

SECTION 33 05 23
TRENCHLESS UTILITY INSTALLATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavation and backfill for approach trenches and pits.
 - 2. Excavation for Casing pipe.
 - 3. Carrier pipe.
 - 4. Disposal of excess materials.

- B. Related Sections:
 - 1. Section 03 30 00 - Cast-In-Place Concrete.
 - 2. Section 31 23 17 - Trenching: Excavating and backfilling access pits.
 - 3. Section 33 01 32 - Sewer and Manhole Testing.
 - 4. Section 33 11 13 - Water Utility Distribution Piping.
 - 5. Section 33 13 00 - Disinfecting of Water Utility Distribution.
 - 6. Section 33 31 00 - Sanitary Utility Sewerage Piping.
 - 7. Section 33 34 00 - Sanitary Utility Sewerage Force Mains.
 - 8. Section 33 41 00 - Storm Utility Drainage Piping.
 - 9. Section 33 42 13 - Pipe Culverts.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M133 - Standard Specification for Preservatives and Pressure Treatment Processes for Timber.

- B. American Railway Engineering and Maintenance-of-Way Association:
 - 1. AREMA - Manual for Railway Engineering.

- C. ASTM International:
 - 1. ASTM A36 - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A139 - Standard Specification for Electric fusion (Arc) Welded steel Pipe (NPS 4-inch and over).
 - 4. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - 5. ASTM A449 - Standard Specification for Quenched and Tempered Steel Bolts and Studs.
 - 6. ASTM A1011- Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

- D. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.

- E. National Utility Contractors Association:
 - 1. NUCA - Pipe Jacking & Microtunneling Design Guide.
 - 2. NUCA - Trenchless Excavation Construction Equipment & Methods Manual.

- F. SCDOT Standard Specifications:

1. Standard Specifications for Highway Construction, 2007, published by the South Carolina Department of Transportation.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Prepare scaled shop Drawings to supplement Drawings, signed and sealed by Professional Engineer.
 1. Include details of casing, jacking head, sheeting, and other falsework for trenches and pits and support for adjacent facilities, field sketches, and other details to complete the Work.
 2. Show relation of proposed installation to adjacent facilities and natural features over installation, angle of installation, right-of-way lines, and general layout of built facilities.
 3. Show cross-section or sections from field survey showing installation in relation to actual profile of ground.
- C. Submit history of previous work completed of equivalent nature and scope. Include qualification and experience of key personnel.
- D. Installation Plan: Submit description of proposed construction plan, dewatering plan, and plan to establish and maintain vertical and horizontal alignment.
- E. Submit emergency response procedures to handle situations when conduit is compromised and jeopardizes integrity of installation or safety.
- F. Submit written report results of visual check prior to installation of carrier pipe of entire length of casing or liner, to verify there are no voids or defective joints.
- G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of casing or tunnel liner, carrier pipe, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with SCDOT Standard Specifications, NUCA Trenchless Excavation Construction Equipment and Methods Manual, NUCA Pipe Jacking & Microtunneling Design Guide, and AREMA when jacking under railroads.
- B. Maintain one copy of each document on site.

1.6 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum five years documented experience.
 1. Work Experience: Include projects of similar magnitude and conditions.
 2. Furnish list of references upon request.

1.7 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this Section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping and jacking systems from entry of foreign materials and water by temporary covers, completing sections of work, and isolating parts of completed system.
- D. Accept system components on site in manufacturer's original containers or configuration. Inspect for damage.
- E. Use wooden shipping braces between layers of stacked pipe. Stack piping lengths no more than three layers high.
- F. Store field joint materials indoors in dry area in original shipping containers. Maintain storage temperature of 60 to 85 degrees F.
- G. Support casing and carrier pipes with nylon slings during handling.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Conduct operations so as not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

1.10 FIELD MEASUREMENTS

- A. Verify invert elevations of existing work prior to excavation and installation of casing or tunnel.

PART 2 PRODUCTS

2.1 CASING AND JACKING PIPE MATERIALS

- A. Steel Casing Pipe: ASTM A53 or ASTM A139, 35,000 psi minimum yield strength, full circumference welded joints in accordance with AWS D1.1 to withstand excavation forces, minimum wall thickness and diameter as shown on the plans or otherwise shown below:

CARRIER PIPE	Casing Pipe	Thickness		Recommended Min. Tunnel
		D.O.T.	R.R.	
6-Inch Ductile Iron	14"	.250"	.281"	48"
8-Inch Ductile Iron	18"	.250"	.281"	48"
10-Inch Ductile Iron	20"	.250"	.344"	48"
12-Inch Ductile Iron	22"	.250"	.375"	48"
16-Inch Ductile Iron	28"	.312"	.469"	48"
18-Inch Ductile Iron	30"	.312"	.469"	48"
20-Inch Ductile Iron	32"	.375"	.501"	48"
24-Inch Ductile Iron	36"	.375"	.532"	48"

2.2 CARRIER PIPE MATERIALS

- A. Water Distribution System Piping: As specified in Section 33 11 00.
- B. Sanitary Sewage System Piping: As specified in Section 33 31 00.
- C. Sanitary Sewage Force Mains Piping: As specified in Section 33 34 00.
- D. Storm Drainage Piping: As specified in Section 33 41 00.
- E. Pipe Culverts: As specified in Section 33 42 13.

2.3 GROUT AND COVER MATERIALS

- A. Soil Backfill for Trench Approaches and Pits to Finish Grade: As specified in Section 33 23 17.
- B. Fill and Seal Grout at Pipe Ends: Mortar conforming to Division 700 of SCDOT Standard Specifications proportioned as described below. Do not add more water than is necessary to make a workable mixture.
 - 1. Mix No. 1: 1 part Portland cement, 1/4 part hydrated lime, 3-3/4 parts mortar sand (maximum).
 - 2. Mix No. 2: 1 part Portland cement, 1 part masonry cement, 6 parts mortar sand (maximum).
- C. Pressure Grout Mix: One part Portland cement and six parts mortar sand mixed with water to consistency applicable for pressure grouting.

2.4 ACCESSORIES

- A. Supports and Insulators:

1. Steel and Plastic: 14 gage stainless steel band, 5/16 inch stainless steel flange bolts, heavy duty PVC liner, polyethylene or phenolic skids.
 2. Plastic: Polyethylene casing insulator band and skids with stainless steel bolts.
- B. Steel Strapping: ASTM A36.
- C. Concrete: Class A Concrete conforming to Division 500 of the SCDOT Standard Specifications.
1. Compressive strength of 3,000 psi at 28 days.
 2. Air entrained.
 3. Water cement ratio of 0.488 with rounded aggregate and 0.532 with angular aggregate.
 4. Maximum slump of 3.5 inch for vibrated concrete and 4 inch for non-vibrated concrete.
 5. Minimum cement content of 564 pounds per cubic yard for vibrated concrete and 602 pounds per cubic yard for non-vibrated concrete.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify connection to existing piping system size, location, and invert elevations are in accordance with Drawings.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities indicated to remain from damage.
- C. Notify utility company to remove and relocate utilities.
- D. Protect plant life, lawns, rock outcroppings] and other features remaining as portion of final landscaping.
- E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- F. Establish minimum separation of from other utility piping in accordance with local code.

3.3 EXCAVATION AND BACKFILL

- A. Excavate and backfill in accordance with Section 31 23 17.

3.4 DEWATERING

- A. Intercept and divert surface drainage precipitation and groundwater away from excavation through use of dikes, curb walls, ditches, pipes, sumps, or other means.
- B. Develop substantially dry subgrade for prosecution of subsequent operations.
- C. Comply with State of South Carolina requirements for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.

3.5 EXISTING WORK

- A. Maintain access to existing facilities and other remaining active installations requiring access. Modify installation as necessary to maintain access.

3.6 PITS OR APPROACH TRENCHES

- A. Excavate approach trenches or pits in accordance with shop drawings and as site conditions require.
- B. Ensure casing entrance face as near perpendicular to alignment as conditions permit.
- C. Establish vertical entrance face at least 1 foot above top of casing.
- D. Install dewatering measures and excavation supports as specified in Section 31 23 17.

3.7 CASING PIPE INSTALLATION

- A. Boring:
 - 1. Push pipe into ground with boring auger rotating within pipe to remove spoil. Do not advance cutting head ahead of casing pipe except for distance necessary to permit cutting teeth to cut clearance for pipe. Arrange machine bore and cutting head to be removable from within pipe. Arrange face of cutting head to provide barrier to free flow of soft material.
 - 2. When unstable soil is encountered during boring retract cutting head into casing to permit balance between pushing pressure and ratio of pipe advancement to quantity of soil.
 - 3. When voids develop greater than outside diameter of pipe by approximately one inch, grout to fill voids.
 - 4. When boring is obstructed, abandon boring, relocate jack or tunnel as directed by Engineer.
- B. Jacking
 - 1. Construct adequate thrust wall normal to proposed line of thrust.
 - 2. Impart thrust load to pipe through suitable thrust ring sufficiently rigid to ensure uniform distribution of thrust load on full pipe circumference.
- C. Drilling and Jacking
 - 1. Use oil field type rock roller bit or plate bit made up of individual roller cutter units solidly welded to pipe which is turned and pushed for its entire length by drilling machine to give bit necessary cutting action.
 - 2. Inject high density slurry (oil field drilling mud) to head as cutter lubricant. Inject slurry at rear of cutter units to prevent jetting action ahead of pipe.
- D. Mining and Jacking: Utilize manual handmining excavation from within casing pipe as casing is advanced with jacks, allowing minimum ground standup time ahead of casing pipe.

3.8 PRESSURE GROUTING

- A. Pressure grout annular space between casing pipe and surrounding earth.

3.9 CARRIER PIPE INSTALLATION

- A. Clean, inspect, and handle pipe in accordance with applicable Section for carrier pipe.

- B. Exercise care to prevent damage to pipe joints when carrier pipe is placed in casing.
- C. Support pipeline within casing so no external loads are transmitted to carrier pipe. Attach supports to barrel of carrier pipe; do not rest carrier pipe on bells.
 - 1. Use minimum 2 supports per joint of carrier pipe.
- D. Grout ends of casing to seal.

3.10 TOLERANCES

- A. Do not over cut excavation by more than 1 inch greater than outside diameter of casing pipe.
- B. Install casing pipe to vertical and horizontal alignment on Drawings within plus or minus 3 inches prior to installation of carrier pipe.
- C. Install pipe bells with minimum 1/2 inch clearance to casing.

3.11 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspecting and testing.
- B. Compaction Testing: As specified in Section 31 23 17.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.12 REMOVAL OF FACILITIES AND CONTROLS

- A. Remove temporary facilities for casing installation and jacking operations in accordance with Section 01 50 00 - Temporary Facilities and Controls.

END OF SECTION