SECTION 02350 DIRECTIONAL DRILLING

PART 1 GENERA 1.1 WORK INCLUDED

- A. Furnish all labor, materials and equipment required to install 6" nominal diameter water main pipe or 12" and 14" nominal diameter casing pipe using directional drilling method of installation where shown on the Drawings. DIRECTIONAL DRILLING MAY ALSO BE USED IN LIEU OF THE OPEN CUT METHOD IF DESIRED BY THE CONTRACTOR; HOWEVER, NO ADDITIONAL PAYMENT WILL BE MADE FOR DIRECTIONA DRILLING (if the contractor elects to directional drill areas called out as open cut, the contractor shall be paid at the contract unit price for open cut for those areas). The pipe size, type and length shall be as specified herein and as shown on the Drawings. Work shall include and not be limited to proper installation, testing, restoration of underground es and environmental protection and restoration
- B. The Contractor shall be responsible for all installation processes and procedures associated with the installation by horizontal directional drilling in accordance with this vertices.
- C. The directional drill shall be accomplished by first drilling a pilot hole to design standards, and then enlarging the pilot hole no larger than 1.5 times larger than the outer diameter of the pipe and fittings to accommodate the pull back of the pipe through the enlarged hole. D. See CONDITIONS OF THE CONTRACT and GENERAL REQUIREMENTS, which
- contain information and requirements that apply to the Work specified herein and are mandatory for this project. 1.2 SCOPE
- A. This specification covers high density polyethylene pipe (C906, DR 11) and restrained joint polyvinyl chloride pipe (C900, DR-18), with ductile iron inside diameters of 6* 14" installed by the directional drilling method. 1.3 REFERENCE DOCUMENTS
- A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those other standards are included as references under this section as if referenced directly. In the event of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of design, bid, or construction, whichever is earliest. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was
- C. American Society for Testing Materials (ASTM) 1. ASTM D1784: Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly 2. ASTM D1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- 3. ASTM D2122: Standard Test Method for Determining Dimensions of Thermoplastic
- Pipe and Fittings 4. ASTM D2152: Test Method for Degree of Fusion of Extruded ASTM D2152: Test Method for Digited of Plastic of Landau Planta Pl

02350-1

- 7. ASTM D2774-08 Standard Practice for Underground Installation of Thermoplastic
- Pressure Piping 8. ASTM D2837: Standard Test Method for Obtaining Hydrostatic Design Basis for
- Thermoplastic Pipe Materials 9. ASTM D3034: Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 10. ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fitting
- 11. ASTM F477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- ASTM F477: Elastomenic Seals (Gaskels) for Joining Plastic Pipe
 ASTM F1055: Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing
 ASTM F1057: Standard Practice for Estimating the Quality of Extruded Poly (Vinyl Chloride) (PVC) Pipe by the Heat Reversion Technique
 ASTM F1290-98a (2004) Standard Practice for Electrofusion Joining Polyolefin Pipe
- 15. ASTM F1962-05e1 Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River
- Crossings 16. ASTM F2164-02(2007) Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure 17. ASTM F2620-09e1 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
- D. American Water Works Association (AWWA)
- 1. AWWA C110: American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-AWWA C110: American National standard for Ductile-Iron and Gray-Iron Fidings, 3-inch through 48-inch, for Water and Other Liquids
 AWWA C111: American National Standard for Rubber-Gasket Joints for Ductile-Iron
- Pressure Pipe and Fittings 3. AWWA C153: AWWA Standard for Ductile-Iron Compact Fittings for Water Service 4. AWWA C605: Standard for Underground Installation of Polyvinyl Chloride (PVC)
- AWWA Coop: Standard for Underground Instantation of Styles, http://www.awwa.coop.coop.awwa.coop.awwa.coop.awwa.coop.awwa.coop.awwa.coop.coop.aw
- 63", for Water Distribution and Transmission 8. AWWA M23: AWWA Manual of Supply Practices PVC Pipe-Design and
- 9. AWWA M55: AWWA Manual of Water Supply Practices PE Pipe Design and
- E. National Sanitation Foundation (NSF) NSF14: Plastic Pipe System Components and Related Materials NSF61 Drinking Water System Components - Health Effects

02350-2

- F. UNI-PUB-08 Tapping Guide for PVC Pressure Pipe
- 1.4 REQUIREMENTS A. Genera
 - Products delivered under this specification shall be manufactured only from wate istribution pipe and couplings conforming to AWWA C900 (PVC) or C906
- B. Materials: 1. HDPE - Pipe and fittings shall be made from virgin resins exhibiting a minimum cell classification of PE 345444C as defined in ASTM D3350 with an established hydrostatic-design-basis of 1600 psi for water at 73°F. The resin shall be listed by the PPI (Plastic Pipe Institute) in its pipe-grade registry Technical Report (TR) 4
- "Listing of Plastic Pipe Compounds" 2. Polyvinyl Chloride Pipe (PVC) - Restrained Joint PVC pipe and couplings shall be made from unplasticized PVC compounds having a minimum cell classification of 12454-B, as defined in ASTM D1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4 Degrees F, in accordance with the requirements of ASTM D2837
- C. Approvals
- 1. The pipe products shall have been tested and approved by an independent third party laboratory for continuous use at rated pressure. Copies of Agency approval reports or product listing shall be provided to the Engineer. Products intended for contact with potable water shall be evaluated, tested, and certified for conformance with NSF Standard 61 by an acceptable certifying organization D. Dimensions
- 1. Outside diameters and wall thicknesses shall follow the Dimension Ratio (DR) listed in this specification as prescribed in AWWA C900 for PVC or AWWA C906 for HDPE HDPE pipe diameters must be ductile iron outside diameter (DIOD). Laying lengths are 20 feet standard for PVC and 40 or 50 feet for HDPE.
- E. Joints HDPE Pipe
 - HDPE pipe shall be fusion joined in accordance with ASTM F2620 for butt fusion or ASTM F1290 for electrofusion. Only flanges or other mechanical joint systems proven for HDPE pipes shall be used.
- 2. Connections to other pipe materials shall be made with "Harvey Style" HDPE mechanical joint (MJ) adapter kits. **PVC Pipe**
- The pipe shall be joined using non-metallic couplings which, together, have been designed as an integral system for maximum reliability and interchangeability. High-strength flexible thermoplastic splines shall be inserted into matting

02350-3

F. Marking: 1. Pipe shall be legibly and permanently marked with the following information. Manufacturer and Trade Name Nominal Size & DR Rating/Pressure Class (NSF-61) Manufacturing Date Code Pipe and fittings shall also bear the mark of the certifying agency(s) which have

test requirements of ASTM D3139.

- ested and approved the product for use in fire protection applica G. WORKMANSHIP
- 1. As defined in AWWA C900, PVC pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

precision-machined groves in the pipe and coupling to provide full 360 degree restraint with evenly distributed loading.

Couplings shall be designed for use at the rated pressure of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage the transformation of ACTM 51400.

2. As defined in AWWA C906, PE pipe and fittings shall be homogeneous throughout and free from voids, cracks, inclusions, and other defects, and shall be as uniform as commercially practicable in color, opacity, density, and other physical characteristics.

1.5 LOCATIONS

- Locations where directional boring is required are indicated on the plans. Directional boring may be utilized in lieu of open cut for areas not specifically indicated as directional bore areas on the plans. No additional payment will be made for utilizing directional bore method in lieu of open cut.
- 1.6 SUBMITTALS
- Directional drilling contractor's gualifications and experience. Work plan: Prior to beginning work, the CONTRACTOR must submit to the ENGINEER a work plan detailing the procedure and schedule to be used to execute the project. Th work plan should include a description of all equipment to be used, down-hole tools, a list of personnel and their qualification and experience (including backup personnel in the event that an individual is unavailable), list of subcontractors, a schedule of work activity a safety plan (including MSDS of any potentially hazardous substances to be used), an environmental protection plan and contingency plans for possible problems. Work plan should be comprehensive, realistic and based on actual working conditions for this particular project. Plan should document the thoughtful planning required to successfully
 - Material: Specifications on material to be used shall be submitted to ENGINEER Material shall include the pipe, fittings and any other item which is to be an

02350-4

- installed component of the project. The following product data is required at a
- Pipe Size Dimensionality

minimum

- Pressure Class per applicable standard
- Recommended Minimum Bending Radius Recommended Maximum Safe Pull Force Fusion technician qualification for FPVC
- Equipment: Submit specifications on directional drilling equipment to be used to
- ensure that the equipment will be adequate to complete the project. Equipment shall include but not be limited to: drilling rig, mud system, mud motors (ii applicable), downhole tools, guidance system, rig safety systems. Calibration acords for guidance equipment shall be included. Specifications for any drilling luid additives that CONTRACTOR intends to use or might use shall be
- 1.7 QUALITY ASSURANCE
- All directional drilling operations shall be done by a qualified directional drilling CONTRACTOR with at least (3) years experience involving work of a similar nature to the work required of this project B. Notify ENGINEER and OWNER a minimum of three (3) days in advance of the state of
- C. All work shall be performed in the presence of the OWNER or ENGINEER.

PART 2 PRODUCTS 2.1 HIGH DENSITY POLYETHYLENE PIPE

- A. The polyethylene pipe material shall meet AWWA C906 standards for Polyethylene pipe and fittings with a DR of 11. The pipe OD sizes shall be available in ductile iron pipe
- The pipe is to be joined by heat fusion, flanges or other mechanical joint systems proven for HDPE pipes. Both pipe and fittings must be NSF listed by the manufacturer with the pipe bearing the "NSF" logo or mark.
- Where HDPE pipe is upsized to meet the required design ID, ductile iron reducers shall be used to connect to fittings and valves or the fittings and valves may be upsized to meet the pipe OD.
- 2.2 POLYVINYL CHLORIDE PRESSURE PIPE FOR POTABLE WATER
- The pipe shall be joined using a separate PVC coupling with beveled edges, built in sealing gaskets and restraining grooves. The restraining splines shall be square and made from Nylon 101.

02350-5

B. Plyvinylchloride pipe shall be manufactured in a standard 20' nominal length. C. Polyvinylchloride pipe shall be blue in color for potable water use.

D. Pipe shall be marked as follows: Nominal pipe size

- Dimension Ratio, Standard Dimension Ratio, or Schedule
- AWWA pressure class AWWA standard designation number
- NSF-61 mark verifying suitability for potable water service Extrusion production-record code Trademark or trade name
- Cell Classification 12454 and/or PVC material code 1120 may also be included Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

2.2.1 JOINTS

- The pipe shall be joined using non-metallic couplings which, together, have been designed as an integral system for maximum reliability and interchangeability. Highstrength flexible thermoplastic splines shall be inserted into matting precision-machined groves in the pipe and coupling to provide full 360 degree restraint with evenly distributed
- C. Couplings shall be designed for use at the rated pressure of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirement of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM

2.2.2 CONNECTIONS AND FITTINGS FOR PRESSURE APPLICATIONS

- A. Connections shall be defined in conjunction with the coupling of project piping, as well as the tie-ins to other piping systems. B. DUCTILE IRON MECHANICAL AND FLANGED FITTINGS
- Acceptable fittings for use with fusible polyvinylchloride pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10, or AWWA/ANSI C153/A21.53 and AWWA/ANSI C111/A21.11.
- Connections to fusible polyvinyichloride pipe may be made using a restrained or n-restrained retainer gland product for PVC pipe, as well as for MJ or flanged
- Bends, tees and other ductile iron fittings shall be restrained with the use of ust blocking or other means as indicated in the construction document
- Ductile iron fittings and glands must be installed per the manufacturer's
- C. PVC GASKETED, PUSH-ON FITTINGS

02350-6

1. Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe during handling and pullback operations. 2. A sufficient quantity of rollers and spacing, per the pipe supplier's guidelines shall be used to assure adequate support and excessive sagging of the product pipe

2.4 PERSONNEL REQUIREMENTS All personnel shall be fully trained in their respective duties as part of the directional

drilling crew and in safety. Each person must have at least two years directional drilling

02350-9

B. PIPE PULL HEADS

C. PIPE ROLLERS

 b. Distance along the baseline, and
 c. Depth of cover. Point of rotation of the head shall also be monitored. 4. For gravity application and on-grade drilling, sonde/beacon or approved

equipment applicable for grade increments of 1/10th of one percent shall be used.

1. Pipe pull heads shall be utilized that employ a positive through-bolt design

2. Pipe pull heads shall be specifically designed for the pipe to be used as

assuring a smooth wall against the pipe cross-section at all times.

recommended by the pipe supplie

- The drilling head shall be remotely steer-able by means of an electronic or magnetic detection system. The drilling head location shall be monitored in three dimensions: a. Offset from the baseline
- 1. Calibration of the electronic detection and control system shall be verified prior to the start of the bore.
- Closed-loop drilling fluid system and a drilling fluid cleaning system should be used to whatever extent practical, depending upon project size and conditions. Under no circumstances shall drilling fluid that has escaped containment be request to the difference of the system. reused in the drilling system. G. DRILLING CONTROL SYSTEM
- drilling fluid recycling system (if used) to prevent spills into the surrounding ment. Pumps, vacuum truck(s), and/or storage of sufficient size shall be in place to contain excess drilling fluid
- 3. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. The use of spill containment measures shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and
- 2. The delivery system shall have filters or other appropriate in-line equipment to

- fluid in accordance with the drilling equipment pull-back rating at a constant

- 02350-8
- F. DRILLING FLUID DELIVERY AND RECOVERY SYSTEM 1. The drilling fluid pumping system shall have a minimum capacity to supply drilling
- 3. The mixing system shall continually agitate the drilling fluid during drilling
- fluid for the project 2. The mixing system shall be able to ensure thorough mixing of the drilling fluid. The drilling fluid reservoir tank shall be sized for adequate storage of the fluid.
- to the drilling fluid unless they have been submitted per this specification. E. MIXING SYSTEM 1. Drilling fluid mixing system shall be of sufficient size to mix and deliver drilling
- d. Drilling fluid shall be disposed of off-site in accordance with local, state and federal requirements and/or permit conditions e. No additional chemicals or polymer surfactants shall be allowed to be added
- c. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall(s)
- the mixing requirements of the mixture manufacturer b. The water and additives shall be mixed thoroughly to assure the absence of
- a. Drilling fluid shall be composed of clean water and the appropriate additive(s for the fluid to be used. Water shall be from a clean source and shall meet
- D. DRILLING FLUID SYSTEM A. DRILLING FLUID (DRILLING MUD)
- C. Drill head shall contain all necessary cutters and fluid jets for the operation, and shall be of the appropriate design for the ground medium being drilled.
- B. The system must be able to control the depth and direction of the drilling
- A. The horizontal directional drilling equipment shall produce a stable fluid lined tunnel with the use of a steer-able drill head and any subsequent pre-reaming
- C. The drilling rig shall have a system to monitor pull-back hydraulic pressure during C. DRILL HEAD
- B. The drilling rig hydraulic system shall be of sufficient pressure and volume to power drilling operations. The hydraulic system shall be free from leaks.
- rotate, push and pull drill pipe while delivering a pressurized fluid mixture to a drill head. The machine shall be anchored to withstand the pulling, pushing and

- 02350-7
- B. DRILLING RIG A. The directional drilling machine shall consist of a hydraulically powered system to
- materials and spare parts on hand to maintain the system in good working order for the duration of this project. All required equipment shall be included in the emergency and contingency plan as submitted per these specifications.
- 1. The directional drilling equipment, as a minimum, shall consist of a directional drilling rig of sufficient capacity to perform the bore(s) and pull-back of the pipe(s), a drilling fluid mixing & delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations, and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies,
- Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating. 2.3 DRILLING SYSTEM EQUIPMENT A GENERAL
- F. CONNECTION HARDWARE
- Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and shall be restrained as indicated in the construction do Expansion-type mechanical couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.
- Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself. E. EXPANSION AND FLEXIBLE COUPLINGS
- SLEEVE-TYPE COUPLINGS Sleeve-type mechanical couplings shall be manufactured for use with PVC pressure pipe, and shall be restraine as indicated in the construction documents
- PVC gasketed, push-on fittings and mechanical restraints, if used, must be installed per the manufacturer's guide
- gasketed PVC, push-on type couplings and fittings, including bends, tees, and couplings as shown in the drawings. Bends, tees and other PVC fittings shall be restrained with the use of thrust
- Acceptable fittings for use with fusible polyvinylchloride pipe shall include standard PVC pressure fittings conforming to AWWA C900 or AWWA C905. Acceptable fittings for use joining fusible polyvinylchloride pipe other sections of fusible polyvinylchloride pipe or other sections of PVC pipe shall include

being fused, per the pipe supplier's guidelines. b. CARRIAGE - Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage c. GENERAL MACHINE - Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.

d. DATA LOGGING DEVICE – An approved datalogging device with the current version of the pipe supplier's recommended and compatible software shall be used. Datalogging device operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent

10V power source shall be available to extend battery life

5. Other equipment specifically required for the fusion process shall include the

a. Pipe rollers shall be used for support of pipe to either side of the machine

A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement,

extreme temperatures, and /or windy weather, per the pipe supplier's

c. An infrared (IR) pyrometer for checking pipe and heat plate temperatures.

Facing blades shall be used for fusible polyvinyichloride pipe, which are specifically designed for cutting FPVC.

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion process. The

software shall register and/or record the parameters required by the pipe supplier and

these specifications. Data not logged by the data logger shall be logged manually and be

d. Fusion machine operations and maintenance manual shall be kept with the

- condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe
- 02350-11
- incorporate the following elements: a. HEAT PLATE - Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good
- Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. 4. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must
- after the fusion process and in accordance with this specification and pipe 2. Fusible polyvinylchloride pipe shall be fused by qualified fusion technicians, as documented by the pipe supplier
- Pipe shall be stored and stacked per the pipe supplier's guidelines. 3.4 FUSION PROCESS A. GENERAL 1. Pipe shall be handled in a safe and non-destructive manner before, during, and
- If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation
- job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter. Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or
- Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the owner or engineer Pipe lengths should be stored and placed on level ground. Pipe should be stored at the
- HANDLING AND STORAGE Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or
- impact could cause damage, particularly during cold weather. If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks

02350-10

- E. During removal and handling, be sure that the pipe does not strike anything. Significant
- Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23 or AWWA M55, and all of the pipe supplier's guidelines shall be followed. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
- card pipe singlifies been damaged. Notify owner or engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.
- All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer Each pipe shipment should be inspected prior to unloading to see if the load has shifted
- 3.2 DELIVERY AND OFF-LOADING
- C. All equipment used by the CONTRACTOR on Owner's property and right-of-ways may be inspected by the OWNER or the Owner's Representatives and shall not be used if considered unsatisfactory by OWNER or Owner's Representatives. The Contractor shall be fully responsible for all damages arising from his failure to comply with the regulations and the requirements of these Specifications.
- B. All work under this specification affecting the Indiana Department of Transportation (INDOT) property, right-of-way or facilities shall be carried out to the full satisfaction of the INDOT authorized representative. The CONTRACTOR shall fully inform himself of all requirements of the INDOT as it pertains to specific project and shall conduct all his work
- 3.1 GENERAL REQUIREMENTS A. The ENGINEER must be notified 3 days in advance of starting work. The Directional Bore shall not begin until the ENGINEER is present at the job site and agrees that proper preparations for the operation have been made. The ENGINEER'S approval for beginning the installation shall in no way relieve the CONTRACTOR of the ultimate esponsibility for the satisfactory completion of the work as authorized under the
- cases, the supervisor must be continually present at the job site during the actual Directional Bore operation. The CONTRACTOR and Subcontractor shall have a sufficient number of competent workers on the job at all times to insure the Directional Bore is made in a timely and satisfactory manner Personnel who are unqualified, incompetent or otherwise not suitable for the performance of this project shall be removed from the job site and replaced with a suitable person.

PART 3 EXECUTION

3.3

A competent and experienced supervisor representing the CONTRACTOR and Drilling Subcontractor shall be present at all times during the actual diffining operations. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed must be in direct charge and control of the operation at all times. In all

		1.	Correct location of all under is the responsibility of the C drawings or previous survey
		2.	Utility location and notification to the start of construction.
		3.	All existing lines and underr exposing those facilities that HDD installation as determin Contractor and HDD system of safe offset from existing conditions and layering, equipment, and foreign subs
	C.	SITEL	OCATION PREPARATION
		1.	Work site as Indicated on o working area. No alteration made
		2.	Contractor shall confine all a
	D.	DRILL	ING LAYOUT AND TOLERAN
		1.	The drill path shall be accur appropriate locations within guidance system, drill pat variations or anomalies.
		2.	Instrumentation shall be pr locates the pilot hole, m measures drilling fluid disch
		3.	Entry and exit areas shall be the pipe as recommended b
	E.	PILOT	HOLE BORE
		1.	Pilot hole shall be drilled al- deviate from the bore path, the location along bore path
	_	2.	The Contractor shall limit or during pull-back. The mini specified by the pipe supplie
	F.	REAM	After successfully completin
			diameter which meets the re table is offered as an estimation of the second sec
			0235
			< 8 inches 8 inches to 24 inches > 24 inches
		2.	Multiple reaming passes sh
		3.	shall conform to this specific In the event of a drilling fluid Contractor shall be respons condition and cleaning up th
3.6	PIPE P	PULL-BA	CK AND INSERTION
	A.	Pipe si length.	hall be fused prior to insertion
	В.	Contra insertio past th	ctor shall handle the pipe in on. Vertical and horizontal cu ne pipe supplier's minimum a
	C.	The pi	ed. Damaged portions of the pe entry area shall be grade ree movement into the bore ho
		1.	The pipe shall be guided in to, the pipe.
		2.	The pipe may be continuous Engineer approved friction d long as the pipe is not ov Installation.
		3.	A swivel shall be used bet torsion stress on the pipe as
	D.	exceed	ncy modification shall be at the pipe supplier's guideline: of the pipe. Damage caused Contractor.
	E.	Once	pull-back operations have of
	F.	The pi crackin	ption until the pipe is complete pe shall be installed in a n g, or movement and distortio ctor's operations shall be com
3.7	CLEAN		
	Α.	better and co pavem materia	ing the installation, the proje than the pre-construction cor compacted per the construct ent and hardscape shall be re als shall be removed from the fluid shall be property dispo
			0235
		jurisdic	tional laws.
	B.	Contra are sou	ctor shall verify that all utilities und.
3.8	PREPA	ARATIO	N PRIOR TO MAKING CONN
	A.	Approx	imate locations for existing

shall:

3.9 PIPE SYSTEM CONNECTIONS

connection plans.

Saddle Tapping per Uni-Pub-8.

bolted design for 10" mains.

strictly prohibited.

- A. GENERAL 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
- B. LOCATION AND PROTECTION OF UNDERGROUND UTILITIES
- contract documents unless approved otherwise by Owner or Engineer.

02350-12

fusion machine at all times.

cluded in the Fusion Technician's joint report.

B. JOINT RECORDING

3.5 DRILLING OPERATIONS

	WC GINEERING - TERRE HAUTE CIE - NEW ALBANY			
SPRINGBROOK SECTION 4	FCRWD SANITARY SEWER SPECIFICATIONS			
No. No. 11400758 STATE OF MDIAN STATE OF MDIAN STATE OF MDIAN MOLAN M				
DRAWN BY TS/TD/GM CHECKED BY KE DATE AUGUST 11, 2020 SCALE N/A SHEET CRWD SANITARY SEWER				

©2020

erground utilities that may impact the HDD installation Contractor, regardless of any locations shown on the /s completed. ion services shall be contacted by the Contractor prior

rground utilities shall be positively identified, including hat are located within an envelope of possible impact of mined for the project specific site conditions. It is the m operator's responsibility to determine this envelope utilities. This will include, but is not limited to, soil utility proximity and material, HDD system and surface material.

drawings shall be graded or filled to provide a level ns beyond what is required for operations are to be activities to designated work areas.

NCES

rately surveyed with entry and exit areas placed in the n the areas indicated on drawings. If using a magnetic ath will be surveyed for any surface geomagnetic

provided and maintained at all times that accurately measures drill-string axial and torsional loads and harge rate and pressure. e drilled so as not to exceed the bending limitations of by the pipe supplier.

long bore path. In the event that the pilot bore does , it may require contractor to pull-back and re-drill from h before the deviation.

curvature in any direction to reduce force on the pipe inimum radius of curvature shall be no less than that er and as indicated on the drawings.

ing the pilot hole, the bore hole shall be reamed to a requirements of the pipe being installed. The following nated guide:

350-13

Pipe Dia. + 4 inches Pipe Dia. X 1.5 Pipe Dia. + 12 inches

Bore Hole Diameter

hall be used at the discretion of the Contractor and fracture, returns loss or other loss of drilling fluid, the

sible for restoring any damaged property to original he area in the vicinity of the damage or loss.

n, if the site and conditions allow, into one continuous in a manner that will not over-stress the pipe prior to curves shall be limited so that the pipe does not bend allowable bend radius, buckle, or otherwise become e pipe shall be removed and replaced.

ed as needed to provide support for the pipe and to nto the bore hole to avoid deformation of, or damage

siv or partially supported on rollers or other Owner and decreasing implement during joining and insertion, as over-stressed or critically abraded prior to, or during

etween the reaming head and the pipe to minimize t the sole discretion of the Contractor, and shall not tes in regards to maximum pull force or minimum bend

by buoyancy modifications shall be the responsibility

commenced, the operation shall continue without tely pulled through the bore hole. manner that does not cause upheaval, settlement, on of surface features. Any damages caused by the rected by the Contractor.

ect site shall be returned to a condition equal to or indition of the site. All excavations will be backfilled ction documents and jurisdictional standards. All epaired per applicable jurisdictional standards. All e site, and disturbed areas shall be re-landscaped. All bosed of per these specifications and all applicable

350-14

s, structures, and surface features in the project area VECTIONS INTO EXISTING PIPING SYSTEMS Approximate locations for existing piping systems are shown in the construction

documents. Prior to making connections into existing piping systems, the contractor 1. Field verify location, size, piping material, and piping system of the existing pipe.

 Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents. 3. Have installed all temporary pumps and/or pipes in accordance with established

B. Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

A. Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines. B. If possible, pipe installed via HDD shall be filled with water prior to making any onnections to the existing system or other portions of the project.

3.10 TAPPING FOR POTABLE WATER APPLICATIONS Tapping saddles for HDPE pipe shall be as recommended by the manufacturer, and tapping shall be performed in accordance with the manufacturer's recommendations. B. Tapping for PVC pipe shall be performed using standard tapping saddles designed for

use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping for PVC shall be performed in accordance with the applicable sections for Caddle Taples are U.B. Det B.

Service saddles shall be bronze or brass and shall be Ford S90/S91, Mueller H-13000, S-13000, or proved equal. Hinged design shall be used for 4" – 8" mains and 2-piece All connections requiring a larger diameter than that recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.

Equipment used for tapping shall be made specifically for tapping PVC pipe: Tapping bits shall be slotted "shell" style cutters, specifically made for PVC pipe

Hole saws' made for cutting wood, steel, ductile iron, or other materials are

02350-1

2. Manually operated or power operated drilling machines may be used. Taps may be performed while the pipeline is filled with water and under pressure ('wet' tap,) or when the pipeline is not filled with water and not under pressure ('dry' tap).

3.11 TESTING

- A. Cleaning and flushing are to be done by the CONTRACTOR in accordance with the B. Directional drilling pipe shall be tested by CONTRACTOR after pullback. The average pressure shall be maintained at 150 psi for six hours. The test pump and water supply shall be arranged to allow accurate measurements of the water required to maintain the test pressure. Any material showing seepage or the slightest leakage shall be replaced as directed by the OWNER at no additional expense to the OWNER.
- C. Hydrostatic testing of HDPE pipe should be performed in accordance with ASTM F2164. D. The manufacturer's recommendations on pipe stretch allowances, bend radius and tensile strength, allowable make-up water, and duration of test pressure shall be
- E. Pipeline shall be tested end to end. 3.12 DISINFECTION OF THE PIPELINE FOR POTABLE WATER PIPING
- After installation, the pipeline, having passed all required testing, shall be disinfected prior to being put into service. Unless otherwise directed by the owner or engineer, the pipeline will be disinfected per AWWA C651. See specification Section 15371 for disinfection requirements.
- 3.13 PARTIAL TESTING Segments of the pipe may be tested separately in accordance with standard testing procedure. s approved by the owner and engineer. Testing of each HDD installation prior to connection to the system or other piping is preferred.
- 3.12 RECORD KEEPING AND AS-BUILTS
- A. CONTRACTOR shall maintain a daily project log of drilling operations and a guidance system log with a copy given to the ENGINEER at completion of project. B. The drilling data shall be recorded every 25-feet during the actual drilling operation. The CONTRACTOR shall furnish "as-built" plan a profile drawing based on these recordings showing the actual location horizontally and vertically of the installation, and all utility facilities found during the installation. The data shall be certified accurate by the CONTRACTOR to the capability of the drilling system.
- C. "As-built" drawings shall be completed and certified by an Indiana registered professional surveyor or engineer at Contractors expense.

END OF SECTION

02350-16

CONTRACTOR SHALL ADHERE AND REFERENCE THE CURRENT FALL CREEK REGIONAL WASTE DISTRICT STANDARDS FOR DESIGN AND CONSTRUCTION OF SANITARY SEWERS.