

SECTION 02270

AUGERING WATER PIPE AND CONDUIT

PART I: GENERAL

1.1 GENERAL REQUIRMENTS

- A. Installing water line service pipe by methods of augering or casing by jacking and boring.
- B. Installing Telecommunication Conduit along or under Public Ways

1.2 MEASUREMENT AND PAYMENT

- A. Unit Prices:
 - 1. No separate payment will be made for augering pipe for water lines under this Section. Include payment in the unit price for Section 02400 – Water Lines.
 - 2. When open-cut construction is requested by the Contractor for his convenience in areas designated for augering and when approved in advance by the Project Manager, such areas shall be paid for at the unit price for Section 02400 – Water Lines.
 - 3. Refer to Section 01270 – Measurement and Payment for unit price procedures.
- B. Stipulated Price (Lump Sum):
 - 1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 DEFINITIONS

- A. Auger Method: Installation of steel casing by excavating soil at advancing end of casing and transporting spoil through casing by otherwise uncased auger, while advancing casing by jacking at same rate as auger excavation progresses.
- B. Slurry Auger Method: Installation of casing or pipe by first drilling small diameter pilot hole from pit to pit, followed by removing excess soil and installing pipe or conduit by pull-back or jacking method.

1.4 REFERENCE STANDARDS

- A. ASTM – American Society for Testing and Materials.
 - 1. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
 - 2. ASTM D648 – Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position.
 - 3. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
 - 4. ASTM D790 – Standard Test Method for Flexural Properties of

Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

- B. CFTS – City of Friendswood Technical Specifications.

1.5 REGULATORY REQUIREMENTS

- A. Conform to Texas Department of Transportation (TxDOT) for installations under state highways. The City shall obtain required permits for State Highway crossings on behalf of the contractor.

- B. Installations Under Railroads:

1. The City shall obtain required permits for Railroad crossings, from affected railroad companies, on behalf of the Contractor.
2. Comply with requirements of right-of-entry for crossing Railroad Company's easement or right-of-way from railroad companies affected. Comply with railroad permit requirements.
3. Use dry auger method only.
4. Damages due to delays caused by railroad requesting work to be done at hours which shall not inconvenience railroad shall be at no additional cost to the City.
5. Maintain a minimum of thirty-five foot (35 Ft) clearance from centerline of tracks, to the closest edge of the bore pit, but in any case outside of the right-of-way unless otherwise permitted by the railroad.
6. At no time shall any equipment, excavations or materials be closer than thirty-five feet (35 Ft) from the centerline of tracks.

1.6 SUBMITTALS

- A. Conform to requirements of Section 01330 – Submittal Procedures.

- B. For installation by augering, submit for review:

1. Description of mechanized excavating equipment.
2. Method of controlling line and grade.
3. Grouting techniques to be used for filling annular void between water line pipe and casing, and void between water line pipe or casing and ground, including equipment, pumping and injection procedures, pressure grout types, and mixes.
4. Locations and dimensions of pits.
5. Pit design and construction drawings.
6. Identification of casings required and paid under Contract and casings installed at the Contractor's option.
7. Design of casings.
8. Copy of railroad company permits and right-of-entry.

- C. Prepare auger pit and casing design submittals that are site specific. Have auger pit and casing design submittals signed and sealed by a Professional Engineer licensed by State of Texas.

- D. Include in construction phase submittals:

1. Daily logs of augering and boring operations

2. Settlement monitoring data to meet requirements of paragraph 3.11, Settlement Monitoring.
3. Submit daily logs and settlement monitoring data within five days (5 D) after day of observation

1.7 CRITERIA FOR CASING INSTALLATION LOADS

- A. The Contractor shall be responsible for selection of casing, pipe and pipe joints to carry anticipated thrust of jacks or loads.

PART II: PRODUCTS

2.1 MATERIALS

- A. Piping and Fittings: As required by the Technical Specifications or the Drawings.
- B. Casings: Where shown on the Drawings, in accordance with Section 02250 – Steel Pipe and Fittings.
- C. Casing Spacers: Where casings are shown on the Drawings, use casing spacer width eight inches (8 In) for pipe sizes four inches (4 In) to twelve inches (12 In); twelve inches (12 In) for pipe sizes fourteen inches (14 In) and larger. Wood skids or concrete "donuts" are not acceptable.
 1. For welded steel pipe twelve inches (12 In) and smaller, use Pipeline Seal & Insulator Model PE or approved equal.
 2. For other pipe materials, use Pipeline Seal & Insulator Model C8G-2 or approved equal for pipe sizes up to twelve inches (12 In).
 3. For all pipe sizes above twelve inches (12 In), use Pipeline Seal & Insulator Model C12G-2 or approved equal.
 4. Obtain approval for equal product in writing from the Project Manager prior to bid.
 5. Use ISO-9002 registered casing spacer manufacturer or supplier. Submit copy of current certificate with submittal package.
- D. Casing End Seals: Provide Pipeline Seal and Insulator Model C or approved equal.
- E. Casing Spacers (For Pipes Diameters sixteen inches (16 In) or Greater): Bolt-on style with shell made of two (2) sections of fourteen (14) gauge carbon steel, hot rolled, cleaned and lined with PVC liner, ninety thousandths inch (0.090 In) thick with Durometer A 85-90 overlapping edges to secure liner to spacer; deep embossed flanges for added strength; coated prior to installation of liner and runner with fusion-bonded PVC powder of fourteen (14) mils to twenty (20) mils thickness; electroplated studs, nuts and washers.
 1. Runners [For Pipe Diameters sixteen inches (16 In) or Greater]: Supported by ten (10) gauge carbon steel MIG risers welded to shell. Total length of weld beads shall be at least fifty percent

(50%) of the length of the runner. Fill bolt holes with caulk or approved equal to provide a water-tight seal. Minimum requirements: Glass reinforced plastic conforming to the following tests:

- a. Tensile Strength: ASTM D638; Seventeen thousand six hundred pounds per square inch (17600 psi).
- b. Flexural Strength: ASTM D790; Twenty-Five thousand three hundred pounds per square inch (25300 psi).
- c. Compression Strength: ASTM D695; Eighteen thousand pounds per square inch (18000 psi).
- d. Deflection Temperature at two hundred sixty-four pounds per square inch (264 psi): ASTM D648; Four hundred five degrees Fahrenheit (405° F).
- e. Polyethylene runners are not acceptable.

PART III: EXECUTION

3.1 LIMITS ON AUGER LENGTH WITHOUT CASING

- A. Do not exceed one hundred feet (100 Ft) for length of auger hole without receiving pit.
- B. Do not exceed seventy-five feet (75 Ft) for length of auger hole for PVC pipe twelve inches (12 In) and less in diameter without receiving pit.
- C. Do not exceed forty feet (40 Ft) for length of auger hole for PVC pipe fourteen inches (14 In) to twenty-four inches (24 In) in diameter without receiving pit.
- D. Specifications in this paragraph that are in conflict with permit requirements, the permit requirements shall supersede all Technical Specifications. As such this may require substitution of other materials.

3.2 PREPARATION

- A. Conform to applicable provisions of Section 02100 – Clearing and Grubbing.
- B. Utility Relocations: Relocate utility lines clear of pit and zone of potential significant settlement or other ground disturbance.
- C. Install casings as required by the Drawings, in accordance with this Section.
- D. Install temporary solid plug at open end of water line to prevent contamination.

3.3 TRAFFIC CONTROL

- A. Conform to applicable provisions of Section 01555 – Traffic Control and Regulation.
- B. Secure right-of-entry for crossing Railroad Company's easement or right-of-way.
- C. During construction operations, furnish and maintain barricades and

lights to safeguard traffic and pedestrians, until such time as backfill has been completed and removed from site. Provide additional barricades and lights as directed by the Project Manager.

3.4 LOCATION AND SIZE OF AUGER PITS

- A. Show location of auger pits on auger pit construction drawings. Locate auger pits for slurry boring so that distance between pits is no greater than eighty feet (80 Ft); and for dry augering not more than one hundred twenty feet (120 Ft) apart, except where larger distances are required by railroad permits or railroad rights-of-way.
- B. Locate auger pits and associated work areas to avoid blocking driveways and cross streets and to minimize disruption to business and commercial interests. Avoid auger pit locations near areas identified as potentially contaminated.
- C. Pit Size: Size pits to provide adequate room to meet operational requirements for auger construction as well as structures indicated on the Drawings. Provide minimum six inch (6 In) space between pipe and walls of auger pit. Maximum allowable width of pit shall be five feet (5 Ft). Width of pit at surface shall not be less than at bottom. Maximum allowable length of pit shall be no more than five feet (5 Ft) longer than one (1) full section of pipe and shall not exceed twenty-five feet (25 Ft).
- D. Excavate bore pits to finished grade at least six inches (6 In) lower than grade indicated by stakes.
- E. Auger pits that are excavated and backfilled as part of open-cut water line construction shall be in accordance with Section 02125 – Excavation and Backfill for Utilities.
- F. Provide and properly maintain safety protection against traffic and accidental or unauthorized entry. Provisions to include concrete traffic barriers or other suitable barriers around periphery of pit as appropriate. Fully cover and secure pits where no construction activity is in progress.
- G. Install sheeting, lining, shoring and bracing required for protection of workmen and public in accordance with Section 02280 – Trench Safety Systems.
- H. Provide full cover or other security fencing for each access pit in which there is no construction activity or which is unattended by the Contractor's personnel.
- I. Provide groundwater control and drainage from pits while work is in progress and until pit is properly backfilled. Conform to requirements of Section 01585 – Control of Ground and Surface Water.

3.5 AUGERING (BORING)

- A. Auger from approved pit locations. Excavate for pits and install shoring as outlined above under Paragraph 3.4, Pits. Auger mechanically with use of pilot hole entire length of crossing and check for line and grade. Diameter of auger hole not to exceed pipe bell diameter plus two inches (2 In). Place excavated material outside working pit and dispose of as

specified. Use water or other fluids in connection with boring operation only to lubricate cuttings; jetting is not permitted.

- B. In unconsolidated soil formations, gel-forming colloidal drilling fluid may be used. Fluid is to consist of at least ten percent (10%) of high-grade processed bentonite and shall consolidate cuttings of bit, seal walls of hole and shall furnish lubrication for subsequent removal of cuttings and installation of pipe.
- C. Depending on character of soil encountered during augering operation, conduct operations without interruption, insofar as practical, to prevent hole from collapsing or pipe from seizing up in hole before installation is complete.
- D. Allowable variation from line and grade shall be as specified under Paragraph 3.9, Jacking.
- E. Remove and replace pipe damaged in augering operations.

3.6 DRY AUGERING OF CASING

- A. Provide jacks, mounted on frame or against backstop, of capacity suitable for forcing excavating auger and casing through soil conditions to be encountered. Operate jacks so that even pressure is applied to casing.
- B. Provide steerable front section of casing to allow vertical grade adjustments. Provide water level or other means to allow monitoring of grade elevation of auger casing.
- C. Bentonite slurry may be used to lubricate casing during installation. Use of water to facilitate removal of spoil is permitted; however, water jetting for excavation of soil is not allowed when jacking casing.
- D. Tolerances from lines and grades shown on the Drawings for water line pipe installed in casing are plus or minus six inches (± 6 In) in horizontal alignment, and plus or minus one and one-half inches ($\pm 1\text{-}1/2$ In) in elevation.

3.7 SLURRY BORING OF CASING OR PIPE

- A. Drill small diameter pilot hole and check for line and grade at receiving end. Re-drill pilot hole when bored pipe does not meet specified tolerances.
- B. Using pilot hole as guide bore larger diameter hole of sufficient size for pipe or casing installation. Water jetting is not permitted.
- C. Bentonite slurry may be used to maintain stable hole and furnish lubrication for pipe or casing installation.
- D. Tolerances from lines and grades shown on the Drawings for installed water line pipe are plus or minus six inches (± 6 In) in horizontal alignment and plus or minus one and one-half inches ($\pm 1\text{-}1/2$ In) in elevation.
- E. Completely fill annular space between water line pipe and surrounding soil or casing as specified in Paragraph 3.8, Filling Annular Space.

- F. Do not discharge auguring liquid into operating storm sewer system. If water only, pump to adjacent ground area where sediment shall be filtered from the liquid by ground. If auguring liquid is Bentonite slurry, pump to tank or container, and dispose of off-site.

3.8 FILLING ANNULAR SPACE

- A. For installation of water line, block void space around pipe in augered hole with approximately twelve inches (12 In) of packed clay or approved equal material to prevent bedding or backfill from entering void around pipe in augered hole when compacted. For pipe diameters four inches (4 In) through eight inches (8 In) use minimum one-half cubic foot (1/2 Cf) clay; for pipe diameters twelve inches (12 In) through sixteen inches (16 In) use minimum three-quarters cubic foot (3/4 Cf) clay.

3.9 JACKING

- A. Comply with Section 02280 – Trench Safety for all pits, end trenches and other excavations relating to work required by the Technical Specifications. Dewater as required to provide safe working conditions.
- B. Wherever end trenches are cut into sides of embankment or beyond it, sheath securely and brace such work to prevent earth caving.
- C. Make up only one (1) joint at time in pit or trench prior to jacking.
- D. Do not interfere with operation of railroad, street, highway or other facility, nor weaken or damage embankment or structure.
- E. Use heavy-duty jacks sized for forcing casing through embankment. Use appropriate jacking head, usually of timber and bracing between jacks and jacking head and jacking frame or backstop. Apply jacking pressure uniformly around ring of casing. Set casing to be jacked on guides, properly braced together, to support section of casing and to direct it in proper line and grade. Place jacking assembly in line with direction and grade of casing. Excavate embankment material just ahead of casing and remove material through casing. Force casing through embankment with jacks into excavated auger hole.
- F. Conform excavation for underside of casing to contour and grade of casing, for at least one-third (1/3) of circumference of casing. Provide clearance of not more than two inches (2 In) for upper half of casing. Taper off upper clearance to zero (0) at point where excavation conforms to contour of casing.
- G. Excavation may extend beyond end of casing depending on character of material, but shall not exceed two feet (2 Ft). Decrease advance excavation at direction of the Project Manager, when character of material being excavated makes it desirable to keep advance excavation closer to end of casing.
- H. Jack casing from low or downstream end. Lateral or vertical variation in final position of casing from line and grade as shown on the Drawings shall be permitted only to extent of one inch (1 In) in ten feet (10 Ft), provided such variation is regular and only in one (1) direction and that

final grade of flow line is in direction indicated on the Drawings.

- I. Use cutting edge of steel plate around head end of casing extending short distance beyond end of casing with inside angles or lugs to keep cutting edge from slipping back onto casing.
- J. Once jacking of casing is begun, carry on without interruption, insofar as practicable, to prevent casing from becoming firmly set in embankment.
- K. Remove and replace casing damaged in jacking operations.
- L. Backfill pits or trenches excavated to facilitate jacking operations immediately after completion of jacking of casing.
- M. Grout annular space between casing and excavated hole when loss of embankment occurs or when clearance of two inches (2 In) is exceeded. Grout as specified in Section 03105 – Grout.

3.10 SPACER INSTALLATION

- A. There shall be no inadvertent metallic contact between casing and carrier pipe. Place spacers to ensure that carrier pipe is adequately supported throughout length, particularly at ends, to offset settling and possible electrical shorting unless otherwise approved by the Project Manager. Place end spacer within six inches (6 In) of end of casing pipe, regardless of size of casing and carrier pipe or type of spacer used. Spacing between spacers depends largely on load bearing capabilities of pipe coating and flexibility of pipe.
- B. Grade bottom of trench adjacent to each end of casing to provide firm, uniform and continuous support for carrier pipe. When trench requires some backfill to establish final trench bottom grade, place backfill material in six inch (6 In) lifts and compact to density of undisturbed soil.
- C. Install casing spacers in accordance with manufacturer's instructions. Take special care to ensure that sub-components are correctly assembled and evenly tightened and that no damage occurs during tightening of insulators or carrier pipe insertion.
- D. Seal annulus between carrier pipe and casing with casing end seals at each end of casing.
- E. Insulator Spacing:
 - 1. Spacing shall be as shown on Drawing with maximum distance between spacers to be ten feet (10 Ft) for pipe sizes four inches (4 In) to fourteen inches (14 In) and eight feet (8 Ft) for pipe sizes sixteen inches (16 In) to thirty inches (30 In).
 - 2. For ductile iron pipe or bell-and-spigot pipe, install spacers within one foot on each side of bell or flange and one (1) in center of joint when eighteen foot (18 Ft) to twenty foot (20 Ft) long joints are used.
 - 3. If casing or carrier pipe is angled, bent or dented, reduce spacing as directed by the Project Manager. Provide casing with smooth, continuous interior surface.

3.11 SETTLEMENT MONITORING

- A. Monitor ground surface elevation along length of augering operation. Locate and record settlement monitoring points with respect to construction baseline and elevations. Record elevations to accuracy of one hundredth feet (0.01 Ft) for each monitoring point location. Establish monitoring points at locations and by methods that protect them from damage by construction operations, tampering, or other external influences. As minimum, locate survey points as follows:
 - 1. For road crossings: Centerline and each shoulder.
 - 2. Railroads: Track subbase at centerline of each track.
 - 3. Utilities and Pipelines: Directly above and ten feet (10 Ft) before and after utility or pipeline intersection.
 - 4. Long bores under improved areas such as pavements: Ground surface elevations must be recorded on centerline ahead of augering operations at locations not to exceed fifty feet (50 Ft) apart (including points located for roads, railroads, utilities, and pipelines), or at least three (3) locations per augering drive.
- B. Reading Frequency and Reporting. Take settlement survey readings:
 - 1. Prior to auger excavation reaching point.
 - 2. After auger reaches monitoring point in plan.
 - 3. After grouting of ground supporting pipe or casing is complete.
- C. Immediately report to the Project Manager movement, cracking, or settlement which is detected.
- D. Following substantial completion but prior to final completion, make final survey of monitoring points.

3.12 DISPOSAL OF EXCESS MATERIAL

- A. Remove and dispose of spoil from job site in accordance with Section 01580 – Waste Material Disposal.

END OF SECTION