SECTION 2224

PIPE BORING, DRILLING AND JACKING

PART 1: GENERAL

1.1 General Description of Work

This work shall consist of boring, drilling or jacking operations related to the installation of water pipe and sanitary sewer pipe, in areas where trenching is not feasible or permitted, or as designated on the plans.

PART 2: PRODUCTS

2.1 Steel Casing

A. The steel casing shall be seamless or electric resistance-welded tubing for sizes under 24-inch O.D. and standard double-submerged arc-weld for sizes over 24".

B. Steel pipe shall be A-139, Grade B with one bevelled end (to 37 degrees) and other end square cut.

C. The following table shall be used for determining minimum casing size.

CASING SIZE VERSUS CARRIER SIZE				
Steel Casing Diameter	MINIMUM WALL THICKNESS		Carrier Pipe I.D.	
	Highway	Railroad	Gravity	Pressure
10"	.188"	.188"	NA	4"
12"	.188"	.188"	4"	6"
14"	.250"	.250"	6"	8"
16"	.250"	.250"	8"	10"
18"	.250"	.250"	10"	10"
20"	.250"	.250"	12"	12"
24"	.250"	.281"	14"	14"
24"	.250"	.281"	16"	16"
30"	.250"	.312"	18"	18"
30"	.312"	.344"	20"	20"
36"	.312"	.406"	24"	24"
42"	.375"	.469"	30"	30"
48"	.500"	.532"	36"	36"
60"	.500"	.563"	42"	42"
72"	.625"	.625"	48"	48"

PART 3: EXECUTION

3.1 Boring and Jacking

A. Boring shall be performed to alignment and grade as shown on the construction drawings.

B. The earth and/or rock augers shall not exceed the O.D. (outside diameter) of the steel casing by more than ¼ of an inch. The boring and insertion of the steel casing shall be performed with equipment capable of simultaneous operations.

C. The feed rate of augers and hydraulic pushing of the casing shall be the same. Under no circumstances will boring be allowed unless operations are simultaneous.

D. Every effort shall be made to avoid loss of earth.

E. Excavated material shall be removed from the casing as excavation progresses and no accumulation of such material within the casing shall be permitted.

F. Upon completion of the boring operations, all voids around the outside face of the casing shall be filled by grouting. Grouting equipment and material shall be on the job site before boring operations are started in order that grouting around the bored casing may be started immediately after the boring operations have finished.

G. The allowable tolerance as to grade and alignment of the installed casing shall not exceed 1/10 of a foot per hundred feet of casing length.

H. The Contractor shall be responsible for protecting any underground utilities and for any damage resulting to located utilities.

I. The contractor shall be fully responsible for producing a sound, tight installation, true to line and grade. Gravity pipe shall be skidded through the casing on redwood or pressure treated, stainless-steel tied skids. Ductile iron pipe may be used instead of skids.

3.2 Installation Details

A. Prior to the start of the boring operations, the Contractor shall submit the following details to the Engineer when requested.

1. Boring pit bracing.

2. Casing boring head.

B. Only workmen experienced in boring operation shall perform the work.

3.3 Drilling and Jacking for Conduit

A. Metallic conduit shall be installed under existing pavement by approved jacking or drilling methods.

B. Nonmetallic conduit shall not be installed by jacking. Nonmetallic conduit may be installed by drilling if a hole larger than the conduit is pre-drilled and the conduit is hand-installed.

C. Jacking or drilling pits shall be at least 2 feet from the edge of any type of any pavement, measured from the side of the pit nearest to the pavement.

3.4 Jacking

A. If the grade of the pipe at the jacking end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking operations and for placing end joints of the pipe. Such work shall be sheeted securely and braced in a manner to prevent earth cavings and to provide a safe, stable work area.

B. Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used so that pressure will be applied to the pipe uniformly around the ring of the pipe.

C. A suitable jacking frame or back stop shall be provided. The pipe to be jacked shall be set on guides properly braced together, to support the section of the pipe and to direct it in the proper line and grade.

D. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe. In general, embankment material shall be excavated just ahead of the pipe and material removed through the pipe and the pipe forced through the embankment with jacks, into the space thus provided.

E. The excavation for the underside of the pipe, for at least 1/3 of the circumference of the pipe, shall conform to the contour and grade of the pipe. A clearance of not more than 2 inches may be provided for the upper half of the pipe. This clearance is to be tapered off to zero at the point where the excavation conforms to the contour of the pipe.

F. The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but it shall not exceed 2 feet in any case. This distance shall be decreased if the character of the material being excavated makes it desirable to keep the advance closer to the end of the pipe.

G. The pipe, preferably, shall be jacked from the low or downstream end. Lateral or vertical variation in the final position of the pipe from the line and grade established by the Engineer will be permitted only to the extend of 1 inch in 10 feet, provided that such variation shall be regular and only in one direction and that the final grade or flow line shall be in the direction indicated.

H. If the Contractor desires, he may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or lugs to keep the cutting edge from slipping onto the pipe.

I. When jacking of pipe is once begun, the operation shall be carried on without interruption, insofar as practical, to prevent the pipe from becoming firmly set in the embankment.

J. Any pipe damaged in jacking operations shall be removed and replaced by the Contractor at his entire expense.

K. Immediately after jacking is complete and the carrier or encasement pipe is accurately positioned and approved for line and grade, the clearance space between the pipe and soil shall be completely filled by pressure grouting for the entire length of the installation.

L. The pits or trenches excavated to facilitate jacking operations shall be backfilled immediately after the jacking of the pipe has been completed.

PART 4: MEASUREMENT AND PAYMENT

4.1 Measurement

A. Boring

1. Measurement shall be per linear foot of bored casing, and shall include furnishing all labor, materials, equipment, and work involved in the boring operations.
2. The unit measurement shall also include skids, steel ties, grouting, and other items associated with the boring and casing.

B. Drilling and Jacking for Electrical Conduits

Measurement shall be per linear foot of installed electrical conduit and shall include all labor, materials, equipment, and work required for the operation.

C. Jacking

Jacking pipe will be measured by the linear foot of pipe complete in place. Such measurement will be made between the ends of the pipe along the central axis as installed.

4.2 Payment

A. Boring

1. The accepted quantities for boring will be paid at the unit bid price per diameter of casing per linear foot.

2. Payment for carrier pipe will be paid in accordance with Section 02556 and Section 2570.

B. Drilling and Jacking for Conduit

1. The accepted quantities for drilling and jacking for conduit will be paid at the unit bid price per diameter per linear foot.

2. The accepted quantities for jacking will be paid at the unit bid price per linear foot of the type, size, and class indicated.

C. When not listed as a separate contract pay item, boring, drilling and jacking conduit or jacking shall be considered as incidental work, and the cost there of shall be included in such contract pay item(s) as provided in the contract proposal.

D. Compensation, whether by contract pay item or incidental work will be for furnishing all materials, labor, equipment, tools and incidentals required for the work, all in accordance with the plans and these specifications.