Section 02447

AUGERING PIPE AND CONDUIT

PART 1 G E N E R A L

1.01 SECTION INCLUDES

A. Installing water service pipe by methods of augering or casing by jacking and boring.

B. Installing Telecommunication Conduit along or under Public Ways

1.02 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 unit price for Section 02511 - Water Lines.

2. When open-cut construction is requested by Contractor for his convenience in areas designated for augering, and when approved in advance by City Engineer, such areas shall be paid for at Unit Price for Section 02511 - Water Lines. Payment includes necessary surface restoration and pavement repair.

3. Refer to Section 01270 - Measurement and Payment for unit price procedures.

B. Stipulated Price (Lump Sum). If Contract is Stipulated Price Contract, payment for work in this Section is included in total Stipulated Price.

1.03 DEFINITIONS

A. Dry 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 shaft to shaft, followed by removing excess soil and installing pipe or conduit by pull-back or jacking method.

1.04 REFERENCE STANDARDS

A. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

B. ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

C. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.

D. ASTM D 790 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.05 REGULATORY REQUIREMENTS

A. Conform to TxDOT for installations under state highways. City will obtain required permits for State Highway crossings.

B. Installations Under Railroads:

1. Secure and 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.

2. Use dry auger method only.

3. Damages due to delays caused by railroad requesting work to be done at hours, which will not inconvenience railroad, will be at no additional cost to City.

4. Maintain equipment and excavations minimum 35-foot clearance from centerline of tracks.

1.06 SUBMITTALS

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

B. Submit product data for casing insulators for approval.

C. Prior to commencement of work, furnish for City Engineer's approval, plan showing pit locations, size, depth, and areas for storage, material, and spoil handling. Approval of this plan does not relieve Contractor from responsibility to obtain specified results.

D. Show actual pit locations dimensioned on as-built drawings so that they can be identified in field.

E. Submit copy of executed railroad company rights of entry to City Engineer.

1.07 CRITERIA FOR SELECTION OF MATERIAL

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

PART 2 P R O D U C T S

2.01 MATERIALS

A. Piping and Fittings: As required by Specification or Drawings.

B. Casings: Where shown on Drawings, in accordance with Section 02502 - Steel Pipe and Fittings.

C. Casing Spacers: Where casings are shown on Drawings, use casing spacer width 8 inches for pipe sizes 4 to 14 inches; 12 inches for pipe sizes greater than 16 inches. Wood skids or concrete Adonuts@ are not acceptable.

1. For welded steel pipes 12 inches 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 12 inches.

3. For all pipe sizes above 12 inches, use Pipeline Seal & Insulator Model C12G-2 or approved equal.

4. Obtain approval for equal product in writing from City Engineer 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 16 Inches or Greater): Bolt-on style with shell made of two sections of 14-gauge carbon steel, hot rolled, cleaned, and lined with PVC liner, 0.090 inch 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 14 to 20 mils thickness; electroplated studs, nuts, and washers.

1. Runners (For Pipe Diameters 16 Inches or Greater): Supported by 10-gauge carbon steel MIG risers welded to shell. Total length of weld beads shall be at least 50 percent 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 D 638; 17,600 psi

b. Flexural Strength: ASTM D 790; 25,300 psi

c. Compression Strength: ASTM D 695; 18,000 psi

d. Deflection Temperature at 264 psi: ASTM D 648; 405 F

e. Polyethylene runners are not acceptable

PART 3 E X E C U T I O N

3.01 LIMITS ON AUGER LENGTH

A. Do not exceed 100 feet for length of auger hole without intermediate pit.

B. Do not exceed 75 feet for length of auger hole for PVC pipe 12 inches and less in diameter without intermediate pit.

C. Do not exceed 40 feet for length of auger hole for PVC pipe 14 inches to 24 inches in diameter without intermediate pit.

3.02 PREPARATION

A. Conform to applicable provisions of Section 02233 - 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 Drawings, in accordance with this Section.

D. Install temporary solid plug at open end of water line to prevent contamination.

3.03 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 City Engineer.

3.04 PITS

A. Construct pits on segments of line and within right-of-way. Locate auger pits where there is minimum interference with traffic or access to property. Do not locate pits close to storm drainage channels, ditches, storm water lines, or culverts. Avoid pit locations near potentially contaminated areas.

B. Pit Size: Size pits to provide adequate room to meet operational requirements for auger construction as well as structures indicated on Drawings. Provide minimum 6-inch space between pipe and walls of bore pit. Maximum allowable width of pit shall be 5 feet. Width of pit at surface shall not be less than at bottom. Maximum allowable length of pit shall be no more than 5 feet longer than one full joint of pipe and shall not exceed 25 feet.

C. Excavate bore pits to finished grade at least 6 inches lower than grade indicated by stakes.

D. Backfill in accordance with Section 02317 - Excavation and Backfill for Utilities.

E. Auger pits that are excavated and backfilled as part of open-cut water line construction shall be in accordance with Section 02316 - Excavation and Backfill for Structures and Section 02317 - Excavation and Backfill for Utilities.

F. Provisions for safety protection against traffic, and accidental or unauthorized entry, as specified in Section 02400 - Tunnel Shafts, shall be followed in applicable situations.

G. Install sheeting, lining, shoring, and bracing required for protection of workmen and public in accordance with Section 02260 - Trench Safety Systems.

H. Provide groundwater control and drainage from pits while work is in progress and until pit is properly backfilled. Conform to requirements of Section 01578 - Control of Groundwater and Surface Water.

3.05 AUGERING (BORING)

A. Auger from approved pit locations. Excavate for pits and install shoring as outlined above under Paragraph 3.04, 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 2 inches. 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 10 percent 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 3.07, Jacking.

E. Remove and replace pipe damaged in augering operations.

F. Log horizontal and vertical position of bore hole for every 20 feet of installed conduit.

3.06 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 Drawings for gravity sewer pipe installed in casing are plus or minus 6 inches in horizontal alignment, and plus or minus 1-1/2 inches in elevation.

3.07 FILLING ANNULAR SPACE

A. For installation of water line, block void space around pipe in augered hole with approximately 12 inches 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 4 inches through 8 inches use minimum 2-cubic-foot clay; for pipe diameters 12 inches through 16 inches use minimum: -cubic- foot clay.

3.08 JACKING

A. Comply with Section 02260 - Trench Safety for all pits, end trenches, and other excavations relating to work required by specifications. Dewater as required to provide safe working conditions.

B. If grade of casing at jacking end is below ground surface, excavate pits or trenches for conducting jacking operations and for placing end joints of casing. 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 joint at time in pit or trench prior to jacking.

D. Do not interfere with operation of railroad, street, highway, or other facility, nor to 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 of circumference of casing. Provide clearance of not more than 2 inches for upper half of casing. Taper off upper clearance to zero 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 2 feet. Decrease advance excavation at direction of City Engineer, 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 Drawings will be permitted only to extent of 1 inch in 10 feet, provided such variation is regular and only in one direction and that final grade of flow line is in direction indicated on 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 2 inches is exceeded.

3.09 SPACER INSTALLATION

6. There must 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 City. Place end

spacer within 6 inches 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 6-inch 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 10 feet for pipe sizes 4 to 14 inches and 8 feet for pipe sizes 16 to 30 inches.

2. For ductile iron pipe or bell-and-spigot pipe, install spacers within one foot on each side of bell or flange and one in center of joint when 18- to 20-foot-long joints are used.

3. If casing or carrier pipe is angled, bent, or dented, reduce spacing as directed by City Engineer. Provide casing with smooth, continuous interior surface.

3.10 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 0.01 feet 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 a 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 10 feet 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 50 feet apart (including points located for roads, railroads, utilities, and pipelines), or at least 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 casing is complete

C. Immediately report to City Engineer movement, cracking, or settlement, which is detected.

D. Following substantial completion but prior to final completion, make final survey of monitoring points.

3.11 DISPOSAL OF EXCESS MATERIAL

A. Conform to applicable provisions of Section 01576 - Waste Material Disposal.

END OF SECTION