

Section 1550

**SECTION 1550
TRENCHLESS INSTALLATION OF UTILITIES**

1550-1 DESCRIPTION

Install pipe using a trenchless method. Pipe refers to the specified pipe, which may be the primary carrier pipe or an encasement pipe. Shoring means the earth support system used for installing the pipe. The terms for encasement, casing, encasement pipe and casing pipe are interchangeable. Casing is considered shoring except where specified.

An engineer licensed by the State of North Carolina shall design the method and certify the work will not damage the roadway above or endanger the roadway user.

1550-2 MATERIAL

Refer to Division 10.

Item	Section
Concrete	1000
Encasement Pipe	1540
Flowable Fill	1000-6
Structural Timber	1082
Structural Steel	1072
Treated Timber	1082-2

Use pipe joints that are modified to suit the installation method. Provide engineering calculations for piping and shoring. Submit material certifications and obtain approval from the Department's Engineer before installation.

Use steel or concrete liner plates. Steel tunnel liner plates shall meet Sections 16 and 25 in *AASHTO LRFD Bridge Design Specifications*. Concrete liner plates shall meet AASHTO specifications.

Drilling fluids consist of water, bentonite and polymer additives.

Other materials will be considered with adequate design and quality control.

1550-3 CONSTRUCTION METHODS

(A) General

Apply Section 1505 for excavation, trenching, pipe laying and backfill.

Install the pipe to the lines and grades shown in the plans. Use workers that are skilled in the method of construction. Construct with good workmanship by skilled workers along with proper safety precautions.

Locate ends of trenchless construction and pits beyond the vehicle recovery area of the roadway. The vehicle recovery area may be reduced using acceptable traffic control methods.

(B) Design

Assess soil conditions expected during trenchless operations.

Use a trenchless method appropriate for the field conditions and for the specified pipe. Design the method to insure no settlement of the pipe or the completed roadway section. Use methods of construction and installation that will not disturb the soils outside of the immediate vicinity of the pipeline or pits.

1 Before construction, provide detailed plans for the method of installation certified by
 2 an engineer licensed by the State of North Carolina. Provide certified calculations
 3 demonstrating the method of installation as safe and of minimal risk. Provide certified
 4 calculations of the structural adequacy of all materials. The design shall meet
 5 *AASHTO LRFD Bridge Design Specifications*. An engineer licensed by the State of
 6 North Carolina shall certify changes or modifications to the designed method as needed
 7 for actual field conditions.

8 (C) Water Control

9 Provide groundwater control and removal as appropriate for the method of excavation
 10 and installation. Remove the groundwater using an engineered dewatering system. Keep
 11 surface waters out of the excavation and pits.

12 (D) Shoring

13 Maintain continuous and active support (shoring) to the soils surrounding both the pit and
 14 the trenchless excavation. Provide temporary or permanent shoring, as needed. Provide
 15 temporary shoring to maintain the hole or pit excavation for the duration of the work.
 16 Casing pipe 36" and larger, tunnel liner, pit and trench shoring and shoring that is not
 17 certified for permanent use is considered temporary. Provide permanent shoring when
 18 desired or specified to maintain the open hole for an indefinite time. Permanent shoring
 19 requires certification of durability and a design life of 100+ years.

20 Fill all voids around the excavation and shoring with structural fill material as work
 21 progresses. Fill the annular space between the specified pipe and temporary shoring.

22 Either work continuously (24 hours/day and 7 days/week) on the operations from the
 23 time the excavation begins through the filling of voids or use an engineered system for
 24 shoring the excavation during work stoppage.

25 (E) Pre-Construction Meeting

26 The Contractor shall conduct a pre-construction meeting with the Department's Engineer
 27 to review the proposed method for installation of the pipe. Conduct the meeting at least
 28 48 hours before beginning installation. The meeting shall consist of, but is not limited to:

- 29 (1) Presentation of the construction methods for understanding by all involved,
- 30 (2) Presentation of methods for filling any potential voids around the pipe,
- 31 (3) Advising the Department's Engineer of any work to be observed for "Not In Soil"
 32 classification,
- 33 (4) Demonstrating that appropriate equipment and materials are on site,
- 34 (5) Providing a progress schedule, and
- 35 (6) Demonstrating ability to react to failures or roadway settlement.

36 1550-4 TRENCHLESS METHODS

37 (A) Bore and Jack

38 For bore holes up to 6" diameter in stable ground, the hole may be augured and the pipe
 39 pushed or jacked through the cleaned out hole. For bore holes greater than 6", provide
 40 continuous support of the hole by simultaneously jacking the pipe or casing into the hole.

41 Use equipment suitably sized and designed to simultaneously bore or drill the soil or rock
 42 while pushing or jacking pipe on a controlled grade. Position the cutter head within one
 43 diameter of the leading edge of the pipe. In cohesive, dense and dry soils and rock,
 44 position the cutter head in front of the leading edge. In non-cohesive or loose soils,
 45 position the cutter head inside the pipe.

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1 Dry bore only, do not use jetting or wet boring methods. Use drilling fluids only on the
2 outside of pipe for lubrication or hole stabilization.

3 Minimize over bore, match cutter diameter to the outside diameter of the encasement
4 pipe. Limit overbore to 5% of bore diameter or 2", whichever is less.

5 Provide steering controls as necessary to maintain line and grade.

6 (B) Directional Drilling

7 For drilled holes up to 6" diameter in stable ground, the hole may be drilled and reamed
8 followed by pulling the pipe into the hole within 8 hours. For drilled holes greater than
9 6", simultaneously pull the pipe or casing into the hole as reaming occurs. Multi-pass
10 reaming larger than 6" requires certification by the Contractor's engineer that the soils are
11 self-supporting of the dead and live loads.

12 When under pavement or within a one horizontal to one vertical distance from pavement,
13 maintain the depth of cover in Table 1550-1.

Drilled Hole Diameter	Single Pass Reaming Minimum Depth of Cover	Multi-Pass Reaming Minimum Depth of Cover
2" to 6"	4 ft	4 ft
> 6"to 22"	8 times the hole diameter	12 times the hole diameter
> 22"to 32"	15 ft	25 ft

14 Begin bores at locations that allow transitioning the bore to meet the above depths.

15 Use drilling fluids as appropriate for the type soils. Pump drilling fluids only while
16 drilling or reaming. Monitor flow rates to match the amount leaving the bore hole. Do
17 not increase pressure or flow to free stuck drillheads, reamers or piping.

18 Limit drilled or reamed holes to 2" larger than the pipe.

19 (C) Tunneling

20 Tunnel using hand mining or mechanical excavation. Use tunnel shields or fore poling
21 along with benched excavation and breast boarding as appropriate for the field
22 conditions. Alternatively, the Contractor's engineer may certify that the soils are
23 self-supporting of the dead and live loads and design tunneling methods as appropriate.

24 Provide active support to the tunnel walls. Shore tunnel walls using liner plates, steel ribs
25 with lagging or other engineered method or by jacking piping into place.

26 Limit over excavation to 1" larger than the liner or shield. Grout the external voids as
27 work progresses and as specified by the Contractor's engineer.

28 (D) Pipe Ramming

29 Use pipe ramming only where soils are homogeneous and free of rock, boulders, stumps
30 and debris. Do not use in the vicinity of quick or liquefiable soils.

31 Steel bands 1/2" thick are allowed on the outside of the leading edge of the pipe or casing
32 to oversize the hole to reduce friction. Steel bands 1/2" thick may be used on the inside
33 to compact the spoil and to prevent plugging.

34 Install at the following minimum depth of cover.

TABLE 1550-2 DEPTH OF COVER FOR PIPE RAMMING	
Pipe or Casing Diameter	Minimum Depth of Cover
2" to 6"	4 ft
> 6" to 14"	6 pipe diameters
>14" to 24"	8 ft

1 Contain spoil within the casing during ramming. After completion, use compressed air or
2 augers to remove the spoil. Clean the interior using a pig. Provide appropriate safety
3 devices. Limit air pressure to less than the rating of the pipe or casing.

4 Use lubricants and surfactants as needed.

5 **(E) Other Methods**

6 Other methods will be considered on a case by case basis when thoroughly engineered.

7 **(F) Lubrication and Drilling Fluids**

8 Use drilling fluids for lubrication as needed at low pressure, low flow and low volume.
9 Do not use water alone. Low pressure is less than the weight of the soil above the
10 excavation. Low flow is less than one gallon per minute. Low volume is less than the
11 calculated annular space between the piping and excavated hole.

12 **1550-5 QUALITY CONTROL**

13 The Contractor, at no cost to the Department, shall replace or repair damaged or defective
14 installations. The method to be used shall be designed by the Contractor's engineer and
15 approved by the Engineer.

16 **(A) Ground Movement**

17 Before excavation, establish control points for measuring settlement of the road at 10 ft
18 intervals along the centerline and 10 ft each side of the pipeline. A land surveyor
19 licensed in the State of North Carolina shall monitor these points daily until construction
20 is complete.

21 Cease trenchless operations when measured settlement exceeds 0.02 ft. Determine cause
22 of settlement and repair as necessary. Modify trenchless methods as needed.

23 **(B) Line and Grade**

24 Abandon and grout all pipes that are not at required alignment and grade in conformance
25 with Section 1530.

26 Trenchless installation of proposed water main may not vary more than 2% of total length
27 from required horizontal alignment, one foot from vertical alignment and shall maintain
28 minimum cover.

29 Trenchless installations for grade and alignment dependent pipes such as sewers may not
30 vary.

31 **(C) Leakage**

32 Control leakage through tunnel walls to minor seepage. Seal all leaks in pipes, casing or
33 other permanent shoring.

34 **(D) Roundness**

35 Provide permanent shoring with at least 95% of nominal diameter in all directions.

36 **(E) External Voids**

37 Fill all external voids greater than 2" high or 2 ft wide. Fill with compacted flowable fill,
38 grout or Class II or III select material.

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1 **1550-6 MEASUREMENT AND PAYMENT**

2 *Trenchless Installation of _____ in Soil* will be measured and paid in linear feet. Measurement
3 will be made horizontally to the nearest tenth of a linear foot.

4 *Trenchless Installation of _____ Not in Soil* will be measured and paid in linear feet.
5 Measurement will be made horizontally to the nearest tenth of a linear foot.

6 Trenchless installations will be considered “In Soil” unless classified as “Not in Soil” by
7 observation of the Engineer. “Not in Soil” is all material other than soil as determined and
8 observed by the Engineer. It is the Contractor’s responsibility to request and obtain the
9 Department’s Engineer’s observation for installations “Not in Soil.”

10 Measurement will be made along utility pipes with required trenchless installation. Payment
11 for trenchless installation will be made as additional compensation for utility piping with
12 contract pay items of the various sizes. No additional payment will be made for access pits or
13 shoring. No payment will be made for abandoning defective installations.

14 Payment will be made under:

Pay Item

Trenchless Installation of _____ in Soil

Trenchless Installation of _____ Not in Soil

Pay Unit

Linear Foot

Linear Foot