the existing sewer flow while completing the Work.
   1. Provide all labor, supervision, tools, equipment, and materials to perform all operations in connection with pumping of sewage and wet weather flows, if required, around the existing connection points.
   2. Maintain sewage flow in the construction area in order to prevent backup or overflow into upstream pipe segments and laterals.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. Bypass Pumping:
   1. Measurement: Work specified in this section is included is other work.
   2. Basis of Payment: Includes pumps, labor, flow diversion equipment, and any other equipment incidental to bypassing sections of pipe when bypass pumping is deemed necessary by the contractor.

1.3 SUBMITTALS

A. Sequence and Setup: Submit bypass pumping plan that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Information shall include, at a minimum, the following information:
   1. Setup area for all bypass equipment including approximate dimensions of bypass pumping layout and proposed discharge piping layout.
   2. Description of bypass pumping discharge point including any structure modifications required to connect to proposed discharge point.
   3. Description of pumps, flow controls, and rated flow capacity.
   4. Operations sequence of pumps based upon bypass pumping flow requirements.
   5. Source of power (i.e. power feed, diesel generator, etc.).
   6. Description of piping (i.e. sizes, type, lengths).
   7. Use of ramps or other means of protecting bypass piping from local (if applicable) and construction traffic.

PART 2 - PRODUCTS

2.1 BYPASS PUMPING SYSTEM

A. General: Provide and maintain adequate pumping equipment, force mains and other necessary appurtenances in order to maintain reliable sanitary sewer service as required for construction of the Project.

1. Bypass pump system shall be reviewed by OWNER and ENGINEER. However, the CONTRACTOR shall be responsible for the proper sizing and maintenance of the bypass pump system.
2. CONTRACTOR shall be responsible for all incidental costs and work related to the bypass pumping effort including, but not limited to: required permits, equipment and piping costs, installation of all equipment and piping, temporary traffic control, power and/or fuel costs associated with equipment, labor costs necessary to provide reliable 24 hours per day/7 days a week operation, modifications to suction and discharge structures for temporary connections including repair of structures at end of bypass pumping process, providing equipment that meets local noise ordinances, servicing of pumps and equipment, and necessary site work at end of pumping period (i.e. repair stone drives, asphalt, sidewalks, and grassed areas).
3. Demonstrate that the pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run during peak flow hours (7:00 am to 9:00 am, Monday through Friday) prior to beginning the work. The CONTRACTOR is responsible for providing equipment that will handle peak flow in the pipe. CONTRACTOR may choose to complete the work during dry weather but shall make sure that all connections are completed prior to wet weather occurrences.
4. Backups or overflows as the result of inadequate equipment are the responsibility of the CONTRACTOR (refer to 3.1 G. below). Damages caused by overflow or backups shall be repaired by the CONTRACTOR at the no additional cost to the OWNER.
5. Provide required bulkheads, pumping equipment, piping, hoses and appurtenances, to accomplish the sequence of pumping.
6. All piping, hose, joints and accessories shall be designed to withstand at least twice the maximum system pressure.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Provide bypass pumping of sewage and, if necessary, wet weather flows around the connection points as necessary to complete the installation of the Work.

B. Sequence of construction and phasing of the Project shall be determined by the CONTRACTOR.

C. Complete the Work and satisfactorily pass all tests, inspections and repair all deficiencies prior to discontinuing bypass pumping operations and routing flow to new sewers or structures.

D. During bypass pumping, no sewage shall be leaked, dumped, or spilled in or onto, any area outside of the existing sanitary sewer system. When bypass pumping operations are complete,

all components of the bypass pumping system shall be drained into the sanitary sewer prior to disassembly.

E. Plug off and pump down the sewer manhole, line segment, or sanitary sewer structure in the immediate work area and maintain the sanitary sewer system so that surcharging does not occur. Where work requires the line to be blocked beyond working hours, CONTRACTOR shall operate bypass pumping and man the system twenty-four (24) hours a day.

F. Ensure that no damage will be caused to surrounding property as a result of bypass pumping operations.

G. In the event that sewage accidentally drains onto the ground or creek, immediately stop the overflow, notify the OWNER and the Indiana Department of Environmental Management (IDEM), and take the necessary action to clean up and disinfect the spillage to the satisfaction of the OWNER and IDEM. If the CONTRACTOR is unable to remedy the situation, suspend or terminate the Work until overflows have been controlled. Damage to materials or equipment that is intended for use on the job or adjacent property caused by surcharges as a result of the Work shall be corrected by the CONTRACTOR at no additional cost to the OWNER. If sewage is spilled onto public or private property, CONTRACTOR shall wash down, clean up and disinfect the spillage to the satisfaction of the OWNER and IDEM. It shall be the CONTRACTOR's responsibility to contact IDEM in a timely manner in the case of an accidental spill. CONTRACTOR shall be responsible for any and all fines that may be charged due to the spills. Notification information to IDEM's Emergency Response Section has been attached to this specification section for use by the CONTRACTOR.

H. Locate bypass pumping suction and discharge lines so as to not cause undue interference with the use of Site or surrounding area to remain open for local use.

I. It is the intent of these specifications to require the CONTRACTOR to establish adequate bypass pumping as required regardless of the flow conditions.

END OF SECTION 01 51 00

SECTION 01 55 26 - MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 GENERAL

1.1 DESCRIPTION

A. Contractor shall keep all streets and traffic ways open for passage of traffic during the Work, unless otherwise approved by owner of the street, traffic way, or right-of-way, as applicable. Construction traffic shall access the Site only via previously approved entrance(s) or as noted on the Drawings.

B. When required to cross, obstruct or temporarily close a street or traffic way, provide and maintain suitable bridges, detours or other approved temporary expedient for the accommodation of traffic. Closings shall be for shortest time practical, and passage shall be restored immediately after completion of backfill and temporary paving or bridging. Fire hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, or other utility controls shall be left unobstructed and accessible during the construction period.

C. Contractor shall notify and coordinate with the fire department, police department, and other emergency services prior to the implementation of the proposed construction operations. Emergency traffic must have access to the Project area at all times.

D. Give reasonable notice to owners or tenants of private property who may be affected by construction operations. Give minimum seventy-two (72) hours' notice.

E. Provide signs, signals, barricades, flares, lights and other equipment, service, and personnel required to regulate and protect all traffic and warn of hazards. Such Work shall conform to requirements of Owner and authority having jurisdiction at the Site. Remove temporary equipment and facilities when no longer required, and restore grounds to original or to specified conditions, as applicable.

1.2 MEASUREMENT AND PAYMENT

A. Item 004: Maintenance and Projection of Traffic

1. Payment for Maintenance and Protection of Traffic shall be on a lump sum basis.
2. The pay quantity for this item shall be the percentage of Work completed at the time of billing (i.e., 10 percent of the lump sum amount for Maintenance and Protection of Traffic will be earned at 10 percent of earned Contract amount).

1.3 TRAFFIC SIGNALS AND SIGNS

A. Provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in all areas under Contractor's control, and areas affected by Contractor's operations.

B. All signs, barricades, and lights shall be in good condition and conform to Indiana Manual on Uniform Traffic Control Devices and Section 801 of the Indiana Department of Transportation (INDOT) Standard Specifications (Latest Edition).

C. As a minimum provide traffic control and directional signs, mounted on barricades or standard posts at the following locations:
   1. Each change of direction of a roadway and at each crossroad.
   2. Detours and hazardous areas.
   3. Parking areas.

1.4 FLAGMEN

A. Provide qualified and suitably equipped flagmen when construction operations encroach on traffic lanes, as required for regulation of traffic and in accordance with requirements of the authority having jurisdiction.

1.5 PARKING CONTROL

A. Control all Contractor-related vehicular parking within limits of the Work to preclude interfering with: public traffic or parking, access by emergency vehicles, Owner's operations, and construction operations. Provide temporary parking facilities for the public, as required, because of construction or operations.

B. Monitor parking of all construction and private vehicles at the Site:
   1. Maintain free vehicular access to and through parking areas.
   2. Prohibit parking on or adjacent to access roads, and in non-designated areas.
   3. Construction vehicles must possess current vehicle registration.
   4. Private vehicles shall park only in designated areas.

1.6 HAUL ROUTES

A. Consult with authorities having jurisdiction to establish thoroughfares that will be used as haul routes and Site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to expedite traffic flow, and to minimize interference with normal traffic.

1.7 STREET SWEEPING

A. All open streets upon which construction activities have occurred shall be broom cleaned at the end of each workday. These construction activities include, but are not limited to, deliveries, hauling, and equipment transport. Large pieces of debris shall be removed immediately.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 57 13

EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
1. Contractor shall provide and maintain methods, equipment, and temporary construction as required to control conditions at the Site and adjacent areas.
2. Contractor shall maintain all controls until Contractor warranty period is complete, or until controls are no longer needed, whichever is earlier. Upon completion of the Work, remove temporary controls and restore Site to specified condition; if condition is not specified, restore Site to pre-construction condition.

1.2 QUALITY ASSURANCE

A. Comply with applicable provisions and recommendations of the following:
1. Erosion Control methods and procedures shall comply with 327 IAC 15-5. Any inconsistencies with 327 IAC 15-5 will not apply except if inconsistency has been approved by IDEM or the IDNR Division of Soil Conservation.
2. Indiana Storm Water Quality Manual, formerly the Indiana Handbook for Erosion Control in Developing Areas. Copies are available from Indiana State Department of Agriculture, Division of Soil Conservation 101 W. Ohio Street, Suite 1200, Indianapolis, IN 46204, or downloaded at http://www.in.gov/idem/4899.htm.
3. Indiana Department of Transportation (INDOT) Standard Specifications, current edition.

1.3 SUBMITTALS

A. Erosion Control Plan:
1. Contractor will be responsible for submitting any revisions to the Engineer that deviate from the erosion control drawings/details as provided for approval.

B. Product Data, Manufacturer Installation and Maintenance Instructions:
1. Submit manufacturer product data, installation instructions and maintenance instructions for all erosion control products included in this specification, this includes the sediment control sacks and the dewatering bags.

C. Erosion Control Inspection Log
1. Contractor shall submit a copy of all erosion control inspection logs, completed in accordance with Section 3.2, with each monthly pay application.
2. Pay application will not be approved without the submittal of the erosion control inspection log.

1.4 MEASUREMENT AND PAYMENT

A. Item 042: Erosion Control

1. Payment for Erosion and Sedimentation Control shall be a lump sum price.
2. The lump sum price shall constitute full compensation for providing all labor, materials, and equipment, both temporary and permanent, and all other cost associated with the installation and maintenance of all control devices, with the removal of sediment deposits and temporary erosion control devices as required, cleaning of paved surfaces and all other cost associated with erosion and sediment protection.

1.5 STORMWATER RUNOFF

A. Stormwater Control – General:
   1. Provide methods to control stormwater runoff (surface drainage) and water from excavations and structures to prevent damage to the Work, the Site, and adjoining properties.
   2. Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff courses to prevent erosion, damage, or nuisance.

B. Equipment and Facilities for Stormwater Control: Provide, operate, and maintain equipment and facilities of adequate size to control storm water runoff.

C. The Contractor shall at all times during construction provide and maintain ample means and devices with which to remove promptly and dispose of properly all stormwater runoff entering the excavations or other parts of the Work and shall keep said excavations dry until the structures to be built or pipelines to be placed therein are completed. No stormwater shall be allowed to rise over or come in contact with masonry until the concrete and mortar have attained a satisfactory set, except in cases where the concrete has been tremied into place with the approval of the Engineer. In water bearing sand, well points and/or sheeting shall be supplied, together with pumps and other appurtenances of ample capacity to keep the excavation free of stormwater.

D. Discharge and Disposal: Dispose of stormwater in manner to prevent flooding, erosion, and other damage to any and all parts of the Site and adjoining areas, and that conforms to Laws and Regulations.
   1. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the water downstream of the point of discharge, shall not be directly discharged. Such waters shall be diverted through a settling basin, filter or other approved method, before being discharged.
   2. Contractor will be held responsible for the condition of any pipe, conduit or channel used for drainage purposes and all such pipes, conduits or channels shall be left clean and free of sediment.

1.6 EROSION CONTROL

A. Erosion Control – General:
   1. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
   2. Hold to a minimum the areas of bare soil exposed at one time.
   3. Provide temporary control measures such as berms, dikes, and drains.
   4. Construct fills and waste areas by selective placement to reduce surface silts or clays that will erode.
   5. Periodically inspect earthwork to detect evidence of the start of erosion; apply corrective measures as required to control erosion. Continue inspections and corrective measures until permanent vegetation has been established.
   6. The Contractor shall maintain drainage flow at all times through any ditches disturbed during construction. The Contractor shall minimize disturbance and sedimentation due to excavation in ditches and shall restore the ditches to their original condition and performance.
   7. Periodically inspect impacted ditches and streams to detect evidence of the start of erosion; apply corrective measures as required to control erosion. Continue inspections and corrective measures until permanent erosion control and vegetation have been established.

1.7 WARRANTY

A. General Warranty: The special warranties specified in this Section shall not deprive Owner of other rights or remedies that Owner may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties required by Contractor under the Contract Documents.

B. Special Warranties: The Contractor shall guarantee a good stand vegetation that is part of permanent erosion controls, by watering, regrading and reseeding eroded areas and otherwise maintaining all permanent erosion controls until final acceptance. Any areas which do not show uniform growth or has bare spots shall be replanted and repaired at the Contractor's expense with the plantings and materials as originally used thereon and such replanting and repairs shall be repeated until all affected areas are repaired. Final acceptance of all permanent erosion control measures may be required by the Contractor after 60 days from the date of installation. The above does not release the Contractor from the standard provisions included in the Guaranty or Maintenance Bond agreement.

1.8 MAINTENANCE

A. Contractor shall maintain erosion controls during Contractor warranty period, including inspections after rain events, and restoration to original design condition as required.

PART 2 PRODUCTS

2.1 GENERAL-EROSION AND CONTROL

A. All erosion control products shall be in accordance with the Indiana Department of Transportation Standards Specifications (INDOTSS).

B. All materials provided under this Specification shall meet the requirements of the applicable sections of the Indiana Department of Transportation Standards Specifications (INDOTSS), latest edition or Indiana Storm Water Quality Handbook.

2.2 SITE PREPARATION

A. Temporary Construction Entrance
   1. Construction of temporary construction entrances shall conform to the details provided in the Contract Documents.
   2. Manufacturers: The following geosynthetic material will be accepted:
      a. Mirafi HP270
      b. Or approved equal
   3. A woven geotextile fabric shall be installed for separation of subbase and base aggregate materials. Geotextile fabrics for use in construction entrances shall conform to the following table:

Woven Geotextile Fabric Requirements				
Construction Entrance Installation				
Physical Properties	Test Method	Unit	Minimum Value	
			MD	CD
Tensile Strength (at ultimate)	ASTM D4595	lbs/ft	2640	2460
Tensile Strength (at 2% strain)			480	588
Tensile Strength (at 5% strain)			1212	1356
Tensile Strength (at 10% strain)			2340	2412
Factory Sewn Seam	ASTM D4884	lbs/ft	1250	
Flow Rate	ASTM D4491	gal/min/ft2	50	
Permeability		cm/sec	0.04	
Permittivity		sec-1	0.70	
Apparent Opening Size (AOS)	ASTM D4751	U.S. Sieve	30	
UV Resistance (at 500hrs)	ASTM D4355	% strength retained	80	

   4. Base aggregate material shall consist of INDOT #2 aggregate and capped with INDOT #5 aggregate. Thickness of each aggregate layer shall conform to the dimensions indicated on the Drawings.
   5. Prior to installation, all vegetation shall be removed from foundation area.
   6. Foundation area shall be graded for positive drainage.
   7. Where possible, divert all stormwater runoff and drainage from the temporary construction entrance.
   8. Construction of sediment barriers shall conform to the details provided in the Contract Documents.
   9. Sediment barriers shall be designed and used in situations in which only sheet or overland flows are expected.
   10. Geotextile fabrics for use in sediment barriers shall conform to the following table:

Woven Geotextile Fabric Requirements			
Sediment Barrier Installation			
Physical Property	Test Method	Unit	Min. Value
Grab Tensile Strength	ASTM D 4632	lbs.	95-125
Grab Tensile Elongation	ASTM D 4632	%	15
Puncture Strength	ASTM D 4833	lbs.	60
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Sieve	#30
Permittivity	ASTM D 4491	sec^{-1}	0.1
Flow Rate	ASTM D 4491	$gal/min/ft^2$	10

11. Sediment barriers shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.
12. Sediment barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
13. Should the sediment barrier decompose or become ineffective prior to the upslope area being permanently stabilized, the barrier shall be replaced promptly.
14. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
15. Any sediment deposits remaining, in place, after the barrier has been removed shall be dressed to conform to the existing grade, prepared, and seeded.

B. Temporary Perimeter Protection - Silt Fence
1. Construction of sediment barriers shall conform to the details provided in the Contract Documents.
2. Sediment barriers shall be designed and used in situations in which only sheet or overland flows are expected.
3. Geotextile fabrics for use in sediment barriers shall conform to the following table:

Woven Geotextile Fabric Requirements			
Sediment Barrier Installation			
Physical Property	Test Method	Unit	Min. Value
Grab Tensile Strength	ASTM D 4632	lbs.	95-125
Grab Tensile Elongation	ASTM D 4632	%	15
Puncture Strength	ASTM D 4833	lbs.	60
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Sieve	#30
Permittivity	ASTM D 4491	sec^{-1}	0.1
Flow Rate	ASTM D 4491	$gal/min/ft^2$	10

4. Sediment barriers shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

5. Sediment barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
6. Should the sediment barrier decompose or become ineffective prior to the upslope area being permanently stabilized, the barrier shall be replaced promptly.
7. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
8. Any sediment deposits remaining, in place, after the barrier has been removed shall be dressed to conform to the existing grade, prepared, and seeded.

C. Temporary Perimeter Protection - Filter Sock
1. Manufacturers: The following proprietary sediment control devices will be accepted for use as perimeter protection:
   a. Filtrexx Sediment Control
   b. Or equal
2. Construction of sediment barriers shall conform to the details provided in the contract documents.
3. Sediment barriers shall be used and installed as recommended by the manufacturer.
4. Filtrexx Sediment Control Soxx for use in sediment barriers shall conform to the following table:

Filtrexx Sediment Control					
Filtrexx Soxx Material					
Material Type	3mil HDPE	5mil HDPE	5mil HDPE	Multi-Filament Polypropylene (MFPP)	Multi-Filament Polypropylene Safety Soxx
Material Characteristics	Photodegradable	Photodegradable	Biodegradable	Photodegradable	Photodegradable
Design Diameters (inch)	5 8 12 18	5 8 12 18 24 32	8 12 18 24 32	8 12 18 24 32	8 12 18 24 32
Mesh Opening (inch)	⅜	⅜	⅜	⅜	⅛
Tensile Strength (psi)	ND	26	26	44	202
% Original Strength form Ultraviolet Exposure (ASTM G-155)	23% at 1,000 hr	23% at 1,000 hr	ND	100% at 1,000 hr	100% at 1,000 hr
Functional Longevity/Project Duration	6 mo–2 yr	9 mo–3 yr	6 –12 months	1 –4 year	2 –5 year

5. Filtrexx Sediment Control Soxx shall contain a coarse composted material that is a Certified Filtrexx Filter Media.

6. Sediment barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
7. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
8. Any sediment deposits remaining, in place, after the barrier has been removed shall be dressed to conform to the existing grade, prepared, and seeded.
9. Filtrexx Sediment Control, including Filtrexx Filter Media, shall be properly disposed of offsite.

2.3 CONCRETE WASHOUT AREA

A. General
1. A concrete washout location shall be designated and a system shall be implemented to reduce the discharge of pollutants associated with concrete washout waste.
2. Construction/Installation of a concrete washout system shall be complete prior to concrete delivery.
3. Do not wash out concrete trucks or equipment into storm drains, wetlands, streams, rivers, creeks, ditches, or streets.
4. Signage shall be installed to designate location of concrete washout system.
5. Washout system shall utilize a pit or bermed area designed and maintained at a capacity to contain all liquid and concrete waste generated by washout operations, between scheduled cleanout periods.
6. Pit shall be lined with ten millimeter polyethylene lining to control seepage.
7. Place flags, safety fencing, or equivalent to provide a barrier to construction equipment and other traffic.
8. Inspect the overall washout system daily for leaks, spills, tracking of soil by equipment, lining failure, and hardened concrete.
9. Once concrete wastes have hardened, remove and dispose off-site.
10. Excess concrete shall be removed when the washout system reaches 50 percent of the design capacity.
11. Replace the plastic liner after each cleaning of the concrete washout system.
12. Concrete washout systems shall be cleaned, removed, filled, graded, and stabilized at the completion of concrete operations.

2.4 TEMPORARY INLET PROTECTION

A. Temporary Inlet Protection – Geotextile Fabric
1. Application
   a. Geotextile fabric inlet protection shall be installed at existing and new-construction storm sewer drop inlets, where area immediately surrounding inlet is not paved.
   b. Geotextile fabric inlet protection is not permitted for use where area immediately surrounding inlet is paved.
2. Structure
   a. Inlet protection shall be constructed and installed in conformance with the details provided in the contract documents.
   b. Structure shall be constructed to a height 12” to 18” above the top of the storm drain inlet; maximum post spacing is 36”.

c. Geotextile fabric shall be woven and shall conform to the requirements listed in the following table:

Woven Geotextile Fabric Requirements			
Temporary Inlet Protection Installation			
Physical Property	Test Method	Unit	Min. Value
Grab Tensile Strength	ASTM D 4632	lbs.	124
Grab Tensile Elongation	ASTM D 4632	%	15
Puncture Strength	ASTM D 4833	lbs.	60
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Sieve	#30
Permittivity	ASTM D 4491	sec^{-1}	0.1
Flow Rate	ASTM D 4491	$gal/min/ft^2$	10

d. Structure shall be constructed and braced as required to withstand 1 ½ foot head of water and sediment without collapsing or undercutting.
e. Pre-manufactured and site constructed structures, meeting the requirements of this specification and details provided in the Drawings, are permitted.

3. Installation
   a. Inlet protection installation shall conform to the requirements of the details provided in the contract documents.
4. Maintenance
   a. Inspect all inlet protection controls daily and make required repairs immediately.
   b. Remove sediment when it has accumulated to four inches anywhere along the inlet protection.
   c. All sediment shall be removed and disposed of off-site.
   d. When contributing drainage area has been stabilized, remove inlet protection, remove sediment, grade area to the required elevation and stabilize immediately.
   e. If area around inlet is to be paved, prior to stabilization of all contributing drainage area, remove and replace inlet protection with an inlet protection approved for paved areas.

B. Temporary Inlet Protection – Sediment Control Sack
1. Application
   a. Temporary sediment control sacks shall only be installed at all existing and new-construction storm sewer inlets and catch basins, where area immediately surrounding inlet is paved.
   b. Temporary sediment control sacks are not permitted for use where area immediately surrounding inlet is not paved.
2. General
   a. Temporary sediment control sacks shall be proprietary devices and shall be submitted for approval prior to installation.
   b. Proprietary inlet protection devices shall provide a filtering efficiency that removes at least 80% of the Total Suspended Solids.
   c. Proprietary devices shall not slow the runoff into the structure such that ponding occurs on the travel lanes of street.

d. Temporary sediment control sacks shall include framework or basket.
e. Inlet protection shall be designed and installed with a bypass to allow stormwater to flow into the storm system during excessive storm events.
f. Inlet protection shall be designed and installed with dumping straps to allow for ease of maintenance.

3. Material
   a. Frame or basket shall have a top width and length such that it will fit into the inlet and be supported by the inlet, grate, or storm sewer.
   b. Temporary sediment control sacks shall only be used for the specific type of inlet they were designed and recommended by the manufacturer.
4. Installation
   a. Inlet protection installation shall conform to the manufacturer requirements for each specific type of inlet or catch basin.
5. Maintenance
   a. Inspect all inlet protection controls daily and make required repairs immediately.
   b. Remove accumulated sediment and debris after each storm event.
   c. Remove sediment when it has accumulated to four inches in the sediment control sack.
   d. All sediment shall be removed and disposed of off-site.
   e. Inlet protection devices shall be removed when contributing drainage area has been stabilized.

C. Temporary Inlet Protection – Stone Bags
1. Application
   a. The use of stone bag inlet protection is permitted at existing and new-construction storm sewer drop inlets and curb inlets, in both paved and un-paved areas.
2. Structure
   a. Stone bag inlet protection shall be constructed and installed in conformance with the details provided in the contract documents.
   b. Structure shall be constructed to a height of one to three layers of bags (as necessary).
   c. Structure shall be constructed to surround storm drain inlets in sump (depression) areas or to a minimum of three feet long at the up-slope side of storm drain inlets and curb inlets (as necessary).
3. Materials
   a. Bags shall be constructed of non-woven geotextile fabric.
   b. Traffic Barricades – As needed, to prevent vehicles from hitting the barrier.
   c. INDOT #5 washed aggregate. Aggregate must be larger than storm sewer grate openings.
4. Installation
   a. Inlet protection installation shall conform to the requirements of the details provided in the contract documents.
   b. Where bags meet existing curbs, overlap bags onto curb, at least half a bag in length.
   c. Additional layers of bags shall be overlapping with the layer below, with staggered joints.
   d. Construct a spillway as shown on the Drawings.
5. Maintenance
   a. Inspect all inlet protection controls daily and make required repairs immediately.

b. Remove sediment when it has accumulated to four inches anywhere along the inlet protection.
c. All sediment shall be removed and disposed of off-site.
d. When contributing drainage area has been stabilized, remove inlet protection, remove sediment, grade unpaved areas to the required elevation and stabilize immediately.

D. Temporary Inlet Protection – Filter Sock
1. Inlet Protection- Filtrexx Inlet Protection
a. Manufactures: The following proprietary sediment control devices will be accepted for use as inlet protection:
1) Filtrexx Inlet Protection
2) Or equal
b. Inlet protection shall be used and installed as recommended by the manufacture.
c. Filtrexx Soxx for use in inlet protection shall conform to the following table:

Filtrexx Inlet Protection					
Filtrexx Soxx Material					
Material Type	3mil HDPE	5mil HDPE	5mil HDPE	Multi-Filament Polypropylene (MFPP)	Multi-Filament Polypropylene Safety Soxx
Material Characteristics	Photodegradable	Photodegradable	Biodegradable	Photodegradable	Photodegradable
Design Diameters (inch)	5 8 12 18	5 8 12 18 24 32	8 12 18 24 32	8 12 18 24 32	8 12 18 24 32
Mesh Opening (inch)	⅜	⅜	⅜	⅜	⅛
Tensile Strength (psi)	ND	26	26	44	202
% Original Strength form Ultraviolet Exposure (ASTM G-155)	23% at 1,000 hr	23% at 1,000 hr	ND	100% at 1,000 hr	100% at 1,000 hr
Functional Longevity/Project Duration	6 mo–2 yr	9 mo–3 yr	6 –12 months	1 –4 year	2 –5 year

d. Filtrexx Inlet Control Soxx shall contain a coarse composted material that is a Certified Filtrexx Filter Media.
e. Sediment barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

f. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
g. Any sediment deposits remaining, in place, after the barrier has been removed shall be removed offsite.
h. Filtrexx Inlet Control including Filtrexx Filter Media, shall be properly disposed of offsite.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION AND MAINTENANCE OF EROSION AND SEDIMENTATION CONTROL

A. All erosion and sediment control items shall be installed in strict conformance with the manufacturer's instructions for proprietary items. On-site construction methods shall conform to the Indiana Storm Water Quality Handbook.

B. Prior to site work, erosion control measures shall be installed to control erosion and prevent sediment laden water from exiting the site. This shall include, but not be limited to, the installation of temporary earthen berms, silt fences, filter curtains, riprap, drainage piping, catch basins, inlet protection and other items that are needed to control sediment.

C. Both temporary and final seeding is required. Should any areas outside of the project area remain inactive for a period of 15 days or more, it shall be seeded with a temporary or permanent vegetative cover such as oats, wheat or rye.

D. Construction operations shall be carried out in such a manner and sequence that erosion shall be minimized and held within acceptable limits. It is important that material excavated from this Project be contained.

3.2 INSPECTION AND MAINTENANCE SCHEDULE

A. The Project area shall be inspected no less than once per week, and after every rainfall event greater than 0.5" in 24 hours. Deficiencies and damages to the erosion control measures must be rectified within 24 hours.

B. An Inspection and Maintenance form or record log shall be kept by the Contractor.

C. The following Erosion Control Schedule shall be used for this Project:

CONTROL MEASURE	INSTALLATION SEQUENCE	INSPECTION AND MAINTENANCE
Construction Entrance	Prior to Clearing and Grading	Minimum of 1 Entrance shall be Provided
Silt Fence Perimeter Protection	Prior to Clearing and Grading	Weekly, after Storm Events and as Needed
Existing Inlet/Drain Pipe Protection	Prior to Clearing and Grading	Weekly, after Storm Events and as Needed
Tree Protection	Along with Rough Grading	Weekly, after Storm Events and as Needed
Temporary Seeding	After Rough Grading	Water as Needed
Permanent Seeding	After Finish Grading	Water as Needed
Erosion Control Matting (Blankets)	After Finish Grading	Weekly, after Storm Events and as Needed
Inlet Protection	After Each Inlet is Placed	Weekly, after Storm Events and as Needed
Soil Stabilization (Seeding)	After Finish Grading Around Finished Inlets	Water as Needed
Removal of Inlet Protection	After All Areas Draining to These Areas Are Stabilized	N/A
Removal of Perimeter Protection	After All Areas Draining to These Areas Are Stabilized	N/A

END OF SECTION 01 57 13

SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Field engineering.

B. Closeout procedures.

C. Project record documents.

D. Product warranties and product bonds.

E. Examination.

F. Preparation.

G. Execution.

H. Cutting and patching.

I. Protecting installed construction.

J. Final cleaning.

1.2 FIELD ENGINEERING

A. Verify setbacks and easements; confirm Drawing dimensions and elevations.

B. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.

C. Maintain complete and accurate log of control and survey Work as Work progresses.

1.3 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
   1. Submit maintenance manuals, Project record documents, digital images of construction photographs**,** and other similar final record data in compliance with this Section.
   2. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.

3. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
4. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
5. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
6. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:
   1. When Contractor considers Work to be substantially complete, submit to Engineer:
      a. Written certificate that Work, or designated portion, is substantially complete.
      b. List of items to be completed or corrected (initial punch list).
   2. Within seven days after receipt of request for Substantial Completion, Engineer and Owner will make inspection to determine whether Work or designated portion is substantially complete.
   3. Should Engineer determine that Work is not substantially complete:
      a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
      b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
      c. Engineer and Owner will reinspect Work.
      d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's and Owner's inspection.
   4. When Engineer finds that Work is substantially complete, Engineer will:
      a. Prepare Certificate of Substantial Completion on EJCDC C-625 - Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
      b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
   5. After Work is substantially complete, Contractor shall:
      a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
      b. Complete Work listed for completion or correction within time period stipulated.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
   1. When Contractor considers Work to be complete, submit written certification that:
      a. Contract Documents have been reviewed.
      b. Work has been examined for compliance with Contract Documents.
      c. Work has been completed according to Contract Documents.
      d. Work is completed and ready for final inspection.
   2. Submittals: Submit following:
      a. Final punch list indicating all items have been completed or corrected.
      b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
      c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
      d. Accounting statement for final changes to Contract Sum.
   3. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:
   1. Within seven days after receipt of request for final inspection, Engineer and Owner will make inspection to determine whether Work or designated portion is complete.
   2. Should Engineer consider Work to be incomplete or defective:
      a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
      b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.
      c. Engineer and Owner will re-inspect Work.
      d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.

1.4 PROJECT RECORD DOCUMENTS

A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed Shop Drawings, product data, and Samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates used.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
   1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
   2. Include locations of concealed elements of the Work.
   3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
   4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
   5. Identify and locate existing buried or concealed items encountered during Project.
   6. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   7. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   8. Field changes of dimension and detail.

9. Details not on original Drawings.
10. Note length lined on both Main Line segments and Laterals in the Sanitary Pipe Rehabilitation Table and Sanitary Lateral Rehabilitation Table respectively.

G. Submit PDF electronic files of marked-up documents to Engineer with claim for final Application for Payment.
    a. Originals of warranties and bonds.

1.5 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.

B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include table of contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time of Submittals:
1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual Specification Sections.

D. Verify that utility services are available with correct characteristics and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
   1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
   2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.

E. Allow for expansion of materials and building movement.

F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
   1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
   2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.

G. Adjust operating products and equipment to ensure smooth and unhindered operation.

H. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.4 CUTTING AND PATCHING

A. Employ skilled and experienced installers to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.

3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight-exposed elements.
5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:
1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install or correct ill-timed Work.
3. Remove and replace defective and nonconforming Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore Work with new products according to requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

H. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

3.5 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

C. Prohibit traffic from landscaped areas.

3.6 FINAL CLEANING

A. Execute final cleaning prior to final Project assessment.

B. Clean Site; sweep paved areas, rake clean landscaped surfaces.

C. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION

SECTION 01 71 16 - VIDEO DOCUMENTATION OF CONDITIONS

PART 1 GENERAL

1.1 DESCRIPTION

A. Prior to the beginning of construction, Contractor shall create a video with audio sound, of the entire Project Site, and any off-site areas used for hauling, dumping, access, storage, etc. This video shall include all Right-of-Entry Sites.

B. A copy of the completed video(s) shall be submitted to the Owner prior to beginning of construction for the Owner's use during the Project. The discs shall remain available for viewing by the Contractor and Engineer and may be reviewed by the Contractor or Engineer at any time for assistance in resolving disputes that arise with property owners claiming improper restoration of their properties or damage to their properties during construction. The video(s) shall be used as a guide by the Owner and Engineer, prior to issuance of final payments, in determining the adequacy of restoration and/or determination of the extent of damages attributable to the Contractor's Work. The video(s) shall also be used by the Owner to address any complaints received by property owners during construction and after the completion of the Project.

C. Notify Owner or Engineer in writing at least 48 hours in advance of video activities.

D. If requested by Owner, conduct all documentation in the presence of Owner or Engineer.

E. The video shall become property of the Owner who shall maintain same for viewing by the Contractor for a period not to exceed 1 year after completion of the Project.

F. Coverage:
   1. The recording shall include coverage of all surface features located within construction zone-of-influence including, but not limited to:
      a. The area within the permanent and temporary easements and areas adjacent to these easements which may be affected by routine construction operations.
      b. The road right-of-way and areas adjacent to these right-of-ways which may be affected by routine construction operations.
      c. The areas directed by the Owner.
   2. The surface features within the construction zone shall include, but not be limited to, all roadways, pavements, curbs, driveways, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, shrubbery and fences. Of particular concern shall be existence or non-existence of any faults, fractures, or defects.

1.2 MEASUREMENT AND PAYMENT

A. **Item 003: Video Documentation of Conditions**
   1. Payment under this item shall be on a lump sum basis. All requirements shall be met to receive full pre-construction video payment.
   2. The lump sum price shall constitute full compensation for providing all labor, materials, and equipment, both temporary and permanent, and other cost associated with this item.

1.3 QUALITY ASSURANCE

A. Videographer Qualifications:
   1. Videographer shall have a minimum of 3 years' experience producing substantially similar video to that specified in this Section and shall be able to document, at Owner's request, at least 3 satisfactory clients by submitting client names and phone numbers.

1.4 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Pre-construction Video Documentation: Submit acceptable pre-construction video documentation prior to mobilizing to and disturbing the Site. However, neither the Engineer nor Owner assumes responsibility for the contents of the video. The Contractor shall be responsible for ensuring that the quality and contents of the video adequately show the Work area.
   2. The Contractor shall keep one copy video for their records.

PART 2 PRODUCTS

2.1 VIDEO DOCUMENTATION

A. Videography:
   1. The camera shall be a high quality color unit.
   2. The video portion of the recording shall reproduce bright, sharp, clear pictures with accurate colors and shall be free from distortion, tearing, rolling, or any other form of imperfection.
   3. The video(s) shall be submitted as electronic format.
   4. The video(s) shall be formatted with separate chapters for each section or Work area of the Project.
   5. The audio portion of the recording shall reproduce precise and concise explanatory notes by the camera operator with proper volume, clarity and freedom from distortions.
   6. The video(s) shall clearly show all physical features along the route and shall provide a complete record of the physical conditions of the entire Project before construction.

PART 3 EXECUTION

3.1 PRODUCTION

A. At the start of production and at the beginning of a new street or easement, an identification summary shall be read into the record while using a wide-angle view of the video to display numeric displays for visual record. This summary shall include:
   1. Job Title.
   2. Job Location.
   3. Positional location at start of job.
   4. Date and Time.
   5. Weather.
   6. Any other notable conditions.

B. Visibility:
   1. No recording shall be performed during periods of significant precipitation, mist or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subjects of recording. No recording shall be performed when the ground area is covered with snow unless otherwise authorized by the Engineer or Owner.

C. Rate of Travel:
   1. The rate of travel of the vehicle used to perform the recording or the walking speed shall not exceed 48 feet per minute. The rate of travel shall be indirectly proportional to the number, size, and value of the surface features within the construction area's zone-of-influence.

END OF SECTION 01 71 16.13

SECTION 01 71 33 - PROTECTION OF THE WORK AND PROPERTY

PART 1 GENERAL

1.1 DESCRIPTION

A. Contractor shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage, as specified in the General Conditions and this Section.

B. To prevent damage, injury, or loss, Contractor's actions shall include the following:
   1. Storing apparatus, materials, supplies, and equipment in an orderly, safe manner that will not unduly interfere with progress of the Work or Work of other contractors or utility company.
   2. Providing suitable storage facilities for materials subject to injury by exposure to weather, theft, breakage, or otherwise.
   3. Placing upon the Work or any part thereof only loads consistent with the safety and integrity of that portion of the Work.
   4. Frequently cleaning up refuse, rubbish, scrap materials, and debris caused by Contractor's operations so that, at all times, the Site is safe and orderly, and workmanlike in appearance.
   5. Providing barricades and guard rails around the following: openings, scaffolding, temporary stairs and ramps, around excavations, elevated walkways, and other hazardous areas.

C. Do not, except after written consent from proper parties, enter or occupy privately-owned land with personnel, tools, materials or equipment, except on lands and easements provided by Owner.

D. Contractor has full responsibility for preserving public and private property and facilities on and adjacent to the Site. Direct or indirect damage done by, or on account of, any act, omission, neglect, or misconduct by Contractor in executing the Work, shall be restored by Contractor, at his expense to condition equal to that existing before damage was done.

E. The Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction related activities. Any disturbed monuments must be replaced by an Indiana Professional Land Surveyor, and approved by the Engineer, at the Contractor's expense.

1.2 MEASUREMENT AND PAYMENT

A. This item shall be included in overall Project cost and not bid as a separate Work item.

1.3 BARRICADES AND WARNING SIGNALS

A. Barricades and Warning Signals – General:

1. Where Work is performed on or adjacent to roadway, access road, right-of-way, or public place, Contractor shall provide barricades, fences, lights, warning signs, danger signals, watchmen, and take other precautionary measures for protecting persons, property, and the Work.
2. Contractor shall paint barricades to be visible at night.
3. From sunset to sunrise, Contractor shall furnish and maintain at least one light at each barricade.
4. Contractor shall erect sufficient barricades to keep vehicles from being driven on or into Work under construction.
5. Contractor shall furnish watchmen as required to protect the Work.
6. Contractor's responsibility for maintaining barricades, signs, lights, and for providing watchmen shall continue until the Work is accepted, by the Owner, in accordance with the General Conditions.

B. Temporary Fencing:
1. Contractor shall provide and maintain temporary security fencing to protect Work if required.

1.4 PROTECTION OF EXISTING STRUCTURES

A. Underground Facilities:
1. Underground Facilities are defined in the General Conditions.
2. All Underground Facilities known to Owner and Engineer, except water, gas, sewer, electric, and communications services to individual buildings and properties, are shown. This information is the best available to Owner and Engineer but, in accordance with the General Conditions, is not guaranteed to be correct or complete.
3. Contractor shall explore ahead of trenching and excavation Work and shall uncover obstructing Underground Facilities sufficiently to determine their location, to prevent damage to Underground Facilities, and to prevent service interruption to building or parcels served by Underground Facilities. If Contractor damages an Underground Facility, Contractor shall restore it to original condition, in accordance with requirements of the owner of the damaged facility and the General Conditions.
4. Necessary changes in the location of the Work may be directed by Owner or Engineer to avoid Underground Facilities not shown or indicated on the Contract Documents.
5. If permanent relocation of an existing Underground Facilities is required and is not otherwise shown or indicated in the Contract Documents, Contractor will be directed in writing to perform the Work. When the relocation Work results in a change in the Contract Price, Contract Time, or both, the relocation Work shall be paid after execution of associated Change Order, in accordance with the Contract Documents.

B. Surface Structures:
1. Surface structures are existing buildings, structures, and other facilities at or above ground surface, including their foundations or any extension below ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage, exposed piping and utilities, poles, exposed wires, posts, signs, markers, mailboxes, curbs, walks, and other facilities visible at or above ground surface.

2. Existing surface facilities, including but not limited to guard rails, posts, guard cables, signs, poles, markers, mailboxes, and curbs that are temporarily removed to facilitate the Work shall be replaced and restored to their original condition at Contractor's expense.

C. Protection of Underground Facilities and Surface Structures:
   1. Contractor shall sustain in their places and protect from direct or indirect injury all Underground Facilities and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure or facility. Before proceeding with the Work of sustaining and supporting such structure or facility, Contractor shall satisfy Engineer that methods and procedures to be used have been approved by party owning same.
   2. Contractor shall bear all risks attending the presence or proximity of all Underground Facilities and surface structures within or adjacent to limits of the Work, in accordance with the Contract Documents. Contractor shall be responsible for damage and expense for direct or indirect injury caused by his Work to structures and facilities. Contractor shall repair immediately damage caused by his Work, to the satisfaction of owner of damaged structure or facility.

1.5 PROTECTION OF INSTALLED PRODUCTS AND LANDSCAPING

A. Protect installed products to prevent damage from subsequent operations. Remove protection facilities when no longer needed prior to completion of Work.

B. Control traffic to prevent damage to equipment, materials, and surfaces.

C. Coverings:
   1. Provide coverings to protect equipment and materials from damage.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 71 33

SECTION 01 75 11 - CHECKOUT AND STARTUP PROCEDURES

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall coordinate initial start-up and place equipment installed under the Contract into successful operation, in accordance with the equipment manufacturer's written instructions and as instructed by Supplier at the Site.
   2. Provide all material, labor, tools, and equipment required to complete equipment checkout and start-up.
   3. Provide chemicals, lubricants, and other operating fluids required for start-up of equipment, unless otherwise specified.
   4. Provide fuel, electricity, water, filters, and other expendables required for start-up of equipment, unless otherwise specified.
   5. General Activities Include:
      a. Cleaning, as required under other provisions of the Contract Documents.
      b. Removing temporary protective coatings.
      c. Flushing and replacing lubricants, where required by manufacturer.
      d. Lubrication.
      e. Checking shaft and coupling alignments and resetting where required.
      f. Checking and setting motor, pump, and other equipment rotation, safety interlocks, and belt tensions.
      g. Checking and correcting (if necessary) leveling plates, grout, bearing plates, anchorage devices, fasteners, and alignment of piping, conduits, and ducts that may place stress on the connected equipment.
      h. All adjustments required.

B. Coordination:
   1. Coordinate checkout and start-up with Owner, other Contractors and Subcontractors, as necessary.
   2. Do not start up system or subsystem for continuous operation until all components of that system or subsystem, including instrumentation and controls, have been tested to the extent practicable and proven to be operable as intended by the Contract Documents.
   3. Owner will provide sufficient personnel to observe during equipment start up, but Contractor shall be responsible for proper operation.
   4. Supplier shall be present during checkout, start-up, and initial operation, unless otherwise acceptable to Owner or Engineer.
   5. Startup of heating and air conditioning equipment and systems is dependent upon the time of the year. Return to the Site at beginning of next heating or air conditioning season (as applicable) to recheck and start the appropriate systems.
   6. Do not start up system, unit process, or equipment without submitting acceptable preliminary operations and maintenance manuals, in accordance with Section 01 78 23, Operations and Maintenance Data.
   7. Do not start up system, unit process, or equipment until checkout and startup documentation has been submitted and approved by Owner or Engineer.

C. Owner's Assumption of Operational Responsibility for Equipment and Systems:
   1. Owner will assume operational responsibility for equipment and systems upon acceptance of Substantial Completion.

2. Prior to turning over system or equipment operation and maintenance responsibility to Owner, Contractor shall:
    a. Provide training of operations and maintenance personnel in accordance with equipment technical specifications. Review equipment sections for applicable material.
    b. Complete system field quality control testing in accordance with the Contract Documents.
    c. Submit acceptable final operations and maintenance manuals
    d. Obtain final certificate of Substantial Completion for the entire Work or the portion of Work being turned over to Owner.
    e. Transfer all keys and locks for the facility to the Owner.

1.2 RELATED SECTIONS

A. Section 33 32 19 - Pumping Station

1.3 MEASUREMENT AND PAYMENT

A. This item is to be included in overall project cost and not bid as a separate work item.

1.4 DEFINITIONS

A. Checkout: Field inspection, testing, adjustments, and sign off by the approved representative of the manufacturer, indicating that the component, system, or unit process meets the manufacture's requirements.

B. Commissioning: Systematic process of ensuring systems perform interactively according to design intent and Owner's operational needs. Commissioning process encompasses and coordinates system documentation, equipment startup, instrumentation and control system calibration, testing and balancing, performance testing and training, and verification of actual performance.

C. Person-Day: One person for 8 hours within regular Contractor working hours.

D. Start-up: Placing a component, system or unit process in operation. Start-up can be a commissioning activity or a normal operating activity.

1.5 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified in the individual technical specification section(s).

B. Representative subject to acceptance by Owner and Engineer

1.6 SUBMITTALS

A. Action Submittals: Submit the following:
    1. Prior to request for certificate of Substantial Completion of the Work or, specified part thereof, submit the following checkout and startup documents:

a. Commissioning Submittals: Submit the following for each piece of operating equipment.
    1) Site/Structural/Mechanical Checklist
    2) Pump Manufacturer's Start Up Report
    3) Lift Station Electrical Inspection Field Documentation
    4) I&C Point to Point Checklist
    5) Start-Up Logs
    6) Test Reports
    7) Manufactures Certificates
2. Provide an electronic scan of the completed check out and start-up documents in a portable electronic document (PDF), or similar format.
3. Scanned documents shall be clear and legible.
4. Submit in accordance with Section 01 33 00, Submittal Procedures.
5. Use templates for certification and checklists provided at the end of this specification Section, as required.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 FULFILLMENT OF SPECIFIED SERVICES

A. Furnish manufacturer's services, when required by an individual technical specification section(s), to meet the requirements of this section.
    1. Manufacturer's services shall be provided as required, regardless of any minimum time specified, until operation of the equipment is satisfactory to Owner, at no additional cost to Owner.

B. Contractor to prepare the commissioning plan for the project.
    1. Coordinate meetings for the purposes of completing the commissioning plan.
    2. Attendance and participation of the following groups at commissioning meetings are required.
        a. Engineer's project representatives
        b. Owner's project representatives
        c. Subcontractors
        d. Installers
        e. Programmers
        f. Suppliers
        g. Manufacturer's representatives as necessary.
        h. Owner's maintenance crew personnel.
        i. Owner's operations crew personnel.
    3. Submit dates of startup of each item of equipment and system for review 14 days prior to startup.
    4. Re-submit anticipated startup dates as revised but not less than 2 weeks prior to startup.
    5. Prefunctional Checklists, functional tests and systems demonstrations are to be performed in sequence from components, to subsystems, to systems.
        a. Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
        b. No sampling of identical or near identical item is allowed.
        c. These checklists do not replace manufacturer's recommended startup checklists, regardless of apparent redundancy.

C. Schedule manufacturer's services in coordination with Owner or Engineer to avoid conflict with other onsite testing or other manufacturer's onsite services.

D. Determine, before scheduling services, that conditions necessary to allow successful testing have been met.

E. Only those days of service approved by Engineer will be credited to fulfill specified minimum services.

F. When not otherwise specified in individual technical specification sections, manufacturer's onsite services shall include:
   1. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor's assembly, erection, installation or application procedures.
   2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary Manufacturer's Certificate of Installation.
   3. Providing, on a daily basis, copies of manufacturer's representatives field notes and data to Engineer.
   4. Revisiting the Site as required to correct problems and until installation and operation are acceptable to Engineer.
   5. Resolution of assembly or installation problems attributable to or associated with respective manufacturer's products and systems.
   6. Assistance during functional and performance testing, and facility startup and evaluation.

G. Training of Owner's personnel in the operation and maintenance of respective product as required.

3.2 MINIMUM START-UP REQUIREMENTS

A. General
   1. Start-up Logs, Test Reports, and Manufacturer's Certifications are to be filled out during system and equipment start-up. Information shall be recorded, and submitted on PMIS for approval by engineer.
      a. Start-up logs shall clearly demonstrate equipment is in conformance with the Contract Documents and assist maintenance personnel in servicing and adjusting equipment.
      b. Test reports shall be in accordance with testing standards and performed by a reliable independent testing laboratory or agency.
      c. Manufacturer's certificate of installation shall be submitted for products ,

B. Bearings and Shafting:
   1. Inspect for cleanliness, and clean and remove foreign matter.
   2. Verify alignment.
   3. Replace defective bearings and those that operate rough or noisy.
   4. Grease as necessary, in accordance with manufacturer's recommendations.

C. Motors:
   1. Check each motor for comparison to amperage nameplate value.
   2. Correct conditions that produce excessive current flow and conditions that exist due to equipment malfunction.

D. Pumps:
   1. Check glands and seals for cleanliness and adjustment before running pump.
   2. Inspect shaft sleeves for scoring.
   3. Inspect mechanical faces, chambers, and seal rings, and replace if defective.
   4. Verify that piping system is free of dirt and scale before circulating liquid through pump.

E. Valves:
   1. Inspect manual and automatic control valves, and clean bonnets and stems.
   2. Tighten packing glands to ensure no leakage, but allow valve stems to operate without galling.
   3. Replace packing in valves to retain maximum adjustment after system is determined to be complete.
   4. Replace packing on valves that continue to leak.
   5. Remove and repair bonnets that leak.
   6. After cleaning, coat packing gland threads and valve stems with appropriate surface preparation.

F. Verify that control valve seats are free of foreign matter and are properly positioned for intended service.

G. Tighten flanges and other pipe joints after system has been placed in operation. Replace gaskets that show signs of leakage after tightening.

H. Inspect all joints for leakage:
   1. Promptly remake each joint that appears to be faulty; do not wait for rust other corrosion to form.
   2. Clean threads on both parts, and apply compound and remake joints.

I. After system has been placed in operation, clean strainers, drives, pockets, orifices, valve seats, and headers in fluid system to ensure freedom from foreign matter.

J. Open steam traps and air vents, where used, and remove operating elements. Clean thoroughly, replace internal parts, and place back into operation.

K. Remove rust, scale, and foreign matter from equipment and renew defaced surfaces.

L. Set and calibrate draft gauges of air filters and other equipment.

M. Inspect fan wheels for clearance and balance. Provide factory-authorized personnel for adjustment when needed.

N. Check each electrical control circuit to verify that operation complies with the Contract Documents.

O. Inspect each pressure gauge, thermometer, and other instruments for calibration. Replace items that are defaced, broken, or that read incorrectly.

P. Repair damaged insulation.

Q. Excess Gasses and Fluids:
   1. Vent gasses trapped in systems.
   2. Verify that liquids are drained from all parts of gas or air systems.

3.3 ELECTRICAL SYSTEM STARTUP SERVICES

A. Tests and inspections shall establish:
   1. Electrical equipment is operational within industry and manufacturer's tolerances and standards.
   2. Installation operates properly.
   3. Equipment is suitable for energizing.

B. Installation conforms to requirements of Contract Documents and NFPA 70, NFPA 70E, NFPA 101, and IEEE C2.

C. Perform inspection and testing in accordance with NETA ATS, industry standards, and manufacturer's recommendations.

D. Set, test and calibrate protective relays, circuit breakers, fuses, power monitoring meters and other applicable devices in accordance with values established by short circuit, coordination, and harmonics studies as specified.

E. Adjust mechanisms and moving parts of equipment for free mechanical movement.

F. Adjust and set electromechanical electronic relays and sensors to correspond to operating conditions, or as recommended by manufacturer.

G. Verify nameplate data for conformance to Contract Documents and approved submittals.

H. Realign equipment not properly aligned and correct discrepancies.

I. Properly anchor electrical equipment found to be inadequately anchored.

J. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench/screw driver to manufacturer's recommendations, or as otherwise specified in NETA ATS.

K. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.

L. Provide proper lubrication of applicable moving parts.

M. Electrical Enclosures:
   1. Remove foreign material and moisture from enclosure interior.
   2. Vacuum and wipe clean enclosure interior.
   3. Remove corrosion found on metal surfaces.
   4. Repair or replace, as determined by Engineer door and panel sections having dented surfaces.
   5. Repair or replace, as determined by Engineer, poor fitting doors and panel sections.
   6. Repair or replace improperly operating latching, locking, or interlocking devices.
   7. Replace missing or damaged hardware.
   8. Finish:
      a. Provide matching paint and touch up scratches and mars.
      b. If required due to extensive damage, as determined by Engineer, refinish entire assembly.

N. Replace fuses and circuit breakers that do not conform to size and type required by the Contract Documents or approved submittals.

3.4 FIELD INPUT/OUTPUT AND SOFTWARE TESTING

A. General:
1. Field testing is intended to check installation of the Process Control System PLC in addition to providing a diagnostic check of field equipment and wiring.
2. Field testing shall make use of operator workstation provided. Install PLC programming software onto operator workstation, and provide any configuration required to establish Ethernet communications with the Process Control System PLC.
3. Testing shall begin after Process Control System PLC has been installed and all terminations are complete.
4. Use PLC configuration utilized for In-Factory Testing.
5. Test as follows:
    a. Run hardware diagnostics.
    b. Testing of all input and output (I/O) signals by activation or injection of signal at field device.
        1) Digital input signals:
            a) For all equipment run signals, test by on/off operation of equipment. If operation of equipment is deemed inadvisable by Owner or PLC Supplier due to potential process upset, inaccessibility of generating device, hazard to personnel or other factors, test by jumpering of motor starter auxiliary contact or other source of run signal.
            b) For all alarm or status signals, test by activation of device generating alarm. If generation of alarm is deemed inadvisable by Owner or PLC Supplier due to potential process upset, inaccessibility of generating device, hazard to personnel or other factors, test by jumpering of alarm contact at nearest accessible location to generating device.
            c) For signals designated as spare, test by jumpering of signal at Process Control System PLC panel field termination point.
            d) Demonstrate change of state in PLC data table.
        2) Analog input signals:
            a) Verify impedance capabilities of transmitting device has not been exceeded by installation of Process Control System PLC.
            b) Disconnect transmitting device and inject 0, 4, 12, and 20 mAdc into loop.
            c) Demonstrate proper response to various signals in PLC data table.
            d) Verify proper response of other devices I analog loop to various signals.
            e) For signals designated as spare, test by injection of signal at Process Control System PLC panel field termination point.
        3) Digital output signals
            a) Manipulate PLC data table or use forces to test response of all discrete output signals.
            b) Verify proper response of other devices in loop to signals.
            c) For signals designated as spare, test by checking signal at Process Control System PLC panel field termination point.
        4) Analog Output Signals
            a) Verify impedance capabilities of analog output is not exceeded.
            b) Generate 4, 12, and 20 mAdc signals for all analog outputs through PLC data table.
            c) Verify proper response of other devices in analog loop to various signals. Verify proper loop current through measurement.
            d) For signals designated as spare, test by measuring of signal at Process Control System PLC panel field termination point.

6. Documentation
    a. Prepare field testing sign-off document. Document shall include following as a minimum:
        1) Project description and number.
        2) Company name for PLC Supplier, Owner, and Engineer.
        3) For each I/O point, include area for initials of PLC Supplier's, Owner's, and Engineer's representative indicating passing of inspection. Include separate line for I/O point to be tested.
        4) Include area for handwritten notes of any corrections required.
7. Problem Field Devices or Wiring
    a. Provide written documentation of any problems encountered with Owner's field devices or wiring during testing. Correction of such problems is not considered part of this project.

3.5 ATTACHMENTS

A. Site/Structural/Mechanical Checklist

B. Pump Manufacturer's Start Up Report

C. Lift Station Electrical Inspection Field Documentation

D. I&C Point to Point Checklist

+ + END OF SECTION + +

SECTION 03 00 05 - CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete, including all forming, reinforcing, and related materials. This Section shall apply to the construction of all cast-in-place concrete items.
   2. The Work includes:
      a. Providing concrete consisting of Portland cement, fine and coarse aggregates, water, and approved admixtures; combined, mixed, transported, placed, finished, and cured.
      b. Fabricating and placing reinforcing, including ties and supports.
      c. Design, erection, and removal of formwork.
      d. Building into the concrete all sleeves, frames, anchorage devices, inserts, and other items required to be embedded in concrete.
      e. Providing openings in concrete as required to accommodate Work under this and other Sections.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items to be installed in the concrete Work.

C. Classifications of Concrete:
   1. Class “A” concrete shall be steel-reinforced structures, sidewalks, curbs, gutters, drives and all other concrete unless otherwise shown or indicated.
   2. Class “B” concrete shall be placed without forms or with simple forms, with little or no reinforcing and includes the following:
      a. Concrete fill.
      b. Duct banks.
      c. Unreinforced encasements.
      d. Thrust blocks.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Concrete:
   1. Measurement: Work specified in this section is included in other work.
   2. Basis of Payment: Includes pumps, labor, required excavation, formwork, reinforcing, concrete, finishing and testing.

1.3 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Concrete Institute.
      a. ACI 214R, Evaluation of Strength Test Results of Concrete.
      b. ACI 224R, Control of Cracking in Concrete Structures.
      c. ACI 301, Specifications for Structural Concrete.
      d. ACI 304R, Guide for Measuring, Mixing, Transporting and Placing Concrete.
      e. ACI 305R, Hot Weather Concreting.
      f. ACI 306R, Cold Weather Concreting.
      g. ACI 309R, Guide for Consolidation of Concrete.
      h. ACI 318, Building Code Requirements for Structural Concrete and Commentary.
      i. ACI 347, Guide to Formwork for Concrete.
      j. ACI SP-66, ACI Detailing Manual.
   2. ASTM International.
      a. ASTM A185/A185M, Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
      b. ASTM A615/A615M, Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
      c. ASTM C31/C31M, Practice for Making and Curing Concrete Test Specimens in the Field.
      d. ASTM C33/C33M, Specification for Concrete Aggregates.
      e. ASTM C39/C39M, Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      f. ASTM C42/C42M, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
      g. ASTM C94/C94M, Specification for Ready-Mixed Concrete.
      h. ASTM C138/C138M, Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
      i. ASTM C143/C143M, Test Method for Slump of Hydraulic-Cement Concrete.
      j. ASTM C150/C150M, Specification for Portland Cement.
      k. ASTM C172, Practice for Sampling Freshly Mixed Concrete.
      l. ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
      m. ASTM C260, Specification for Air-Entraining Admixtures for Concrete.
      n. ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
      o. ASTM C494/C494M, Specification for Chemical Admixtures for Concrete.
      p. ASTM C579, Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
      q. ASTM C618, Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
      r. ASTM C989, Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
      s. ASTM C1064/C1064M, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

t. ASTM C1077, Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
u. ASTM D1752, Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
v. ASTM E96/E96M, Test Methods for Water Vapor Transmission of Materials
w. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
x. ASTM E1745, Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

3. U.S. Army Corps of Engineers.
   a. CRD-C 572, Specification for Polyvinylchloride Waterstops.
4. Concrete Reinforcing Steel Institute.
   a. CRSI 1MSP, Manual of Standard Practice.

1.4 QUALITY ASSURANCE

A. Concrete Testing Laboratory Qualifications:
   1. All standard tests specified in this Section and elsewhere shall be arranged by the Contractor. They shall be conducted by an approved independent laboratory and will be made at the expense of the Contractor, unless specifically noted otherwise.
      a. Testing agency shall be in accordance with ASTM E329 and ASTM C1077.
      b. Testing laboratory shall have been inspected and passed within previous two years by Cement and Concrete Reference Laboratory (CCRL) of NIST for: testing concrete aggregates, and for preparing and testing concrete trial batches with or without admixtures. Testing laboratory shall provide documentation indicating how deficiencies, if any, in most recent CCRL inspection report were corrected.
      c. Selection of testing laboratory is subject to Owner's acceptance.

B. Concrete Material Testing:
   1. A test shall be made, in advance, of cement, fine aggregate, coarse aggregate, and reinforcing steel used in the Work covered by this specification; and unless specifically stated otherwise, the ASTM test and specification for the type and class of material indicated shall be used for the test. A manufacturer's certificate of tests will generally be accepted by Engineer.

C. Laboratory Trial Batch Testing
   1. Where more than 100 cubic yards of concrete are required for the entire Project, advance tests of each concrete mix design used shall be made by an independent laboratory in accordance with ASTM C39 and ASTM C33. Perform the following testing on each trial batch:
      a. Aggregate gradation for fine and coarse aggregates.
      b. Slump.
      c. Air content.
      d. Compressive strength based on 8 cylinders of each mix design; 4 tested at 7 days and 4 tested at 28 days.
      e. Water content for mix designs shall be varied to produce values for water to content-strength curves.
   2. Submit for each trial batch the following information:

a. Project identification name and number (if applicable).
b. Date of test report.
c. Complete identification of aggregate source of supply.
d. Tests of aggregates for compliance with the Contract Documents.
e. Scale weight of each aggregate.
f. Absorbed water in each aggregate.
g. Brand, type, and composition of cementitious materials.
h. Brand, type, and amount of each admixture.
i. Amounts of water used in trial mixes.
j. Proportions of each material per cubic yard.
k. Gross weight and yield per cubic yard of trial mixtures.
l. Measured slump.
m. Measured air content.
n. Compressive strength developed at 7 days and 28 days, from not less than 4 test cylinders cast for each 7 day and 28-day test, and for each design mix.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings for fabricating, bending, and placing concrete reinforcing. Comply with ACI SP-66.
   2. Product Data:
      a. List of concrete materials, concrete accessories, grout material, and concrete mix designs proposed for use. Include results of material tests or manufacturer certificate of tests performed to qualify the materials and to establish the mix designs.
      b. Manufacturers' Specifications with application and installation instructions for proprietary material and items, including admixtures and bonding agents.
      c. Laboratory Trial Batch Reports: Submit laboratory test reports for concrete cylinders, materials, and mix design tests.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transportation, Delivery, and Handling:
   1. Deliver concrete reinforcing products to Site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings on approved Shop Drawings.
   2. Materials used for concrete shall be clean and free from foreign matter during transportation and handling, and kept separate until measured and placed into concrete mixer.
   3. Implement suitable measures during hauling, piling, and handling to ensure that segregation of coarse and fine aggregate particles does not occur and grading is not affected.
   4. Deliver grout materials from manufacturers in unopened containers that bear intact manufacturer labeling.
   5. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage:
   1. Store formwork materials above ground on framework or blocking. Cover wood for forms and other accessory materials with protective, waterproof covering. Provide for adequate air circulation or ventilation under cover.
   2. Store concrete reinforcing materials to prevent damage and accumulation of dirt and excessive rust. Store on heavy wood blocking so that reinforcing does not come into contact with the ground. Space framework or blocking supports to prevent excessive deformation of stored materials.
   3. Store concrete joint materials on platforms or in enclosures or covered to prevent contact with ground and exposure to weather and direct sunlight.
   4. For storage of concrete materials, provide bins or platforms with hard, clean surfaces.
   5. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 PRODUCTS

2.1 GENERAL

A. All cementitious materials, admixtures, curing compounds and other industrial produced material used in concrete, or for curing or repairing of concrete, that can contact potable water or water that will be treated to become potable shall be listed in NSF 61.

2.2 CEMENTITIOUS MATERIALS

A. Cement:
   1. Portland cement shall be Type II ASTM C150/C150M.
   2. Portland cement shall be produced by one facility. Alternate cement sources may be used provided that mix design has been approved and acceptable trial batch verifying performance has been made.
   3. Do not use cement that has deteriorated because of improper storage or handling.

2.3 AGGREGATES

A. General:
   1. Aggregate shall conform to ASTM C33, Class Designation 4S, and as specified in this Section.
   2. Do not use aggregates containing soluble salts or other substances, such as iron, sulfides, pyrite, marcasite, ochre or other materials that can cause stains on exposed concrete surfaces.

B. Fine Aggregate:
   1. Provide clean, sharp, natural sand that is free of loam, clay, lumps and other deleterious substances is acceptable.
   2. Dune sand, bank run sand and manufactured sand are unacceptable.

C. Coarse Aggregate:
   1. Provide clean, uncoated, processed aggregate containing no clay, mud, loam or foreign matter, as follows:

a. Crushed stone, processed from natural rock or stone.
b. Washed gravel, either natural or crushed. Slag, pit gravel and bank run gravel are unacceptable.

2.4 WATER

A. Water: Water used in producing and curing concrete shall be clean and free of injurious quantities of oils, acids, alkalis, organic materials and other substances that may be deleterious to concrete and steel.

2.5 CONCRETE ADMIXTURES

A. Provide admixtures in accordance with product manufacturer's published instructions. Admixtures shall be compatible with each other. Admixtures shall not contain thiocyanates, shall not contain more than 0.05 percent chloride ion, and shall be non-toxic in the concrete mix after 30 days. Do not use admixtures that have not been incorporated and tested in the accepted mixes, unless otherwise approved by Engineer.

B. Air Entraining Admixtures: ASTM C260.
1. Air entraining admixture shall be vinsol resin or vensol rosin-based.

C. Water-Reducing Admixture: ASTM C494, Type A.
1. Proportion Class "A", and Class "B" concrete with non-air entraining, normal setting, water-reducing, aqueous solution of modified organic polymer. Admixture shall not contain lignin, nitrates, or chlorides added during manufacturing.

D. High Range Water-Reducing Admixture (HRWR): ASTM C494, Type F/G.
1. Use high range water-reducing admixture in the concrete classifications so specified or indicated. Use of HRWR admixture is allowed at Contractor's option in all other classifications of concrete. When used, HRWR admixture shall be added to concrete in accordance with admixture manufacturer's published instructions. Specific admixture formulation shall be as recommended by admixture manufacturer for Project conditions.

E. Set Control Admixtures: In accordance with ASTM C494. Use the following as required:
1. Type B, Retarding.
2. Type C, Accelerating.
3. Type D, Water reducing and Retarding.
4. Type E, Water reducing and Accelerating.
5. Type F, Water-reducing, high range admixtures.
6. Type G, Water-reducing, high range, and retarding admixtures.

F. Calcium Chloride: Do not use calcium chloride.

2.6 PROPORTIONING AND DESIGN OF MIXES

A. Prepare concrete design mixes in accordance with Table 03 00 05-A:

TABLE 03 00 05-A

CONCRETE DESIGN MIX CRITERIA

Concrete Class	Coarse Aggregate[1]		Minimum Cementitious (lbs/cu yd)	Max. W/CM[4]	Slump[2]	Air (%)	Min. Comp Strength[3] (psi)
	Size A	Size B					
Class "A"	No. 57	No. 8	564	0.42	4" max.	6 +/- 1	4,500
Class "B"	No. 57 or No. 67		517	0.50	4" max.	6 +/- 1	3,000

Notes Applicable to Table 03 00 05-A:

1. Coarse aggregate size numbers refer to ASTM C33. Where Size A and B are designated in Table 03 00 05-A, it is intended that the smaller Size B aggregate is to be added, replacing a portion of the coarse or fine aggregate, in the minimum amount necessary to make a workable and pumpable mix with sand content not exceeding 41 percent of total aggregate.
2. Slumps indicated are prior to addition of high range water reducer (super plasticizer).
3. Mix designs shall be made so that the compressive strength achieved for laboratory trial batches will not be less than 125 percent of specified design strength.
4. Quantity of water to be used in the determination of water-cementitious materials (W/CM) ratio shall include free water on aggregates in excess of SSD and water portion of admixtures.

B. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, Site conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as approved by Engineer. Before using adjusted concrete mixes, laboratory test data and strength results shall be submitted to and approved by Engineer.

C. Admixtures:
   1. Use air-entraining admixture in concrete, unless otherwise shown or indicated. Add air-entraining admixture at admixture manufacturer's prescribed rate to produce concrete at point of placement having air content within prescribed limits.
   2. Use water-reducing or high-range water-reducing admixtures in all Class "A" concrete.
   3. Use amounts of admixtures recommended by admixture manufacturer for climatic conditions prevailing at the Site at time of placing. Adjust quantities and types of admixtures as required to maintain quality.

D. If adding water at the Site is desired, withhold water at the batch plant so that specified water-cement (or cementitious material) ratio is not exceeded. Addition of water shall be accordance with ASTM C94. After high-range water-reducing admixture is incorporated into the batch, addition of water is not allowed.

2.7 FORMS

A. Design Criteria:
   1. Design, erect, support, brace and maintain forming in accordance with ACI 347 so that forming safely supports vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure. Carry vertical and lateral loads to ground by

forming system or in-place construction that has attained adequate strength for the purpose. Construct forming so that concrete members and structures are of correct size, shape, alignment, elevation, and position.

2. Design forms and falsework to include values of live load, dead load, weight of moving equipment operated on forming, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
3. Provide shores and struts with positive means of adjustment capable of taking up forming settlement during concrete placing operations, using wedges or jacks, or a combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
4. Support form facing materials by structural members spaced sufficiently close to prevent beyond tolerance deflection, in accordance with ACI 117. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities and within allowable tolerances. For long-span members without intermediate supports, provide camber in forming as required for anticipated deflections resulting from weight and pressure of fresh concrete and construction loads.
5. Design and construct forming to be readily removable without impact, shock or damage to concrete surfaces and adjacent materials.
6. Provide forming sufficiently tight to prevent leakage of cement paste during concrete placing. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

B. Form Materials:
   1. Forms for Smooth Finish Concrete:
      a. Unless otherwise shown or indicated in the Contract Documents, construct forming for smooth concrete surfaces with plywood, metal, metal-framed plywood-faced, or other panel type materials acceptable to Engineer, to provide continuous, straight, smooth as-cast surfaces with no wood grain or other surface texture imparted by forming. Provide in largest practical sizes to minimize number of joints and to conform to joint system shown or specified in the Contract Documents. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
   2. Forms for Standard Finish Concrete:
      a. Form concrete surfaces designated to have standard formed finish with plywood, lumber, metal, or other acceptable material. Provide lumber that is dressed on at least two edges and one side.
   3. Form Ties:
      a. Provide factory-fabricated metal form ties, designed to prevent form deflection, and to prevent spalling of concrete surfaces upon removal.
      b. Unless otherwise shown or indicated in the Contract Documents, provide ties so that portion of tie remaining within concrete after removal of exterior parts of tie is at least 1.5 inches from the outer concrete surface. Unless otherwise shown or indicated in the Contract Documents, provide form ties that will leave a hole no larger than one-inch diameter in concrete surface.
      c. Ties shall have waterstops on all exterior, below-grade walls, and walls subject to hydrostatic pressure.
      d. Ties shall leave a uniform, circular hole when forms are removed.

e. Do not use removable ties unless accepted by Engineer. Removable ties are not allowed on exterior below-grade walls or walls subject to hydrostatic pressure. If removable ties are accepted, Contractor shall submit hole repair details for Engineer approval.
f. Wire ties are not allowed.
g. Do not use reinforcing bars shown by the Drawings as part of the form tie system unless approved by Engineer.

4. Form Coatings:
   a. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compounds. For concrete surfaces that will be in contact with potable water or water that will be treated to become potable, form coating shall be a mineral oil base coating.

2.8 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed bars.

B. Provide supports for reinforcing including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing in place.
   1. Use wire bar-type supports complying with CRSI MSP1 recommendations, except as specified in this Section. Do not use wood, brick, or other unacceptable materials.
   2. For slabs on grade, use precast concrete blocks, four inches square minimum with compressive strength equal to or greater than the surrounding concrete, or supports with sand plates or horizontal runners where base materials will not support chair legs.
   3. For all concrete surfaces where legs of supports are in contact with forms, provide supports having either hot-dip galvanized, plastic-protected, or stainless steel legs in accordance with CRSI MSP1.
   4. Provide precast concrete supports over waterproof membranes.

2.9 RELATED MATERIALS

A. Waterstops:
   1. Hydrophilic Waterstops:
      a. Products and Manufacturers: Provide one of the following:
         1) Duroseal Gasket, by BBZ USA, Inc.
         2) Adeka Ultraseal MC-2010M, by Asahi Denka Kogyo K.K.
         3) Hydrotite, by Greenstreak Plastic Products Company.
         4) Or equal.
      b. Hydrophilic waterstop materials shall be bentonite-free and shall expand by minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast.
      c. Waterstop material shall be composed of resins and polymers that absorb water and cause a completely reversible and repeatable increase in volume.
      d. Waterstop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.

e. Select material in accordance with manufacturer's recommendations for type of liquid to be contained.
f. Minimum cross-sectional dimensions: 3/16 inch by 3/4 inch.
g. Location of hydrophilic waterstops shall be as shown or indicated on the Drawings, or where approved by Engineer.
h. Hydrophilic Sealant: Shall adhere firmly to concrete, metal, and PVC in dry or damp condition and be indefinitely elastic when cured.
    1) Products and Manufacturers: Provide one of the following:
        a) Duroseal Paste, by BBZ USA, Inc.
        b) Adeka Ultraseal P-201, by Asahi Denka Kogyo K.K.
        c) Hydrotite, by Greenstreak Plastic Products Company.
        d) Or equal.
i. Provide accessories by same manufacturer as vapor retarder.

B. Concrete Curing Materials:
1. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 10 ounces per square yard and complying with AASHTO M 182, Class 3.
2. Curing Mats: Shall be heavy carpets or cotton mats, quilted at 4 inches on centers, and weighing minimum of 12 ounces per square yard when dry.
3. Moisture-Retaining Cover: Provide one of the following, complying with ASTM C171:
    a. Waterproof paper.
    b. Polyethylene film.
    c. White burlap polyethylene sheet.
4. Liquid Curing Compound: ASTM C309 Type 1-D (water retention requirements):
    a. Provide fugitive dye.
    b. Curing compound shall be applied by roller or power sprayer.
    c. Product shall be listed in NSF 61.

C. Epoxy Bonding Agent:
1. Two-component epoxy resin bonding agent.
2. Products and Manufacturers: Provide one of the following:
    a. Sikadur 32, Hi-Mod LPL, by Sika Corporation.
    b. Eucopoxy LPL, by the Euclid Chemical Company.
    c. Or equal.

D. Epoxy-Cement Bonding Agent:
1. Three-component blended epoxy resin-cement bonding agent.
2. Products and Manufacturers: Provide one of the following:
    a. Sika Armatec 110 EpoCem, by Sika Corporation.
    b. Duralprep A.C., by Euclid Chemical Company.
    c. Or equal.

E. Joint Sealant and Accessories Used on Isolation Joints, Control Joints, and Expansion Joints:
1. Before purchasing each sealant, investigate its compatibility with joint surfaces, joint fillers, and other materials in joint system. Provide products that are fully compatible with actual installation condition, verified by manufacturer's published data or certification, and as shown on approved Shop Drawings and other approved submittals.

2. Do not install joint sealants when temperatures are below or above manufacturer's recommended limitations for installation.
3. Provide elastomeric joint sealants for interior and exterior joint applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
4. Exterior and Interior Horizontal and Vertical Joints; Submerged and Intermittently Submerged in Wastewater:
    a. Provide one of the following two-component Polyurethane Sealant:
        1) Sikaflex- 2c NS by Sika Corporation.
        2) Vulkem 227 by Tremco Sealant/Waterproofing Division of RPM International, Inc.
        3) Or equal.
5. Exterior and Interior Vertical Joints; Non-submerged:
    a. Provide one of the following two-component Polyurethane Sealant:
        1) Sikaflex- 2c NS by Sika Corporation.
        2) Dymeric 240 FC by Tremco Sealant/Waterproofing Division of RPM International, Inc.
        3) Or equal.
6. Exterior and Interior Horizontal Joints; Non-submerged:
    a. Provide one of the following two-component Polyurethane Sealant:
        1) Sikaflex- 2c SL by Sika Corporation.
        2) THC/900 by Tremco Sealant/Waterproofing Division of RPM International, Inc.
        3) Or equal.

2.10 GROUT

A. Non-shrink Grout:
1. Pre-packaged, non-metallic, cementitious grout requiring only the addition of water at the Site.
2. Minimum 28-day Compressive Strength: 7,000 psi.
3. Products and Manufacturers: Provide one of the following:
    a. NS Grout by Euclid Chemical Company.
    b. Set Grout by Master Builders, Inc.
    c. NBEC Grout by Five Star Products, Inc.
    d. Or equal.

B. Epoxy Grout:
1. Pre-packaged, non-shrink, non-metallic, 100 percent solids, solvent-free, moisture-insensitive, three-component epoxy grouting system.
2. Minimum Seven-day Compressive Strength: 14,000 psi, when tested in accordance with ASTM C579.
3. Products and Manufacturers: Provide one of the following:
    a. Euco High Strength Grout, by Euclid Chemical Company.
    b. Sikadur 42, Grout Pak, by Sika Corporation.
    c. Five Star Epoxy Grout, by Five Star Products, Inc.
    d. Or equal.

C. Grout Fill:
   1. Grout mix shall consist of cement, fine and coarse aggregates, water, and admixtures complying with requirements specified in this Section for similar materials in concrete.
   2. Proportion and mix grout fill as follows:
      a. Minimum Cement Content: 564 pounds per cubic yard.
      b. Maximum Water-Cement Ratio: 0.45.
      c. Maximum Coarse Aggregate size: 1/2 inch, unless otherwise indicated.
      d. Minimum 28-day Compressive Strength: 4,000 psi.

PART 3 EXECUTION

3.1 INSPECTION

A. Concrete shall not be placed until the forms and reinforcement have been inspected and approved by the Engineer or their authorized representative.

3.2 FORMWORK

A. Construct formwork in accordance with ACI 347 such that concrete members and structures are of correct size, shape, alignment, elevation, and position.

B. Provide openings in formwork to accommodate the Work of other trades. Accurately place and securely support items required to be built into formwork.

C. Clean and adjust forms prior to placing concrete. All debris and ice shall be removed from the space to be occupied by the concrete. Apply form release agents or wet forms as required. Re-tighten forms during and after concrete placing, when required, to eliminate cement paste leaks.

D. Removing Formwork:
   1. Comply with ACI 301 and ACI 347, except as otherwise indicated in the Contract Documents.
   2. Do not remove formwork and shoring until supported concrete members have acquired minimum of 90 percent of specified compressive strength. Results of suitable quality control tests of field-cured specimens may be submitted to Engineer for review as evidence that concrete has attained sufficient strength for removal of supporting formwork and shoring prior to removal times indicated in the Contract Documents.
   3. Removal time for formwork is subject to Engineer’s acceptance.
   4. Repair form tie-holes following in accordance with ACI 301.

3.3 REINFORCING, JOINTS, AND EMBEDDED ITEMS

A. Comply with the applicable recommendations of Laws and Regulations and standards referenced in this Section, including CRSI MSP1, for details and methods of placing and supporting reinforcing.

B. Clean reinforcing to remove loose rust and mill scale, earth, ice, and other materials which act to reduce or destroy bond between reinforcing material and concrete.

C. Position, support, and secure reinforcing against displacement during formwork construction and concrete placing. Locate and support reinforcing by means of metal chairs, runners, bolsters, spacers, and hangers, as required.
   1. Arrange, space, and securely tie bars and bar supports together with 16-gage wire to hold reinforcing accurately in position during concrete placing. Set with ties so that twisted ends are directed away from exposed concrete surfaces.
   2. Do not secure reinforcing to formwork using wire, nails or other ferrous metal. Metal supports subject to corrosion shall not be in contact with formed or exposed concrete surfaces.

D. Provide sufficient quantity of supports of strength required to carry reinforcing. Do not place reinforcing more than two inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

E. Splices: Provide standard reinforcing splices by lapping ends, placing bars in contact, and tying tightly with wire. Provide sufficient lap to transfer the stress between bars by bond and shear (minimum 24 diameters).

F. Install welded wire fabric in lengths as long as practical, lapping adjoining sections a minimum of one full mesh.

G. Do not place concrete until reinforcing is inspected and Engineer indicates that conditions are acceptable for placing concrete. Concrete placed in violation of this paragraph will be rejected. Notify Engineer in writing at least two working days prior to proposed concrete placement.

H. Joints:
   1. Provide construction, isolation, expansion, and control joints as indicated or required. Locate construction joints so as to not impair the strength and appearance of the structure. Place isolation and control joints in slabs-on-grade to stabilize differential settlement and random cracking.
   2. Locations of joints shall be in accordance with the Contract Documents and as approved by Engineer in the Shop Drawings.
   3. Where construction joints are indicated to be roughened, intentionally roughen surfaces of previously-placed concrete to amplitude of 1/4 inch.

I. Installation of Embedded Items: Set and build into the Work anchorage devices and embedded items required for other Work that is attached to, or supported by, cast-in-place concrete. When applicable, coordinate with other sections and other contracts for locating and setting. Refer to Paragraph 1.1.B of this Section. Do not embed in concrete uncoated aluminum items. Where aluminum items are in contact with concrete surfaces, coat aluminum to prevent direct contact with concrete.

3.4 CONCRETE PLACING

A. Site Mixing: Use drum-type batch machine mixer, mixing not less than 1.5 minutes for one cubic yard or smaller capacity. Increase required mixing time by minimum of 15 seconds for each additional cubic yard or fraction thereof.

B. Ready-Mixed Concrete: Comply with ASTM C94/C94M.

C. Concrete Placing:
   1. Place concrete in a continuous operation within planned joints or sections in accordance with ACI 304R.
   2. Do not begin placing concrete until Work of other trades affecting concrete is completed.
   3. Wet concrete and subgrade surfaces to saturated surface dry condition immediately prior to placing concrete.
   4. For Structures other than precast manholes, deposit concrete as near its final location as practical to avoid segregation due to re-handling or flowing.
   5. Avoid separation of the concrete mixture during transportation and placing. Concrete shall not free-fall for distance greater than three feet during placing.
   6. Complete concrete placing within 90 minutes of addition of water to the dry ingredients.

D. Consolidate placed concrete in accordance with ACI 309R using mechanical vibrating equipment supplemented with hand rodding and tamping, such that concrete is worked around placing and other embedded items and into all parts of formwork. Insert and withdraw vibrators vertically at uniformly-spaced locations. In no case shall a vibrator be extended into previously placed batches. Do not use vibrators to transport concrete within the formwork. Vibration of formwork or placing is not allowed.

E. Cold Weather Placing:
   1. Protect concrete Work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures, in compliance with ACI 306R and the Contract Documents.
   2. When air temperature has fallen to or may be expected to fall below 40 degrees F, provide adequate means to maintain temperature in area where concrete is being placed between 50 degrees F and 70 degrees F for a period of seventy-two hours after placing. Provide temporary housings or coverings including tarpaulins or plastic film. Maintain temporary heating and protection as necessary so that ambient temperature does not fall more than 30 degrees F in the 24 hours following the seventy-two hour period. Avoid rapid dry-out of concrete due to overheating, and avoid thermal shock due to sudden cooling or heating.
   3. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing for concrete as required to obtain concrete mixture temperature not less than 70 degrees F and not more than 90 degrees F at point of placement.
   4. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Before placing concrete, verify that forms, reinforcing, and adjacent concrete surfaces are entirely free of frost, snow, and ice.
   5. Do not use salt or other materials containing antifreeze agents. Do not use chemical accelerators or set-control admixtures unless approved by Engineer and tested in mix design proposed for use.

6. During pouring and curing periods, a permanent temperature record shall be kept showing the date, hour outside temperature at several points within the enclosure to show the most favorable and unfavorable conditions to which the concrete is subjected. Thermometer readings shall be taken at the start of Work in the morning and again in the late afternoon, and the data so obtained shall be recorded in such a manner that it will show the location of each reading and any conditions which might have an effect on the temperature. A copy of the temperature record shall be made available to the Engineer.
7. Before concreting any section of a structure, the section shall be completely housed or enclosed in a manner that will provide the maintenance of the specified temperatures. The housing shall be left in place for the curing period specified except that sections may be temporarily removed as required to accommodate the placing of column forms or concrete, provided that they are replaced immediately after the form or concrete is in its final position.
8. In placing floor slabs, tarpaulins supported on horses or other framework shall follow closely the placing of the concrete so that only a few feet of the finished slab is exposed to the outside atmosphere at any one time. Such tarpaulins shall be arranged so that the heated air from the space below can circulate freely in the space between the tarpaulin and the freshly placed concrete. If necessary, in order to maintain the proper temperature between the slab and the tarpaulins, temporary openings may be left in the floor and forms to facilitate the circulation of warm air in this space. Such openings shall not exceed 18 inches in their greatest dimension.
9. Top covers may be removed between the hours of 8:00 a.m. and 5:00 p.m. on days when the temperature is above 35 degrees F to permit erection of forms, but they shall be replaced not later than 5:00 p.m.
10. Within the enclosure, such means of artificial heat shall be provided as will maintain the temperatures specified continuously and with reasonable degree of uniformity in all parts of the enclosure. All exposed concrete surfaces within the heated area shall be wet with a hose stream at least once every 24 hours during the hardening period, except where a stream curing is provided.
11. The Contractor shall provide adequate fire protection accessible at all times where heating is in progress and shall maintain watchmen or other attendants to keep the heating units in continuous operation.
12. Heating appliances shall not be placed in such a manner as to endanger form work or centering or expose any area of concrete to drying out or other injury due to excessive temperatures.

F. Hot Weather Placing:
1. When hot weather conditions exist that would impair the quality and strength of concrete, place concrete in compliance with ACI 305R and the Contract Documents.
2. When ambient air temperature is at or above 90 degrees F and rising, cool ingredients before mixing concrete to maintain concrete temperature at time of placement below 80 degrees F. When ambient air temperature is at or above 90 degrees F and falling, cool the ingredients before mixing concrete to maintain concrete temperature at time of placement below 85 degrees F. In no case shall the concrete temperature at time of placement exceed 90 degrees F.
3. Mixing water may be chilled, or chopped ice may be used to control concrete temperature provided the water equivalent of ice is calculated in total amount of mixing water. If

required, reduce the time from addition of mix water to placement, or use set-retarding admixture.

4. Cover reinforcing materials with water-soaked burlap if ambient air temperature becomes too hot, so that reinforcing material temperature does not exceed ambient air temperature immediately before embedment of reinforcing in concrete.
5. Wet forms thoroughly before placing concrete.
6. Do not place concrete at temperature that causes difficulty from loss of slump, flash set, or cold joints.
7. Do not use set-control admixtures unless approved by Engineer in mix design.
8. Obtain Engineer's approval of substitute methods and materials proposed for use.

3.5 QUALITY OF CONCRETE WORK

A. Make concrete solid, compact, smooth, and free of laitance, cracks, and cold joints.

B. Concrete for liquid-retaining structures and concrete in contact with earth, water, or exposed directly to the elements shall be watertight.

C. Cut out and properly replace to the extent directed by Engineer, or repair to satisfaction of Engineer, surfaces that contain cracks or voids, are unduly rough, or are in defective in any way. Patches or plastering are unacceptable.

D. Repair, removal and replacement of defective concrete directed by Engineer shall be at no additional cost to Owner.

3.6 CURING

A. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by using moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until formwork is removed. Provide protection, as required, to prevent damage to exposed concrete surfaces. Total curing period shall not be less than seven days. Curing methods and materials shall be compatible with scheduled finishes.

3.7 FINISHING

A. Slab Finish:
   1. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently. Use a wood float only. Check and level surface plane to a tolerance not exceeding 1/4 inch in ten feet when tested with a 10 foot straightedge placed on the surface at not less than two different angles. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, re-float the surface to a uniform, smooth, granular texture. Slab surfaces shall receive a float finish. Provide additional trowel finishing as required in this Section.
   2. After floating, begin first trowel finish operation using power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over the surface.

3. Consolidate concrete surface by the final hand troweling operation. Finish shall be free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8 inch in 10 feet when tested with a 10 foot straightedge. Grind smooth surface defects that would telegraph through applied floor covering system.
4. Use trowel finish for the following:
    a. Interior exposed slabs, unless otherwise shown or indicated.
    b. Apply non-slip broom finish, after troweling, to exterior concrete slab and elsewhere as shown.

B. Apply chemical floor hardener to exposed interior concrete floor areas when cured and dry, in accordance with hardener manufacturer's instructions.

C. Formed Finish:
1. Provide smooth form concrete finish at exposed surfaces. Use largest practical form panel sizes to minimize form joints. Exposed surfaces include interior water-contacting surfaces of tanks, whether or not directly visible. All surfaces shall be considered as exposed, unless buried or covered with permanent structural or architectural material. After removing forms, patch form tie holes and defects in accordance with ACI 301. Remove fins exceeding 1/8 inch in height. Where surface will be coated or will receive further treatment, remove all fins flush with concrete surface.
2. Provide rough form finish at all unexposed surfaces. After removing forms, patch form tie holes and defects in accordance with ACI 301. Remove fins exceeding 1/2 inch in height.

3.8 GROUT PLACING

A. Place grout as shown and indicated, and in accordance with grout manufacturer's instructions and recommendations. If grout manufacturer's instructions conflict with the Contract Documents, notify Engineer and do not proceed until obtaining Engineer's clarification.

B. Dry-packing is not allowed, unless otherwise indicated.

C. Manufacturers of proprietary grout materials shall make available upon 72-hours notice the services of qualified, full-time, factory-trained employee to aid in providing proper use of grout materials at the Site.

D. Placing grout shall comply with temperature and weather limitations described in Article 3.4 of this Section.

3.9 FIELD QUALITY CONTROL

A. Site Testing Services:
1. Contractor shall employ independent testing laboratory to perform field quality control testing for concrete. Engineer will direct where Samples are obtained.
2. Testing laboratory will provide all labor, material, and equipment required for sampling and testing concrete, including: scale, glass tray, cones, rods, molds, air tester, thermometer, and other incidentals required.

3. Contractor shall provide curing and necessary cylinder storage. Actual curing in the structure shall be closely paralleled.

B. Quality Control Testing During Construction:
   1. Perform sampling and testing for field quality control during concrete placing, as follows:
      a. Sampling Fresh Concrete: ASTM C172.
      b. Slump: ASTM C143/C143M; one test for each concrete load at point of discharge.
      c. Concrete Temperature: ASTM C1064/C1064M; one for every two concrete loads at point of discharge, and when a change in the concrete is observed. Test each load when time from batching to placement exceeds 75 minutes.
      d. Air Content: ASTM C231; one for every two concrete load at point of discharge, and when a change in the concrete is observed.
      e. Unit Weight: ASTM C138/C138M; one for every two concrete loads at point of discharge, and when a change in the concrete is observed.
      f. Compression Test Specimens:
         1) In accordance with ASTM C31/C31M, make one set of compression cylinders for each 50 cubic yards of concrete, or fraction thereof, of each mix design placed each day. Each set shall be four standard cylinders, unless otherwise directed by Engineer.
         2) Cast, store, and cure specimens in accordance with ASTM C31/C31M.
      g. Compressive Strength Tests:
         1) In accordance with ASTM C39/C39M; 1 specimen tested at 7 days, and 3 specimens tested at 28 days.
         2) Concrete that does not comply with strength requirements will be considered as defective Work.
      h. Within 24 hours of completion of test, testing laboratory will transmit certified copy of test results to Contractor and Engineer.
      i. When there is evidence that strength of in-place concrete does not comply with the Contract Documents, Contractor shall employ the services of a concrete testing laboratory to obtain cores from hardened concrete for compressive strength determination. Cores and tests shall comply with ASTM C42/C42M.

END OF SECTION 03 00 05

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes but not limited to:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Temporary erosion- and sedimentation-control measures.

B. Related Sections:

1. Section 01 50 00 - Temporary Facilities and Controls, for temporary utility services, construction and support facilities, security and protection facilities**,** and temporary erosion- and sedimentation-control measures.

C. Payment Procedures:

1. Work specified in this Section is considered incidental and will be include as part of appropriate Unit Price stated in Bid.

1.2 SUBMITTALS

A. Submit coordinates and elevation of each located underground pipe.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, as indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises as determined by Owner.

C. Utility Locator Service: Notify Utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control are in place.

E. The following practices are prohibited within plant protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards plant protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near plant protection zones.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Protect existing site improvements to remain from damage during construction.

   1. Restore damaged improvements to their original condition, as acceptable to Owner.

   2. Minimize vegetative and ground disturbance for access and construction activities.

3.2 PROTECTION

A. Protect utilities indicated to remain, from damage.

B. Protect trees, plant growth, and features designated to remain, as final landscaping.

C. Protect benchmarks and existing structures from damage or displacement.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to site.

3.3 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.4 EXISTING UTILITIES

A. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than 2 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owners written permission.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit access for rehabilitation work.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Do not cut or remove trees greater than 5-inches in diameter at breast height.
3. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
4. Use only hand methods for grubbing within protection zones.
5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 REMOVAL

1. Remove obstructions such as mounds of dirt, stones, or debris located within construction limits.
2. Remove surface features including pavements, curb and gutter, signs, posts, mailboxes, fences, shrubs, landscaping features, and other miscellaneous items. Street signs, culverts, advertising signs, mailboxes, etc. shall be replaced to original condition.
3. Full depth saw cut all pavement, sidewalk and curving to be removed.

3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00

SECTION 31 23 17 – TRENCHING & EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Trenching and backfilling to the elevations shown on the Drawings and as needed for installation of underground piping and utilities associated with the Work and to meet the requirements of the Contract Documents.

B. Payment Procedures:
   1. Work specified in this Section is considered incidental and will be includes as part of appropriate Unit Price stated in Bid.

1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Item 0027 - Stone Drive Repair, 8" depth
1. Stone drive repair will be measured by the square yard along the front face of the section at the finished grade elevation of the type specified.
2. This item shall include all costs to furnish all labor, materials, equipment, tools, and compacting required to place and compact the No 11 and #53 stone material described as herein. Stone Drive Repair is to be placed as shown on the Drawing.
3. The cost for complete removal and hauling away of excavated material is included in respective specification for pipe material, manholes, structures, etc.
4. The quantity of stone drive repair shall be by square yard per the thickness as noted on the drawings.

B. Item 0028 – Compacted Aggregate, No. 53/73
1. Compacted aggregate will be measured by the cubic yard of the section at the finished grade elevation of the type specified.
2. This item shall include all costs to furnish all labor, materials, equipment, tools, and compacting required to place and compact the No 11 and #53 stone material described as herein. Stone Drive Repair is to be placed as shown on the Drawings.
3. The cost for complete removal and hauling away of excavated material is included in respective specification for pipe material, manholes, structures, etc.
4. The quantity of # 53/73 aggregate shall be by the cubic yard as noted on the drawings.

C. Item 0029 – Flowable Fill for Pipe Abandonment
1. Flowable Fill for Pipe Abandonment will be measured by the cubic yard of the section at the finished grade elevation of the type specified.
2. This item shall include all costs to furnish all labor, materials, equipment, and tools required to place Flowable Fill that shall meet the requirements set forth in INDOT Specification Section 213, current edition. Flowable Fill is to be placed as shown or specified on the Drawings. As necessary, disposal of native materials prior to installation of fill is included in this item unless included under a separate Work item.
3. The quantity of Flowable Fill in place shall be the number of cubic yards within the pipes as described herein.

4. The payment of Flowable Fill shall be based on the unit price per cubic yard as listed on the submitted Bid schedule.

1.3 SUBMITTALS

A. Test Results.
   1. Compaction test results.
   2. Gradation of bedding, cover, and backfill.

B. Miscellaneous Submittals.
   1. Test results to verify fill materials and bedding and cover materials meet Specifications.

C. Submit in accordance with Section 01 33 00.

1.4 QUALITY ASSURANCE

A. Testing shall be provided by CONTRACTOR in accordance with this Section.

B. Sheeting, shoring, and bracing shall conform to safety requirements of federal, state, and local agencies.

1.5 PROJECT / SITE CONDITIONS

A. Notify owners of above or below ground utilities encountered during trenching operations.

B. Cap and remove or relocate services in accordance with instructions of owners of such utilities.

C. Protect, support, and maintain conduits, wires, pipes or other utilities that are to remain in accordance with requirements of owners of such utilities.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

PART 2 - PRODUCTS

2.1 BEDDING MATERIALS

A. Subgrade stabilizing aggregate, if required, shall be INDOT No. 53 crushed stone.

B. Pipe bedding material shall be INDOT No. 8 crushed stone or fractured face aggregate.

C. Bedding for manholes shall be INDOT No. 2 crushed stone.

2.2 COVER MATERIALS (INITIAL BACKFILL)

A. To the extent shown on the drawings, INDOT No. 8 crushed stone or fractured face aggregate shall be used as initial backfill for all pipe materials.

2.3 BACKFILL MATERIALS

A. To the extent shown on the drawing, INDOT No. 53/73 Granular Backfill shall be used for final backfill (above the cover or initial backfill) for all areas subject to vehicular traffic.

B. For areas 5 feet outside of pavement limits, backfill shall include the use of native soil backfill (to the extent shown on the drawings). Native soil backfill material shall contain no more than 5% organic material, no particles larger than four inches and shall be free of trash, rubble and debris. The Plastic Index of the fraction passing the no. 40 sieve shall not be more than 25. Native soil material not meeting these requirements shall be replaced with INDOT Granular Backfill (B-Borrow).

2.4 FILTER FABRIC

A. Porous non-woven fabric with multiple layers of randomly arranged fibers, min 4.0 oz/sq yd (typical).

B. Manufacturers:
1. Mirafi 140N by Mirafi, Inc.
2. Typar 340I by DuPont.
3. Supac 5P by Phillips Fibers Corp.
4. Propex 4545 by Amoco Fabrics Co.
5. Or Equal.

2.5 SHEETING, SHORING, AND BRACING

A. Type, design, detail, and installation of sheeting, shoring, and bracing shall be determined by and sole responsibility of CONTRACTOR.

2.6 SOURCE QUALITY CONTROL

A. Testing:
1. One sieve analysis, plasticity index, and uniformity coefficient for each source of structural fill.
2. One sieve analysis for each source of bedding material and cover material.

PART 3 - EXECUTION

3.1 EXAMINATION

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 such as areas loosened by frost

action or softened by flooding or weather, or existence of unsuitable materials. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Natural soils or fill softened by frost, flooding or weather shall be removed and replaced.

B. Remove unsuitable material from within trenches.

3.3 SHEETING, SHORING, AND BRACING

A. Whenever necessary to prevent caving during excavation and to protect adjacent, piping, structures, property, workers, and public; trenches shall be sheeted, shored, and braced.

B. When sheeting, shoring, and bracing is required, install to prevent soil from entering excavation below or through sheeting.

C. Remove sheeting, shoring, and bracing after backfilling, or when approved by ENGINEER as backfill is being placed.

D. Remove sheeting, shoring, and bracing in manner not damaging to facility. Fill voids remaining after sheeting is pulled with sand or other approved material.

E. Fill settled areas after sheeting, shoring, and bracing has been removed.

3.4 DEWATERING

A. CONTRACTOR shall dewater excavation site prior to starting trenching and shall maintain groundwater minimum of 12 in. below bottom of trench.

B. CONTRACTOR is responsible for choosing method of groundwater control.

C. If CONTRACTOR chooses to use deep wells or well points, wells and well points shall be designed, installed, and operated to prevent removal of in-situ materials.

D. Keep construction site free-draining. Keep trenches free of water.

E. Remove soil disturbed by pressure or flow of groundwater.

F. Maintain dewatering system to prevent uplifting of or damage to facilities.

G. Protect adjacent utilities, structures, and properties from damage resulting from dewatering operations.

H. Drill, maintain, and abandon dewatering wells in accordance with federal, state, and local ordinances.

3.5 EXCAVATION

A. Excavate to the lines, grades, and elevations indicated and necessary to complete construction.

B. Method of excavation shall be consistent with soil types encountered and result in undisturbed subgrade. Loosened soils shall be re-compacted or removed and replaced.

C. Trench Tolerances:
   1. Maximum width of trench at top of pipe shall be outside diameter of pipe plus 24 in. When sheeting, shoring, and bracing required, width of trench may be increased to allow for their use, provided provisions for excess width of trench are met.
   2. Where trench width below top of pipe exceeds specified limit, Contractor shall furnish pipe with strength adequate for actual trench width.
   3. Minimum trench width shall be outside diameter of pipe plus 18 in.
   4. Top of concrete encasement for electrical duct or top of conduit shall be minimum of 24 in. below final grade or as shown on Drawings.

D. Do not advance excavation of trenches more than 300 ft. ahead of completed pipe installation.

E. Do not excavate within influence zone of existing footings or foundations without prior approval of ENGINEER.

F. Excavation through Rigid Pavement:
   1. Remove pavement min 1 ft. beyond anticipated edge of excavation.
   2. Saw cut pavement to ensure straight joint.
   3. Pavement replacement shall match existing.

G. Excavation, backfill, and pavement replacement of roadways shall conform to requirements of local highway authority. In no case shall the replacement pavement edges bear on less than 12 in. of undisturbed soil.

3.6 FILL USAGE

A. Bedding Material:
   1. Bedding material shall be placed over the entire width of the trench bottom such that after the pipe has been placed thereon, imbedded to grade and aligned, there remains a 4-inch minimum depth of material below the pipe barrel and a minimum of 3 inches below the bell.
   2. The bell holes shall be excavated so that the entire pipe barrel rests on the bedding.

B. Cover Material:
   1. Cover material shall be placed to the limits shown on the drawings.

C. Within trenches under pavements and sidewalks and within piping or electrical duct influence zone, INDOT B-Borrow shall be used.

D. Earth Fill: Other areas not previously specified.

3.7 PLACING FILL

A. Notify ENGINEER before placing fill material.

B. Do not use frozen material or place fill on frozen subgrade.

C. Do not backfill until concrete is properly cured and has reached design strength, coatings approved, and required tests accepted.

D. Place fill simultaneously on both sides of freestanding structures.

E. Where pipes or electrical ducts cross, protect piping or ducts at higher elevation by backfilling trench within influence zone of higher pipe or duct with INDOT B-Borrow.

F. Where pipes or electrical ducts leave structures, protect by backfilling within influence zone of pipe or duct with INDOT B-Borrow.

G. Provide mechanical compaction. Jetting, flooding, puddling, or vibroflotation methods shall not be used for compaction.

H. Place and compact bedding material and cover material in lift thickness and to densities listed.
   1. Degree of compaction: ASTM D1557, Modified Proctor or ASTM D4253 (Relative Density).
   2. Moisture Content: Within 3% of optimum.

Location	Maximum Lift Thickness (in.)	Modified Proctor (%)	Relative Density (%)
Bedding Material or Cover Material	6	95 min	70 min

3.8 FIELD QUALITY CONTROL

A. Testing:
   1. One field density test for each 25 cu yds. of granular fill, bedding material and cover material, minimum one each lift.
   2. One field density test for each 500 cu yds. of earth fill.
   3. Determine in-place density of fill at maximum intervals specified in accordance with ASTM D1556, D2167, D2922 or D2937.

END OF SECTION

SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide asphalt pavement where shown on Drawings, as specified herein, and as needed for a complete and proper installation.

B. Provide milling to a depth of 1.5” and resurfacing to the area designated on the drawings.

C. Repair driveways damaged in the course of the work.

1.2 DEFINITIONS

A. INDOT Specifications: Indiana Department of Transportation Standard Specification, latest edition

B. ASTM: American Society for Testing and Materials

C. AASHTO: American Association of State Highway and Transportation Officials

1.3 GENERAL REQUIREMENTS

A. Contractor shall be responsible for any damage to drives, roads, sidewalks, culverts, and other structures whether existing and/or new as constructed as part of Contractor’s work. Any repairs made due to damage caused by Contractor shall be at Contractor’s expense.

B. Contractor shall comply with all City of Greenfield and latest approved and adopted edition of the Indiana Department of Transportation (INDOT) Standard Specifications for materials and execution of pavement construction.

C. Contractor shall comply with all City of Greenfield and Indiana Department of Transportation traffic control and safety requirements and regulations for all work along public roads.

D. Contractor shall keep all pavements completely clean from mud, loose aggregate and other debris and objectionable materials by the end of each workday.

E. Contractor shall store and protect miscellaneous items on the Project site so they do not interfere with the property owners or the general public.

F. Any damaged areas prior to acceptance are to be restored including clean-up, at no additional cost to owner.

1.4 SUBMITTALS

A. General:
   1. Submit Product Data in sufficient detail to confirm compliance with requirements of this Section. Submit Product Data and Shop Drawings in one complete submittal package. Partial submittals are unacceptable.

B. Source of Aggregates showing use on previous local Department of Transportation Projects.

C. Asphalt Mix Design, including aggregate gradation, showing use on previous local Department of Transportation Projects.

D. Test Results of Quality Assurance Testing

E. Submit in accordance with Section 01 33 00.

1.5 QUALITY ASSURANCE

A. Asphalt supplier shall have a minimum of 5 years of experience producing asphalt mixes for the Department of Transportation.

B. Do not commence placement of asphalt until mix design has been reviewed and approved by Engineer. Contractor shall employ an independent testing laboratory to perform specific services and verify that proper asphalt mix designs are in compliance with the specifications.

C. Testing shall be provided by Contractor in accordance with this section.

1.6 MEASUREMENT AND PAYMENT

A. Item 030: Common Excavation (Asphalt Pavement)
   1. Asphalt pavement removal will be measured by the cubic yard of the section at the finished grade elevation of the type specified.
   2. The accepted quantities of asphalt Work will be paid at the unit price per cubic yard as listed on the submitted Bid schedule for asphalt, of the type specified.

B. Items 037-039: Asphalt Pavement Replacement for Road Restoration
   1. Measurement: Work specified in this Section is measured per ton of raw material used for paving or resurfacing.
   2. Basis of Payment: This contract item shall consist of all material, labor and equipment to provide and install Asphalt Hot Mix Asphalt (HMA) aggregate base, intermediate, and surface as trench restoration and resurfacing as shown on the plans, including, but not necessarily limited to: removal and proper disposal of existing and temporary pavement; asphalt pavement; surface preparation; tack coat; replacement or repair of utilities, drainage systems, structures, and miscellaneous property; removal and replacement of all snow plowable raised pavement markers and blue hydrant markings as directed by Owner; and clean-up, as shown in the Contract Documents.

C. Item 040: Milling

1. Measurement: Work specified in this section is measured per square yard of pavement milled at a depth of 1.5 inches.
2. Basis of Payment: This contract item shall consist of all material, labor and equipment to prepare a foundation for resurfacing by removing existing pavement surfaces as shown in the Contract Documents including but not limited to: disposal of material and clean-up in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.1 PAVEMENT MATERIALS

A. Aggregate:
1. Furnish coarse aggregate from local Department of Transportation approved sources.
2. Aggregate for Bituminous Base:
   a. Sound, angular crushed stone, crushed gravel, or crushed slag, sand, stone or slag screenings.
   b. Uncrushed gravel may be used in base course mixture if required to suit local material availability.
   c. Gradation: Well graded between limits specified and shall conform to INDOT Specs Subsection 402.04, gradation No. 5, Class D or higher.
3. Aggregate for Bituminous Binder:
   a. Sound, angular crushed stone, crushed gravel, or crushed slag, sand, stone or slag screenings.
   b. Gradation: Well graded between limits specified and shall conform to INDOT Specs Subsection 402.04, gradation No. 8, Class C or higher.
4. Aggregate for Bituminous Surface:
   a. Crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand.
   b. Sand prepared from stone, blast-furnace slag, gravel, or combinations thereof may be used if required to suit local material availability.
   c. Gradation: Well graded between limits specified and shall conform to INDOT Specs Subsection 402.04, gradation No. 11, Class B or higher.
5. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D242.

B. Bituminous Materials:
1. Asphalt Cement: Penetration Grade PG 58-28 in accordance with ASTM D946.

C. Mix Design:
1. Conform to Section 401.04 of INDOT Specifications.
2. ESAL Category 1.

D. Prime Coat and Tack Coat
1. Prime Coat: Emulsified asphalt Type AE-PMP per AASHTO M 140.
2. Tack Coat: Emulsified asphalt meeting the one of the following Types per AASHTO M 140: AE-T, AE-PMT, SS-1h

PART 3 - EXECUTION

3.1 WEATHER LIMITATION

A. Apply prime and tack coats when ambient temperature is above 35 degrees Fahrenheit. Do not apply when base is wet or contains standing water.

B. Place asphalt material when atmospheric temperature is above 35 degrees Fahrenheit and rising, and when base is dry.

C. Do not place asphalt material on frozen subgrade or base.

3.2 PREPARATION

A. Check base course for soundness, outline, and contour. Prepare base course for areas to be paved by scraping down or filling irregularities. Compact base course prior to paving.

B. Prime Coat:
1. Apply at rate of 0.25 to 0.80 gallon per square yard, over compacted aggregate base.
2. Apply material to penetrate and seal, but not flood, surface.
3. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

C. Tack Coat:
1. Apply to contact surfaces of previously paved surfaces abutting or projecting into areas to be paved.
2. Apply to surface free of loose dirt, dust or other foreign matter.
3. Apply at a rate of 0.025 gallon per square yard of surface.
4. Apply only to areas expected to be paved in the same day.
5. Allow to dry prior to paving.
6. Avoid tracking or smearing bituminous materials onto adjoining surfaces. Remove material tracked or smeared to adjoining surfaces.

D. The milling or scarification of existing pavements shall be done in accordance with the current version of the Indiana Department of Transportation (INDOT) Standard Specifications Section 306 – MILLING.

3.3 Contractor shall remove the minimum amount of existing pavement, curbing, driveway, and other roadway and paved area appurtenances necessary for construction unless otherwise required, or as directed by Owner. MILLING UP TO 1 ½ INCHES

This work consists of preparing a foundation for resurfacing by removing the existing bituminous surface as specified in the typical cross section.

Milling shall be milled one and one half (1 ½) inches. All work shall be in accordance with Section 202.05 of the INDOT Standard Specifications. Transitions shall be provided between existing pavements and new HMA surfaces. A minimum 10-foot long transition shall be provided.

The equipment for removing the bituminous surface shall be a power operated planing machine or grinder. The equipment shall be capable of accurately establishing profile grades by referencing from either the existing pavement or from independent grade control. The equipment shall have a positive means for controlling cross slope elevations and have an effective means for removing excess material from the surface finish and shall not vary longitudinally more than ½ inch from a ten foot straight edge. The equipment shall be capable of providing for a good bond to the new overlay. Sufficient cutting teeth will be required on the cutting drum such that 100% of the conglomerate particles will pass a 1-1/2" sieve.

The road shall be left broom clean before being opened to traffic. All work shall be done in a workman like manner and all loose material shall be removed as soon as possible so as not to inconvenience traffic flow. If the milling operation results in a vertical or near vertical longitudinal face exceeding 1 ¼" in height, this longitudinal face shall be sloped in a manner acceptable to construction inspector so as not to create a hazard to traffic using the facility. Transverse faces that are present at the end of a working period will be tapered in a manner approved by construction inspector to avoid creating a hazard for traffic.

The removed surface material shall be disposed of by contractor.

3.4 DELIVERY, STORAGE, AND HANDLING

A. Transport asphalt materials in covered trucks during rainy weather and when air temperature falls below 65 degrees F.

B. Adjust weight, type, capacity, haul routes, and method of operation of hauling vehicles such that no damage results to existing streets, subgrade, or base course.

C. Owner has final authority to designate haul routes, procedures, and operation times.

3.5 PLACING ASPHALT MIX

A. Place asphalt mixture on prepared surface, spread, and strike-off. Spread mixture at a temperature within 20 degrees Fahrenheit of temperature the asphalt material supplier recommends.

B. Place using a self-propelled paver to ensure uniform spreading and strike-off of mix. Provide a smooth mixture free of tearing and segregation. Place mixture to required grade, cross-section, and compacted thickness.

C. Place inaccessible and small areas by hand. Place mixture to required grade, cross-section, and compacted thickness.

D. Joints: Place asphalt continuously to limit the number of joints. Make joints between old and new pavements and between successive days' work, to ensure continuous bond between adjoining work. Clean contact surfaces and apply tack coat. Construct joints to have same texture, density, and smoothness as other sections of asphalt pavement.

3.6 COMPACTION

A. Compact asphalt mix while still hot. Compact each layer by uniformly rolling.

B. In small areas not accessible by a roller, compact using mechanical tampers.

C. Compact until no further consolidation is visible under action of the compaction equipment.

D. Keep roller wheels moistened to avoid sticking.

3.7 FIELD QUALITY CONTROL

A. Pavement Testing:
   1. General: Test in-place asphalt courses for compliance with requirements for surface smoothness and thickness. Repair or remove and replace unacceptable paving.
   2. Thickness Tolerance: In-place compacted thickness will not be acceptable if actual thickness exceeds the following allowable variation from required thickness:
      a. Binder Course: 1/4 inch.
      b. Surface Course: 1/8 inch.
   3. Surface Smoothness Tolerances: Test finished surface of each asphalt concrete course for smoothness, using 10 foot straight edge applied parallel with, and at right angles to, the centerline of paved area. Surfaces will not be acceptable if deviations exceed 1/8 inch.

END OF SECTION 321216

SECTION 32 16 23 – CONCRETE, CURBS, GUTTERS, SIDEWALKS & RAMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide portland cement concrete sidewalk including form work and reinforcement, base materials with compaction, where shown on Drawings, as specified herein, and as needed for a complete and proper installation.

1.2 REFERENCES

A. ASTM: American Society for Testing and Materials

B. CRSI: Concrete Reinforcing Steel Institute

C. NRMCA: National Ready Mixed Concrete Association

D. INDOT: Indiana Department of Transportation Standard Specifications, latest edition.

1.3 SUBMITTALS

A. General:
   1. Submit Product Data in sufficient detail to confirm compliance with requirements of this section.

B. Product Data:
   1. Verification of concrete mix design.

C. Test Results:
   1. Tests indicating compliance of reinforcement with referenced standards.
   2. Concrete test results.
   3. Base material test results.
   4. Concrete delivery tickets: With each load of concrete delivered, provide duplicate tickets, one for Contractor, one for Engineer, with following information.
      a. Serial number of ticket.
      b. Date and truck number.
      c. Name of supplier.
      d. Class of concrete.
      e. Type of cement and cement content in bags/cubic yard.
      f. Admixture brand names.
      g. Aggregate size.
      h. Time loaded.
      i. Amount of concrete in load.
      j. Gallons of water added at site and slump of concrete after addition of water.
      k. Temperature of concrete at delivery.
      l. Time unloaded.

5. Certified reports of field tests and observations.

D. Submit in accordance with Section 01 33 00.

1.4 QUALITY ASSURANCE

A. Plant Certification: Plant or concrete supplier shall comply with requirements of NRMCA certification plan as regards material storage and handling, batching equipment, central mixer, truck mixers with counters, agitators, non-agitating units, and ticketing system.

B. Do not commence placement of concrete until mix designs have been reviewed and approved by Engineer.

C. Concrete Testing: Testing shall be provided by Contractor in accordance this Section.
1. Conduct tests on sample material in accordance with methods listed below:
   a. Slump: ASTM C143.
   b. Air-Entrainment: ASTM C231.
   c. Compressive Strength: ASTM C31 and ASTM C39.

1.5 MEASUREMENT AND PAYMENT

A. Item 031: Pavement Removal (Concrete Pavement)
1. Concrete pavement removal will be measured by the square yard along the front face of the section at the finished grade elevation of the type specified.
2. The accepted quantities of concrete Work will be paid at the unit price per square yard as listed on the submitted Bid schedule for concrete, of the type specified.

B. Item 032: Curb Ramp, Concrete
1. Payment for ADA Curb Ramps shall be measured by the square yard of finished surface.
2. The accepted quantities will be paid at the unit price per square yard as listed on the submitted Bid schedule, complete in place.

C. Item 033: Curb and Gutter, Roll Curb
1. Curb and gutter will be measured by the linear foot along the front face of the section at the finished grade elevation of the type specified.
2. The accepted quantities of curb and gutter Work will be paid at the unit price per linear foot as listed on the submitted Bid schedule for curb and gutter, of the type specified.

D. Item 034: Curb and Gutter, Remove
1. Curb and gutter removal will be measured by the linear foot along the front face of the section at the finished grade elevation of the type specified.
2. The accepted quantities of curb and gutter Work will be paid at the unit price per linear foot as listed on the submitted Bid schedule for curb and gutter, of the type specified.

E. Item 035: Sidewalk, Concrete
1. The accepted quantities of sidewalks will be measured by the square yard of finished sur face.
2. The accepted quantities will be paid at the unit price per square yard as listed on the sub mitted Bid schedule, complete in place.

F. Item 036: Sidewalk, Concrete, Remove

1. The accepted quantities of sidewalks to be removed will be measured by the square yard.
2. The accepted quantities will be paid at the unit price per square yard as listed on the sub mitted Bid schedule.

PART 2 - PRODUCTS

2.1 BASE MATERIAL

A. Crushed Aggregate Base Course shall be a 4” thickness of dense grade aggregate size 53 in accordance with Section 302 of INDOT Specs.

2.2 FORMS

A. Construct forms to exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in finished concrete. All forms must be inspected and approved by Engineer, prior to placement of concrete.

B. Forms shall be straight and of sufficient strength to resist pressure of concrete without bending, tipping, or other deformation. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.

C. Forms shall not be removed from freshly placed concrete until it has hardened sufficiently to resist spalling, cracking or any other damage.

D. Slip form machines may be used provided sidewalk can be constructed to the requirements of specifications.

2.3 CONCRETE

A. A.Conform to INDOT 702, Class A.

2.4 OTHER MATERIALS

A. Curing Compounds:
   1. AASHTO M148, Type 2.

B. Preformed Expansion Joint Material:
   1. Meet requirements of ASTM D 1751.
   2. 1/2 inch thick and premolded.

PART 3 - EXECUTION

3.1 PREPARATION

A. Place base material in accordance with INDOT standards.

B. Check base course outline, and contour. Scrape down or fill irregularities.

C. Compact base course prior to paving.

D. Set castings and frames of manholes, catch basins, clean outs, etc. to required alignment and grade. Hand vibrate concrete adjacent to structures.

E. Remove foreign matter accumulated in formwork. Forms may be oiled, if necessary.

F. Remove excess material not required by Owner, material not suitable for backfilling or site grading, and unsuitable materials from site. Dispose of excavated material in accordance with local, state, and federal requirements.

3.2 MIXING AND DELIVERY

A. Use ready mixed concrete conforming to ASTM C94.

B. Deliver and complete discharge within 1-1/2 hours of commencing of mixing. Limitations may be waived by Engineer if concrete slump, after 1-1/2 hours, is sufficient so that concrete can be placed without addition of water. In hot weather, time criteria may be reduced by Engineer.

C. Do not use concrete that has stood for over 30 minutes after leaving the mixer.

3.3 CONVEYING CONCRETE

A. Perform concrete placement at such a rate that concrete which is being integrated with fresh concrete is still plastic.

B. Deposit concrete as nearly as practicable in its final location so as to avoid separation due to rehandling and flowing.

C. Do not use concrete which becomes non-plastic and unworkable, does not meet required quality control limits, or has been contaminated by foreign materials.

D. Remove rejected concrete from job site.

3.4 CONCRETE PLACEMENT

A. Deposit concrete in a continuous operation, within limits of construction joints, until placing of a section is complete.

B. Consolidate concrete immediately after placing by use of internal concrete vibrators supplemented by hand spading, rodding, or tamping.

C. Do not vibrate forms or reinforcement.

D. Do not use vibrators to transport concrete inside the forms.

E. Bring surfaces to correct level with straightedge, and then strike off.

F. Use bullfloats or darbies to smooth surface, leaving surface free from bumps and hollows.

3.5 CONCRETE FINISHING

A. Check sidewalk with 10-foot straight edge. For areas showing irregularities of 0.25 inches or more cut down high areas or fill depressions with freshly mixed concrete and strike off, consolidate and refinish concrete Do not add water to correct surface deficiencies.

B. Provide a light broom finish perpendicular to direction of travel.

C. Expansion joints:
   1. Extend entire width of sidewalk, at intervals not to exceed 100 feet.
   2. Install full depth of sidewalk.
   3. Install at all construction joints and where sidewalk abuts castings or other rigid structures.
   4. Place expansion joints perpendicular to sidewalk.

D. Control Joints:
   1. Spacing: Maximum intervals of 6 feet.
   2. Formed control joints:
      a. Depth of not less than 1/4 the sidewalk depth
      b. Use 0.25 inch radius jointing tool.
   3. Sawed joints:
   4. Not less than 2 inches deep
   5. Make within 24 hours after concrete placement.

E. Finish all edges with 0.25 inch radius edging tool.

F. Apply curing compound to all exposed surfaces immediately after finishing operations have been completed and surface water has disappeared.

3.6 PROTECTION FROM FREEZING

A. These provisions shall be followed when the atmospheric temperature is 35°F, or is expected to drop below 35°F during the curing period.

B. Heating of aggregates and water:
   1. Concrete temperature shall be at least 50°F and not more than 80°F at the time of placing.
   2. Heating equipment or methods which alter or prevent the entrainment of the required amount of air in the concrete shall not be used.
   3. The equipment shall be capable of heating the materials uniformly.

4. Neither aggregates nor water used for mixing shall be heated to a temperature exceeding 150°F.
5. Materials containing frost or lumps of frozen material shall not be used.
6. When either aggregates or water are heated to 100°F, they shall be combined first in the mixer before cement is added.

C. Immediately after a pour is completed, the freshly placed concrete and forms shall be covered so as to form a protective enclosure and the air in the enclosure kept at a temperature above 50°F for at least 72 hours.

3.7 FIELD QUALITY CONTROL

A. Conform to INDOT Standard Specifications.

B. If tests verify Work in-place is not in conformance with Specifications, Engineer will determine if Work in-place is adequate for intended use. If Work in-place is determined to be inadequate, Contractor shall follow such remedial or replacement measures which Engineer may require. Contractor shall bear costs associated with testing, engineering analysis, remedial work, and replacement required under terms of this paragraph.

END OF SECTION 321623

SECTION 32 92 19 – SEEDING & RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Preparing ground surface.
   2. Turf Seed.
   3. Fertilizer.
   4. Mulch.
   5. Maintenance.
   6. Erosion Control Blankets.

B. All areas of the site, except as noted herein, which are disturbed and not restored with other surfacing, shall be top-soiled, fertilized, mulched, and seeded. Contractor staging areas are included in this requirement.

C. Seeded surfaces on less than 3H to 1V slope shall be protected from erosion with mulching materials as specified. Surfaces equal to or steeper than 3H to 1V slope shall be seeded and protected from erosion with erosion control blankets.

1.2 SUBMITTALS

A. Certifications:
   1. Seed mix (INDOT Type U)
   2. Fertilizer.

B. Product information
   1. Erosion control Blankets
   2. Mulch

C. Submit in accordance with Section 01 33 00.

1.3 QUALITY ASSURANCE

A. Meet or exceed the specifications of Federal, State, and local laws requiring inspection for plant disease and insect control.

B. Seed shall conform to U.S. Department of Agriculture Rules and Regulations under Federal Seed Act and requirements of state seed laws.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Provide seed mixture in sealed containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer to site in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Deliver erosion control blankets in manufacturer's original containers/wrapping. Do not allow materials to become contaminated with mud or soil prior to installation.

1.5 WARRANTY

A. Warranty lawn areas for period of 1 yr. after acceptance of seeding to be alive and in satisfactory growth at end of warranty period.
   1. For purpose of establishing acceptable standard, scattered bare spots, none larger than 1 sq. ft., will be allowed up to a max of 3% of lawn.
   2. If an area of seeding is found to be damaged or destroyed due to vandalism, malicious mischief, vehicle ruts and tracks, or acts of God such as flooding and storm debris, then the Owner shall have the responsibility of replacing those lawn areas without cost or responsibility to the Contractor.

1.6 MEASUREMENT AND PAYMENT

A. Item 041: Seeding and Restoration
   1. Payments shall be on a lump sum basis as listed on the submitted Bid schedule for seeding and restoration, which shall include all required fertilizer, topsoil, mulch, final grading and equipment, unless these items are classified separately in the Contract Documents.
   2. This pay item includes reconditioning of adjacent areas disturbed by construction, required landscaping, seeding and grading.

PART 2 - PRODUCTS

2.1 SEED

A. Fresh, re-cleaned, new crop seed in specified varieties and proportions indicated.

B. Weed content shall not exceed 0.25%.

C. Mulched Seeding Seed mixture shall conform to the requirements for Seed Mixture U as described in Section 621.06 (a) of the INDOT Specifications.

D. Temporary Erosion Control seed mixture shall consist of oats for spring application or winter wheat for fall application. Seed Mixture U may also be used.

2.2 FERTILIZER

A. Commercial balanced, uniform in composition, free flowing, conforming to state and federal laws.

B. Contain percentage by weight as follows, or as modified by topsoil test recommendations.

1. Prior to seeding: 6-24-24.
2. After seeding: 12-12-12.

C. 50% of elements shall be derived from organic sources.

2.3 ACCESSORIES

A. Mulch: Dry oat or wheat straw or wood cellulose fiber free of weeds and foreign matter detrimental to plant life. Hay or chopped corn stacks are not acceptable. Mulch to be applied at two (2) tons per acre and placed within 24 hours after seeding. The mulch shall have a uniform density of at least 75% over the soil surface.

B. Water: Furnished by Owner from existing on-site source. Provide pumps, tankage, hose, piping, and attachments as required to bring water to point of use.

C. Erosion Control Blanket shall conform to Section 621.05 (d), 621.05 (f), or 621.05 (g) of the INDOT Standard Specifications.
1. Roll type, consistent thickness with even fiber distribution over entire area.
2. Approximately 1 in. sq. mesh, nominal weight 1 lb./sq. yd.

PART 3 - EXECUTION

3.1 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.

3.2 PLANTING SEASONS

A. Seeding and sodding shall conform to the schedules and requirements set forth in Section 621.11 of the INDOT Specifications except as follows:
1. Erosion control seeding shall occur when required

B. Perform planting of seed only when weather conditions and soil conditions are acceptable.

C. Planting season limits may be changed when approved by Engineer.

3.3 PREPARATION

A. Finish grading and topsoiling shall be completed prior to sodding.

B. Do not plant seed until trees, shrubs, and other landscaping are completed.

C. Scarify existing topsoil where grade is not being raised, or where topsoil is over compacted, to depth of 2 in. In excess excavated spoil material disposal piles (including prairie grass and wildflower areas) scarify top surface of stockpiled materials.

D. Grade, rake, and roll with roller weighing not more than 100 lbs./ft. or less than 25 lbs./ft.

E. Maximum variation from correct elevation is 1/2 in. in 10 ft.

3.4 FERTILIZING

A. Before seeding, apply 6-24-24 fertilizer at uniform rate of 20 lbs./1000 sq. ft. (or as recommended by prairie grass and wildflower seed supplier). Make 2 passes at right angles. Incorporate fertilizer into soil to depth of at least 2 inches by discing, harrowing, or other approved method.

B. In areas with turf grass after completion of required interim mowings, apply 12-12-12 fertilizer at rate of 15 lbs./1000 sq. ft. Make 2 passes at right angles. Apply fertilizer as recommended by prairie grass and wildflower seed supplier.

C. Lightly water to aid dissipation of fertilizer.

3.5 SEEDING

A. Apply Type U seed mix at a total rate of not less than 4 lbs./1000 sq. ft. Make 2 passes at right angles.

B. Seeding method shall establish smooth, uniform turf and may distribute mulch simultaneously if hydroseeding is performed.

C. Cover seed with 1/8 in. of soil by light raking unless hydroseeding used.

D. Do not seed following rain, if soil has been compacted by rain, or if ground is too dry.

E. Do not seed when wind velocity exceeds 6 mph.

F. Do not seed areas in excess of that which can be mulched on same day.

G. Immediately after seeding, apply mulch to areas less than 4H:1V slope (unless hydroseeded) and erosion control blanket to slopes equal to or steeper than 4H:1V.

H. Place mulch loose to allow some sunlight to penetrate and air to circulate, but thick enough to shade ground, conserve soil moisture, and prevent erosion.

I. Butt ends and edges of erosion control blanket snugly and staple to ground surface with 6 in. staples.

J. Apply water with fine spray immediately after area has been mulched or application of erosion control blanket. Leave area thoroughly soaked at close of each working day.

3.6 PROTECTION

A. Protect turf areas by erecting temporary fences, barriers, signs, and similar protection as necessary to prevent trampling until acceptance by Owner.

B. Replace, repair, or replant damaged seeding.

C. Protect slopes and embankments against erosion until Work is accepted. Repair eroded areas by refilling, reseeding, and re-mulching as required.

3.7 FIELD QUALITY CONTROL

A. Acceptance:
   1. Notify Engineer when lawn areas are ready for final inspection.
   2. Substantial completion will be granted for turf areas upon conformance with the following;
      a. Turf reasonable free from weeds, diseases or other visible imperfections.
      b. Turf displays uniform color, quality and coverage.
      c. Min 3 mowings performed except on excess excavated material spoil pile where only 1 mowing is required.
      d. Fertilizer application performed after mowing.
   3. Substantial completion will be granted to Prairie Grass and wildflower mix areas upon conformance with the following;
      a. Areas are reasonably free from unsightly weeds, diseases or other visible imperfections.
      b. Turf displays uniform quality and coverage
   4. After substantial completion, Owner will be responsible for maintenance.

3.8 MAINTENANCE

A. Maintenance shall begin immediately following installation of seed. Continue until substantial completion. If Contractors staging area is not restored prior to substantial completion, staging area shall be maintained until final completion with a minimum of one cutting performed.

B. Maintain lawns by watering, mowing, and repairing or replanting as may be necessary to produce uniform stand of grass or grass and wildflowers until Work accepted.

C. Perform first mowing to turf areas when average height of grass reaches 4 in. Perform interim mowings, 2 minimum, as needed to maintain grass height at 3 to 3-1/2 in. Do not remove more than 1/3 of leaf blade by mowing. Do not mow prairie grass and wildflower seeded areas.

D. After completion of required interim mowings, apply 12-12-12 fertilizer as specified for turf areas and in accordance with prairie grass and wildflower seed supplier recommendations.

E. Control weed growth. Apply herbicide in accordance with manufacturer’s instructions in turf areas only.

F. Top dress excessive cracks appearing upon soil shrinkage.

END OF SECTION 329219

SECTION 33 01 30.13 - SEWER AND MANHOLE TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Testing of Gravity Sewer Piping:
      a. Low pressure air testing.

   2. Deflection testing of plastic sewer piping.

   3. Testing of Manholes:
      a. Vacuum testing.

B. Related Requirements:
   1. Section 330130.72 - Relining Sewers: Relining of sanitary sewer piping and associated preparatory Work.
   2. Section 333111 – Public Sanitary Sewerage Gravity Piping.
   3. Section 330513.16 – Public Manholes and Structures.

1.2 REFERENCE STANDARDS

A. ASTM International:

   1. ASTM C1244-11a - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

   2. ASTM F1417-11a – Standard Practice for Installation Acceptance of Plastic Non-Pressure Sewer Lines using Low-Pressure Air
   3. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

1.3 MEASUREMENT AND PAYMENT

A. Unit Pricing:
   1. Work specified in this section shall be considered incidental and payment shall be included as part of appropriate unit prices included in the Bid Form.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:

   1. Testing procedures.

2. List of test equipment.
3. Testing sequence schedule.
4. Provisions for disposal of flushing and test water.
5. Certification of test gage calibration.

C. Test and Evaluation Reports: Indicate results of manhole and piping tests.

PART 2 - PRODUCTS

2.1 AIR TESTING

A. Equipment:

1. Air compressor.
2. Air supply line.
3. Shutoff valves.
4. Pressure regulator.
5. Pressure relief valve.
6. Stopwatch.
7. Plugs.
8. Pressure Gage: Calibrated to 0.1 psi.

2.2 DEFLECTION TESTING

A. Equipment:

1. "Go, no go" mandrels.
2. Pull/retrieval ropes.

2.3 VACUUM TESTING

A. Equipment:

1. Vacuum pump.
2. Vacuum line.
3. Vacuum Tester Base:

    a. Compression band seal.
    b. Outlet port.

4. Shutoff valve.
5. Stopwatch.
6. Plugs.
7. Vacuum Gage: Calibrated to 0.1 in. Hg.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that manholes and piping are ready for testing.

C. Verify that trenches are backfilled.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for preparation.

B. Plugs:

1. Plug outlets, wye branches, and laterals.
2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Low-Pressure Air Testing:

1. Test each reach of gravity sewer piping between manholes.
2. Introduce air pressure slowly to approximately 4 psig.
3. Determine ground water elevation above spring line of piping.
4. For every foot of ground water above spring line of piping, increase starting air test pressure by 0.43 psi.
5. Do not increase pressure above 10 psig.
6. Allow pressure to stabilize for at least five minutes.
7. Adjust pressure to 3.5 psig or to increased test pressure as determined above when ground water is present.
8. Do not make allowance for laterals.
9. Minimum Testing Duration in Minutes per 100 feet:

    a. Pipe Size 3 Inches: 0.2.
    b. Pipe Size 4 Inches: 0.3.
    c. Pipe Size 6 Inches: 0.7.
    d. Pipe Size 8 Inches: 1.2.
    e. Pipe Size 10 Inches: 1.5.
    f. Pipe Size 12 Inches: 1.8.
    g. Pipe Size 15 Inches: 2.1.

h. Pipe Size 18 Inches: 2.4.
i. Pipe Size 21 Inches: 3.0.
j. Pipe Size 24 Inches: 3.6.
k. Pipe Size 27 Inches: 4.2.
l. Pipe Size 30 Inches: 4.8.
m. Pipe Size 33 Inches: 5.4.
n. Pipe Size 36 Inches: 6.0.

10. Record drop in pressure during testing period.
11. If air pressure drops more than 1.0 psi during testing period, piping has failed.
12. If 1.0 psi air pressure drop has not occurred during testing period, piping is acceptable; discontinue testing.
13. If piping fails, test reach of piping in incremental stages until leaks are isolated, repair leaks, and retest entire reach between manholes.

C. Deflection Testing of Plastic Sewer Piping:

1. Perform vertical ring deflection testing on PVC and acrylonitrile butadiene styrene sewer piping after backfilling has been in place for at least 30 days but not longer than 12 months.
2. Allowable maximum deflection for installed plastic sewer pipe is no greater than five percent of original vertical internal diameter.
3. Perform deflection testing using properly sized rigid ball or "go, no go" mandrel.
4. Furnish rigid ball or mandrel with diameter not less than 95 percent of base or average inside diameter of pipe, as determined by ASTM standard to which pipe is manufactured; measure pipe diameter in compliance with ASTM D2122.
5. Perform testing without mechanical pulling devices.
6. Locate, excavate, replace, and retest piping that exceeds allowable deflection.

D. Manhole Testing:

1. If air testing, test whenever possible prior to backfilling in order to more easily locate leaks.
2. Repair both outside and inside of joint to ensure permanent seal.
3. Test 100% of manholes with manhole frame set in place.
4. Vacuum Testing:

a. Comply with ASTM C1244.
b. Plug pipe openings; securely brace plugs and pipe.
c. Inflate compression band to create seal between vacuum base and structure.
d. Connect vacuum pump to outlet port with valve open, then draw vacuum to 10 in. Hg.
e. Close valve.
f. Manhole Test Duration in Seconds:

1) Diameter 4 Feet; 60.
2) Diameter 5 Feet; 75.
3) Diameter 6 Feet; 90.

g. Record vacuum drop during test period.

h. If vacuum drop is greater than 1 in. Hg during testing period, repair and retest manhole.
i. If vacuum drop of 1 in. Hg does not occur during test period, manhole is acceptable; discontinue testing.
j. If vacuum test fails to meet 1 in. Hg drop in specified time after repair, repair and retest manhole.

5. If unsatisfactory testing results are achieved, repair manhole and retest until result meets criteria.
6. Repair visible leaks regardless of quantity of leakage.

END OF SECTION 330130.13

SECTION 33 05 05.41 - AIR TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Low-pressure air testing of gravity sewer piping.

B. Related Requirements:
   1. Section 333111 - Public Sanitary Sewerage Gravity Piping: Pipe materials, manholes, and accessories normally encountered with gravity sewerage piping.

1.2 MEASUREMENT AND PAYMENT

A. Unit Price:
   1. All work specified in this section shall be considered incidental and payment shall be included as part of the applicable unit prices included in the Bid Form.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:

   1. Testing procedures.
   2. List of test equipment.
   3. Testing sequence schedule.
   4. Provisions for disposal of flushing and test water.
   5. Certification of test gage calibration.

C. Test and Evaluation Reports: Indicate results of piping tests.

D. Qualifications Statement:

   1. Submit qualifications for applicator.

1.4 QUALITY ASSURANCE

A. Perform Work according to City of Greenfield standards.

1.5 QUALIFICATIONS

A. Applicator: Company specializing in performing Work of this Section with minimum three years' experience.

PART 2 - PRODUCTS

2.1 AIR TESTING

A. Equipment:

1. Air compressor.
2. Air supply line.
3. Shutoff valves.
4. Pressure regulator.
5. Pressure relief valve.
6. Stopwatch.
7. Plugs.
8. Pressure Gage: Calibrated to 0.1 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that piping is ready for testing.

C. Verify that trenches are backfilled.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for preparation.

B. Lamping:

1. Lamp gravity piping after flushing and cleaning.
2. Perform lamping operation by shining light at one end of each pipe section between manholes.
3. Observe light at other end.
4. Pipe not installed with uniform line and grade will be rejected.
5. Remove and reinstall rejected pipe sections.
6. Clean and lamp until pipe section is installed to uniform line and grade.

C. Plugs:

1. Plug outlets, wye branches, and laterals.
2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Low-Pressure Air Testing:

1. Test each reach of gravity sewer piping between manholes.
2. Introduce air pressure slowly to approximately 4 psig.
3. Determine ground water elevation above spring line of piping.
4. For every foot of ground water above spring line of piping, increase starting air test pressure by 0.43 psi.
5. Do not increase pressure above 10 psig.
6. Allow pressure to stabilize for at least five minutes.
7. Adjust pressure to 3.5 psig or to increased test pressure as determined above when ground water is present.
8. Do not make allowance for laterals.
9. Minimum Testing Duration in Minutes Per 100 Feet:

    a. Pipe Size 3 Inches: 0.2.
    b. Pipe Size 4 Inches: 0.3.
    c. Pipe Size 6 Inches: 0.7.
    d. Pipe Size 8 Inches: 1.2.
    e. Pipe Size 10 Inches: 1.5.
    f. Pipe Size 12 Inches: 1.8.
    g. Pipe Size 15 Inches: 2.1.
    h. Pipe Size 18 Inches: 2.4.
    i. Pipe Size 21 Inches: 3.0.
    j. Pipe Size 24 Inches: 3.6.
    k. Pipe Size 27 Inches: 4.2.
    l. Pipe Size 30 Inches: 4.8.
    m. Pipe Size 33 Inches: 5.4.
    n. Pipe Size 36 Inches: 6.0.

10. Record drop in pressure during testing period.
11. If air pressure drops more than 1.0 psi during testing period, piping has failed.
12. If 1.0-psi air pressure drop has not occurred during testing period, piping is acceptable; discontinue testing.
13. If piping fails, test reach of piping in incremental stages until leaks are isolated, repair leaks, and retest entire reach between manholes.
14. If unsatisfactory testing results are achieved, make necessary repairs and retest until result meets criteria.
15. Repair visible leaks regardless of quantity of leakage.

END OF SECTION 330505.41

SECTION 33 05 05.43 - MANDREL TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Deflection testing of plastic sewer piping.

B. Related Requirements:
   1. Section 33 05 13.16 – Public Manholes and Structures
   2. Section 33 31 11 – Public Sanitary Sewerage Gravity Piping

1.2 REFERENCE STANDARDS

A. ASTM International:

   1. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

1.3 MEASUREMENT AND PAYMENT

A. Unit Price:
   1. All work specified in this section shall be considered incidental and payment shall be included as part of the appropriate unit prices included in the Bid Form.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:

   1. Testing procedures.
   2. List of test equipment.
   3. Testing sequence schedule.
   4. Provisions for disposal of flushing and test water.
   5. Certification of test gage calibration.
   6. Deflection mandrel drawings and calculations.

C. Test and Evaluation Reports: Indicate results of piping tests.

PART 2 - PRODUCTS

2.1 DEFLECTION TESTING

A. Equipment:

1. Properly sized "go, no go" mandrel.
2. Pull/retrieval ropes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that piping is ready for testing.

C. Verify that trenches are backfilled.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for preparation.
B. Lamping:
1. Lamp gravity piping after flushing and cleaning.
2. Perform lamping operation by shining light at one end of each pipe section between manholes.
3. Observe light at other end.
4. Pipe not installed with uniform line and grade will be rejected.
5. Remove and reinstall rejected pipe sections.
6. Clean and lamp until pipe section is installed to uniform line and grade.

C. Plugs:
1. Plug outlets, wye branches, and laterals.
2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Deflection Testing of Plastic Sewer Piping:

1. Perform vertical ring deflection testing on PVC and ABS sewer piping after backfilling has been in place for at least 30 days, but not longer than 12 months.
2. Allowable maximum deflection for installed plastic sewer pipe is no greater than five percent of original vertical internal diameter.

3. Perform deflection testing using "go, no go" mandrel.
4. Mandrel Diameter:

    a. Not less than 95 percent of base or average ID of pipe.
    b. Pipe Diameter: Comply with ASTM D2122.

5. Perform testing without mechanical pulling devices.
6. Locate, excavate, replace, and retest piping that exceeds allowable deflection.

END OF SECTION 330505.43

SECTION 33 05 13.16 - PUBLIC MANHOLES AND INLETS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Modular precast concrete manholes and structures with tongue-and-groove joints and transition to cover frame, covers, anchorage, and accessories.
   2. Bedding and cover materials.

B. Related Requirements:
   1. Section 31 23 17 - Trenching: Backfilling after manhole and structure installation.
   2. Section 33 01 30.13 - Sewer and Manhole Testing

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Item 022: 48” Sanitary Manholes
   1. Payment for Concrete Manholes and Inlets shall be on a unit price basis for each size and type.
   2. The pay quantity shall be the actual number of sanitary manholes and inlets in each size and type successfully furnished and installed.
   3. This Work will be at the unit price as listed on the submitted Bid schedule for size and type of the concrete manholes and structures and shall include the following: temporary bypass pumping, pavement removal, excavation, disposal of excess excavated material, base stabilization, dewatering, sheeting, riser rings, utility marking posts, castings and lids, external wraps and seals, precast sections or cast in place concrete, channels, inverts, drop piping, granular backfill material, connecting pipes, placing and compacting backfill, testing, utility adjustments, temporary pavement replacement if necessary, and any other requirements to complete the Work in accordance with the drawings and specifications, unless otherwise classified as a separate Work item.

B. Item 023: Manhole Removal
   1. This item is measured on an each basis for Work shown on the Drawings, otherwise specified, or necessary to complete the Work shown on the drawings
   2. Payment for removal of existing manholes shall be paid based on the number of structures successfully completed per the Contract Documents or as shown on the drawings.
   3. Contractor shall dispose of all removed manholes and structures away from the project site.
   4. This item shall include costs to furnish labor, materials, tools, and equipment, both permanent and temporary, for removal of existing structure including surface patching and backfill.

C. Item 024: Inlet, Remove
   1. This item is measured on an each basis for Work shown on the Drawings, otherwise specified, or necessary to complete the Work shown on the drawings
   2. Payment for removal of existing inlets shall be paid based on the number of structures successfully completed per the Contract Documents or as shown on the drawings.

3. Contractor shall dispose of all removed inlets and structures away from the project site.
4. This item shall include costs to furnish labor, materials, tools, and equipment, both permanent and temporary, for removal of existing structure including surface patching and backfill.

D. Item 025: Sewer Connection to Existing Manhole

1. This item is measured on an each basis for Work shown on the Drawings, otherwise specified, or necessary to complete the Work shown on the drawings.
2. Payment for modifications to existing manholes shall be paid as a lump sum.
3. This item shall include all costs to furnish all labor, materials, tools, and equipment, both permanent and temporary, for manhole modifications associated with Work shown on the Drawings including, but not limited to: cleaning existing manhole as required to perform the Work, excavation, riser ring, castings, chimney seals, furnishing and installing concrete for patching abandoned inlets/outlets, and core drilling existing structures to facilitate construction. The Work includes protection of existing utilities, installation of concrete plugs, site restoration and incidentals for performing all Work as specified unless otherwise classified as a separate Work Item.

E. Item 026: Force Main Connection to Manhole

1. The lump sum price shall include core drilling the existing manhole to accept the proposed 12" force main.
2. The cost for this item will also include lining the manhole per the spec's as noted on the related detail sheet.
3. This Work shall also include costs for excavation, bends, fitting, pipe, link seal, legal disposal of excess excavated material, sheeting, fill material and site grading, if necessary, and any other requirements to complete the force main connection and epoxy coating in accordance with these Contract Documents.

F. Item 005: Abandon Existing Pump Station

1. This Work will be a lump sum price as listed on the submitted Bid schedule and shall include the following Work: pump removal, pipe removal, removal of valve vault in its entirety, plugging pipe penetrations, grout fill, core drilling for new pipe connection, electrical components removal, excavation, disposal of excess excavated material, base stabilization, dewatering, sheeting, bypass pumping, fill material and site grading, if necessary, and any other requirements to complete the abandonment of the station in accordance with these Contract Documents, unless otherwise detailed by the Engineer as a separate Work item.

1.3 REFERENCE STANDARDS

A. ASTM International:
1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
4. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
5. ASTM C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for manhole covers, component construction, features, configuration, and dimensions.

C. Shop Drawings:
   1. Indicate structure locations and elevations.
   2. Indicate sizes and elevations of piping and penetrations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Buoyancy calculation: For each manhole, documenting that buoyancy is not a problem. Criteria for buoyancy calculations are as follows:
   1. Minimum safety factor 1.2.
   2. Surface friction with backfill materials shall not be included.
   3. Submerged soil weight of 55 pounds per cubic foot where soil weight is used to help hold down the manhole. Only soil directly above manhole or any anti-floatation devices may be included.
   4. Water table at grade
   5. No water weight to be included inside structure
   6. Weights for castings, all precast components and any manufacturer supplied fillets in bottom of manhole may be included.

F. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:
   1. Submit qualifications for manufacturer and installer.
   2. Submit manufacturer's approval of installer.

1.5 QUALITY ASSURANCE

A. Perform Work according to City of Greenfield standards.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer’s original packaging and inspect for damage.

C. Comply with precast concrete manufacturer's instructions for unloading, storing, and moving precast manholes and drainage structures.

D. Storage:
   1. Store precast concrete manholes and drainage structures to prevent damage to Owner's property or other public or private property.
   2. Repair property damaged from materials storage.

PART 2 PRODUCTS

2.1 MANHOLES AND STRUCTURES

A. Precast Concrete Manholes
   1. Furnish materials according to City of Greenfield Utilities standards.

2.2 PIPE TO MANHOLE CONNECTIONS

A. All connections shall provide for a watertight seal between pipe and manhole.
   1. Connect sanitary sewer pipe by means of boot-type or compression-type connector, meeting the requirements of ASTM C923.
      a. Kor-n-Seal, by Trelleborg.
      b. A-Lok, by A-Lok Products, Inc.
      c. Z-Lok Cast in Boots, by A-Lok Products, Inc.
      d. PSC Direct Drive, by Press-Seal Gasket Corporation
      e. Or Equal.
   2. Boot type connections are not required for existing structures where grout repair and/or manhole lining is required per the Drawings.

2.3 FRAMES AND COVERS

A. Manufacturers:
   1. Furnish materials according to City of Greenfield Utilities standards.

2.4 ADJUSTING RINGS

A. Furnish materials according to City of Greenfield Utilities standards.

2.5 STEPS

A. Conform to requirements of ASTM C478 and U.S. Department of Labor Occupational Safety and Health Standards.
   1. Furnish materials according to City of Greenfield Utilities standards.

2.6 MATERIALS

A. Cover and Bedding: see Section 31 23 17 – Trenching.

2.7 ACCESSORIES

1. Provide integral anti-floatation collars (extended bases) with a minimum width of 6 inches around bottom of all manholes. Provide larger collars for manholes that calculations indicate have buoyancy safety factors less than 1.2 so that required factor of safety is achieved. Other methods of buoyancy control may also be acceptable upon Engineer's approval.
2. Top Surface: Level.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify correct size of manhole and structure excavation.

3.2 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.

C. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

3.3 INSTALLATION

A. Install sanitary sewer manholes per City of Greenfield Utilities standards.

B. Castings:
   1. Set frames as indicated on Drawings.
   2. Set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.

3.4 FIELD QUALITY CONTROL

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Vacuum test all new concrete manholes according to ASTM C1244 and Section 33 01 30.13.

C. Vertical Adjustment of Existing Manholes and Structures:
   1. If required, adjust top elevation of existing manholes and structures to finished grades as indicated on Drawings.
   2. Frames, Grates, and Covers:
      a. Carefully remove frames, grates, and covers cleaned of mortar fragments.
      b. Reset to required elevation according to requirements specified for installation of castings.

END OF SECTION 33 05 13.16

SECTION 33 05 23.13 - UTILITY HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall furnish and install pipe by horizontal directional drilling (HDD) construction methods, as shown on the drawings and conform to this specification. The Work includes, but is not limited to, excavation, dewatering, removal of all materials encountered in the drilling operations, disposal of all material not required in the Work, as shown on the drawings and as specified herein.
   2. Contractor shall be responsible for the final constructed product, and for furnishing the permits, qualified labor and superintendence necessary for this method of construction.

B. Coordination:
   1. Review construction sequencing and installation procedures under other Sections.
   2. Contractor responsible to coordinate between other construction contracts that may be on going simultaneously.

C. Related Sections:
   1. Section 31 23 17, Trenching.
   2. Section 33 05 38.16, HDPE Pressure Utility Piping

1.2 MEASUREMENT AND PAYMENT

A. Measurement and payment for HDD installation of piping and associated appurtenances shall be included in the measurement and payment of each pipe material, except for specific Work items listed in other specification sections.

1.3 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ASTM International.
      a. ASTM D2774, Practice for Underground Installation of Thermoplastic Pressure Piping.
      b. ASTM D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
      c. ASTM F-714, Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
   2. American Water Works Association
      a. AWWA C651, Disinfecting Water Mains

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements and recommendations of authorities having jurisdiction over the Work, including.
    a. Indiana Department of Environmental Management
2. Obtain required permits for Work in roads, rights of way, and other areas of the Work, unless otherwise stipulated by Owner.

B. The Contractor or sub-contractor performing the horizontal directional drilling work shall have previous experience with projects of similar size, type and complexity.

C. All supervisory personnel must be adequately trained in directional drilling.

1.5 SUBMITTALS

A. The Contractor shall prepare and submit for review only, prior to the start of construction, the following:
    1. Horizontal Directional Drilling Plan describing the equipment, methods, procedures (pilot hole drilling, insertion, reaming, pullback, coating protection, internal cleaning, internal gauging, hydrostatic tests, dewatering, purging, etc.), monitoring procedures (pressures, depth, alignment, placement, entrance and exit points, etc.), construction sequence and scheduling, contingency plans, and other items of concern to be performed during the horizontal directional drilling process.
    2. Project Safety Plan.

B. Informational Submittals: Submit the following:
    1. Field Quality Control Submittals:
        a. Results of each specified field quality control test.
    2. When requested by Engineer, submit:
        a. Information on previous horizontal directional drilling projects, both firm and employees, of similar size, type and complexity.
        b. A list of references of persons or firms who can attest to the quality of performed work.

C. Closeout Submittals: Submit the following:
    1. Record Documentation:
        a. Maintain accurate and up-to-date record documents in accordance with 01 78 39, Project Record Drawings showing modifications made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping Work. Submittal shall show actual location of all piping Work and appurtenances at same scale as the Drawings.
        b. Show piping with elevations referenced to Project datum and dimensions from permanent structures. For each horizontal bend in piping, include dimensions to at least three permanent structures, when possible. For straight runs of piping provide offset dimensions as required to document piping location.
        c. Include profile drawings with buried piping Record Documents when the Contract Documents include piping profile drawings.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Material delivery, storage and handling must conform to requirements in Contract Documents. Refer to Section 01 65 00 Product Delivery Requirements and Section 01 66 00 Product Storage and Handling Requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. General:
   1. Refer to division 33 specification sections for pipe material requirements.

B. Equipment Requirements:
   1. The Contractor shall ensure that appropriate equipment is provided to facilitate the installation. Equipment shall be matched to the size of pipe being installed and shall have appropriate torque and thrust/pullback capacity for the diameter and length of the intended drilling sections. The Contractor will ensure that the drill rod can meet the bend radius required for the proposed installation.

C. Drilling Fluids:
   1. A mixture of bentonite clay or other approved slurry and potable water shall be used as the cutting and soil stabilization fluid. The viscosity shall be varied to best fit the soil conditions encountered. Water shall be clean and fresh. No other chemicals or polymer surfactant is to be used in the drilling fluid without the written consent of the Engineer and after a determination is made that the chemicals to be added are not harmful or corrosive to the facility and are environmentally safe.
   2. The Contractor shall identify the source of fresh water for mixing the drilling mud. The Contractor shall be responsible for approvals and permits required for such sources as streams, rivers, ponds, or fire hydrants. Any water source other than potable water may require a pH Test.
   3. Monitoring of the drilling fluids such as the pumping rate, pressures, viscosity, and density is required during the pilot bore, back reaming, and pipe installation stages, to ensure adequate removal of soil cuttings and the stability of the bore hole. Relief holes can be used as necessary to relieve excess pressure down hole. To minimize heaving during pullback, the pull back rate is determined in order to maximize the removal of soil cuttings without building excess down hole pressure. Excess drilling fluids shall be contained at entry and exit points until they are recycled or removed from the site. Entry and exit pits shall be of sufficient size to contain the expected return of drilling fluids and soil cuttings.
   4. The Contractor shall ensure that all drilling fluids are disposed of or recycled in a manner acceptable to the appropriate local, state, or federal regulatory agencies. When drilling in suspected contaminated ground, the drilling fluid shall be tested for contamination and disposed of appropriately. Any excess material shall be removed upon completion of the bore.
   5. Restoration for damage caused by heaving, settlement, escaping drilling fluid (fracout) or the directional drilling operation, is the responsibility of the Contractor. Any pavement

heaving or settlement damage requires restoration/replacement of the pavement per applicable standards of authorities having jurisdiction.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
1. Contractor shall install the pipelines by means of horizontal directional drilling as shown, specified and as recommended by the manufacturer.
2. Contractor shall be responsible for his means and methods of directional drilling construction and shall ensure the safety of the work, the Contractor's employees, the public, and adjacent property, whether public or private.
3. Contractor shall anticipate that portions of the drilled excavation will be below the groundwater table.
4. Contractor shall comply with all local, state, and federal laws, rules, and regulations at all times to prevent pollution of the air, ground, and water.
5. If there is a conflict between manufacturer's recommendations and the Drawings or Specifications, request instructions from Engineer before proceeding.
6. The pipe shall be installed in the location and to the line and grade designated on the drawings.
7. 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.
8. All surfaces shall be finish graded to original contours and ground cover.
9. Excavated material, which is not removed from the immediate site, shall be stockpiled so as to cause as little inconvenience to the property owners as possible. Driveways and street crossings must be kept clear.
10. Excavation for entry, recovery pits, slurry sump pits, or any other excavation shall be carried out in accordance with Specification Section 312317, Trenching. Sump areas or holding tanks are required to contain drilling fluids.
11. After completing installation of the product the work site shall be restored. The work site shall be cleaned of all excess slurry left on the ground. Removal and final disposition of excess slurry or spoils as the product is introduced shall be the responsibility of the Contractor.
12. Excavated areas shall be restored in accordance with the Contract Documents. The cost of restoring damaged pavement, curb, sidewalk, driveways, lawns, storm drains, landscape, and other facilities is borne by the Contractor.
13. If underground utilities and/or structures not shown on the Drawings are encountered, notify the Owner and do not proceed until instructions are obtained. Notify the Owner if springs or running water are encountered.

B. Utility Verification (Potholing)
1. Prior to the start of water main construction, Contractor shall verify all underground utilities (potholing) that may conflict with water main construction. Cost of potholing shall be included in the cost of the pipe installation unit price.

2. Potholing results shall be presented to the Engineer on a full set of drawings showing accurate locations of utilities. Information marked on the plans should include horizontal tie downs as well as depths related to USGS elevation.
3. Alignment of the proposed water main (horizontal and vertical) may be adjusted in the field upon review of potholing results by the Engineer.

C. Locating and Protecting Existing Building Sewers.
1. Building sewers are considered "private" and are not part of the public sewer system and begin at the inside face of the public sewer.
2. City Utilities will televise the sanitary sewer main and furnish the Contractor with sanitary sewer tap locations, to the best of their ability, as a measurement from the downstream manhole.
3. It shall be the Contractor's responsibility to pothole and verify the location of the underground utility that may be in conflict with the water main construction.
4. It shall be the Contractor's responsibility to protect building sewers during all construction activities.
5. Any and all costs associated with locating, protecting, and repairing building sewers shall be considered incidental to the project cost and the responsibility of the Contractor.

D. Drilling Operations:
1. Bore path and alignment are as indicated in the Contract Documents. The path of the bore may be modified based on field and equipment conditions. Entry and exit locations and control-point elevations shall be maintained as indicated in the Contract Documents.
2. Bend radii shown in the Contract Documents are minimum allowable radii and shall not be reduced.
3. Directional drilling/boring shall use techniques of creating or directing a borehole along a predetermined path to a specified target location. Directional drilling shall involve use of mechanical and hydraulic deviation equipment to change the boring course and Contractor shall use instrumentation to monitor the location and orientation of the boring head assembly along a predetermined course.
4. Drilling shall be accomplished with fluid assisted mechanical cutting. The spoils shall be transported from the Site and be properly disposed. Under no circumstances will the drilling spoils be permitted to be disposed into waterways, sanitary, storm, or any other public or private drainage system.
5. Steering shall be accomplished by the installation of an offset section of drill stem that causes the cutterhead to turn eccentrically about its centerline when it is rotating. When steering adjustments are required, the cutterhead offset section is rotated toward the desired direction of travel and the drill stem is advanced forward without rotation. Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100-feet. In the event that pilot does deviate from the bore path more than 5-feet of depth in 100-feet, Contractor will notify Engineer and Engineer may require Contractor to pull-back and re-drill from the location along bore path before the deviation. In the event that a drilling fluid fracture, inadvertent return, or returns loss occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and wait another 30 minutes. If mud fracture or returns loss continues, Contractor will discuss additional options with the Engineer and work will then proceed accordingly.

E. Locating and Tracking:
   1. The Contractor shall at all times provide and maintain instrumentation that will accurately locate the pilot bore/hole and measure drilling fluid flow and pressure.
   2. The Contractor shall describe the method of locating and tracking the drill head during the pilot bore. The Owner recognizes walkover, wire line, and wire line with surface grid verification, or any other system as approved by the Engineer, as the accepted methods of tracking directional bores. The locating and tracking system shall be capable of ensuring that the proposed installation is installed as intended. The locating and tracking system shall provide information on:
      a. Clock and pitch information
      b. Depth.
      c. Battery status.
      d. Position (x,y).
      e. Azimuth, where direct overhead readings (walkover) are not possible (i.e. subaqueous or limited access transportation facility.)
      f. Alignment readings or plot points shall be taken and recorded every 5 feet.
      g. Before commencement of a directional drilling operation, proper calibration of the equipment (if required) shall be undertaken.
   3. Contractor shall provide Engineer access to all data and readout pertaining to the position of the bore head and fluid pressures and flows.
   4. All facilities shall be installed in such a way that their location can be readily determined by electronic designation after installation. For non-conductive installations this shall be accomplished by attachment of tracing wire, as buried piping identification.
   5. The drill path shall be accurately surveyed with entry and exit areas placed in the appropriate locations within the areas indicated on drawings. If using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.
   6. Entry and exit areas shall be drilled so as not to exceed the bending limitations of the pipe as recommended by the pipe supplier.

F. Ream and Pullback:
   1. After an initial bore has been completed, a reamer will be installed at the termination/exit pit and the pipe will be pulled back to the starting/entry pit.
   2. Reaming operations shall be conducted to enlarge the pilot after acceptance of the pilot bore. The number and size of such reaming operations shall be conducted at the discretion of the Contractor.
   3. Back ream hole diameter shall be no greater than the sum of the maximum product outside diameter (OD) plus 6 inches.
   4. The maximum allowable pull exerted on the pipe pipelines shall be measured continuously and limited to the maximum allowed by the pipe manufacturer so that the pipe or joints are not over stressed.
   5. A swivel shall be used to connect the pipeline to the drill pipe to prevent torsional stresses from occurring in the pipe.
   6. The lead end of the pipe shall be closed during the pullback operation.
   7. The pipelines shall be adequately supported by rollers and side booms and monitored during installations so as to prevent over stressing or buckling during the pullback operation.

G. Joining Pipe Sections
   1. Refer to Section 33 11 00 for pipe jointing requirements.

H. Transitions from One Type of Pipe to Another:
   1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

3.2 WORK AFFECTING EXISTING PIPING

A. Location of Existing Piping:
   1. Locations of existing piping shown on the Drawings shall be considered approximate.
   2. Contractor shall determine the true location of existing piping to which connections are to be made, and location of other facilities which could be disturbed during earthwork operations, or which may be affected by Contractor's Work.

B. Taking Existing Pipelines Out of Service:
   1. Do not take pipelines out of service unless approved by Engineer.
   2. Notify Engineer, in writing, at least 48 hours prior to taking pipeline out of service.

3.3 QUALITY CONTROL

A. A representative of the Contractor must be in control of the operation at all times. The representative must have a thorough knowledge of the equipment and the procedures to be performed, and must be present at the job site during the installation.

B. The Owner must be notified 48 hours in advance of starting work. The installation shall not begin until the Owner's representative is present at the job site and agrees that proper preparations have been made.

3.4 TESTING OF PIPING

A. General:
   1. Refer to applicable Division 33 piping installation specifications for testing requirements.
   2. When there is any indication a pipe has sustained damage and may leak, the Work is to be stopped and the damage investigated. The Engineer may require a pressure test. The testing may consist of one of the following methods but shall always meet or exceed Engineer's testing requirements:
      a. Manufacturer's pressure testing recommendations for the type of pipe being installed are followed. The Engineer shall be notified and at his/her option be present during the test for review of the test results for compliance. The pressure test shall be performed within twenty-four (24) hours. A copy of the test results shall be furnished to the Engineer. If the pipe is not in compliance with specifications, the Owner may require it to be filled with flowable fill.
      b. Product carrier pipes installed without a casing shall meet pressure requirements set by the Engineer. A copy of the test results shall be furnished to the Engineer. If the pipe is not in compliance with specifications the Owner may require it to be filled with flowable fill.

3.5 CLEANING AND DISINFECTION

A. General:
   1. Refer to applicable Division 33 piping installation specification for cleaning and disinfection requirements.

+ + END OF SECTION + +

SECTION 33 05 33 - DUCTILE IRON PRESSURE PIPING

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install ductile iron pipe and fittings as shown and specified.
   2. Extent of piping is shown on the Drawings.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with, or before, the ductile iron utility pipe Work.

C. Related Sections:
   1. Section 31 00 05 - Trenching and Earthwork.
   2. Section 33 41 00 – Sanitary Piping Installation.

1.2 MEASUREMENT AND PAYMENT

A. Ductile Iron Utility Piping
   1. Measurement: Work specified in this section is included under Regional Pump Station pay item.
   2. This item includes all costs to furnish all labor, materials, tools, and equipment, both permanent and temporary, to install the ductile iron pipe as shown and specified. The Work includes, but is not limited to, trench excavation, dewatering, furnishing and placement of bedding, pipe, all necessary fittings, placement of required backfill, testing of materials, compaction of bedding and backfill, utility verification, temporary sheeting, shoring and bracing, pressure testing, protection of existing utilities and structures, and incidentals for performing all Work as specified unless otherwise provided for as a separate Work item.

1.3 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute.
      a. ANSI B18.2.1, Square and Hex Bolts and Screws Inch Series.
      b. ANSI B18.2.2, Square and Hex Nuts. (Inch Series).
   2. ASTM International.
      a. ASTM A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
      b. ASTM A194, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both

c. ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
d. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
e. ASTM A575, Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
f. ASTM D5162, Practice for Discontinuity (Holiday) Testing of Non-Conductive Protective Coating on Metallic Substrates.
g. ASTM G14, Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test).

3. American Water Works Association.
   a. AWWA C104, Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
   b. AWWA C105, Polyethylene Encasement for Ductile-Iron Pipe Systems.
   c. AWWA C110, Ductile Iron and Gray Iron Fittings.
   d. AWWA C111, Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
   e. AWWA C115, Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
   f. AWWA C116, Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray Iron Fittings.
   g. AWWA C150, Standard for Thickness Design of Ductile Iron Pipe.
   h. AWWA C151, Ductile Iron Pipe, Centrifugally Cast.
   i. AWWA C153, Ductile Iron Compact Fittings for Water Service.
4. The Society for Protective Coatings.
   a. SSPC Painting Manual, Volume 1, Para. XIV.
   b. SSPC PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
5. Manufacturers Standardization Society of the Valve and Fittings Industry.
   a. MSS SP-60, Connecting flange joint between tapping sleeves and tapping valves.
6. National Association of Corrosion Engineers.
   a. NACE RP0188, Discontinuity (Holiday) Testing of Protective Coatings.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of 5 years successful experience producing ductile iron pipe and fittings and shall be able to show evidence of at least 5 installations in satisfactory operation in the United States that are similar applications to the specified service.
   2. Lining and coating products shall be manufactured by a firm with a minimum of 5 years successful experience in protecting pipelines exposed to the specified service conditions , and shall be able to show evidence of at least 5 installations in satisfactory operation in the United States that are similar applications to the specified service.

B. Component Supply and Compatibility:
   1. Ductile iron pipe manufacturer shall review and approve or prepare all Shop Drawings and other submittals for pipe, fittings, and appurtenances furnished under this Section.
   2. Pipe, fittings, and appurtenances shall be suitable for the specified service and shall be integrated into overall piping system by ductile iron pipe manufacturer.

3. Ductile iron pipe manufacturer shall be responsible for all products and all factory-applied linings and coatings, whether installed at pipe manufacturer's facility or at manufacturer's Supplier's facility.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Submit product data for pipe, fittings, gaskets, appurtenances, linings, and coatings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Ship and store in accordance with manufacture's recommendations.

B. Inspect all materials during unloading process.

C. Notify Owner of any cracked, flawed or otherwise defective material.

D. Remove all materials from the Site that are found to be unsatisfactory.

E. Material delivery, storage and handling must conform to requirements in Contract Documents. Refer to Section 01 65 00 Product Delivery Requirements and Section 01 66 00 Product Storage and Handling Requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. General:
   1. Piping systems shall be suitable for their intended use.
   2. Joints shall be as specified in the Contract Documents. If not specified, provide flanged joints for exposed piping and push-on or mechanical joints for buried piping. Provide couplings on pipe with plain or grooved ends where shown or where approved by Engineer.

B. Ductile Iron Pipe, Joints, and Fittings:
   1. Flanged Pipe: Fabricate in accordance with AWWA C115**.**
      a. Pressure Rating: As specified in on Contract Drawings. If not otherwise specified, 3 inch to 12 inch diameter pipe shall be a minimum Pressure Class 350 in accordance with AWWA C150. Pipes with a diameter larger than 12 inch shall be a minimum Pressure Class 250 in accordance with AWWA C150.
   2. Non-Flanged Pipe: Conform to AWWA C151 for material, pressure, dimensions, tolerances, tests, markings, and other requirements.
      a. Pressure Class:
         1) 3 inch diameter through 12 inch diameter shall be a minimum Pressure Class 350 in accordance with AWWA C150.
         2) Larger than 12 inch diameter shall be a minimum Pressure Class 250 in accordance with AWWA C150.

3. Pipe Joints:
    a. Flanged Joints: Conform to AWWA C110 and AWWA C111 capable of meeting the pressure rating or special thickness class, and test pressure specified in piping schedule or on Contract Drawings.
        1) Gaskets: Unless otherwise specified, gaskets shall be at least 1/8 inch thick, ring or full-face as required for the pipe, of synthetic rubber compound containing not less than 50 percent by volume nitrile or neoprene, and shall be free from factice, reclaimed rubber, and other deleterious substances. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.
        2) Bolts: Comply with ANSI B18.2.1.
            a) Exposed: ASTM A307, Grade B.
            b) Buried or Submerged: ASTM A193, Grade B8M, Class 2, Heavy hex, Type 316 stainless steel.
        3) Nuts: Comply with ANSI B18.2.2.
            a) Exposed: ASTM A563, Grade A, Heavy hex.
            b) Buried or Submerged: ASTM A194, Grade B8M, Heavy hex, Type 316 stainless steel.
    b. Mechanical Joints: Comply with AWWA C111 and AWWA C151, capable of meeting pressure rating or special thickness class, and test pressure specified.
        1) Glands: Ductile iron.
        2) Gaskets: Plain tip.
        3) Bolts and Nuts: Cor Blue, Ble Fluoro, or approved equal.
    c. Push-On Joints: Comply with AWWA C111 and AWWA C151, capable of meeting pressure class or special thickness class, and test pressure specified.
        1) Gaskets: Vulcanized SBR, unless otherwise specified.
        2) Stripes: Each plain end shall be painted with a circular stripe to provide a guide for visual check that joint is properly assembled.
        3) Products and Manufacturers: Provide one of the following:
            a) Tyton or Fastite Joint by Clow Water Systems, Atlantic States Cast Iron Pipe Company, Canada Pipe Company, Ltd., McWane Cast Iron Pipe Company, Pacific States Cast Iron Pipe Company, and Griffin Pipe Products Company.
            b) Fastite Joint by American Cast Iron Pipe Company.
            c) Tyton Joint by U.S. Pipe and Foundry Company.
            d) Or equal.
    d. Restrained Joints: Restrained joints shall comply with AWWA C110 or AWWA C153. Restrained push-on joints shall be capable of being deflected after full assembly. Field cuts of restrained pipe are not allowed without approval of Engineer.
        1) Products and Manufacturers: Provide restrained joints by one of the following:
            a) Megalug, Series 1100, by EBBA Iron Sales, Inc.
4. Flanged and Push-On Joint Fittings: Comply with AWWA C110 and AWWA C111.
    a. Material: Ductile iron.
    b. Pressure rating, gaskets, bolts, and nuts shall be as specified for flanged joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of the connected pipe.
5. Mechanical Joint Fittings: Comply with AWWA C110 and AWWA C111.

a. Material: Ductile iron.
b. Glands: Ductile iron.
c. Pressure rating, gaskets, bolts, and nuts shall be as specified for mechanical joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of connected pipe.

C. Cement-mortar Lining:
1. Pipes and fittings shall be lined with bituminous seal coated cement-mortar lining in accordance with AWWA C104.

D. Specials:
1. Transition Pieces:
a. Provide suitable transition pieces (adapters) for connecting to existing piping.
b. Unless otherwise shown or indicated, expose existing piping to determine material, dimensions, and other data required for transition pieces.

2.2 MARKING FOR IDENTIFICATION

A. Stamp, mark, and identify push-on joint and mechanical joint pipe with:
1. Name or trademark of manufacturer.
2. Weight, class or nominal thickness, and casting period.
3. Country where cast.
4. Year the pipe was produced.
5. Letters “DI” or “Ductile” shall be cast or metal stamped
6. Pipe Size

B. In addition to identification markings specified, also stamp, mark, and identify flanged pipe with:
1. Flange manufacturer’s mark, size, and letters “DI” cast or stamped on the flanges.
2. Fabricator’s mark if other than flange manufacturer.
3. Length and weight.
4. Pipe Size

C. In addition to identification markings specified, also stamp, mark, and identify fittings with:
1. Manufacturer’s identification.
2. Pressure rating.
3. Nominal diameters of openings.
4. Country where cast.
5. Number of degrees or fraction of the circle on bends.
6. Letters “DI” or “Ductile” cast on them.

2.3 EXTERIOR SURFACE PREPARATION AND COATINGS

A. Buried Pipe and Fittings:
1. Asphaltic Coating: Coat pipe and fittings with an asphaltic coating approximately 1 mil thick, in accordance with AWWA C151, AWWA C115, AWWA C110, and AWWA C153, as applicable.
2. Fusion Bonded Epoxy Coating for Fittings:

a. When specified, fittings shall be factory coated with 100 percent solids, thermosetting, dry powder epoxy, in conformance with AWWA C116.
b. Apply coating utilizing a method, recommended by manufacturer that meets requirements of this Section, with finished dry film thickness of at least 6 mils, with exception of joint areas, which shall receive at least a 4 mil dry film thickness coating. Heat and cure fittings in accordance with coating manufacturer's recommendations.
c. Source Quality Control: Cut a test coupon from coated fitting no less than 6 inches in diameter, and approximately four inches long, and split coupon lengthwise into 2 equal sections. Surface preparation, application procedure, thickness, and curing parameters shall be the same for test coupon as for Project fittings. Perform the following tests on test coupon:
    1) Scribe coating material through to bare surface of fitting with an "X" across full length of test coupon. Immerse coupon for 500 hours in 150 degree F bath of distilled water. Coating shall show no signs of disbondment or blistering.
    2) Test coupon shall be impact tested using ASTM G14 test method with 20 inch pound impact applied near center of convex section of test coupon. Coating shall show no signs of cracking or disbondment without magnification.
d. Manufacturer's Inspection and Certification:
    1) All coated fittings shall be visually inspected by manufacturer and show no sign of blisters, cracks, or lack of coverage.
    2) Check all coated fittings for coating thickness using magnetic film thickness gage utilizing method outlined in SSPC PA 2 Film Thickness Rating.
    3) Holiday-test all coated fittings in accordance with ASTM D5162, NACE RP0188, and SSPC Painting Manual Volume 1, Paragraph XIV, with low-voltage, wet sponge holiday detector. Repair methods and materials for holidays shall be as recommended by coating manufacturer and made prior to shipment to the Site.
e. Products and Manufacturers: Provide one of the following:
    1) PipeClad 1500, by Valspar Corporation.
    2) Or equal.

2.4 POLYETHYLENE ENCASEMENT

1. Supply polyethylene in tubes or sheets.
2. Provide polyethylene encasement for ductile iron piping to prevent contact between pipe and surrounding bedding material and backfill.
3. Polyethylene encasement materials shall be in accordance with AWWA C105.

2.5 SOURCE QUALITY CONTROL

A. Shop Tests:
1. Pipe manufacturer shall maintain continuous quality control program.
2. Where applicable and when requested by Engineer, submit results of source quality control tests specified in reference standards.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect pipe materials for defects in material and workmanship. Verify compatibility of pipe and fittings.

3.2 INSTALLATION

A. Buried Piping Installation
   1. Refer to the applicable Division 33 piping installation section.

B. Bedding and Backfill
   1. Refer to Section 31 00 05 Trenching and Earthwork.

C. Contractor shall be responsible for verification of pipe loading during construction. Pipe design is based on final installation depth and required cover.

3.3 POLYETHYLENE ENCASEMENT

A. Provide polyethylene encasement for ductile iron piping to prevent contact between pipe and surrounding bedding material and backfill.

B. Polyethylene encasement installation shall be in accordance with AWWA C105.

C. Lumps of clay, mud, cinders etc. on the pipe surface shall be removed prior to installation of the polyethylene encasement.

D. Polyethylene film shall be fitted to the contour of the pipe creating a snug, but not tight, encasement with the 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.

E. Overlaps and ends shall be secured with adhesive tape of plastic tie straps.

F. Installations below the water table tube-form polyethylene should be used with both ends thoroughly sealed with adhesive tape or plastic tie straps at the joint overlaps.

G. Circumferential wraps of tape shall be placed at 2 foot internals along the barrel of the pipe.

+ + END OF SECTION + +

SECTION 33 05 34.13

CONCRETE NON-PRESSURE UTILITY PIPING

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals shown, specified, and required to furnish and install reinforced concrete piping (RCP) and fittings as shown and specified.
   2. Extent of Concrete Non-Pressure Utility Piping to be provided is shown on the Drawings.

B. Coordination:
   1. Review installation procedures under this and other applicable sections and coordinate installation of items to be installed with or before Concrete Non-Pressure Utility Piping Work.
   2. Contractor is required to notify other contractors in advance of Concrete Non-Pressure Utility Piping Work to provide other contractors with sufficient time for installing items included in their contracts that are to be installed with or before reinforced concrete pipe.

C. Related Sections:
   1. Section 03 00 05, Concrete.
   2. Section 31 00 05, Trenching and Earthwork.
   3. Section 33 41 00, Storm Utility Piping Installation.

1.2 MEASUREMENT AND PAYMENT

A. Item 016: 12” RCP, Storm Sewer
   1. The pay quantity for RCP Utility Piping shall be the actual number of lineal feet of pipe successfully installed, backfilled, and tested, as measured from outside wall of structure to outside wall of structure, as measured along the centerline of the pipe.
   2. The payment of RCP Utility Piping shall be based on the unit price per linear foot as listed on the submitted Basis of Bid Form for each pipe size successfully installed. Payment for any associated restoration shall be paid for under its respective Work item.
   3. The unit price for RCP Utility Piping shall include all costs to furnish all labor, materials, tools, and equipment, both permanent and temporary, to install the concrete non-pressure utility piping as shown and specified. This Work includes, but is not limited to, trench excavation, dewatering, furnishing and placement of bedding, pipe, placement of required backfill, disposing of excess excavated material, required fittings, testing of materials, compaction of bedding and backfill, temporary sheeting, shoring and bracing, removing/resetting fences, mailbox, street signs and other disturbed items not included under other Work items, protection of existing utilities and structures, testing and incidentals for performing all Work as specified, unless otherwise outlined as a separate Work item.

1.3 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Association of State Highway and Transportation Officials.
      a. AASHTO, Policy on Geometric Design of Highways and Streets.
      b. AASHTO M198, Standard Specifications for Joints for Concrete Pipe, Manholes and Precast Sections Using Preformed Flexible Joint Sealants.
   2. ASTM International.
      a. ASTM A82, Specification for Steel Wire, Plain for Concrete Reinforcement.
      b. ASTM A185, Specification for Steel Welded Wire Reinforcement, Plain for Concrete.
      c. ASTM A496, Specification for Steel Wire, Deformed, for Concrete Reinforcement.
      d. ASTM A497/A497M, Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
      e. ASTM C33, Specification for Concrete Aggregates.
      f. ASTM C76, Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
      g. ASTM C150, Standard Specification for Portland Cement.
      h. ASTM C361, Specification for Reinforced Concrete Low-Head Pressure Pipe.
      i. ASTM C443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
      j. ASTM C497, Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
      k. ASTM C595, Standard Specification for Blended Hydraulic Cements.
      l. ASTM C655, Standard Specification for Reinforced Concrete D-load Culvert, Storm Drain and Sewer Pipe.
      m. ASTM C1619, Standard Specification for Elastomeric Seals for Joining Concrete Structures.
   3. Indiana Test Methods or Procedures
      a. ITM 813, Certified precast concrete producer program.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer shall have a minimum of 5 years of experience producing reinforced concrete pipe and fittings and shall be able to document satisfactory service in at least 5 completed installations in operation for at least 5 years each.
      b. Concrete pipe and associated fittings shall be from a source listed in the INDOT List of Certified Precast Concrete Producers, in accordance with ITM 813.

B. Component Supply and Compatibility:
   1. Each type of concrete pipe and associated fittings shall be furnished by the same manufacturer.
   2. Concrete pipe and fittings Supplier shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. Components shall be suitable for specified service conditions.

C. Quality of materials, process of manufacture and finished pipe shall be subject to inspection by Engineer.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Detailed product data on pipe, fittings, gaskets, fastening hardware, pipe gasket lubricant and, where applicable, and appurtenances sufficient to demonstrate compliance with the Contract Document.
      b. Required Calculations (i.e., structural).
      c. Detailed descriptions for future repair, maintenance, connections, etc.
      d. Results from required quality control test.

B. Informational Submittals: Submit the following:
   1. Certifications:
      a. Submit certificate signed by manufacturer of each product certifying that products conform to applicable referenced standards.
      b. Submit proof of manufacturer's INDOT Precast Concrete Producer Certification.
   2. Supplier Instructions:
      a. Pipe manufacturer instructions for handling, storing, and installing products.
   3. Source Quality Control:
      a. Submit manufacturers' certificates for joint testing compliance in accordance with this Section and ASTM C497.

PART 2 PRODUCTS

2.1 MATERIALS, REINFORCED CONCRETE PIPE FOR CULVERTS, STORM DRAINS, AND STORM SEWERS

A. General
   1. Pipe and fittings shall conform to requirements of ASTM C76 or ASTM C655. Pipe shall be free of fractures and surface roughness. Planes of ends of pipe shall be perpendicular to longitudinal axis. Joints shall be designed so that, when sections are laid together, they make a continuous line of pipe with smooth interior free of irregularities in flow line. Fittings shall be constructed of the same pipe material and material class as the storm sewer pipe.

B. Pipe Materials:
   1. Cement for concrete Work shall be in accordance with, ASTM C150 or ASTM C595.
   2. Aggregates shall conform to ASTM C33.
   3. Steel bar reinforcement shall be in accordance with ASTM A82 or ASTM A496.
   4. Steel wire fabric reinforcement shall be in accordance with ASTM A185.

C. Concrete pipe shall be Class III. Quality of materials, process of manufacturer, and finished pipe shall be subject to inspection and approval by Engineer.

D. Joints:
   1. Joints shall have a groove on the spigot for placement of a flexible, rubber gasket in conformance with ASTM C443.
   2. Gasket shall be a continuous ring that fits snugly to form a flexible soil-tight seal. Gasket materials shall meet the requirements of ASTM C1619 Class C.
   3. For round pipes with a diameter greater than 24 inch, Petroleum Based Mastic material may be used in lieu of rubber gaskets, and shall conform to ASTM C990.

E. Fittings:
   1. Fittings shall be constructed of Type I or Type II Portland Cement in accordance with ASTM C150. And be produced to the same standards as the pipe.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect pipe materials for defects in material and workmanship. Verify compatibility of pipe and fittings.

3.2 FIELD QUALITY CONTROL

A. Complete pipe-testing requirements in accordance with Section 33 41 00, Storm Utility Piping Installation.

3.3 INSTALLATION

A. Buried Piping Installation
   1. Refer to the applicable Section 33 41 00, Storm Utility Piping Installation.

B. Bedding and Backfill
   1. Refer to Section 31 00 05, Trenching and Earthwork.

C. Contractor shall be responsible for verification of pipe loading during construction. Pipe design is based on final installation depth and required cover.

END OF SECTION

SECTION 33 05 38.16 - HDPE PRESSURE UTILITY PIPING

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, test, and install the High Density Polyethylene (HDPE) utility pipe and fittings as shown and specified.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items with, or before, the HDPE utility pipe Work.

C. Related Sections:
   1. Section 03 00 05, Concrete.
   2. Section 31 00 05, Trenching and Earthwork.
   3. Section 33 05 23.13, Utility Horizontal Directional Drilling.

1.2 MEASUREMENT AND PAYMENT

A. Items 008 - 009: 12” Force Main, HDPE, DR 11 Pipe (Open Cut or Directionally Drilled)
   1. The quantity of pipe installed shall be the number of linear feet successfully installed, backfilled, and tested, as measured from inside wall of structure to inside wall of structure, as measured along the centerline of the pipe.
   2. The payment of pipe shall be based on the unit price per linear foot as listed on the submitted Bid schedule for each size successfully installed. Payment for any associated restoration shall be paid for under its respective Work item.
   3. These Work items shall include all costs to furnish all labor, materials, tools, and equipment, both permanent and temporary, to install the HDPE pipe and all appurtenances as shown and specified. The Work includes, but is not limited to, trench excavation, pavement removal and disposal if necessary, dewatering, furnishing and placement of bedding, pipe, pipe installation, restrained joints, fittings, thrust blocking, fusion jointing of pipe lengths, placement of required backfill, special backfill, compaction of bedding and backfill, utility verification, disposing of excess excavated material, testing of materials, temporary sheeting, shoring and bracing, tracing wires, pressure testing, restoration/replacement of all disturbed items not included under other Work items, protection of existing utilities and structures, and incidentals for performing all Work as specified unless otherwise provided for as a separate Work item. Restraint of mains and fittings shall also be included. Incidental costs associated with HDD installation are included in this item.

B. Item 010: 8” Gravity Sewer, HDPE DR 11 (Directionally Drilled)
   1. The quantity of utility pipe installed by directional drilling shall be measured horizontally along the centerline of the successfully installed carrier pipe as shown and specified.

4. The payment of HDD shall be based on the unit price per linear foot as listed on the submitted Bid schedule and shall include all labor, materials, tools, excavation, and equipment needed in accordance with the Contract Documents. Payment for any backfill or associated restoration shall be paid for under their respective Work items.
5. This item shall include all costs to furnish all labor, materials, tools, and equipment, both permanent and temporary, to install the pipe drilling as shown and specified. The Work includes, but is not limited to, pavement removal, pit excavations, disposal of excavated material, dewatering, furnishing and placement of bedding, tracer wire, placement of required backfill, required fittings and couplings, temporary surface, testing of materials, compaction of bedding and backfill, temporary sheeting, shoring and bracing, restoration/replacement of all disturbed items not included under other Work items, protection of existing utilities and structures, pressure and deflection testing, and incidentals for performing all Work as specified unless otherwise broken down as a separate Work item.

1.3 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Society for Testing and Materials, Inc., (ASTM).
      a. ASTM D3261, Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
      b. ASTM D3350, Specification for Polyethylene Plastics Pipe and Fittings Materials.
      c. ASTM F714, Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.
      d. ASTM F2620, Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.
   2. American Water Works Association.
      a. AWWA C901, Polyethylene (PE) Pressure Pipe and Tubing, 1/2-inch through 3-inch, for Water Service.
      b. AWWA C906, Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch, for Water Distribution.
      c. AWWA M55, PE Pipe – Design and Installation.
   3. National Fire Protection Association
      a. NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
   4. National Science Foundation.
      a. NSF/ANSI Standard 61, Drinking Water System Components - Health Effects.
   5. Plastic Pipe Institute.
      a. PPI TR-4: PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings For Thermoplastic Piping Materials or Pipe.

1.4 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:
   1. Manufacturer shall have a minimum of 5 years’ recent experience producing HDPE pressure pipe and fittings for at least the specified sizes and lengths, and shall be able to

submit documentation of at least 5 installations in satisfactory operation for at least 5 years.

2. HDPE pipe and fittings manufacturers and distributors shall be listed as current members of the Plastics Pipe Institute (PPI).
3. Contractor shall have a minimum of 5 year' recent experience installing HDPE pressure pipe and fittings for at least the specified pipe and fittings sizes and lengths and shall be able to submit documentation of at least 5 installations in satisfactory operation for at least 5 years.
4. Fusion operators shall have received current training and certification per PPI TN-42.

B. Component Supply and Compatibility:
   1. All pipe and fittings of each material type shall be furnished by the same manufacturer.
   2. The HDPE utility pipe and fittings manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Submit product data on pipe, fittings, restrained joint, plug valves, thrust blocks, gaskets, hardware, and appurtenances sufficient to demonstrate compliance with the Contract Documents.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Submit manufacturer's certificate of compliance standards referenced in this Section.
      b. Submit contractor's certificates of fusion, electrofusion operators training, and experience as described in Paragraph 1.4A.
      c. Submit fusion and EF parameters, test report.
   2. Source Quality Control Submittals:
      a. When requested by Engineer, submit results of source quality control tests. Ensure the quality control tests were completed on the same batch of material as installed.
   3. Qualifications Statements:
      a. Submit qualifications of manufacturer when requested by Engineer.
      b. Submit qualifications of installer when requested by Engineer.

C. Post-Construction Submittals
   1. The following as-recorded data may be requested from the Contractor and/or fusion provider to the Owner upon request:
      a. Approved datalogger device reports
      b. Fusion joint documentation containing the following information:
         1) Pipe Size and Thickness
         2) Machine Size
         3) Fusion Technician Identification
         4) Job Identification
         5) Fusion Joint Number
         6) Fusion, Heating, and Drag Pressure Settings

7) Heat Plate Temperature
8) Time Stamp
9) Heating and Cool Down Time of Fusion
10) Ambient Temperature

c. As-recorded Information
1) The as-recorded plan and profile will reflect the actual installed alignment, and reflect the horizontal offset from the baseline and depth of cover.
2) All fittings, valves, or other appurtenances will also be referenced and shown.
3) A daily project log, along with tracking log sheets, should they be used, shall be provided. Tracking log sheet data, should it be employed, shall include any and all that apply, including inclination, depth, azimuth, and hydraulic pull-back and rotational force measured.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Ship and store in accordance with manufacture's recommendations.

B. Inspect all materials during unloading process and before installation.

C. Notify Owner of any cracked, flawed or otherwise defective material.

D. Remove all materials from the Site that are found to be unsatisfactory.

E. Handle pipe in a manner that does not over stress the pipe. Vertical and horizontal curves shall be limited so that wall stresses do not exceed 50% of yield stress for flexural bending of the pipe. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced by the Contractor at his expense.

F. Handle pipe carefully and use rollers to move system; avoid dragging system on ground or over sharp objects.

G. Inspect delivered pipe for cracked, gouged, chipped, dented or other damaged material and immediately remove from site. Sections of pipe with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and the ends rejoined.

H. Comply with Section 01 65 00 Product Delivery Requirements and Section 01 66 00 Product Storage and Handling Requirements.

PART 2 PRODUCTS

2.1 MATERIALS

A. General:
1. Pipe materials shall be suitable for services intended.

2. Pipe and fittings shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, blisters, and other defects. Unless otherwise shown or indicated, pipe shall be uniform in color, opacity, density, and other physical properties.
3. Buried pipe shall be capable of withstanding external live load, including impact, equal to AASHTO H-20 loading, with cover shown or indicated in the Contract Documents.
4. Clean rework or recycled material generated by the manufacturer's own production may be used as long as the pipe or fittings produced meet all the requirements of this Section.

B. HDPE PIPE
1. Dimensions:
   a. Pipe Dimensions: The nominal inside diameter of the pipe shall be true to the specified pipe size in accordance with AWWA C901 and/or AWWA C906 and/or ASTM F714.
   b. Wall thickness DR 11
   c. HDPE pipe shall be DIPS.
2. The pipe shall meet the requirements of the applicable AWWA C901 and/or AWWA C906 and/or ASTM F714.
3. Pipe shall be pressure rated to meet the service pressure requirements specified by Engineer.
4. Pipe material used for the manufacture of HDPE shall be high density polyethylene (HDPE) having a material designation code of PE 4710 or higher, meeting the requirements of ASTM D3350 with a minimum cell classification of PE 445574C. Pipe material shall be listed in PPI TR-4 and NSF-61 (for potable water only) and have an allowable stress (HDS) of 1000 psi at 73°F.
5. Only smooth wall HDPE will be permitted.
6. Approved manufacturers are: see list on plasticpipe.org.
7. Physical Properties
   a. Materials used for the manufacture of polyethylene pipe and fittings shall meet the following physical property requirements:

Property	Unit	Test Procedure	Value
1. Material Designation	-	PPI/ASTM	-
2. PPI Material Listing	-	PPI TR-4	PE 4710
3. Material Classification	-	ASTM D 1248	III C 5 P34
4. Cell Classification	-	ASTM D 3350	345434C or 355434C
5. Density	g/cm3	ASTM D 1505	>0.941
6. Melt Index (E)	g/10 min	ASTM D 1238	<0.15
7. Flexural Modulus	psi	ASTM D 790	>110,000
8. Tensile Strength	psi	ASTM D 638	<160,000
9. ESCR (C)	hours	ASTM D 1693	3,000 to 3,500
10. HDB	psi	ASTM D 2837	1,600 @ 23°C
11. UV Stabilizer (C)	%carbon black	ASTM D 1603	2 to 3
12. Elastic Modulus	psi	ASTM D 638	110,000
13. Brittleness	Temp F	ASTM D 746	<-180

14. Vicat Softening	Temp F	ASTM D 1525	255
15. Thermal Expansion	in/in/ F	ASTM D 696	8 x 10E-5
16. Hardness	Shore D	ASTM D 2240	64
17. Molecular Weight Category	-	-	Extra-High

b. There shall be no evidence of splitting, cracking, or breaking when the pipe is tested in accordance with Article 2.4, below.
c. Ring Stiffness Constant (RSC) values for the pipe can be directly related to the pipe's class designation. (Nominal RSC of Class 40 pipe = 40, etc.). The minimum RSC is 90 percent of the nominal.

C. HDPE JOINTS
1. General:
   a. Joints shall be as specified in the Contract Documents.
2. Butt Heat Fusion Joints:
   a. Shall be allowed for joining lengths of pipe in a straight run only.
   b. Shall conform to ASTM F2620 and PPI TR-33.
   c. Joint strength shall be equal to or greater than the strength of the pipe, as demonstrated by testing requirements.
3. Special Transition Pieces:
   a. HDPE to Ductile Iron:
      1) Use a butt-fused MJ adaptor and an electro fusion coupling.
   b. HDPE to MJ Valves
      1) Use a butt-fused MJ adaptor and an electro fusion coupling.
4. Fused MJ Adaptors:
   a. Fused MJ adaptors shall be DIPS DR11 provided by:
      1) ISCO Industries
      2) Plasson USA
      3) Integrity Fusion Products
      4) Or approved equal.
5. Electro- Fusion Couplings:
   a. Electro-fusion couplings shall contain heating coils located at the sealing surface.
   b. The following are acceptable manufacturers:
      1) ISCO Industries
      2) Plasson USA
      3) Integrity Fusion Products
      4) Or approved equal.
6. Thrust Anchor:
   a. Where shown on Drawings, connections to existing pipe shall use a thrust anchor.
   b. Concrete thrust collar shall be attached to the HDPE pipe using an electro-fusion flex restraint device. See concrete thrust collar detail.
   c. Taps:
      1) Provide taps where shown or required for small-diameter piping or

D. FITTINGS
1. HDPE Fittings
   a. Provide molded HDPE fittings rated for DR 11, manufactured in accordance with AWWA C906 and ASTM D3261.

b. Match the pressure rating and dimensions of the mainline pipe material.
c. The following are acceptable manufacturers:
    1) ISCO Industries
    2) Plasson USA
    3) Integrity Fusion Products
    4) Or approved equal.

2.2 MARKING FOR IDENTIFICATION

A. Marking:
    1. Each standard and random length of pipe in compliance with this specification shall be clearly marked with the following information that will remain legible during normal handling and storage and per AWWA C901 and/or AWWA C906.
        a. ASTM or AWWA Standard Designation.
        b. Pipe Size.
        c. Class and Profile Number.
        d. Production Code.
        e. Standard Dimension Ratio (SDR).
        f. Standard Material Code Designation.

2.3 SOURCE QUALITY CONTROL

A. At a minimum, incoming polyethylene materials shall be inspected for density in accordance with ASTM D 1505 and melt flow rate in accordance with ASTM D 1238. All incoming polyethylene materials shall be certified by the Supplier. Certification shall be verified by Contractor and submitted to Engineer. Incoming materials shall be approved by Manufacturer's Quality Assurance Program before processing into finished goods.

B. Representative Samples of polyethylene materials shall be tested against the physical property requirements required herein. Each extrusion line and molding machine shall be qualified to produce pressure rated products by taking representative production Samples and performing sustained pressure tests in accordance with ASTM D 1598.

C. Quality Assurance test for representative pipe and fitting Samples shall include:

Test	Standard	Pipe	Fittings
Ring ESCR	ASTM F 1248	Yes	Not Applicable
Sustained pressure at 176°F/725 psi hoop stress: (fo>100 h)	ASTM D 1598	Yes	Yes
Sustained pressure at 73°F/1,600 psi hoop stress: (fo>1000 h)	ASTM D 1598	Yes	Yes

D. The HDPE pipe and fitting manufacturer shall certify that Samples of their production pipe have undergone stress regression testing, evaluation, and validation in accordance with ASTM

D 2837 and PPI TR-3. Under these procedures, the minimum hydrostatic design basis shall be certified by the pipe and fitting manufacturer to be 1,600 psi at 73.4°F and 800 psi at 140°F.

E. Material shall be listed in the name of the HDPE pipe and fitting manufacturer as required by the Plastics Pipe Institute (PPI) in PPI TR-4 with the following Standard Grade ratings:

	73.4°F	140°F
1. Hydrostatic Design Basis (HDB)	1,600 psi	800 psi
2. Hydrostatic Design Stress (HDS)	800 psi	400 psi

PPI material listing in the name of the resin Supplier is not acceptable in meeting this requirement.

F. Inspection Requirements:
   1. Certification: As the basis of the acceptance of the material, the manufacturer will furnish a certificate of conformance of these Specifications upon request.
   2. All outgoing materials shall be inspected for diameter, wall thickness, length, straightness, out-of-roundness, concentricity, toe-in, inside and outside surface finish, markings, and end cut. Manufacturer's Quality Control Program shall perform tests of density, melt flow rate, carbon content, and carbon dispersion. In addition, Samples of the pipe provided shall be tested for hoop tensile strength and ductility by either quick burst in accordance with ASTM D 1599 or ring tensile strength in accordance with ASTM D 2290. Molded fittings shall be subject to x-ray inspection for voids, and tests for knit line strength. All fabricated fittings shall be inspected for fusion quality and alignment.

G. Test Methods:
   1. Flattening: Three specimens of pipe, a minimum of 12-inches long, shall be flattened between parallel plates in a suitable press until the distance between the plates is 40 percent of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is completed within two to five minutes. Remove the load, and examine the specimens for splitting cracking or breaking.
   2. Pipe Ring Stiffness Constant: The pipe ring stiffness constant shall be determined utilizing procedures similar to those outlined in ASTM D 2412. The stiffness of HDPE pipe is defined in terms of the load, applied between parallel plates, which causes one percent reduction of pipe diameter. Test specimens shall be a minimum of two pipe diameters or four feet in length, whichever is less.

H. Pipe may be rejected for failure to conform to these Contract Documents or the following:
   1. Fractures or cracks passing through pipe wall, except single crack not exceeding 2 inches in length at either end of pipe which could be cut off and discarded. Pipes within one shipment shall be rejected if defects exist in more than five percent of shipment or delivery.
   2. Cracks sufficient to impair strength, durability or serviceability of pipe.
   3. Defects indicating improper proportioning, mixing, and molding.
   4. Damaged ends, where such damage prevents making satisfactory joint weld.
   5. Gouges or scrapes exceeding ten percent of the specified wall thickness.

2.4 BURIED PIPING IDENTIFICATION

A. Tracing Wire Requirements
   1. Provide - No.10 Extra High Strength Copper Clad Steel Reinforced with HDPE Insulation tracing wire. The following materials are acceptable:
      a. Soloshot Copperhead Industries, LLC
      b. Or approved equal
   2. Splice tracing wire together with the following material:
      a. DRYCONN Direct Bury Lug Aqua
      b. Or equal
   3. Tracer wire shall be required on:
      a. All force main, HDPE pipes, regardless of size.
   4. All wire utilized for tracing wire shall be designed for and approved by the manufacturer for use in buried low voltage applications and approved by the Engineer.
   5. For open trench installation, the tracer wire shall be laid directly over the force main and attached to the pipe at regular intervals not to exceed ten (10) feet. Wire shall be attached to the water main with plastic "zip" strapping or wire.
   6. For directional drilled installation, use 2 tracer wires.
   7. At each ARV structure line valve the tracing wire shall be drawn to the surface. If the valve is to be in pavement, the wire should be drawn up inside the structure and the wire should be installed with an excess length of 4”-6" that is to be folded down under the lid.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect pipe materials for defects in material and workmanship. Verify compatibility of pipe and fittings.

3.2 INSTALLATION

A. Buried Piping Installation
   1. Refer to the applicable Division 33 piping installation section.

B. Horizontal Directional Drilling Installation
   1. Refer to Section 33 05 23.13 Utility Horizontal Directional Drilling

C. Bedding and Backfill
   1. Refer to Section 31 00 05 Trenching and Earthwork.

D. Contractor shall be responsible for verification of pipe loading during construction. Pipe design is based on final installation depth and required cover.

E. Mainline Tracing Wire
   1. Tracing wire is required force main, not exclusive to non-metal pipe.
   2. Tracing wire shall be laid directly over the water main and attached to the pipe at regular intervals not to exceed 10 feet.
   3. Attach the tracer wire to the pipe using plastic “zip” strapping or metal wire.
   4. The following technique shall be used to splice wires together:

a. Use DryConn Direct Bury Lug and strip the wire to 5/8".
b. Place one stripped conductor into the lug.
c. Tighten the set screw till it comes in contact with the solid conductor.
d. Note the location of screwdriver and continue fighting the set screw ¾ turn for # 10 solid copper wire.
e. Repeat the steps for the adjacent side.
f. Remove sealant cover and discard. Close housing, aligning conductors until housing lid is fully latched.

5. Successful completion of conductivity test to be completed by the Contractor and in the presence of the Engineer. Successful completion of the test will be required prior to acceptance of water main.

+ + END OF SECTION + +

SECTION 33 31 11 - PUBLIC SANITARY SEWERAGE GRAVITY PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Sanitary sewerage piping.
2. Manholes
3. Flexible Repair Couplings
4. Connection to existing manholes.
5. Laterals and wye branches.
6. Cleanouts
7. Bedding and cover materials.

B. Related Requirements:
1. Section 31 23 17- Trenching: Execution requirements for trenching and fill required by this Section.
2. Section 33 01 30.13 – Sewer and Manhole Testing.
3. Section 33 05 05.41 – Air Testing.
4. Section 33 05 05.43 - Mandrel Testing: Deflection testing of plastic sewerage piping.
5. Section 33 05 13.16 – Public Manholes and Structures

1.2 DEFINITIONS

A. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. Item 011: 18” PVC, SDR 35, Sanitary Sewer

1. Basis of Measurement: This item is measured by the number of linear feet as measured horizontally along the centerline of the successfully installed, backfilled, and tested from outside wall of structure to outside wall of structure as shown and specified. Measurement shall include length of fittings.
2. Basis of Payment: Includes all excavation; permanent and temporary shoring of the excavation; existing pavement saw cutting, removal, and disposal; groundwater control, treatment and disposal; furnishing and installing pipe, fittings and wye; bedding, haunching, cover, flowable fill, granular material, backfill and compaction; testing; watertight plugs; bypass pumping; televising; protection, replacement or repair of utilities, drainage systems, structures, and miscellaneous property; maintaining service;

removal, replacement, and reconnection of all existing lateral lines as part of the Work; support of any utility crossings; removal and legal disposal of surplus excavated material; erosion control; seeding and grading; and clean up, all in accordance with the Contract Documents.

C. Item 012: 12" PVC, SDR 35, Sanitary Sewer

1. Basis of Measurement: This item is measured by the number of linear feet as measured horizontally along the centerline of the successfully installed, backfilled, and tested from outside wall of structure to outside wall of structure as shown and specified. Measurement shall include length of fittings.
2. Basis of Payment: Includes all excavation; permanent and temporary shoring of the excavation; existing pavement saw cutting, removal, and disposal; groundwater control, treatment and disposal; furnishing and installing pipe, fittings and wye; bedding, haunching, cover, flowable fill, granular material, backfill and compaction; testing; watertight plugs; bypass pumping; televising; protection, replacement or repair of utilities, drainage systems, structures, and miscellaneous property; maintaining service; removal, replacement, and reconnection of all existing lateral lines as part of the Work; support of any utility crossings; removal and legal disposal of surplus excavated material; erosion control; seeding and grading; and clean up, all in accordance with the Contract Documents.

D. Item 013: 8" PVC, SDR 35, Sanitary Sewer

1. Basis of Measurement: This item is measured by the number of linear feet as measured horizontally along the centerline of the successfully installed, backfilled, and tested from outside wall of structure to outside wall of structure as shown and specified. Measurement shall include length of fittings.
2. Basis of Payment: Includes all excavation; permanent and temporary shoring of the excavation; existing pavement saw cutting, removal, and disposal; groundwater control, treatment and disposal; furnishing and installing pipe and fittings, PVC repair couplings, non-shear couplings; bedding, haunching, cover, flowable fill, granular material, backfill and compaction; testing; watertight plugs; bypass pumping; televising; protection, replacement, or repair of utilities, drainage systems, structures, and miscellaneous property; maintaining service; removal, replacement, and reconnection of all existing lateral lines which were moved as part of the Work; support of utility crossings; removal and legal disposal of surplus excavated material; connection of new sanitary sewer to existing manholes; erosion control; seeding and grading; and clean up, all in accordance with the Contract Documents.

E. Item 014: 6" Sewer Laterals:

1. Basis of Measurement: This portion of the work shall be paid by lineal feet placed of sanitary lateral up to the right of way.
2. Basis of Payment: Includes all excavation; existing pavement saw cutting, removal, and disposal; groundwater control, treatment and disposal; furnishing and installing pipe and fittings, PVC repair couplings, non-shear couplings, bedding, haunching, cover, flowable fill, granular material, backfill and compaction; permanent and temporary shoring of the excavation; testing; watertight plugs; bypass pumping; televising; protection, replacement

or repair of utilities, drainage systems, structures, and miscellaneous property; maintaining service, support of any utility crossings; removal and legal disposal of surplus excavated material; connection of new sanitary lateral to existing lateral; erosion control; seeding and grading; sidewalk and driveway replacement; and clean up, all in accordance with the Contract Documents.

F. Item 015: Cleanouts:

1. Basis of Measurement: This portion of the work shall be paid on an each basis for each unit successfully installed, backfilled, and tested.
2. Basis of Payment: These Work items shall include all costs to furnish all labor, materials, tools, and equipment, both permanent and temporary, to install the cleanout as shown and specified. The Work includes, but is not limited to, trench excavation, dewatering, furnishing and placement of bedding, placement of required backfill, legal disposing of excess excavated material, required fittings, plugs, testing of materials, compaction of bedding and backfill, temporary sheeting, shoring and bracing, restoration/replacement of all disturbed items not included under other Work items, protection of existing utilities and structures, testing and incidentals for performing all Work as specified unless otherwise provided for as a separate Work item.

1.4 REFERENCES

A. ASTM International:

1. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
2. ASTM D2241- Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
3. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
4. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
5. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
6. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.5 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with City of Greenfield Utilities.

C. Notify affected utility companies at least 72 hours prior to construction.

1.6 PREINSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Requirements for preinstallation meeting.

1.7 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer information indicating proposed materials, accessories, details, and construction information.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Test and Evaluation Reports: Submit reports indicating field tests made and results obtained.

E. Manufacturer Instructions:

1. Indicate special procedures required to install specified products.

F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statement:

1. Submit qualifications for manufacturer and installer.

1.8 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record invert elevations and actual locations of pipe runs, connections, manholes, and cleanouts.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.9 QUALITY ASSURANCE

A. Perform Work according to City of Greenfield standards.

B. Maintain one copy of each standard affecting Work of this Section on Site.

1.10 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' experience and approved by manufacturer.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:

1. Store materials according to manufacturer instructions.
2. Store valves in shipping containers with labeling in place.

D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Block individual and stockpiled pipe lengths to prevent moving.
3. Provide additional protection according to manufacturer instructions.

1.12 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SANITARY SEWERAGE PIPING

A. Plastic Pipe:

1. Material: PVC.
2. Comply with ASTM D3034, SDR-35.
3. Inside Nominal Diameter: 8 inches, 10 inches.
4. End Connections: Bell-and-spigot style, with rubber-ring-sealed gasket joint.
5. Fittings: PVC.
6. Minimum Cell Class: 12454 or 12364.

B. Joints

1. Flexible gasket joints shall be compression type so that when assembled, the gasket inside the bell will be compressed radially on the pipe spigot to form a watertight seal. The assembly of joints shall be in accordance with the pipe manufacturer’s recommendations and ASTM D-3212 for pipe conforming to ASTM D-3034 or joints shall meet the requirements of ASTM D-3139 for pipe conforming to ASTM D-2241. The gaskets sealing the joint shall be made of rubber of special composition having a

texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five (5) years of experience in the manufacture of rubber gaskets for pipe joints. The gasket shall be a continuous ring of flexible joint rubber of a composition and texture which is resistant to common ingredients of sewage, industrial wastes and groundwater and which will endure permanently under the conditions imposed by this service.

2. The gasket shall conform to the requirements of ASTM F-477.

2.2 MANHOLES

A. As specified in Section 33 05 13.16 – Public Manholes and Structures.

2.3 FLEXIBLE REPAIR COUPLINGS

A. Manufacturers:
   1. Furnish materials according to City of Greenfield standards.

B. Description:
   1. Comply with ASTM C1173, elastomeric, sleeve type, reducing or transition coupling, for joining underground nonpressure piping. Include ends to match same sizes of main line piping and install corrosion-resistant metal tension bands and tightening mechanism on each end.
   2. Sleeve Materials:
      a. For Plastic Pipes: ASTM F477, elastomeric seal.
      b. For Dissimilar Pipes: PVC or other material compatible with pipe materials being joined.
   3. Non-Shear, Flexible Couplings:
      a. Couplings shall be elastomeric sleeve with stainless steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.4 FLEXIBLE PIPE BOOTS FOR MANHOLE PIPE ENTRANCES

A. Manufacturers:
   1. Furnish materials according to City of Greenfield standards.

2.5 LATERALS AND WYES

A. Manufacturers:
   1. Furnish materials according to City of Greenfield standards.

B. Description:
   1. Laterals shall be PVC SDR 35.
   2. Laterals shall be laid at a minimum of 1.00% slope from the sewer main to the right of way line.

3. Wyes shall be PVC SDR 26.

2.6 MATERIALS

A. Bedding and Cover:
   a. Bedding and cover shall be per City of Greenfield Utilities standard details.

2.7 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing of pipe.

B. Owner Inspection:

1. Make completed pipe sections available for inspection at manufacturer's factory prior to packaging for shipment.
2. Notify Owner at least seven days before inspection is allowed.

C. Certificate of Compliance:

1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that trench cut is ready to receive Work of this Section.

C. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Correct over-excavation with #8 stone.

C. Remove large stones (greater than 6-inch) or other hard materials that could damage pipe or impede consistent backfilling or compaction.

D. Protect and support existing sewer lines, utilities, and appurtenances.

E. Utilities:

1. Maintain profiles of utilities.
2. Coordinate with other utilities to eliminate interference.
3. Notify Engineer if crossing conflicts occur.

3.3 INSTALLATION

A. Bedding:

1. Excavate pipe trench as specified in Section 312317 - Trenching.
2. Excavate to lines and grades as indicated on Drawings, or as required to accommodate installation of encasement.
3. Dewater excavations to maintain dry conditions and to preserve final grades at bottom of excavation.

4. Placement:

a. Place bedding material at trench bottom.
b. Level materials in continuous layer not exceeding 6-inch compacted depth.
c. Compact to 95 percent of maximum density.

B. Piping:

1. Installation Standards: Install Work according to City of Greenfield standards.

C. Manholes: As specified in Section 33 05 13.16 – Public Manholes and Structures.

D. Wye Branches:

1. Concurrent with pipe-laying operations, install wye branches at locations indicated on Drawings.
2. Use PVC SDR 26.

E. Sanitary Laterals:

1. Construct laterals from wye branch to right-of-way.
2. Where depth of main pipeline warrants, construct riser-type laterals from wye branch.
3. Minimum Depth of Cover over Piping: 2 feet.
4. Minimum Separation Distance between Laterals: 5 feet.
5. Connect new lateral to existing lateral at the edge of trench utilizing a flexible repair coupling.

F. Backfilling: As specified in Section 31 23 17 - Trenching.

3.4 FIELD QUALITY CONTROL

A. Section 017000 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Request inspection by Engineer prior to placing bedding.

C. Testing:

1. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.
2. Pipe Testing:

    a. Pressure Testing: As specified in Section 330505.41 - Air Testing.
    b. Deflection Testing: As specified in Section 330505.43 - Mandrel Testing.

3. Compaction Testing:

    a. Comply with ASTM D698.

3.5 PROTECTION

A. Section 017000 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

C. Cap open ends of piping during periods of Work stoppage.

END OF SECTION 333111

SECTION 33 32 19 – PUMP STATION

PART 1 GENERAL

1.1 GENERAL

A. The Contractor shall furnish and install automatic pumping stations complete with all needed equipment installed in a structure as shown on the Contract Drawings.

B. **Additional lift station standards and specifications are contained in section 406 of the City of Greenfield Public Improvement Design Standards and can be found in the document section of the City's website: https://www.greenfieldin.org/**

C. The principal items of equipment shall include two submersible, non-clog pumps; valves; piping; control panel with circuit breakers, and automatic pumping level controls and all wiring for the station.

D. Codes, specifications, and standards referred to by number or title shall form a part of this specification to the extent required by the references thereto. Latest revisions shall apply, unless otherwise specified. Where used in these specifications, the following acronyms shall represent:
   1. ANSI - American National Standards Institute.
   2. ASTM - American Society for Testing & Materials.
   3. HI - Hydraulic Institute.
   4. NEMA - National Electric Manufacturer's Association.

1.2 MEASUREMENT AND PAYMENT

A. **Item 007: Regional Pump Station and Related Appurtenances**
   1. The Contractor shall provide all labor, materials, and equipment, both temporary and permanent associated with: the wet well, valve vault, installation of pumps, guide rails, brackets, base elbow, lifting rope/chain, valves, air release and related structure, flow meter and related structure, hatches, ductile iron piping, fittings, electrical/controls, generator and related appurtenances. Additionally this item includes all work associated with the pump station sites including, excavation, legal disposal of excavated materials, pavement, fencing, culvert pipe with end sections, lighting, gable shelter, bedding, required backfill, dewatering, sheeting and shoring, communication systems installation and adjustment, level control indication; testing, to include systems demonstrations, start-up services and instruction; adjustment of utilities; and site restoration as noted on the site plans.
   2. Payment under these Items shall be on a lump sum basis.

1.3 QUALITY ASSURANCE

A. The pumps shall be heavy duty, electric submersible, centrifugal non-clog units designed for handling raw, unscreened sewage and wastewater. The pumps shall be capable of operating in a liquid temperature up to 104 degrees F.

B. The pumps and motor shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged.

C. The pump, mechanical seals and motor units provided shall be from the same manufacturer.

D. The pumping unit manufacturer shall test each pump for mechanical and electrical correctness.

E. Perform field tests specified in this Section.

F. All control panels shall be designed and constructed to UL 508A standards. All control panels shall be UL 508A listed. Control panels shall be made available to the Owner and Engineer during factory testing.

1.4 SUBMITTALS

A. Standard submittal data for pump approval must consist of:
   1. Manufacturer's Certificate of compliance certifying compliance with the referenced specifications and standards.
   2. Shop drawings with performance data and physical characteristics.
      a. Certified performance total dynamic head, capacity, brake horse power, efficiency, pump curves, and required net positive suction head curves for each pump supplied.
   3. Manufacturer's installation instructions.
   4. Manufacturer's operation and maintenance material and manuals.
   5. Certified copies of test reports.
   6. Pump outline drawing.
   7. Station drawing for accessories.
   8. Warranty Information.
   9. Electrical:
      a. Submit all electrical requirements for each piece of equipment including voltage, phase, and load data.
      b. Submit a drawing showing the electrical enclosure placement within the pump station. Placement must be approved by the Engineer prior to installation.
      c. Provide interior and exterior layouts of control panels where applicable. Layouts shall be to scale and a bill of material shall be included.
      d. Submit information on all pilot and control components. This includes but is not limited to: pilot lights, relays, push buttons, and timers.
      e. Provide wiring and interconnection diagrams for each piece of equipment. For example, submitting one diagram for all screening equipment is not acceptable. Differentiate between panel and field wiring.
      f. “Typical” diagrams are not acceptable. Manufacturer’s standard diagrams may be submitted if they are made specific for this project by:
         1) Showing all included options, special items, etc.
         2) Unused options or features shall be crossed out or deleted.
         3) Identify the drawing with project name, equipment name, and tag number.

B. Standard submittal data for plug and check valves approval must consist of:
   1. Shop Drawings
   2. Product Data

C. Operation and Maintenance Manuals
   1. The Contractor shall submit operation and maintenance manuals for the pump equipment furnished hereunder as outlined in Section 01 78 23 – Operations and Maintenance Data.
   2. The Contractor shall submit operation and maintenance manuals for the plug and check valves furnished hereunder.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall be responsible for the delivery, storage, and handling of products.

B. Load and unload all pumps, motors, and appurtenances by hoists or skidding. Do not drop products. Do not skid or roll products on or against other products. Pad slings and hooks in such a manner to prevent damage to products.

C. The pumps furnished shall be packaged in such a manner as to provide ample protection from damage during handling, shipment, and outdoor storage at the lift station site. All openings shall be capped with dustproof closures and all edges sealed or taped to provide a dust-tight closure.

D. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

PART 2 PRODUCTS

2.1 PUMPS

A. Requirements: The Contractor shall furnish and install two Flygt submersible non-clog wastewater pumps at each pump station as manufactured by Xylem Inc. with each pump having the following criteria:

Regional Pump Station

		Duty Point 1
Capacity:		1,100 gpm
Total Dynamic Head:		25 feet
Model:	Flygt 3153 MT3	
Impeller:	1194 mm	
Horsepower:	12 Hp	
RPM:	1765 rpm	

2.2 PIPE, VALVES, AND FITTINGS

A. Furnish complete station piping, valve vault, check valves, air release valves and plug valves per City standards.

B. The discharge pipe and fittings shall be ductile iron Class 350. Inside pipe and fittings shall be flanged. Bell end pipes or fittings with mechanical joints shall be provided at or near the outside face of the wet well. Piping shall be supported independent of the flanges.

PART 3 EXECUTION

3.1 INSTALLATION

A. All equipment shall be installed in accordance with these specifications, construction drawings and the manufacturer's printed instructions.

B. Inspect all equipment and appurtenances prior to installation of the Work. Promptly remove damaged or unsuitable products from the job site. Replace damaged or unsuitable products with new, undamaged and suitable products.

C. All electrical work shall be done by a qualified licensed electrician and shall conform to the National Electric Code.

3.2 TESTING

A. Each pump shall be fully tested in accordance with manufacturer's written instructions. Certified copies of the test results shall be furnished with each pumping unit. Record the test voltage and amperage measurements.

B. Refer to Section 01 75 11 "Checkout and Startup Procedures" for documentation requirements and checklists.

3.3 WARRANTY

A. The pump manufacturer shall warrant the pumps being supplied to the Owner against defects in workmanship and materials for a period of five years under normal use, operation, and service. In addition, the manufacturer shall replace certain parts which shall become defective through normal use and wear or a progressive schedule of cost for a period of five years; parts included are the mechanical seal, impeller, pump housing, wear ring, and ball bearings. The warranty shall be in published form and apply to all units.

B. The manufacturer shall provide as part of his bid price the services of a factory trained representative for one day at the pump station to perform initial start-up of the pumping station and demonstrate satisfactory performance of each piece of equipment and instruct operating personnel in the operation and maintenance of the equipment. If additional time is required for start-up and training, Contractor shall be responsible for additional costs.
   1. The site visit shall be held for the primary and sole purposes of the startup and O&M instruction.

C. All equipment supplied and installed under this item of the specifications shall meet the requirements of the Occupational Safety & Health Act of 1970.

+ + END OF SECTION + +

SECTION 33 49 13

STORM DRAINAGE STRUCTURES

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
1. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all precast and cast-in-place storm drainage manholes and structures.

B. General:
1. Manholes and structures shall conform in shape, size, dimensions, material, and other respects to the construction plans or as directed by Engineer.
2. Cast-iron frames, grates and covers shall be the standard frame and grate or covers unless otherwise shown and shall be as specified in Section 05 56 00, Metal Castings.
3. Concrete for cast-in-place manholes and structures and for inverts in precast manholes and structures shall be Class "A" and shall conform to the requirements specified under Section 03 00 05, Concrete.
4. Precast manholes and structures shall be the standard manholes and structures, unless otherwise shown.

C. Related Sections:
1. Section 03 00 05, Concrete.
2. Section 05 56 00, Metal Castings.
3. Section 31 00 05, Trenching and Earthwork.

1.2 MEASUREMENT AND PAYMENT

A. **Item 017: Storm Pipe Removal (All Sizes)**
1. Payment for Storm Pipe Removal shall be made on a unit price basis per linear foot of pipe removed in accordance with the Contract Documents.
2. The removal of existing pipes shall be done in accordance with the Contract Documents or as determined by the Engineer.
3. Contractor shall dispose of all removed pipes away from the project Site in accordance with applicable laws and regulations governing such disposal.
4. This Work will be paid at the unit price as listed on the submitted Basis of Bid Form for Remove Existing Pipe and such unit price shall include costs to furnish labor, materials, tools, and equipment, both permanent and temporary, for removal of existing pipes including surface patching and backfill.

B. **Item 018: Drain Tile Repair (Assumed Quantity)**
1. Payment for Drain Tile Repair shall be on a unit price basis for each drain tile repair.
2. The pay quantity shall be the actual number of drain tile repairs finished and installed successfully regardless of depth or material.

3. This Work will be at the Contract unit price as listed on the submitted Bid Schedule for drain tile repair and shall include the following Work: pavement removal, excavation, disposal of excess excavated material, base stabilization, dewatering, sheeting, granular backfill material, connecting pipes, placing and compacting backfill, utility adjustments, temporary pavement replacement if necessary, and any other requirements to complete the construction in accordance with the drawings and specifications, unless otherwise classified as a separate Work Item.

C. **Item 019: Casting, Inlet, Adjust to Grade**
   1. Payment for inlet structures shall be on a unit price basis for each size classification furnished and installed in place as shown and specified on the Drawings.
   2. The pay quantity shall be the number of inlets in each size classification actually furnished and installed.
   3. This Work will be at the unit price as listed on the submitted Bid schedule each for catch basin, inlet or special structure and shall include the following Work: pavement removal, excavation, disposal of excess excavated material, base stabilization, dewatering, sheeting, riser rings, metal castings, precast sections or cast in place concrete, channels, inverts, granular backfill material, connecting pipes, placing and compacting backfill, testing, utility adjustments, temporary pavement replacement, if necessary, and any other requirements to complete the construction in accordance with these Contract Documents, unless otherwise detailed by the Engineer as a separate Work item.
   4. This Work item includes connections to new structures where noted in the Drawings, including core drilling, junction gaskets, related hardware, and grouting.

D. **Items 020-021: Storm Drainage Manholes and Structures Various Sizes and Depths**
   1. Payment for Storm Drainage Manholes shall be on a unit price basis for each size and type.
   2. The pay quantity shall be the actual number of manholes and structures in each size and type actually furnished and installed.
   3. This Work will be paid at the unit price as listed on the submitted Basis of Bid Form for each size and type of Storm Drainage Manholes and shall include the following: excavation, disposal of excess excavated material, base stabilization, dewatering, sheeting, adjusting rings, metal castings, precast sections or cast in place concrete sections, channels, inverts, granular backfill material, connecting pipes, placing and compacting backfill, utility adjustments, temporary pavement replacement if necessary, and any other requirements to complete the Work in accordance with the Contract Documents, unless otherwise classified as a separate Work item.

1.3 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ASTM International.
      a. ASTM C443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
      b. ASTM C478, Specification for Precast Reinforced Concrete Manhole Sections.
      c. ASTM C923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.

d. ASTM C990, Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealant.
e. ASTM F949, Standard Specification for PVC Corrugated Sewer Pipe With a Smooth Interior and Fittings
f. ASTM F2648, Standard Specification for 2 to 60 inch Annular Corrugated Profile Wall Polyethylene Pipe and Fittings for Land Drainage Applications.

2. American Association of State Highway and Transportation Officials .
   a. AASHTO-M198, Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
   b. AASHTO-M252, Standard Specification for Corrugated Polyethylene Drainage Pipe
3. Indiana Test Methods or Procedures
   a. ITM 813, Certified precast concrete producer program.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Submit manufacturer's Shop Drawings showing design and construction details for storm drainage manholes per type.

1.5 QUALITY ASSURANCE

A. Qualifications
   1. Manufacturer
      a. Storm Drainage Manholes and Inlets shall be from a source listed in the INDOT List of Certified Precast Concrete Producers, in accordance with ITM 813.

B. Component Supply
   1. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer. Such inspection may be made at the place of manufacture, or on the Project Site, or at both places and the materials shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein. Material rejected after delivery to the Project Site shall be marked for identification and shall be removed from the Site immediately. All materials, which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense.
   2. At the time of inspection, the materials will be carefully examined for compliance with the ASTM standards specified in this Specification Section and with the approved manufacturer's Drawings. All precast manhole sections shall be inspected for general appearance, dimension, "scratch-strength," blisters, cracks, roughness, soundness, etc. The surface shall be dense and close textured.

C. Imperfections in precast manhole sections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that a strong and permanent repair will result. Repairs shall be carefully inspected before final approval.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Any manhole section damaged in the process of transportation or handling, shall be rejected and immediately removed from the Site, and the damaged manhole sections shall be replaced at no increase in Contract Price.

B. Material delivery, storage and handling must conform to requirements in Contract Documents. Refer to Section 01 65 00, Product Delivery Requirements and Section 01 66 00, Product Storage and Handling Requirements.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE MANHOLES AND STRUCTURES

A. Precast manholes and structures shall conform to the details shown on the construction plans. Provide cast-in-place concrete bases where shown.

B. Except where otherwise specified, precast manhole components shall consist of reinforced concrete sections especially designed for manhole construction and manufactured in accordance with ASTM C478, except as modified herein.

C. Precast, reinforced concrete manhole bases, riser sections, flat slabs and other components shall be manufactured by wet cast methods only, using forms which will provide smooth surfaces free from irregularities, honeycombing or other imperfections.

D. Joints between manhole components shall be the tongue and groove type and sealed with the following method:
   1. Preformed Rope Flexible Joint Sealant in accordance with ASTM C990 and AASHTO-M198.
      a. Manufactures: Provide joint sealant from the following:
         1) EZ Stik, by Press-Seal Gasket Corporation.
         2) Kent Seal #2, by Kent-Seal.
         3) Or approved equal.

E. All precast manhole components shall be of an approved design and of sufficient strength to withstand the loads imposed upon them. They shall be designed for a minimum earth cover loading of 120 pounds per cubic foot, an AASHTO H-20 wheel loading, and an additional allowance of 30 percent for impact.

F. Mark date of manufacture and name or trademark of manufacturer on inside of barrel.

G. The barrel of the manhole shall be constructed of various lengths of riser pipe manufactured in increments of 1 foot to provide the correct height with the fewest joints.

H. A precast or cast-in-place slab or precast eccentric cone, as shown or approved, shall be provided at the top of the manhole barrel to receive the metal casting frame and cover.

2.2 MISCELLANEOUS METALS

A. Metal casting frames and covers and similar required items shall be provided as shown and in accordance with Section 05 56 00, Metal Castings.

2.3 ADJUSTING RINGS

A. Adjusting rings must conform to the requirements in the Contract Documents. Refer to Section 05 56 00, Metal Castings.

2.4 MANHOLE STEPS

A. Except where specifically shown on the construction plans, manholes and structures shall be provided with steps.

2.5 FLEXIBLE PIPE JOINT AT MANHOLE BASE

A. An approved flexible joint shall be provided between each pipe entering and exiting the manhole. Pipe to manhole connections shall conform to the details shown on Drawings. The joint into the manhole base shall be completely watertight.

B. Provide products manufactured as listed below and meeting requirements of ASTM C923:
   1. For all pipes:
      a. A-lok STM, manufactured by A-lok Products, Inc.
      b. Z-lok, manufactured by A-lok Products, Inc.
      c. Or approved equal.

PART 3 EXECUTION

3.1 PRECAST MANHOLE BASES

A. Precast bases shall be set at the proper grade and carefully leveled and aligned.

3.2 PRECAST MANHOLE SECTIONS

A. Install sections, joints and gaskets in accordance with manufacturer’s recommendations.

B. Lifting holes, if used in manhole components, shall be repaired using a conical precast concrete plug, properly sealed into place using non-shrink cement or epoxy grout. The repair shall be clean and neat to ensure water tightness.

3.3 MANHOLE CHANNELS

A. Flow Channel
   1. All invert channels through manholes and structures shall be constructed of Class “A” concrete and conform to the requirements of Section 03 00 05, Concrete. Channels shall be properly formed to the sizes, cross sections, grades and shapes shown or as ordered.
   2. For all manholes with equal diameter influent and effluent pipes in a straight through alignment, a minimum 0.1 foot drop between the inverts of the influent and effluent pipes shall be maintained unless otherwise shown on the Drawings.

3. Flow channels through a manhole shall be made to conform in shape, and slope to that of the connecting sewers. The channel walls shall be shaped or formed to the full height of the springline of the outlet sewer so that maintenance, inspection, and flow in the manhole are not obstructed.

B. Bench
   1. Benches shall be provided on each side of the manhole channel when the pipe diameter(s) are less than the manhole diameters.
   2. Benches shall be built up to the heights shown on the Drawings, and shall be sloped no less than 1/2 inch per foot (4 percent), or as directed by the Engineer and given a uniform wood float finish.
   3. Care shall be taken to slope all benches for proper drainage to the invert channel.

3.4 BEDDING AND BACKFILLING AT MANHOLES AND STRUCTURES

A. Conform to applicable requirements of the Contract Documents. Refer to Section 31 00 05, Trenching and Earthwork.

3.5 GRADING AT MANHOLES AND STRUCTURES

A. All manholes and structures in unpaved areas shall be built as shown on the Drawings or as directed by the Engineer. The ground surface shall be graded to drain towards the manhole, or casting. Fill shall be placed around manholes to the level of the upper rim of the manhole frame, and the surface evenly graded on a 1 to 5 slope to the existing surrounding ground, unless otherwise shown or directed by the Engineer. The slope shall be covered with 4 inches of topsoil, seeded and maintained until a satisfactory growth of grass is obtained.

B. Manholes and structures in paved areas shall be constructed to meet the final surface grade. In paved areas on state highways, all manholes and structures shall be 1/2 inch below final wearing surfaces. Manholes and structures shall not project above finished roadway pavements to prevent damage from snowplows.

C. Contractor shall be solely responsible for the proper height of all manholes and structures necessary to reach the final grade at all locations. Contractor is cautioned that Engineer's review of Shop Drawings for manhole components will be general in nature and Contractor shall have at its disposal an adequate supply of random length precast manhole adjusting rings to adjust any manhole to meet field conditions for final grading.

3.6 PIPE CONNECTION TO MANHOLE

A. Holes in storm drainage manholes for the connection of pipes shall be either preformed by the manufacturer or field drilled.

B. Manhole Pipe Opening
   1. Concrete pipe
      a. Provide a clean round pipe opening in the manhole.
         1) Pipe opening in manhole shall not exceed the pipe outer diameter plus six inches. (O.D. +6”).

2. Non-Concrete pipe
    a. Provide a clean round pipe opening in the manhole.
        1) Pipe opening in manhole shall not exceed the pipe outer diameter plus four inches. (O.D. +4”).

C. An approved flexible joint shall be provided between each pipe entering and exiting the manhole. Pipe to manhole connections shall conform to the details shown on Drawings. The joint into the manhole base shall be completely watertight.

D. Provide products manufactured as listed below and meeting requirements of ASTM C923:
    1. For all pipes:
        a. A-lok STM, manufactured by A-lok Products, Inc.
        b. Z-lok, manufactured by A-lok Products, Inc.
        c. Or approved equal.

E. Un-used preformed pipe connections “Knockouts”
    1. All Knockout areas not occupied by a pipe connection shall be filled with 4000 psi Class A concrete flush with the manhole wall.
        a. Manhole with preformed knockouts is still required to meet reinforcement, dimension, and strength requirements specified herein

3.7 CLEANING

A. All new manholes shall be thoroughly cleaned of all silt, debris, and foreign matter of any kind, prior to final inspection.

END OF SECTION 33 49 13

THIS PAGE INTENTIONALLY LEFT BLANK

8-23-1-23), highway, street, or alley, then the Bidder, as a "Tier 1 contractor" (as defined in IC 5-16-3-4), and each "Tier 2 contractor" and "Tier 3 contractor" (as defined in IC 5-16-3-4 (i.e., subcontractors and sub-subcontractors)) employed to perform Work on the Project must be qualified under IC 4-13.6-4 by the Indiana Certification Board established by IC 4-13.6-3-3 before performing any Work on the Project.