SECTION 02275
PIPE AND CASING AUGERING FOR SANITARY SEWERS

PART I: GENERAL

1.1 GENERAL REQUIREMENTS

A. Installation of casing for sewer line pipe by dry augering or slurry boring methods, together with installation of sewer line pipe in casing.

B. Installation of sewer line pipe by slurry boring methods. Construction casing may be used at the Contractor's option.

1.2 MEASUREMENT AND PAYMENT

A. Unit Prices:

1. Casing, including sewer line pipe, installed by augering methods in mid-run of open cut segments where shown on the Drawings, shall be measured and paid by linear foot from end to end of casing. Casing may be installed, at the Contractor's option, at locations other than shown on the Drawings, at no additional cost to the City.
2. Sewer line pipe installed by augering method in mid-run of open-cut segments where shown on the Drawings, shall be measured and paid by linear foot from end to end of augered section.

3. Pipe or casing segments installed by augering methods in locations other than mid-run of open cut segments and shown on the Drawings, shall be measured and paid by linear foot along centerline of completed sewer line from centerline to centerline of manholes to ends of stubs or termination of pipe, and to inside face of lift stations and other structures.

4. Payment shall include and be full compensation for labor, equipment, materials and supervision for excavation and construction of sewer line, complete in place including disposal of excess materials, shoring, dewatering, utility adjustments, grouting, backfill, clean-up, and other related work necessary for construction as indicated on the Drawings and specified in this Section.
5. Cost for pits and other excavations are included in the unit price for pipe with or without casing.
6. Trench safety systems for pits are paid as specified in Section 02280 – Trench Safety Systems.
7. 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. Augering means either “dry augering” or “slurry augering”.
B. Dry augering is jacking casing while excavating soil at heading and transporting spoil back through casing by otherwise uncased auger.
C. 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.

1.4 REFERENCE STANDARDS

A. AREMA – American Railway Engineering and Maintenance-of-Way Association.
    1. American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering.
B. AASHTO – American Association of State Highway and Transportation Officials.
C. CFTS – City of Friendswood Technical Specifications.

1.5 REGULATORY REQUIREMENTS

A. Conform to Texas State 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 SUBMITTAL

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 sewer line pipe and casing, and void between sewer 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 the 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 3.8, Settlement Monitoring.
3. Submit daily logs and settlement monitoring data within five (5) days after day of observation.

1.7 CRITERIA FOR DETERMINING CASING INSTALLATION LOADS

A. Select and design casing pipe and pipe joints to carry thrust of jacks or loads due to pulling mechanism in combination with overburden, earth and hydrostatic loads. Select casings for dry augering to withstand action of auger without damage.

B. Use Professional Engineer licensed by the State of Texas to determine design stresses, design deflections and factors of safety for design of casing. Present such determination as part of design submittal. Apply the following maximum casing pipe stresses and deflections to casings shown on the Drawings:
1. Design stress in pipe wall: Fifty percent (50%) of minimum yield point of steel or eighteen thousand pounds per square inch (18000 psi), whichever is less, when subjected to applicable loading conditions.
2. Wall thickness: Maximum allowable deflection which does not exceed three percent (3%) of nominal casing diameter.

C. Use Cooper E-80 locomotive loading distributions as criteria for railroad crossings in accordance with AREMA specifications for culverts. In design, account for additive loadings due to multiple tracks.

D. Use H-20 vehicle loading distributions as criteria for truck loading in accordance with AASHTO.

E. When not specifically indicated on the Drawings, select casing diameter to permit practical installation (including skids when applicable) and grouting.

PART II: PRODUCTS

2.1 MATERIALS

A. Provide casing pipe which is straight, circular in section, uncoated, welded steel pipe, in accordance with Section 02250 – Steel Pipe and Fittings.
B. Provide sewer line pipe in accordance with Section 02500 – Gravity Sanitary Sewers. Do not use high density polyethylene pipe for augering.
C. Provide restrained-joint sewer line pipe when installing sewer line pipe in slurry bored holes by pullback method.
D. Supply grout as specified in Section 03105 – Grout.

PART III: EXECUTION

3.1 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.

3.2 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.

3.3 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.

3.4 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 gravity sewer 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 (±1-1/2 In) in elevation.

3.5 SLURRY BORING OF CASING OR PIPE

A. Drill small diameter pilot hole and check for line and grade at receiving end. Redrill 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

sewer line pipe are plus or minus six inches (±6 In) in horizontal alignment and plus or minus one and one-half inches (±1-1/2 In) in elevation.

E. Completely fill annular space between sewer line pipe and surrounding soil or casing with grout, without displacing pipe during grouting operation.

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.

3.6 FILLING ANNULAR SPACE

A. Grout annular void between sewer line pipe and casing from end to end of casing. Block and brace sewer line pipe to prevent movement during grout placement and to maintain specified line and grade. Grout as specified in Section 03105 – Grout.

3.7 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 In) 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 feet (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.

3.8 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 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.

3.9 DISPOSAL OF EXCESS MATERIAL

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

3.10 LEAKAGE TESTING

A. Test sanitary sewers for leakage by low pressure air methods in accordance with Section 02525 – Acceptance Testing of Gravity Sanitary Sewer.

END OF SECTION