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SECTION 0 - GENERAL REQUIREMENTS

PART 1 – GENERAL OVERVIEW

1.01

- For the purposes of these Horizontal Directional Drill Specification tions"), the following definitions shall apply "HSE" shall mean Hamilton Southeastern Utilities, Inc., the public utility that provides sanitary sewer service in the Project (as hereafter defined) area. HSE's address is 11901 Lakeside Drive
- Fishers, Indiana 46038, and HSE's phone number is (317)577-2300 "Engineer" shall mean the engineer for HSE, which is Sanitary Management & Engineering Company, Inc. ("SAMCO") or SAMCO's engineers. SAMCO's inspector shall be Engineer's representative
- during construction of the Project. SAMCO's address is 11905 e Drive, Fishers, Indiana 46038, and SAMCO's nho s (317)577-1150 Subscriber" shall mean those signatories identified as Subscribers
- under a Special Contract for extension of Sewer Mains and Facilitie with HSE through which the Project is being undertaken. Subscribe is generally the Owner under a construction contract. This definition nded to include all employees and/or agents acting in the interest of Subscriber. "Contractor" shall mean any construction contractor approved by
- HSE to construct, install, maintain, repair, and remove public or private sanitary sewer facilities within the HSE service area. This definition is intended to include all employees, sub-contractor nd/or agents acting for or on behalf of the Contractor's co
- and/or agents acting for or on behalf of the Contractor's company. "Design Engineer" shall mean the engineer sealing the Construction Plans, as opposed to the Engineer for HSE and the Record Drawing Engineer, both of whom, are also defined under these Specifications This definition is intended to include all employees, sub-contractors and/or agents acting for or on behalf of the Design Engineer's company.
- "Record Drawing Engineer" shall mean the engineer who will certify the record drawings, as opposed to the Engineer for HSE and the Design Engineer, both of whom, are also defined under these Specifications. The Record Drawing Engineer and Design Enginee may be the same person or represent the same company. This ded to include all employees and/or agents acting
- belinition is intended to include all includes analysis analysis activity of for or on behalf of the Record Draving Engineer's company. "Project" shall mean any sanitary sewer facilities constructed under a distinct set of contract documents and shall include all work necessary for the Complete (as hereafter defined) and operable ended on the set of the se nstallation of all sanitary sewer infrastructure and appurtenances in conformity with HSE approved Construction Plans and the standards, pecifications, and details of HSE.
- "Conveyed" with regards to sanitary sewer facilities means Projects for which HSE has received title "Private" with regards to Projects shall mean Projects from which
- ewage flows into HSE's sanitary sewer facilities, but for which title or the sanitary sewer facilities is not to be Conveyed to HSE ted" with regards to Projects shall mean any Projects which ompletea with regards to Projects shall mean any Projects which e acceptably constructed, tested, and through which customer rvice has been authorized by HSE, but for which HSE has not ceived title. All applicable fees must be paid to HSE prior to a Projec
- being deemed Completed. "Construction Plans" shall mean primary plats, secondary plats, sets of construction drawings, architectural plans, shop drawings, landscaping plans, record drawings, easements, deeds, covenants and strictions, and any other documentation to be submitted under these Specifications and HSE's "Design Specifications for Sanitary Sewer facilities". Construction Plans must meet the applicable standards in effect at the time the documents are submitted
- tation" shall mean record drawings and other submitted under HSE's "Sanitary Sewer ation to be sub completion Specifications". Completion Documentation must me he applicable standards in effect at the time the documents are

1.02 Purpose

The purpose of these Specifications is to define the standards for engineering design, construction specifications and construction practices related to the Project which will allow for the orderly and er installation of sanitary sewer facilities cons

1.03

ions are applicable for all Public and Private sanitan r facilities which will be connected to HSE's sanitary sewer m. This includes Private Projects which will not initially be ected to HSE's sanitary sewer system but at some future date may

Liability and Costs for Project No direction, field directive or other instruction contemplated by these Specifications and/or conducted by others shall accrue any liability, charge, or cost to HSE, Engineer or Engineer's inspectors.

Standards, Specifications and Details 1.05

- Standards, Specifications and Details HSE's GravitySanitarySever Details sheet, Gravity SanitarySever Specifications sheet, Lift Station Plan sheets, Lift Station sheets Standards for Design and Construction of Building Sever Laterals, Rules and Regulations, Master Plan, Design Specifications for Sanitary Sever Facilities, and Sanitary Sever Completion Specifications are integral parts of these Specifications. Construction should become familiar with these documents prior to construction of any sanitary and those identified in 1.0SA above are Complementary in nature and should not be interpreted individually.
- complementary in nature and should not be interpreted individually. These Specifications, Master Plan, and other standards, specifications and details are subject to revision at any time prior to the start of construction of the Project. These documents are also subject to revision at any time during construction when, in Engineer's opinion, those revisions materially affect the maintenance, operation or life of the Project. All such revised ding doci nents in the uction Plans at the time when provided to Contracto HSE reserves the right to modify or waive any of these Specifications and/or its Master Plan and other standards, specifications, and
- as are intended to define the construction
- requirements of sanitary sever facilities which are constructed and operated under typical conditions in HSE's service area. Depending on field conditions and the composition and characteristics of sanitary sewer flow, different or unusual conditions may occur which cannot be anticipated in a document of this nature. Engineer may mpose additional or special construction req

Drawing Discrepancies and Omissions Prior to the start of construction, Contr or must notify Engir

licts between the Construction Plans, any s supplied by HSE, and/or these Specification

Resolution of any such conflict will be at Engineer's sole discretion. Any items which are not covered in these Specifications, the Construction Plans or HSE's other standards, specifications, and details, but are required for construction of this Project, must be

letails, but are required for construction of this Project, musc be pproved by Engineer prior to installation and must be made part

of this contract. In the event construction practices are not described, but in Engineer's opinion, will affect the quality of construction or I term maintainability of sanitary sewer facilities, Engineer mu approve any construction practices proposed by Contractor.

Governing Laws, Codes, and Regulations Construction practices must meet all applicable laws, codes, or

aw, code, or regulation governing the Project and thes

HSE and Engineer at their respective business office

a Complete manner in accordance with the Cor

PART 2 - GENERAL CONSTRUCTION REQUIREMENTS

gulations and be in accordancewith the requirements of all wermmental agencies and public entities having jurisdiction. lese Specifications shall not be considered as a substitute, nor all supersede any state or federal law, code, or regulation related the Project. In the event of a conflict between any state or federal

All persons on site must abide by all Indiana Occupational Safety and

th Administration (IOSHA) standards including but not limit neral Construction Practices" and "Trench Safety Standards

ces required by these Specifications must be given to both

These Specifications cover all work necessary for the installation of

onvey sewage to the receiving sewer in an acceptable and rable manner.

All pipe, fittings, valves, and appurtenances must be the size, type, classification, and grade shown on the Construction Plans and

must meet all requirements of these Specifications. Contractor must not substitute materials which differ from the

oved Construction Plans unless approved by Engineer

approved Unstruction hans unless approved by regimeer. All pipe, fittings value sizes, and all references to pipe diameter on the Construction Plans or in these Specifications are intended to be nominal size of Planser and thus to interpreted as such. If a material type is shown on the Construction Plans, the material type must describe a general category of materials the entire these

tor must submit only one model number or type per it oval. Multiple submittals of model number or type fo

ingle item will be cause for rejection of the shop drawing. Before delivery of products to the site (for standard yard stocked

tems) or before fabrication (for items which are not standard yard

stocked items), Contractor must provide submittals to, and obtain

acceptance from Engineer. Submittals must be thoroughly reviewed by Contractor and certified to meet these Specifications (with all exceptions explicitly indicated) prior to submission to

an approval will be an authorization to proceed with construction

of the Project, however, it shall not be construed as authority to

violate, cancel, or set aside any of HSE's requirements or the laws

codes, regulations, and permit processes of governmental agencies or public entities. Approval will be evidenced by an "Approved

nilton Southeastern Utilities. Inc." stamp on the Construction

Plan approvals will be valid for a period of six (6) months from the date of approval stamp. Extensions of this time limit may be

Prior to the start of construction, Design Engineer must receive formal written approval from Engineer. At this time, Design Engineer must supply Engineer with a PDF and an AutoCAD file of

on Plans are formally approved, and Subscriber ha

requested from Engineer if extenuating circumstances exist

Engineer's decision regarding time extensions will be final.

Contractor will not be permitted to initiate construction until

entered into all necessary agreements and authorizations with

Contractor will not be permitted to initiate construction until all

affected governmental agencies and public entities. Copies of

Contractor will not be permitted to initiate construction until all

Pipe layers and foreman (superintendent) assigned to the Project

Notice must be provided to Engineer twenty-one (21) days prior to

must be completed no more than fourteen (14) days prio

ction has commenced. Project must be Completed

nust be approved by HSE prior to the start of construction

A pre-construction meeting is required between Engineer and

All rough grading (on and off site) must be finished to within one

(1) foot of final grade and verified by Engineer prior to the start of

Contractor cannot discontinue work on the Project, except for

weather delays, without written approval from Engineer and in this

case no sanitary sewer structures including gravity manholes, we

wells, valve vaults, air/vacuum release manholes, clean-outs, flow monitoring/metering manholes, etc. can be left open and

All persons, including but not limited to Subscribers, Contractors

sub-contractors, Design Engineers, Record Drawing Engineers, and

surveyors must abide by HSE's "General Procedures for Manhole

Contractor prior to initiation of construction Pre-constru

uction of Sanitary Sewer Facilities

asements have been reviewed, approved, and re

pplicable permits have been obtained from and appr

permits must be submitted to Engineer for review.

complete set of Construction Plans.

by Engineer

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2 05

initiation of construction.

o the start of construction.

Continuity of Construction

incomplete

Confined Space Entry

promptly as directed by Engineer.

and all required fees have been paid to HSE.

r must provide all necessary work to install infrastructure

nent will apply

2.06

Project site must at all-time be kept free of trash, rubbish,

ards, whichever is more stringent.

nsightly materials, and other nuisances All streets, alleys, pavement, parkways, and private property must ighly cleaned each day of all surplus materials, earth and ubbish placed thereon by Contractor Project site must be cleaned at the end of each workday. Trash

Opening and Entry" or the most recent IOSHA confined space entry

- recentacles must be provided as necessary to dispose of waste 2.07 Product Delivery, Handling, and Storage
- nsible for delivery, handling, and storage of Deliver products with manufacturer's tags and labels intact
- Handle products in accordance with manufacturer's endations and with extreme care to not damage or shock Load and unload all products by hoists or skidding. Do not drop roducts. Do not skid or roll products on or against other products. Slings, hooks, and pipe tongs must be padded.
- Keen stored products safe from damage or deterioration in dance with manufacturer's reco of products free from dirt or foreign matter. Drain and store products in a manner that will protect them from freezing. Store electronic and electrical products in a manner that will protect them from freezing and weather. Do not stack products unless allowed by the manufacturer's requirements. Store gaskets and other products affected by sunlight in a cool location out of direct sunlight. Gaskets must not contact petroleum products. Use askets on a first-in/first-out basis
- romptly remove damaged or defective products from the Project site. Replace damaged or defective products with acceptable products
- Contractor is responsible for verifying materials are free of defects and are the proper type, classification, grade, etc. complying with the Construction Plans and/or HSE's standards, Specifications, and details

2.08

- Contractor must test and perform quality assurance requirements on all infrastructure in accordance with these Specifications. Execute work in conformance with applicable sections of the latest published editions of American National Standards Institute (ANSI), merican Society of Mechanical Engineers (ASME), American Society for Testing and Materials (ASTM), American Water Works ssociation (AWWA). American Welding Society (AWS). and lational Electrical Manufacturers Association (NEMA) standards or as indicated in these Specifications and/or the Construction Plans, whichever is more stringent. All materials and products installed by Contractor must be
- approved by the National Electric Code (NEC), Uniform Building Code and Underwriter's Laboratories Inc. (UL). All infrastructure must be new and unused.
- Contractor must provide assurance to Engineer that the pressure/gravity sewer is laid accurately to required line and grade as shown on the Construction Plans. Contractor must constantl check horizontal alignment of the force main. Contractor must coordinate verification of the force main with Record Drawin neer to provide an as-built record set as described in Sec 2.15. Verification is defined as certification by an appropriately registered Indiana Professional as to actual elevation and horizontal location of the force main. Variations from line and grade as shown on the Construction Plans are cause for the force main to be rejected and re-laid in compliance with the Construction Plans.

Test Sections

 Initial Performance Tests – A hydrostatic pressure test may be required on the first six hundred (600) feet of force main of each size and type of material installed. This test will be required when in Engineer's opinion, materials or techniques unproven with HSE are proposed, when Contractor cannot show adequate experience with the materials or techniques to be used, or when field conditions warrant. No additional force main can be installed until the first section of each size and type of material has satisfactorily passed initial performance tests or a waiver is received. No initial performance test is done with gravity sewers. 2. Subsequent Performance Testing - as work progresses, Enginee

may designate additional sections for subsequent perform testing as conditions, in his opinion, warrant. Engineer will notify Contractor of where subsequent test(s) are to be required not late than fifteen (15) days after force main is installed. Unless otherwise authorized, Contractor must arrange to commence subsequent performance test(s) within fifteen (15) days after force main has been installed or fifteen (15) days after receiving notification from Engineer, whichever date is later. 3. Final Performance Testing for Completion – All infrastructure must pass all applicable test requirements of these Specifications

2.09 Inspection and Rejection of Materials

- The quality of all materials, process of manufacture, and finished product are subject to inspection and acceptance by Engineer. Such inspection may be made at the place of manufacture and/or on the work site after delivery. Products are subject to rejection a any time for failure to meet any of the manufacturer's ecifications even though samples may have otherwise beer accepted as satisfactory.
- Immediately prior to being incorporated into the Project, each product must be carefully inspected, and those not meeting these Specifications and HSE's Detail sheets must be rejected, mmediately removed from the site, and replaced at Contractor's
- sole expense c Contractor must not repair, or permit manufacturer to repair, any cast concrete structures with exposed steel or welded wir

2.10 Relation to Wells and Water Supplies

- Α. Force Mains must be laid at least ten (10) feet horizontally from any existing or proposed water main. The distance is to be ed edge to edge. Should specific conditions prevent this separation, Contractor must notify Engineer for specific instructions.
 - Where the force main crosses a water main, it should be laid at least eighteen (18) inches below the water main. Sewer/water supply separations and pipe classifications must conform with the latest edition of the Ten States Standards,
- Indiana State Board of Health's (ISBH) "On-site Water Supply and Wastewater Disposal for Public and Commercial Establis ulletin S.E. 13" and Indiana Department of Environmenta Management (IDEM).

2.11 A Utilitie

- All existing utility systems which conflict with the construction of the Project, which can be temporarily removed and replaced, must be accomplished at the expense of Contractor. Work must be one by the respective utility, unless utility approved in writing at Contractor can do the work. Permanent relocation of Utilities
- 1. Except as otherwise noted on the Construction Plans, it is the responsibility of Contractor to move or pay for moving all utility appurtenances, including but not limited to, water mains, storm sewer inlets, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light and traffic standards, cable ways, signals, etc. located in the public right-of-way or private easement which would permanently interfere with the Project.
- 2. It is understood and agreed that Contractor has considered in his bid all permanent and temporary utility appurtenances shown or otherwise indicated on the Construction Plans. It is also understood and agreed that no additional compensation will be allowed for any delays, inconvenience, or damage sustained by Contractor due to any interference from said utility appurter or the operation of moving them either by the respective utility company or Contractor
- Contractor must provide, at Contractor's expense, all electrical and gas energy, water service (including water for flushing and testing) and telephone service required for the Project until the Project is

Installation Service

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2.14

vide services of a factory-trained representative for up to eight (8) hours for the installation of High-Density Polyethylene (HDPE)

2.13 Product Installation

- Install all products in strict accordance with manufacturer's recommendations and these Specifications in a neat and workmanlike manner. Bring all conflicts between the manufacturer's reco
- and these Specifications to the attention of Engineer and obtain direction from Engineer as to the resolution of any conflict in nstallation directive

As-Built Record Set

- Contractor must maintain, throughout the course of the Project, an up-to-date plan set which accurately reflects the actual as-built nensions (horizontal location and vertical elevation), materials of construction, and other relevant information necessary to develop a set of as-built record drawing in accordance with HSE's "Sanitary Sewer Completion Specifications". As-built horizontal locations and vertical elevations are required or
- all fittings (including ells, tees, valves, and adapters), force main (at a maximum separation of 500 feet), top and bottom of the wet well and valve vault and inverts into the wet well clean-outs and Failure to provide as-built information as specified in HSE's
- "Sanitary Sewer Completion Specifications" may require excavation by Contractor to obtain this information

2.15

- HSE's "Sanitary Sewer Completion Specifications" specify the ments which must be met prior to the time the Project is placed into service. Contractor and Record Drawing Engineer must provide to HSE and
- Engineer in Subscriber's name the necessary Completion umentation for the Project, including record drawings and a digital file. At the end of construction, Engineer will provide a Record Drawing Notification to Subscriber and Record Drawing Engineer. Completion Documentation, including record drawing n a digital file format, must be delivered by Contractor and Record Prawing Engineer in the name of Subscriber to Engineer within thirty (30) days of the date of notification. If Completion Documents have not been provided within sixty (60) days of the date of notification. HSE will procure the services necessary to generate or otherwise acquire Record Drawings and other Completion Documentation at Subscriber's expense. Record Drawing Engineer must also submit Sanitary Sewer Record Drawing Information sheets for all Lift Station/Force Main Manholes that have not been previously as-built. These sheets must be submitted to Engineer within fourteen (14) days of the
- Record Drawing Notification. Contractor must complete all outstanding items detailed in Engineer's correspondence and supply all necessary information (including construction cost documentation, with all applicable change orders, Sanitary Sewer Inventory form, etc.) to Engineer in a timely manner. Contractor must also provide timely responses to Record Drawing Engineer for questions associated with constructed conditions including pipe sizes, pipe types, horize location of concrete capping/encasement, bores, watertight castings, fittings, etc.
- If a manhole top of casting is adjusted after as-builting, then Contractor must supply Engineer with a new measure down to the flow line from top of casting. If new measure down is not provided to Engineer. Contractor must pay Engineer, at their current rate. for all time required obtaining this informatio

Inspection and Reimbursement

- Full time inspection by Engineer is required for all repairs, nce, or construction to infrastructure. Engineer must approve, in writing, all methods of repair to infrastructure as commended by Contractor and manufacturer. Failure to comply will be grounds for removal from HSE Approved Contractor List. r must pay Engineer for all inspector's overtime co Contractors will be charged overtime costs at the prevailing rate per hour outside SAMCO's normal business hours on weekdays and all day on Saturdays. The hourly rate for Sundays and holidays wil be twice the hourly rate. Rates are subject to change without notice, contact Engineer prior to starting construction for curre
- If, at sole discretion of Engineer, construction volume is less than med acceptable, Contractor may be required to pay for
- additional inspection services. Engineer's decision on field changes or construction practices is final. Failure to comply is grounds for removal from the HSE Annroved Contractor List

PART 3 – GENERAL 3.01

2.16

- Work Included Furnish all labor, materials, and equipment required to install the required potable water main, sanitary force main pipe and laterals using directional drilling method of installation, all in accordance with the requirements of the Contract Documents. Pipe size, typ nd length shall be as specified in the Detailed Spe as shown on the drawings. Work shall include, and not be limited to, proper installation, testing, restoration of underground utilities. d environmental protection and restoration
- e directional drill shall be accomplished by first drilling a pilot hole as shown on the approved pilot bore plan, then enlarging the pilot hole to no larger than 1.5 times the outer diameter to commodate the pull back of the pipe through the enlarged hole Soil borings as required for certain subsurface soil con be provided by Direction Drill Contractor within the scope of the
- Work shall include all pressure main and lateral installation using the directional drilling method, clearing and grubbing, valve pit excavation, removal and disposal of any rock and water, disposal of excess excavated material, fittings, thrust blocking, granular backfill, any saw cutting of permanent pavement surfaces for boring and receiving pits to install pressure mains, replacement/repair of any landscaping, sidewalks, fences, curbs, guttering, cable basins, drainage pipes, field tiles and other surface sub-surface structures, pipes, conduits, cable, etc. sheeting and shoring, protection of existing structures, trees, shrubs, bus clean up, and all other operations necessary to complete work as shown on the plans as specified.
- This Specification covers the use of HDPE and thrust-restrained Polyvinyl Chloride (PVC) pipe.

PVC Compounds

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- American Society for Testing and Materials (ASTM) 1. ASTM F1962: Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacle 2. ASTM D1784: Standard for Rigid PVC Compounds and Chlorinated
- 3. ASTM D2837: Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials 4. ASTM D3139: Standard Specification for Joints for Plastic Pipes
- Using Flexible Elastomeric Seals 5 ASTM D3261: Butt Heat Fusion Polyethylene (PE) Plastic Fittings
- for Polyethylene Plastic Pipe and Tubing 6. ASTM D3350: Standard Specification for Polyethylene Plastic Pipe
- and Fitting Materials 7. ASTM F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe American Water Work Association (AWWA)
- 8. AWWA C900: Standard for PVC Pressure Pipe and Fabricated Fittings 4" through 12" for Water Distribution
- AWWA C901: Polyethylene (PE) Pressure Pipe and Tubing ½" through 3" for Water Service. 10. AWWA C905: Standard for PVC Pressure Pipe and Fabricated
- Fittings 14" through 48" for Water Transmission and Distribution AWWA C906: Polyethylene (PE) Pressure Pipe and Fittings 4" through 63" for Water Distribution

3.04 Submittal

- Data supporting the Directional Drilling Contractor's qualifications Work Plan: Prior to beginning work, Contractor must submit to
- Engineer a Work Plan detailing the procedure and schedule to be used to execute the Project. Work Plan should include a description of all equipment to be used, down-hole tools, a list of personnel and their qualifications and experience (including backup personnel if an individual is unavailable), list of actors, a schedule of work activity, a safety plan (including SDS sheets of any potentially hazardous substances to be used), an environmental protection plan, and contingency plans for possible problems. Work Plan should be comprehe neive realistic and ed on actual working conditions for this Project. Plan sh ument thoughtful planning required to successfully complete

the Project. Bore Plan: Prior to beginning work. Contractor must submit to ngineer a signed and sealed, scale drawing of the pilot bore pla or review and approval. (Max vertical scale 1" = 2', max horizor scale 1" = 20'). The plan shall show finished grade, deflection and radii of the pilot bore, all existing utilities with minimum vertical and horizontal clearances. The plan shall also address the location of the drilling rig setups for multiple bores, the lengths of each bore based on soil condition, equipment used, topography, etc. Proposed vertical and horizontal clearances between bored pipe and any existing/proposed conflicting pipes, conduits, or

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Size Min Pag

Of Curva

125

(inch) (feet)

- Pipe shall be joined using non-metallic couplings, which have been designed as an integral system for maximum reliability and nterchangeability. High-strength flexible thermoplastic splines shall be inserted into mated, precision-machined grooves in the pipe and coupling to provide joint 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 twir elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM D3139 or Engineer's requirements, whichever is more stringent.
- High-Density Polyethylene (HDPE) Pipe
- HDPE pipe shall be manufactured by Phillips Driscopipe, Inc., Chevron Chemical Company, or Engineer approved equal and the store of t HDPE pipe shall only be black in color HDPE pipe (PE 3408) shall meet the requirements of ASTM 3350/E714. Cell classification shall be 345444C. Pressure Class and Standard Dimension Ratios (SDR) shall be Class 160 – DR11.

obstructions shall exceed the guidance system accuracy tolerance by a minimum of 100%.

- Material: Specifications on material to be used shall be submitted to Engineer. Material shall include the pipe, fittings, and any other item that is to be an installed component of the Project.
- Equipment: Submit specifications on directional drilling equipment to be used to ensure that equipment will be adequate to com he Project. Equipment list shall include but not be limited to
- drilling rig, mud system, mud motors (if applicable), down-hole tools, guidance system, and rig safety systems. Calibration records for guidance equipment shall be included. Specifications for any drilling fluid additives Contractor intends to use or may use shall also be submitted.

OUALITY ASSURANCE

3.05

- All directional drilling operations shall be performed by a qualified Directional Drilling Contractor with at least three (3) years' experience involving work of a similar nature to work required fo the Project Contractor must have installed a minimum of 50 000 inear feet of pipe (4" diameter or greater) using directional drilling operations. A list of project references is required prior to job
- All work shall be scheduled through Engineer. Notify Engineer a num of three (3) days in advance of the start of work. All work shall be performed in the presence of Engineer All applicable permits and applications must be in place prior to

start of work.

- Polyvinyl Chloride (PVC) Pipe Pipe material to be used for 4" through 12" diameters shall meet AWWA C900 standards for Polyvinyl Chloride pressure pipe and fittings and shall have a dimension ratio of DR 14 (Class 200). Pipe terial to be used for 14" through 18" diameter shall mee WWA C905 standards for Polyvinyl Chloride pressure pipe and fittings and shall have a dimension ratio of DR 18 (Class 235). PVC pipe that is intended for use as a casing for a finished product pipe may have a dimension ration of DR 18. Pipe shall be designated as Certa-Lok C900/RJ or Certa-Lok C905/RJ as manufactured by CertainTeed Corporation. All other pipes shall have the written approval of Engineer and meet all submittal review as an approved tional product
- PVC AWWA C900 and C905 shall only be white in colo Pipe shall be joined using a separate PVC coupling with built-in sealing gaskets and restraining grooves. The restraining splines shall be square and made from Nylon 101.
- Exposed splines shall be cut %" from coupling to reduce soil drag. Couplings shall be beveled on leading edges to minimize soil
- Using Certa-Lok C900/RJ pipe, Contractor shall adhere to pipe manufacturer's most current data regarding tensile load limitatio for trenchless application. Generally, the maximum pull-in force shall not exceed the following

shan not exceed the following values.								
	Size	SDR	Class	Pipe O.D.	Coupling O.D.	Max	Max	
						Bending	No Bending	
	(in.)		(psi)	(in.)	(in.)	(lbs.)	(lbs.)	
	4	18	235	4.800	5.964	8,000	10,300	
	6	18	235	6.900	8.366	9,300	14,700	
	8	18	235	9.050	10.947	18,900	28,800	
	10	18	235	11.100	13.361	24,900	38,300	
	12	18	235	13.200	15.836	28,300	48,300	

- Using Certa-Lok C905/RJ pipe. Contractor shall adhere to pip anufacturer's most current data regarding tensile load limitation for trenchless application.
- Contractor shall adhere to the following data regarding radius of curvature for Certa-Lok C900/RJ pipe used for trenchless application. Confirmation of proposed radius of each bore shall be part of the required submittal prior to work.

lius	Offset per	Deflection per
ature	20' Length	20' Length
	(inch)	(%) .
	19	10.0
	13	6.7
	9	5.0
	7	4.0
	6	3.3

In any case, deflection radius shall not exceed 75% of th maximum allowable curvature allowed for standard C900 PVC

Fittings shall be manufactured in accordance with the reference standards listed in these specifications, material types, design pressure, and temperature ranges specified.

- Fittings shall be manufactured by the same manufacturer as the pipe to which fusion bonding is intended, using identical materials, and meeting the same pressure requ Fittings shall not be field fabricated.
- Tapping sleeves shall not be accepted.
- Flange backup rings shall be of the type and pressure rating as the single backup migs shall be of the type and pressure radio sipe. Harvey couplings will be required for all transitions HDPE to any other pipe material.
- Ductile iron backup rings shall be the convolutant type, fabricated from ductile iron per ASTM A 536, grade range 60/40/18 to 65/45/12. Ductile iron flange backup ring bolting dimension shall conform with ANSI B16.5 Class 150.
- Backup rings shall be cast and finished with flash removed from all edges and bolt holes to the specified dimensions. Additional finish requirements, if any, shall be as noted on the plans and in accordance with the following: 1. Epoxy coated, with bitumastic 300M high build coal tar epoxy or
- equal per manufacture's recommendations Gasket materials shall be compatible with the service piping
- system. Asbestos gaskets are not allowed. Fusion Bonding Procedure
- Piping joints, other than those shown as flanged or otherwise nanically connected, shall be butt fusion bonded in accordance vith a written bonding procedure specification (BPS) as required by ANSI (ASME B31.3, Chapter VII, paragraph A-328). BPS shall include cutting and facing requirements. 1. Materials to be fusion bonded shall be from same manufacturer
- Bonders and bonding operators shall be qualified in the use of the BPS as required by ANSI/ASME B31.3, Chapter VII, paragraph A-328. Qualification records certifying that bonders and bonding operators employed to complete fusion bonding are qualified i e BPS shall be submitted prior to comm bonding work.
- Bonding equipment specified in the BPS shall be in proper operating condition. Equipment heater performance shall be tested and certified prior to use for fusion bonding. Bonders and bonding operators shall be qualified for the specific bonding equipment utilized in fusion bonding work. Quality Assurance
- Pipe and fittings manufacturer shall have an established quality control program responsible for inspecting incoming materials and outgoing pipe, fittings, and components. Incoming polyethylene materials shall be inspected for density per ASTM D1505 and melt flow rate per ASTM D1238 and contamination. All incoming materials shall be certified by the supplier. Certificates shall be verified by the pipe manufacturer and submitted to Engineer

Directional Drilling Equipment Requirem

General: Directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back of the pipe, a drilling fluid mixer, delivery and recovery ystem of sufficient capacity to successfully complete the nstallation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a Magnetic Guidance System (MGS) or "walkover" system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid, trained and competent personnel to operate the system. All equipment shall be in good, safe condition with sufficient supplies, materials, and spare parts n hand to maintain the system in good working order for th

duration of the Project. Drilling Rig: Directional drilling rig shall consist of a hydraulically owered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing, and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient

pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to detect electrical current from the drill string and an audible alarm that automatically sounds when an electrical current is detected Drill Head: The drill head shall be steerable by changing its otation and shall provide necessary cutting surfaces and drilling

- fluid iets. Mud Motors (if required): Mud motors shall be of adequate pow to turn the required drilling tools. Drill Pipe: Shall be constructed of high quality 4130 seamless
- tubing, grade D or better, with threaded box and pins. Tool joints hould be hardened to 32 – 36 RC.

Guidance System

В.

4.04

R

C.

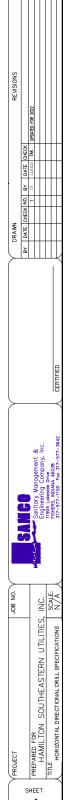
4.05

General: An electronic "walkover" tracking system or a Magnetic Guidance System (MGS) probe or proven (non-experimen gyroscopic probe and interface shall be used to provide a

ntinuous and accurate determination of the location of the dril head during the drilling operation. The guidance system shall be capable of tracking at all depths up to fifty (50) feet and in any soil ition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate and calibrated to manufacturer's specifications of the vertical depth of the borehold at sensing position at depths up to fifty (50) feet and accurate to

- two (2) feet horizontally. Components: Contractor shall supply all components and aterials to install, operate, and maintain the guidance system The MGS shall be setup and operated by trained and experienced personnel. Contractor shall be aware of any geo-magnetic
- anomalies and shall consider such influences in the operation of he guidance syster Drilling Fluid (MUD) System Mixing System: A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid

The mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be



HAMILTON SOUTHEASTERN UTILITIES, INC. GRAVITY SANITARY SEWER SPECIFICATIONS

SHEET 1 OF 2

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5.02

1.000 gallons minimum. Mixing system shall continually agitate

2,000 genots minute. Waking system shall continue agrate the drilling fluid during drilling operations. Drilling Fluids: Composed of bentonite clay, potable water, and appropriate additives. Water shall be from an authorize source with a pH of 8.5 - 10. Water with a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. No additional material may be used in drilling fluid without prior approval from Engineer. The bentonite mixture used shall have the following minimum viscosity as measured by a

March funnel:	March funnel:				
Rock Clay	60 seconds				
Hard Clay	40 seconds				
Soft Clay	45 seconds				
Sandy Clay	90 seconds				

Stable Sand 80 seconds Loose or Wet Sand Loose or Wet Sand 110 seconds These viscosities may be varied to best fit the soil conditions encountered, or as determined by the operator. Delivery System: The drilling fluid pumping system shall have a capacity of 35 – 500 GPM and be capable of delivering the drilling Delivery Sys fluid at a constant minimum pressure of 1200 psi. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Used drilling fluid and drilling fluid spilled during operation shall be contained and conveyed to the drilling fluid recycling system or shall be removed by vacuum trucks or other methods acceptable to Engineer. A berm, minimum 12 inches high, shall be maintained around drill rigs drilling fluid nixing system, entry and exit pits, and drilling fluid recycling system to prevent spills into the surrounding environment Pumping equipment and/or vacuum truck(s) of sufficient size shall be in place to convey drilling fluid from conta

4.06 Other Equipment

Pipe Rollers: Pipe rollers shall be used for pipe assembly during final product pull back.

storage and recycling facilities or disposal

Restrictions: Other devices or utility placement systems for providing horizontal thrust, other than those previously defined, shall not be used unless approved by Engineer prior to commencement of work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated by Engineer without undue delay and shall maintain line and grade within the tolerances prescribed by the conditions of the

4.07 Personnel Requirements

- All personnel shall be fully trained in safety and their respective duties as part of the directional drilling crew. Each person must have at least two years directional drilling experience.
- A competent and experienced supervisor representing Contracto and Drilling Subcontractor shall always be present during the and of mining subcontactor share aways be present ouring the actual drilling 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 cases, the supervisor must be continually present at the job site during the actual Directional Bore operation Contractor and Subcontractor shall always have enough competen workers on the job to ensure 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 suitable personnel.

PART 5 - EXECUTION

- 5.01 General Requirements
- Engineer must be notified a minimum of 3 days in advance of starting work. All necessary permits and approvals must be in place prior to commencement of work. The Directional Bore shall not begin until Engineer is present at the job site and agrees that proper preparations for the operation have been made. Engineer's approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of Engineer to provide inspection personnel

when appropriate without causing undue hardship by reason of when appropriate without causing undue hardship by feason of delay to Contractor. A copy of the Construction Drawing must be on the job site during construction and used for field marking "as-built" information daily. If field "as-built" data is not maintained by Contractor, Engineer shall recommend that Subscriber withhold payment(s) until field data is updated. All work under this specification affecting Indiana Department of

- Transportation (INDOT) property, right-of-way, or facilities shall be carried out to the full satisfaction of INDOT authorized presentative. Contractor shall fully inform himself of all quirements of INDOT as they pertain to Project and shall conduct all work accordingly.
- All equipment used by Contractor on Subscriber's property and C. rights-of-way may be inspected by Subscriber and shall not be used if considered unsatisfactory by Subscriber. Contractor shall be fully responsible for all damages arising from
- his failure to comply with all applicable regulations and the requirements of these specifications. Where the pressure sewer is shown to be constructed parallel and
- close to any existing utility line, the exact location of which is not shown. Engineer will shift the location of the new pressure sewe where possible, to avoid interference with existing utility lines Should such interference develop during construction, no additional compensation will be allowed for shifting of the pressure sewer main to avoid such interference other than unit pressure sewer main to avoid such interference other than unit prices provided in Contract for quantity of items installed. Force Mains shall be laid 10 feet horizontally from any existing or proposed water line, measured edge to edge. Force Mains shall be
- laid to provide a minimum vertical distance of 18 inches between the outside of water main and outside of sanitary sewer
- Contractor shall be responsible for contacting all property owne regarding the location of all existing service lines, water wells, septic tanks, etc. and for contacting all utilities for determination of

the location of all existing underground lines, cables, pipes, valves, vaults, etc. Contractor shall be responsible for restoring existing tions damaged during installation of the new pressure sewer main.

HDPE Connections & Thrust Blocking

- Connections from plain end HDPE pipe to other pipe materials or mechanical joint fittings shall be properly restrained by the following method: 1. If HDPE pipe transitions to a gasket pipe joint product. Contractor
- shall restrain the gasket pipe joint with the recommended joint restrainer a minimum of three joints immediately after the transition.
- 2. Approved polyethylene joint adapters such as Harvey couplings shall be used by fusing the joint adapter to the HDPE carrier pipe and restraining it to transitions by methods specified above. A polyethylene thrust anchor fitting such as a branch saddle or thrust anchor manufactured by Central Plastics Inc. shall also be attached to the outside diameter of the HDPE carrier by butt fusion r electrofusion. The area shall be encased in concrete not more than five (5) feet before the transition and as indicated in the

Contract drawings

- Directional Drilling Operation Contractor shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the borehole shall be consistently maintained throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits. Contractor is responsible for acquiring all permits. The entire drill path shall be accurately surveyed by Contractor with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If Contractor is using a magnetic guidance system, drill path shall be surveyed for any
- urface geo-magnetic variations or anomalies. Contractor shall place silt fence between all drilling operations and any drainage, well-fields, wetlands, waterways, or other area designated for such protection if required by documents, state, federal, and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental egulations. Fuel may not be stored in bulk containers within 200 eet of any water body or wetland.
- Readings shall be recorded after advancement of each successive drill pipe (no more than 10') and the readings plotted on a scaled drawing of $1^{\prime\prime} = 2^{\prime}$ vertical and $1^{\prime\prime} = 20^{\prime}$ borizontal. Access to all recorded readings and plan and profile information shall be made available to Engineer and Subscriber at all times. At no time shall the deflection radius of the drill pipe exceed the deflection limits of
- he carrier pipe as specified herein A complete list of all drilling fluid additives and mixtures to be used in the directional operation will be submitted to Engineer, along with their respective Safety Data Sheets. All drilling fluids and loose cuttings shall be contained in nits or holding tanks for cycling or disposal, no fluids shall be allowed to enter any unapproved areas or natural waterways. Upon completion of the directional drill project, the drilling mud and cuttings shall be disposed of by Contractor at an approved dumpsite. The pilot hole shall be drilled on bore path with no deviati

set of "as-built" records shall be submitted in duplicate to

eports as recorded during the drilling operation.

Engineer. These records shall include copies of the pilot bore path plan and profile record drawing, as well as directional survey

opening or enlarging phase of the installation shall begin. The bore hole diameter shall be increased to accommodate the pullback

Upon approval of the pilot hole location by Engineer, the hole

operation of the required size of carrier pipe. The type of hole

letermined by the types of subsurface soil conditions that have tered during the pilot hole drilling operation.

Contractor shall select the proper reamer type with the final hole

diameter pipe system component to be installed in the bore hole. The open bore hole shall be stabilized by means of bentonite

drilling slurry pumped through the inside diameter of the drill rod and through openings in the reamer. The drillings slurry must be in

a homogenous/flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. The volume of bentonite mud required for each pullback shall be

calculated based on soil conditions, largest diameter of the pipe

vstem component, capacity of the bentonite mud pump, and th

speed of pullback as recommended by the bentonite drilling fluid manufacturer. The bentonite slurry is to be contained at the exit

or entry side of the directional bore in pits or holding tanks. The

slurry may be recycled at this time for reuse in the hole opening

anufacturer's specifications. The gaskets and the ends of pipe

must be inspected and cleaned with a wet cloth prior to each joint assembly so they are free of any dirt or sand. The pipe must be

attached to the pulling head on the lead stick of pipe which in turr will be attached to a swivel on the end of the drill pipe. This will

peration or shall be hauled by Contractor to an approved

free of any chips, scratches, or scrapes. A pulling eve will be

The pipe sections shall be joined together according to

dumpsite for proper disposal.

opener or back reamer to be utilized in this phase shall be

opening being a maximum of 1.5 times the largest outside

- greater than 80% the pipe diameter for force mains and 25% for gravity sewers, over the length of the bore unless previously greed to by Engineer. If pilot does deviate from the bore path more than above tolerances, Contractor will notify Engineer. Engineer may require Contractor to pull-back and re-drill from the location along bore path before the deviation. In the event of a drilling fluid fracture, inadvertent returns, or returns loss during pilot hole drilling operations, Contractor shall cease drilling, wait 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 continue Contractor will discuss additional options with Engineer and work will then proceed as agreed. Upon completion of pilot hole phase of the operation, a complete
 - - Surface restoration shall be completed is accordance with the requirements of the Workmanship & Materials and Detailed specifications or permits to a condition as good as or better than isting prior to constructio

 - operation. Contractor shall furnish to Engineer. "as-built" plan and profile drawings based on these recordings showing the actual ocation horizontally and vertically of the installation, and all utility facilities found during the installation. Guidance data shall be certified accurate by Contractor to the capability of the guidance
 - "As-built" drawings shall be completed and mapped at Contractor's expense in a form as required by Engineer, including
 - signed plans, and electronic data files if available

allow for a straight, smooth pull of the product pipe as it enters and passes through the borehole toward the drill rig and origina entrance hole of the directional bore. The product pipe shall be elevated to the approximate angle of entry and supported by means of a side boom with roller arm, or similar equipment, to allow for the "free stress" situation as the nine is pulled into the exit hole toward the drill rig. The product pullback phase of the directional operation shall be carried out in a continuous manne until the pipe reaches the original entry side of the bore.

5.04

5.05

- Pipe Handling Care shall be taken during transportation of the pipe so it will not be cut, kinked, or otherwise damaged.
- Ropes, fabrics, or rubber protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe and fittings shall not be ropped into rocky or unprepared ground. Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects that could damage the pipe. Stacking the pipe
- shall be limited to a height that will not cause excessive deformation of the bottom layers of pipe under anticipated emperature conditions. Where necessary, due to ground conditions, pipe shall be stored on wooden sleepers, spaced suitably and of such width to prevent deformation of the pipe at the point of contact with the sleeper or between supports. Handling of the assembled pipeline shall be in a manner that pipe is not damaged by dragging it over sharp and cutting objects. Slings for handling the pipeline shall not be positioned at pipe
- ioints. Sections of the pipes with cuts and gouges or excessiv rmation shall be removed and replaced **Testing Pipe**
- Cleaning and flushing are to be done by Contractor to obtain a clear and debris free product. Only potable water shall be used for flushing and pressure testing. Directional drilling pipe shall be tested by Contractor after
- pullback. Average pressure shall be maintained at 100 psi for eight (8) hours. 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 Engineer at no additional expense to Engineer. Pipe manufacturer's recommendations on pipe stretch allowances,
- bending radius, tensile strength, allowable test leakage, and magnitude and duration of test pressure shall be observed. ipeline shall be tested end to end.
- Il new service lines connected to the new main, and installed with new pipe, shall be pressure tested along with the newly installed
- Pressure testing shall not be required for the drilled pipe if the pipe ntended to be used as a casing for a finished product pip

5.06 Tracer Wire

- All mainline and service line pressure sewers shall be provided with two (2) continuous type TW insulated #10 solid tracer wires. The wire shall be installed along the pipe, fastened to the pipe at 20 ft. intervals and terminating above ground with the lead taped round each structure.
- The wire shall be brought to ground level every 400 feet through a vinyl coated aluminum riser pipe with cap and/or at all line valve boxes. All lateral tracer wire connections shall be soldered and a 3M Scotchcast Electrical Insulating Resin 4 Size A epoxy seale packet to be used at ALL spliced locations. The riser pipe and cap shall not be placed in areas which are subject to vehicular traffic. The tracer wire shall be capable of, and demonstrated to be. continuous transmission of tracing signal along the full length of pressure sewer and laterals. A minimum of two (2) wires shall be installed with pressure sewer
- mains and laterals to ensure a continuous line is available.

5.07 Site Rest

5.08

Following drilling operations, Contractor will de-mobilize equipment and restore work site to original conditions or better All excavations will be backfilled and compacted according to the

Record Keeping and As-Builts

- Contractor shall maintain a daily project log of drilling operation and a guidance system log with a copy given to Engineer at completion of project.
- Guidance system data shall be recorded during the actual crossing

