SECTION 5.00
PIPE TRENCHES

SUB-INDEX

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5.01 EXCAVATION AND PREPARATION OF PIPE TRENCHES

Trenches for water distribution lines, sanitary sewer lines, force mains, and storm sewer lines shall be excavated to the required depth to permit installation of the pipe along the lines and grades shown on the construction drawings. The minimum trench width at the top of the pipe shall be at least 18 inches greater than the outside diameter of the pipe. Where excavation is in rock, the rock shall be removed to a depth of at least 6 inches below grade and shall be backfilled with materials in accordance with these specifications. Wet trenches shall be stabilized with #78 M stone or with a base layer of #57 stone.

5.02 PIPE LAYING AND BACKFILLING

All pipe shall be laid in accordance with the manufacturer's recommendations. The subgrade at the bottom of the trench shall be shaped to secure uniform support throughout the length of the pipe. A space shall be excavated under the bell of each pipe to provide space to relieve bearing pressure on the bell and to provide room to adequately make the joint. Open ends of pipe shall be plugged with a standard plug or cap at all times when pipe laying is not in progress. Trench water shall not be allowed to enter the pipe. Backfill material shall be free from construction material, debris, frozen material, organic material, or unstable material. The top 2 feet of backfill material shall be free from stones greater than 4 inches in diameter.

Under roadways and extending at a slope of 1 to 1 beyond the back of curb, measured perpendicular from centerline, backfill shall be compacted to a density of no less than 95% standard Proctor maximum dry density as measured by AASHTO method T99. Backfill shall be placed in lifts of 8 inches or less of the uncompacted soil. Other fill material shall be compacted to a density of no less than 90% of the maximum dry density as measured by AASHTO method T99. Backfill material shall be placed in lifts of 12 inches or less of the uncompacted soil. Suitable backfill material shall be utilized and compacted. Pavement repair shall be in accordance with the Standard Detail section of these standards.

All trenches shall be properly backfilled at the end of each working day. All pavement cuts shall be repaired within a maximum of 2 days from the date the cut is made. Trench repairs in roadways shall be backfilled with stone and binder or flowable fill as directed by the Inspector. If conditions do not permit a permanent repair within the given time limit, permission to make a temporary repair must be obtained from the Executive Director of Utilities and Infrastructure Services. If roadway repairs are not accomplished in accordance with these specifications, Town forces may make such repairs and back charge the project owner in an

amount equal to triple for all associated costs (See Section 2.16 of these specifications).

In locations where backfill material is temporarily stockpiled on the roadway surface, a layer of 1½ inches of screenings shall be used between the pavement surface and the backfill material.

5.03 BORING AND JACKING

All crossings of Town streets shall be by dry bore and jack method in order to minimize pavement cuts and maintenance problems. Crossing of streams and/or creeks shall also be by bore and jack method. Variations with extenuating circumstances may be granted by the Executive Director of Utilities and Infrastructure Services. The Town shall recommend that all crossings of State maintained streets within the Town corporate limits be by the dry bore and jack method. In cases where circumstances such as utility conflicts will not allow crossing by bore and jack method, the Town may consider approving other methods of crossing with additional requirements to minimize pavement failure and maintenance problems.

In locations where open pipe trenches are not allowed, dry bore and jack operations may be allowed.

Smooth wall or spiral welded steel pipe may be jacked through dry bores slightly larger than the pipe bored progressively ahead of the leading edge of the advancing pipe. The spoil material shall be mucked by the auger back through the pipe during the boring operation. As dry boring progresses, each new section of the encasement pipe shall be butt-welded to the section previously jacked into place.

In the event that an obstruction is encountered during the boring and jacking operation, the auger is to be withdrawn and the excess pipe is to be cut off, capped, and filled with 1:3 portland cement grout at a sufficient pressure to fill all voids before moving to another boring site.

If voids are encountered while installing encasement pipe 30 inches and larger, grout holes shall be installed at 10 foot centers and filled with 1:3 Portland cement grout at sufficient pressure to prevent settlement of the roadway, unless NCDOT approval stipulates otherwise. Other grout mixtures may be submitted for approval.

Steel pipe shall be manufactured of grade ‘B’ steel with a minimum yield strength of 35,000 psi in accordance with ASTM A139 and A283. When used along or under a roadway maintained by NCDOT, the encasement pipe shall be coated to meet NCDOT requirements.

In bore and jack installations that run beneath storm drainage culverts, carrier pipe shall be restrained joint type.

Size and wall thickness of smooth wall or spiral welded encasement pipe shall be as follows:

Pipe Size (O.D.) (inches)	Wall Thickness (inches)
12¾	0.188
16	0.250
18	0.250
20	0.250
24	0.250
30	0.312
36	0.375

Casing pipe shall be installed with a minimum cover of 3 feet under the top or surface of the pavement.

All carrier pipe shall be restrained joint resting on metal spiders as shown in the Standard Details section of these standards so as to prevent damage to the pipe bell. Pipe bells shall not contact the interior of the casing pipe. No blocks or spacers shall be wedged between the pipe and the top of the casing. Casing pipe shall have the following minimum sizes:

Carrier Pipe Size (inches)	Casing Pipe Size (inches)
4	12¾
6	12¾
8	18
10	20
12	24
14	26
16	28

All utilities crossing stream beds will be required to be installed with restrained joint pipe inside a steel casing pipe.

5.04 UTILITY LOCATOR INSTALLATION AND DEVICES

Utility locator devices manufactured by 3M Corporation shall be installed at 100 foot intervals and turns/bends. Locater tape, as manufactured by Allen or approved equal, shall also be required to be installed 2 feet above the pipe.

A. Marker Ball

Pressure Piping Systems (Water mains, Force mains and Reclaimed Water mains)

- A minimum of one marker ball shall be located along the alignment every 100 feet spaced equidistant.
- Marker balls shall be located at all fittings.
- Marker ball to be pre-programmed.
- Maximum depth of the marker ball shall 2-feet.

Piping with a Straight Alignment between Structures (Gravity Sewer)

- A minimum of one marker ball shall be located along the alignment at the start and stop of the encasement, if applicable.
- Marker ball to be pre-programmed.
- Maximum depth of the marker ball shall be 2-feet.

B. Tracer Wire

All underground mains and piping shall be electronically locatable.
A tracer wire shall be installed with all underground pipes with the following exclusions:

- Metallic piping can be located electronically with a metal detector.

Tracer wire shall have terminal ends accessible in tracer wire test stations located within a 3-foot radius of every fire hydrant for water lines, and within a 3-foot radius of air release valves and/or every five hundred feet in a concrete donut or mini-manhole for force mains. Other locating technologies may be approved by the Executive Director of Utilities and Infrastructure Services.

C. Tracer Wire Testing Station

Tracer wire testing stations shall be installed at a 500’ maximum spacing.

- The box shall be constructed of a rigid plastic material conforming to ASTM B-253.
- The lid shall be constructed of cast iron or ductile iron.

END OF SECTION 5.00