

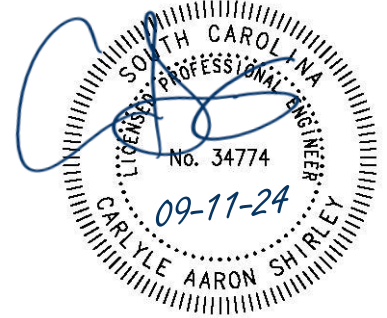
ADDENDUM NO. 1

September 11, 2024

Project: Due West Water System Upgrades
Donalds-Due West Water & Sewer Authority
D&S Project No. 21053

From: Dunn & Shirley, LLC
105 W. Pickens Street
Abbeville, SC 29620

To: Bidders & Plan Holders
[Via email distribution]



This Addendum forms a part of the Project Manual and modifies the original documents “Issued for Bids August 16, 2024” as described below. Bidders should acknowledge receipt of the Addendum in the space provided on the Bid Form (*Section 00 41 43*). Failure to do so may subject the Bidder to disqualification.

This Addendum contains nine (9) pages, inclusive.

1. Section 33 05 07.13 – Horizontal Directional Drilling of Ductile Iron Pressure Mains

Insert the attached specification into the Project Manual where indicated on the Table of Contents. The section was inadvertently left out of the original documents.

Attachments:

Section 33 05 07.13 – Horizontal Directional Drilling of Ductile Iron Pressure Mains

[End of Addendum No. 1 Text]

SECTION 33 05 07.13

HORIZONTAL DIRECTIONAL DRILLING OF DUCTILE IRON PRESSURE MAINS

PART 1 - GENERAL

1.1 SUMMARY

- A. Scope of Work: Furnish and install underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring for pressure pipe. This Work shall include all piping services, equipment, materials, and labor for the complete and proper installation testing, restoration of underground utilities, and environmental protection and restoration. This specification is intended for HDD of Ductile Iron (DIP) Pressure Mains
- B. Related Requirements:
 - 1. Section 31 10 00 "Site Clearing"
 - 2. Section 31 20 00 "Earth Moving"
 - 3. Section 33 14 00 "Water Utility Distribution"
 - 4. Section 33 30 00 "Sanitary Sewerage"
 - 5. Section 33 31 23 "Sanitary Sewerage Force Main Piping"
 - 6. Section 33 31 26 "Sanitary Pressure Sewer Piping"

1.2 QUALITY ASSURANCE

A. Qualifications

- 1. Provide at least ten (10) project references performed in the last five (5) years for the operator and project manager or supervisor that they were directly involved in completing. This reference list shall include the project's description, location, owner and contact information, quantity, size and type of pipe installed by HDD.
- 2. The Contractor's operations shall be in conformance with the Directional Crossing Contractors Association (DCCA) published guidelines (latest edition) and pipe manufacturer's guidelines and recommendations.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. The following standards contain provisions that, through reference in this text, constitute provisions of these guidelines. All standards are subject to revision, and users of these guidelines are cautioned to use the latest revisions.
 - 1. ANSI/AWWA C150/A21.50 – American National Standard for the Thickness Design of Ductile-Iron Pipe
 - 2. ANSI/AWWA C151/A21.51 – American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
 - 3. ANSI/AWWA C111/A21.11 – American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

4. ANSI/AWWA C104/A21.4 – American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
5. ASTM A746 - Ductile Iron Gravity Sewer Pipe
6. ASTM A716 – Standard Specification for Ductile Iron Culvert Pipe
7. ANSI/AWWA C105/A21.5 – American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
8. ANSI/AWWA C110/A21.10 – American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
9. ANSI/AWWA C153/A21.53 – American National Standard for Ductile-Iron Compact Fittings 3-inch through 24-inch and 54-inch through 64-inch, for Water Service
10. ANSI/AWWA C600 – AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances
11. ISO 8179-1 “Ductile iron pipes – External zinc-based coating – Part 1: Metallic zinc with finishing layer. Second edition 2004-06-01.”

1.4 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
 1. General: Prior to the start of drilling, reaming, and pipe placement operations, the Contractor shall properly locate and identify all existing utilities in proximity to the pipeline alignment. The Contractor shall confirm the alignment of all critical utilities, by pot-holing/day-lighting using vacuum excavation or other suitable excavation method, for further detailed confirmations as necessary.
 2. Equipment. Provide the description of the HDD equipment proposed for use on the project including the thrust and torque capacities.
 3. Operator Experience. Provide project references for the operator and project manager or supervisor that they were directly involved in completing. This reference list shall include the project’s description, location, owner and contact information, quantity, size and type of pipe installed by HDD.
 4. Drilling Plan. The drilling plan shall provide a detail of the planned drilled borepath and the method for monitoring and controlling the speed, line, grade, and rate of fluids delivery. It shall include the sequence, size and description of each reamer and the capabilities of each through various geologic formations. The HDD contractor or sub-contractor (Contractor) must maintain the alignment and minimum radii as detailed on the plan sheets. Any drill plan should include a final swabbing of the borepath prior to pipe pullback. Unless approved by the Engineer prior to the start of drilling operations, pipe pullback of the new Flex-Ring® joint pipe without prior swabbing of the borepath to the finished borepath inside diameter will not be permitted.
 - a. Estimated Pullback Thrust. The Contractor shall submit to the Engineer an estimate of the anticipated pullback thrust that will be required to install the new Flex-Ring® pipe. Calculation for pull loads shall be calculated using the Dorwart Method for Ductile Iron Pipe, see appendix A. This estimate shall include the calculated buoyant force or buoyant weight of the new pipe and any proposed method for counter-weighting the pipe during pullback.

5. Drilling Fluids Management. A fluids management plan shall be submitted to the Engineer for review. This plan shall include the proposed mix design for each specific geological strata or formation anticipated during drilling of the borepath, an estimate of quantities, delivery volume and pressure for each and the proposed method for monitoring. This plan shall also include details of the drilling fluid / soil slurry solids separation, recycling or disposal plan that will describe the equipment and capacities for separation and recirculation. If direct vacuum excavation of the slurry is selected the disposal site shall be identified and copies of all required permits shall be presented to the Engineer for approval. The Contractor shall submit a written plan that details the estimated quantity of slurry to be vacuum excavated and provide substantiation that there is sufficient equipment to adequately pump or shuttle the slurry to and from the disposal site(s) as required to maintain a near continuous drilling and pipe pull-back.
6. Inadvertent surface discharge of drilling fluid (Frac-out). The Contractor shall submit to the Engineer a plan for a quick response team to address inadvertent fluid discharges to the surface (frac-outs).
7. Equipment and Expertise: The Contractor should have equipment and expertise, appropriate for horizontal directional drilling installations of the size and scope of the project covered by this document. This includes the preparation and maintenance of the borepath using drilling fluids appropriate for the geology of the soils. The Contractor should also have experience in safely and dependably installing, in similar geology, similar size and length of piping involved.
8. Safety Plan. The Contractor shall be responsible for securing a safe worksite that meets all Federal, State, and Local government codes.

PART 2 - PRODUCTS

1.1 GENERAL

- A. Ductile iron pipe used for directional drilling shall meet all requirements of ANSI/AWWA C151/ A21.51. Unless otherwise specified pipe shall be lined with cement mortar per ANSI/AWWA C104/ A21.4, with all operations completed in a single facility by one manufacturer. Pipe shall be AMERICAN Flex-Ring® or approved equal.
- B. Pipe Joints - General. Joints used for directional drilling shall be boltless, flexible restrained, with smooth contoured bells and shall have the minimum properties as shown in Table no.1. Joints with bulky glands or flanges that may prevent the smooth flow of the drilling fluid/soil slurry over the joint are not acceptable. Pipe shall be AMERICAN Flex-Ring® or approved equal.
 1. Pipe Joints – Rock. Joints used for directional drilling through rock shall be AMERICAN Flex-Ring®.
 2. Pressure and Thrust (Pulling). Joint seals and Flex-Ring® joint pipe used for HDD, when properly assembled and installed, shall be capable of dependably handling the specified internal pressure and pulling loads, in straight alignment or at maximum rated joint deflection. Maximum internal pressure and allowable pulling loads for all sizes are provided in Table 1; please contact AMERICAN for any application requiring capabilities greater than those shown.

3. Proof-of-Design Tests: When requested by the Engineer, the manufacturer shall provide representative proof-of-design tests for each size and type of flexible restrained joint pipe used. These tests shall establish the basis for the maximum allowable pulling loads shown in Table 1. Proof-of-design tests for the pulling heads shall also be made available to the Engineer.
4. External Loads and Buckling. In cases where the borepath alignment is at an extreme depth or if the Contractor anticipates high pumping pressures particularly for larger sizes of pipes, the Contractor shall consult the pipe Manufacturer to assure that the buckling strength of the pipe has been properly evaluated.
5. Linings and Coating - See Reference Specifications
 - a. Special Linings -See Reference Specifications
 - b. Pipe Weight – Net Unit Buoyancy Pipe buoyant force or buoyant weight required in the discussion on “Estimated Pullback Thrust” shall be calculated based on the density of drilling fluid(s) to be used. Any counter-weight placed inside the pipe shall be free from any dirt, grease, oil, or other contaminants that may prevent proper disinfection for waterlines.

Table 1 - Flex-Ring Dimensions and Other Parameters

Nominal Pipe Size (in.)	Maximum Working Pressure ¹ (psi)	Pipe Barrel O.D. (in.)	Pipe Bell Outside Diameter (in.)	Unit Weight Lined PC 350 Pipe (lb/ft)	Bulk Density of Empty Pipe (lb/ft ³)	Net Unit Buoyancy ² , Empty Pipe in Water (lb/ft)	Allowable Pulling Loads ³ (lbs)	Allowable Deflection (Deg.)
4	350	4.80	7.06	13	100	Minus 5	10,000	5
6	350	6.90	9.19	18	69	Minus 2	20,000	5
8	350	9.05	11.33	25	55	3	30,000	5
10	350	11.10	13.56	31	46	11	45,000	5
12	350	13.20	15.74	40	42	19	70,000	5
14	350	15.30	19.31	53	41	27	75,000	4
16	350	17.40	21.43	65	40	38	95,000	3.75
18	350	19.50	23.70	78	37	52	120,000	3.75
20	350	21.60	25.82	90	35	69	150,000	3.5
24	350	25.80	29.88	122	34	104	210,000	3

1. Working pressure is the maximum pressure rating of the joint and is based on its capability to resist thrust due to internal pressure. If higher working pressure is required, check AMERICAN. Pressure rating of the joint is limited by the pressure rating of the parent pipe.
2. Based on weight of empty (full of air) Pressure Class 350 Flex-Ring pipe with standard cement lining immersed in water.
3. Allowable pulling loads are based on pressure class 350 for all sizes.

- C. Entry and Exit Angles. The entry angle of the drill string shall range from 8 degrees to 20 degrees. Exit angles for the drill string shall take into consideration the allowable deflection (reference Table 1) and the method of installation proposed for the new Flex-Ring®, flexible restrained joint ductile iron pipe, (see HDD Installation Methods). The Contractor shall submit a detailed plan showing the connection between the HDD installed piping and the next section of pipeline.

- D. Minimum Radius of curvature. The Contractor shall maintain the borepath alignment and a minimum radius equal to 100-feet per inch of nominal diameter, using 20-foot joint lengths radii that are indicated on the project drawings. Any alternate designs must be submitted to the Engineer for approval prior to commencement of drilling operations.
- E. Borepath inside diameter. The finished inside diameter of the borepath shall be nominally 1.5 times the outside diameter of the Flex-Ring bell (see Table 1) for pipe sizes 4-inch through 24-inch. The inside diameter of the borepath for pipe sizes 30-inch through 48-inch shall be equal to the outside diameter of the Flex-Ring bell (see Table 1) plus 12-inches. To assure proper borepath size and integrity, the borepath shall be swabbed prior to final pipe pullback.
- F. External Protection.
 - 1. Polyethylene Encasement (if required)
 - a. See Reference Specifications and follow Mfg. recommendations
 - 1. Section 33 14 00 "Water Utility Distribution"
 - 2. Section 33 31 23 "Sanitary Sewerage Force Main Piping"
 - 2. Joint Bonding-See Reference Specifications (if required)
 - a. See Reference Specifications and follow Mfg. recommendations
 - 1. Section 33 14 00 "Water Utility Distribution"
 - 2. Section 33 31 23 "Sanitary Sewerage Force Main Piping"
- G. Reference Specifications
 - 1. Fittings and Restraint shall be in accordance with the applicable sections of specifications:
 - a. Section 33 14 00 "Water Utility Distribution"
 - b. Section 33 31 23 "Sanitary Sewerage Force Main Piping"

1.2 UNDERGROUND PIPE MARKERS

- A. Tracing wire and tracing tape shall be in accordance with the applicable sections of specifications:
 - 1. Section 33 14 00 "Water Utility Distribution"
 - 2. Section 33 31 23 "Sanitary Sewerage Force Main Piping"
- B. A minimum of 3 locating wires shall be attached with nylon wire ties at different radial locations around the pipe to ensure continuity in at least 1 wire subsequent to installation. Contractor shall be required to provide as many wires as necessary to maintain continuity throughout the length of the directional bore. Failure of continuous continuity in the locating wire shall result in abandonment and reinstallation of the directional drill, at the discretion of the Engineer.

PART 3 - EXECUTION

1.3 INSTALLATION

- A. The Contractor and Subcontractor(s) shall have sufficient number of competent workers on the Project at all times to ensure the utility placement is made in a timely, satisfactory manner. Adequate personnel for carrying out all phases of the directional drilling operation (where applicable: tunneling system operators, operator for removing spoil material, and laborers as necessary for various related tasks) must be on the job site at the beginning of Work. A competent and experienced supervisor representing the Contractor or Subcontractor that 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 project site during the directional drilling operation.
- B. Cartridge Assembly (*Option 1*). Cartridge assembly option shall be defined by the assembly of individual sections of Flex-Ring®, flexible restrained joint ductile iron pipe in a secured entry and assembly pit. The pipe sections are assembled individually and then progressively pulled into the borepath a distance equivalent to a single pipe section. This assembly-pull process is repeated for each pipe length until the entire line is pulled through the borepath to the exit point. At all times prior to the pipe entering the borepath the Contractor shall monitor the pipe to assure that the allowable joint deflection, as shown in Table 1, is not exceeded. When polyethylene encasement is required, the Contractor shall repair any damage to the wrap prior to the pipe section entering the borepath.
- C. Assembled-Line (*Option 2*). Assembled-line option shall be defined by the pre-assembly of multiple pieces of Flex-Ring®, flexible restrained joint ductile iron pipe, with subsequent pulling installation into the borepath as one continuous pipe string. With this option the Contractor shall provide an entry ramp to the entrance of the borepath. The ramp should be of sufficient length and grade such that no pipe joint exceeds the allowable joint deflection as shown in Table 1, at any point prior to the pipe string entering the properly designed and prepared borepath. The Contractor shall be responsible for providing the necessary equipment or ground surface preparation to allow the pipe to be pulled back along the surface prior to the entry ramp and borepath. If polyethylene encasement is required, the contractor shall provide a sufficient number of pipe rollers such that the pipe is supported every 20- feet for the entire length of the assembled pipe length. At all times prior to the pipe entering the borepath the Contractor shall monitor the pipe to assure that the allowable joint deflection, as shown in Table 1, is not exceeded. When polyethylene encasement is required the Contractor shall repair any damage to the wrap prior to the pipe section entering the borepath.
- D. Pulling Head Assemblies. Pulling head assembly for ductile iron pipe shall be designed and furnished by American Ductile Iron Pipe. The pulling bell shall be a boltless, glandless, flexible restrained joint that will allow for the smooth flow of the drilling fluid/soil slurry over the joint and must also have the same performance characteristics as the pipe to which it is connecting. They shall also be fabricated with filling/testing ports, of appropriate size, for testing of the pipe after it is pulled through the borepath. For pipe that is installed using the Assembled Line method the pulling bell may also be used to test the pipe prior to pull back.
- E. Joint Assembly. The Contractor shall be responsible for the proper assembly of all pipe and appurtenances in accordance with the Manufacturers written procedure and as supplemented by these guidelines. Prior to joint assembly all joints and joint components shall be thoroughly cleaned and examined to assure proper assembly and performance. In the event that the Contractor is not experienced with the assembly of the type of flexible restrained joint being used, it shall be the responsibility of the Contractor to contact a factory-trained representative

for recommendations on the proper and efficient installation of the joint.

- F. Erosion and sedimentation control measures and on-site containers shall be installed to prevent drilling mud from spilling out of entry and/or exit pits. Drilling mud shall be disposed of off-site in accordance with local, state, and federal requirements and/or permit conditions.
 - 1. No other chemicals or polymer surfactant shall be used in the drilling fluid without written consent of the Engineer and after a determination is made that the chemicals to be added are not harmful or corrosive to the facility and are environmentally safe.
- G. Pilot Hole: Pilot hole shall be drilled on borepath with no deviations greater than 2% of depth over a length of 100-feet. In the event that pilot does deviate from borepath more than 2% of depth in 100-feet, the Contractor shall notify the Engineer. The Engineer may require the Contractor to pullback and re-drill from the location along borepath before the deviation.
- H. As-built variance from the designed borepath shall not exceed \pm (plus or minus) 1-foot in the vertical plane and \pm 2-feet in the horizontal plane. The Contractor shall submit any proposed deviations from the design borepath with Shop Drawings.
- I. The pipe entry area shall be graded to provide support for the pipe to allow free movement into the borehole. The pipe shall be guided in the borehole to avoid deformation of, or damage to, the pipe.
- J. If unexpected subsurface conditions are encountered during the bore, the procedure shall be stopped. The installation shall not continue until the Engineer has been consulted.
- K. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.
- L. A boring log shall be kept with horizontal and vertical location every 10-feet. The horizontal location of the bore shall be marked in the field during the bore. The Surveyor shall locate these marks and include this information with the bore depths in the Record Drawings. The Surveyor may make a note on the drawing page containing the directional drill and provide an exception for the directional drill only, as the directional drill route cannot be uncovered and physically located.
- M. Correct location of all underground utilities that may impact the HDD installation is the responsibility of the Contractor, regardless of any locations shown on the drawings or previous surveys completed.
- N. Utility location and notification services shall be contacted by the Contractor prior to the start of construction.
- O. All existing lines and underground utilities shall be positively identified, including exposing those facilities that are located within an envelope of possible impact of HDD installation as determined for the project specific site conditions. It is the Contractor and HDD system operator's responsibility to determine this envelope of safe offset from existing utilities. This will include, but is not limited to, soil conditions and layering, utility proximity and material, HDD system and equipment, and foreign subsurface material.

1.4 COORDINATION OF THE WORK

- A. The Contractor shall notify the Engineer at least 3-days in advance of starting Work. In addition, the actual bore operation shall not begin until the Engineer is present at the project site and agrees that proper preparations for the bore have been made. The Engineer's approval for beginning the bore shall in no way relieve the Contractor from the ultimate responsibility for the completion of the Work.
- B. The Contractor and the Engineer shall select a mutually convenient time for the bore operation to begin in order to avoid schedule conflicts.
- C. The installation of appropriate safety and warning devices shall be completed prior to beginning Work.

1.5 FIELD TESTING

- A. Hydrostatic testing shall be in accordance with the applicable portions of:
 - 1. Specification 33 14 00 – “Water Utility Distribution”
 - 2. Specification 33 31 23 – “Sanitary Sewerage Force Main Piping”
- B. Intermediate Testing
 - 1. Segments of the pipe may be tested separately in accordance with standard testing procedure, as approved by the owner and engineer. Testing of each HDD installation prior to connection to the system or other piping is preferred.
- C. Disinfection of Potable Water Piping
 - 1. Disinfection shall be in accordance with the applicable portions of Specification 33 14 00 – “Water Utility Distribution”

END OF SECTION 33 05 07.13