SECTION 02229

BORE AND JACK INSTALLATION FOR UTILITIES

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this Section includes furnishing all labor, materials and equipment required to bore and jack casings and to properly complete pipeline installation inside casings as described herein and/or shown on the Drawings.

B. Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable. If requested by the WSD, submit evidence that manufacturer has consistently produced products of satisfactory quality and performance over a period of at least two years.

1.2 SUBMITTALS

A. Submit shop drawings, product data and experience in accordance with Section 01300.

B. Material Submittals: The Contractor shall provide shop drawings and other pertinent specifications and product data as follows:

1. Shop drawings for casing pipe showing sizes, wall thicknesses and yield strengths.
2. Design mixes for concrete and grout.
3. Casing Spacers and End Seals

C. Experience Submittals:

1. Boring and jacking casings is deemed to be specialty contractor work. If the Contractor elects to perform the work, the Contractor shall provide evidence as required by the General Conditions. A minimum of five continuous years of experience in steel casing construction is required of the casing installer. Evidence of this experience must be provided with the shop drawings for review by the WSD.

1.3 STORAGE AND PROTECTION

A. All materials shall be stored in accordance with the manufacturer's recommendations and as approved by the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS AND CONSTRUCTION

A. Casing

1. The casing shall be new and unused pipe. The casing shall be made from steel plate having a minimum yield strength of 35,000 psi. The steel plate shall also meet the requirements of ASTM A 36.
2. The thicknesses of casing shown in paragraph B. below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired by the Contractor.
3. The diameters of casing shown in paragraph B. below and shown on the Drawings are minimum. With the WSD's approval, larger casings may be provided for whatever reasons the Contractor may decide, whether it be casing size availability, line and grade tolerances, soil conditions, etc.

B. Minimum Casing Sizes

1. Under Railroads – Table 1:

Pipe Diameter, Inches	*Casing Diameter, Inches*	*Wall Thickness (uncoated), Inches*
		Uncoated
6	14	0.282
8	18	0.375
10	20	0.375
12	22	0.375
14	24	0.500
16	30	0.500
18	30	0.500
20	32	0.500
24	36	0.500
30	42	0.500

2. Under Highways – Table 2:

Pipe Diameter, Inches	*Casing Diameter, Inches*	*Wall Thickness (uncoated), Inches*
6	12	0.250
8	16	0.375
10	20	0.375
12	24	0.375
14	24	0.375
16	30	0.375
18	30	0.375
20	36	0.375
24	36	0.500
30	42	0.500

C. Casing Spacers: Casing spacers shall meet one of the following requirements:

1. Casing spacers shall be all non-metallic (polypropylene), molded in segments for field assembly without any special tools. Spacer segments shall be secured around carrier pipe by insertion of a Slide-Lock. The casing spacer polymer shall contain ultraviolet inhibitors and shall have a minimum compressive strength of 3,000 psi, an 800 Volts/mil dielectric strength and impact strength of 1.5 ft-lb/inch. Each casing spacer shall have full length, integrally molded skids extending beyond the bell or mechanical joint of the carrier pipe. The casing spacers shall be the boltless PSI Ranger II casing spacer as manufactured by Pipeline Seal and Insulator, Inc.
3. Substitutions: Under provisions of Section 01600.

D. Carrier Pipe: Carrier pipe shall be restrained joint and as specified in Sections 02660 or 02730.

E. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall iron pins.

F. End seals shall be minimum 1/8” thick flexible neoprene rubber eccentric wrap with minimum ½ inch stainless steel bands placed at each end of the rubber boot manufactured for casing end seal; or a modular end seal with bolt driven force dispersion plates with direct ground burial applications. Ends seal shall be Model C as manufactured by Pipeline Seal and Insulator Inc.

2.2 EQUIPMENT

A. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.

B. On casing pipe for gravity sewer over 60 feet in length, the installation equipment shall include a steering head and a grade indicator.

C. The steering head shall be controlled manually from the bore pit. The grade indicator shall consist of a water level attached to the casing that will indicate the elevation of the front end of the casing or some other means for grade indication approved by the WSD.

PART 3 EXECUTION

3.1 GENERAL

A. Interpretation of soil investigation reports and data, investigating the site and determination of the soil conditions is the sole responsibility of the Contractor. Any subsurface investigation performed by the Contractor must be approved by the appropriate authority having jurisdiction over the site.

B. Casing construction shall be performed so as not to interfere with, interrupt, or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore all property to its original or better condition.

C. Face Protection: The face of the excavation shall be protected from the collapse of the soil or from debris entering the casing space.

D. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the project engineer. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the Contractor if approved by the WSD. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal 20-foot length may be necessary.

E. Highway Crossings

1. The Contractor shall be held responsible and accountable for the coordinating and scheduling of all construction work within the highway right-of-way.
2. Work along or across the highway department rights-of-way shall be subject to inspection by such highway department.
3. All installations shall be performed to leave free flow in drainage ditches, pipes, culverts or other surface drainage facilities of the highway, street or its connections.
4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway without the express approval of the highway department or agency who has ownership of the right-of way.
5. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are placed on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadway.
6. The Contractor shall be responsible for obtaining a blasting permit in a timely manner.
7. The Contractor shall be responsible for maintaining an executed copy of the bore permit from the appropriate authority at all times.

F. Railroad Crossings

1. The Contractor shall secure permission from the Railroad to schedule work so as not to interfere with the operation of the Railroad.
2. the Contractor shall satisfy all permitting and insurance requirements of the railroad prior to beginning any work.
3. All work on the Railroad right-of-way including necessary support of tracks, safety of operations and other standard and incidental operation procedures may be under the supervision of the appropriate authorized representative of the Railroad affected and any decisions of this representative pertaining to construction and/or operations shall be final and construction must be governed by such decisions.
4. If, in the opinion of the Railroad, it becomes necessary to provide flagging protection, watchmen or the performance of any other work in order to keep the tracks safe for traffic, the Contractor shall coordinate such work.
5. No blasting shall be permitted within the Railroad right-of-way unless expressly permitted by the railroad and the WSD. The

Contractor shall be responsible for maintaining an executed copy of the bore permit from the appropriate authority at all times.

6. Contractor shall be responsible to pay for all railroad permit and inspection fees.

3.2 GROUNDWATER CONTROL

A. The Contractor shall control the groundwater throughout the construction of the casing.

B. Methods of dewatering shall be at the option and responsibility of the Contractor. Maintain close observation to detect the settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the project's Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.

C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24-hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Dewater into a sediment trap and comply with requirements in Section 01563 of these specifications.

3.3 SURFACE SETTLEMENT MONITORING

A. Provide surface settlement markers, placed as specified and as directed by the project's Engineer or the owner of right-of-way.

B. The Contractor shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by, and at the direction of the project Engineer or jurisdictional owner.

C. Promptly report any settlement and horizontal movement immediately to the project Engineer and WSD.

3.4 BORING AND JACKING

A. Shaft

1. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.
2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore

shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to soil and site conditions. Shaft design shall be prepared by a professional engineer licensed in the State of Tennessee. Keep preparations dry during all operations. Perform pumping operations as necessary.

3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the project Engineer or WSD, due to soil conditions.

B. Jacking Rails and Frame

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.
2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.
3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

C. Boring and jacking of casing pipes shall be accomplished by the auger boring method without jetting, sluicing or wetboring.

D. Auger the hole and jack the casing through the soil simultaneously.

E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe installed.

F. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such to require the use of a shield.

G. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed and the alignment and grade checked at minimum intervals of 60 feet.

H. Any casing pipe damaged in jacking operations shall be repaired or removed and replaced.

I. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire circumference, in accordance with AWS recommended procedures. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.

J. The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

K. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.

L. Care shall be taken to ensure that casing pipe installed by the boring and jacking method will be at the proper alignment and grade.

M. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

N. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing shall be removed.

O. Trench excavation, all classes and type of excavation, the removal of rock, muck, and debris, the excavation of all working pits and backfill requirements of Section 02225 are included in this Section.

P. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.

Q. Grout backfill shall be used for unused holes or abandoned casing pipes.

R. Any replacement of the carrier pipe in an existing casing shall be considered a new installation, subject to the applicable requirements of these Specifications.

3.5 VENTILATION AND AIR QUALTITY

A. Provide, operate and maintain for the duration of casing project a ventilation system to meet safety and OSHA requirements.

3.6 ROCK EXCAVATION

A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the project Engineer, cannot be removed through the casing, the project Engineer may authorize the Contractor to complete the crossing using an alternate method. An alternative method must be approved by the WSD and agency authorizing the work by permit (i.e. Railroad, TDOT, etc.).

B. At the Contractors option the Contractor may continue to install the casing, and remove the rock through the casing.

3.7 INSTALLATION OF PIPE

A. After construction of the casing is complete, and has been accepted by the project Engineer and WSD, install the pipeline in accordance with the Drawings and Specifications.

B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.

C. The carrier pipe shall be held in the casing pipe by the following method:

1. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a casing spacer within 1 foot of each side of pipe bell and in the center of each carrier pipe joint. A casing spacer shall also be placed within 1 foot of each end of the casing pipe.. Casing spacers shall be attached to the pipe per the manufacturer's instructions and in accordance with these specifications.

D. Close the ends of the casing per this Section, paragraph 2.1.

3.8 SHEETING REMOVAL

A. Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring and bracing shall be done in such a meaner as not to endanger or damage either new or existing structures, private or public properties and also to avoid cave-ins or sliding in the banks.

3.9 INTERSTATE RESTORATION

A. When boring and jacking operations encroach upon the right-of-ways of the federal interstate system, the Contractor shall restore all screened trees with seedlings of like species.

3.10 CARRIER PIPE TESTING

A. Testing of carrier pipe (water or sewer) shall be performed in accordance with testing required listed in other applicable specification sections.

END OF SECTION 02229 – BORE AND JACK INSTALLATION FOR UTILITIES