New York State Thruway Authority

Design and Construction Requirements for Underground Crossings of Mainline Pavement and Shoulders

Office of Real Property Management

TAP-421B (1/2010)

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I. INTRODUCTION

The Thruway Authority's (Authority) underground crossings of mainline pavements and shoulders policy is intended to maintain a clear zone for safe highway operation with as little interference and impairment as possible to the overall integrity of the highway.

Underground crossings of Authority Property shall be performed in accordance with the New York State Department of Transportation (NYSDOT) "Requirements for the Design and Construction of Underground Utility Installations Within the State Highway Right-of-Way" and the American Association of State Highway and Transportation Officials (AASHTO) publication, "A Policy on the Accommodation of Utilities Within Freeway Right-of-Way," current edition, shall apply, except where specified otherwise by the Authority.

While it is the policy of the Authority that all underground crossings of Mainline pavement and shoulders, including water, sewer, gas and petroleum pipe lines, electric lines, telephone lines, etc., shall be encased in a larger encasement pipe (casing), exceptions to this general policy will be made where the Permittee demonstrates to the satisfaction of the Authority that crossings without casing pipe can be made in accordance with the standards established in Design and Construction Requirements for Unencased Gas Pipelines (TAP-421E).

II. INSTALLATION METHODS

Underground crossings of mainline pavements and shoulders shall be accomplished by auger boring, slurry boring, micro tunneling, horizontal directional drilling and pipe jacking. Water jetting will not be permitted. "Open cut" methods will be considered only on non-mainline pavements and shoulders, and only upon prior written approval of the Authority Division Director or designee. All work shall be performed in accordance with the applicable safety codes and all technical provisions shall follow the NYSDOT specifications “Trenchless Installation of Casing under Highway.”

Unsuitable subsurface conditions exist along Authority Property for nearly every trenchless installation method. The suitability of the proposed method to the subsurface conditions will be determined during the Permit review process.

III. GENERAL REQUIREMENTS

A. PERMITTEE RESPONSIBILITY

The Permittee shall assume all responsibility for the sufficiency and safety of the work, and shall closely supervise all tunneling, jacking, driving and/or boring operations so that the possibility of settlement or construction damage to existing facilities is minimized.

B. SOIL BORINGS

The Permittee may be required to perform soil borings in accordance with section 648 of the NYSDOT Standard Specifications and submit reports for review prior to construction activities. Soil exploration data are required for plan approval. The applicant shall contact the Division Permit Coordinator with the proposed boring location and depth requirements and to obtain Work Permits prior to this activity, as described in TAP-401.

C. DAMAGES

If any settlement or construction damage to Authority traffic lanes, pavements, structures, facilities, appurtenances and/or lands occurs, restoration to original condition or better shall be undertaken and completed at the Permittee's own expense as directed by, and to the satisfaction of, the Authority Division Director or designee. A post-installation survey, including Ground Penetrating Radar, may be required.

D. SUPERVISION BY PERMITTEE

The Permittee’s superintendent/supervisor in charge of the work shall be experienced in tunneling, jacking, driving and/or boring. Before the start of any work on Authority Property, the Permittee shall submit to the Authority Division Director or designee, and receive approval of, a description of the applicable previous experience of the selected superintendent/supervisor.

E. INSPECTION BY THE AUTHORITY

As provided in TAP-401, the Authority reserves the right to inspect all tunneling, jacking, driving and/or boring operations. If, in the Authority's judgment, the inspection results are unsatisfactory, the Permittee, its contractors and/or subcontractors shall immediately stop work upon orders from the Authority Division Director or designee. The Permittee may be required to employ on behalf of the Authority a consulting firm for construction inspection.

F. OPERATIONAL APPROVAL

Before the start of any work on Authority Property, in accordance with the NYSDOT requirements contained in the "Requirements for the Design and Construction of Underground Utility Installations within the State Highway ROW" sections 2.02 through 2.06, the Permittee shall submit to the Authority Division Director or designee, and receive approval of, a description of the proposed operation, formal plans which are accurate-to-scale, and drawings showing construction details, including pits and soil exploration data. Plans must be signed by an individual with a New York State Professional Engineer's License. Actual field conditions encountered may require changes in the approved work schedule or construction details. Such changes shall be designed by a licensed Engineer and subject to approval of the Authority Division Director or designee.

As provided in TAP-401, the Permittee shall, before the start of work on Authority Property, remit a surety deposit and/or post a performance/restoration bond.

G. PERFORMANCE RESPONSIBILITY

Approval of personnel experience, work schedules, construction drawings and dewatering plans shall not relieve the Permittee of the responsibility to perform the work without damage to existing facilities.

H. SETTLEMENT MONITORING

Before beginning the tunneling, jacking, driving and/or boring operations, the Permittee may be required to establish a settlement monitoring system which may require daily monitoring to detect any pavement settling. The settlement monitoring system shall determine elevations on a ten (10) foot grid along the centerline of the operation and extend a distance of twenty (20) feet on both sides of the operation. Elevations shall also be determined along both edges of each lane of Thruway pavement at ten foot (10) intervals starting above the centerline of the operation and extending a distance of twenty (20) feet on both sides of the operation. All elevations shall be determined on marked relocatable points, which will allow Authority personnel to pinpoint exact locations and determine if any pavement has settled.

A bench mark or reference point used for the elevation determination shall be established outside the area of construction influence, a minimum of two hundred (200) feet from construction activity. The elevations of the marked grid and pavement lane points may be re-determined daily during the operation, and the results shall be delivered daily to the Authority Division Director or designee.

I. CONSTRUCTION HAZARDS

Excavations shall be properly shored to prevent settlement. During non-working hours, there shall be no excavation or obstruction closer than thirty (30) feet to any left or right edge of pavement, unless the excavation or obstruction is protected by an existing guide rail installation or by an installation of temporary concrete barrier (TCB) which has been constructed to Authority standards (see TAP-421A General Design and Construction Requirements for Occupancies, Section IV. K.) and as shown in the *Occupancy and Work Permit Specification Diagram: Temporary Concrete Barrier Protection* available from the Division Permit Coordinator. Where existing guide rail installations are used, the excavation or obstruction shall not be placed within the design deflection distance of the type(s) of guide rail as specified by the Authority.

All excavations which have the potential to impact the support of the Thruway's pavement, embankment, structure or other facility shall be supported with a continuous sheeting system which does not allow adjacent earth movement. All sheeting shall be installed in accordance with NYSDOT Standard Specifications Section 552. The systems shall be designed to resist earth pressure, hydrostatic pressure, and surcharges from traffic, construction equipment and/or adjacent structures. The system shall also be designed to have an adequate factor of safety against heave or piping. The system shall be internally braced, if necessary and designed by a NYS licensed Professional Engineer. The design of the system, including details of surface and ground water controls, shall be submitted to the Division Permit Coordinator for approval prior to final permit approval and construction of the excavation. Trench boxes, or other methods of excavation support which allow adjacent earth movements, will not be permitted unless approved by the Division Permit Coordinator in consultation with the NYSTA Geotechnical Engineer. Specifications shall be submitted for approval.

The determination of whether an excavation has the potential to impact the support of the pavement, embankment, structure or other facility shall be made by the Authority Division Director or designee.

In addition to excavation/obstruction regulations established by the Authority, the Permittee shall comply with all other excavation/obstruction rules and regulations established by the Occupational Safety and Health Administration (OSHA) or similar governing agencies.

J. CONTINUOUS OPERATION

Once started, the tunneling, jacking, driving and/or boring operation shall be progressed continuously without interruption until its completion, unless approval for interruption is granted in writing by the Authority Division Director or designee. This requires around-the-clock work during the operation.

K. TRAFFIC CONTROL

As provided in TAP-401, if tunneling, jacking, driving and/or boring operations will affect the movement of Thruway traffic or Thruway traffic safety, the Permittee shall implement a temporary traffic control plan approved by the Authority to ensure the safe movement of traffic in and around the work site and the safety of the Permittee's workforce.

L. HYDRAULIC DESIGN

All new facilities or developments intending to use existing Thruway drainage structures for the discharge of surface water shall ensure that the hydrologic and hydraulic design of such facilities or developments allows no increase in peak flow to occur at the Thruway structures. The criteria for no increase in peak flow shall be calculated on 1, 10, 25, 50 and 100 Year Design Storms. In addition, the effect of this discharge on 500-year storms should also be evaluated. Flow shall be calculated using the appropriate method (HEC-1, TR-55, TR-20 or USGS Regression Equations) as described in NYSDOT Highway Design Manual, Chapter 8 – Highway Drainage. The hydraulic analysis of the facility shall be analyzed using the appropriate software (HEC-RAS, HY8 or HYDRAIN).

Documents submitted with the permit application shall include, but not be limited to, two (2) copies of a comprehensive Engineer's Report that contains a detailed narrative explaining the stormwater management plan, appropriate grading and drainage plans, hydraulic computations, hydrographs showing pre- and post-development conditions, and a statement by the Engineer that "no increase" in peak flow design has been achieved. The documents shall be submitted to and approved by the Authority Division Director or designee.

M. DEWATERING SYSTEM

Where the flow or seepage of water into the operation may contribute to instability of the surrounding ground, the Permittee shall provide a dewatering system adequate to maintain the operation. Dewatering shall be continuous during the period of construction. To insure that no loss of ground attributable to a loss of soils through pumping results, and that no subsidence of adjacent pavement or structures is induced by a lowering of the ground water level, the dewatering system shall be designed and stamped by a Professional Engineer, licensed to practice in New York State, and competent in soil mechanics. The dewatering system plans shall be submitted to the Authority Division Director or designee for approval, prior to beginning work on Authority Property.

IV. TUNNELING

Tunneling will only be permitted under exceptional circumstances and then only when the borehole annulus excess voids can be filled under pressure with a cement grout (also refer to Section V. D.). All work shall be performed in accordance with the applicable safety codes and all technical provisions shall follow the NYSDOT specifications "Trenchless Installation of Casing under Highway."

V. UNDERGROUND CROSSINGS OF MAINLINE PAVEMENT AND SHOULDERS THROUGH ENCASEMENT PIPES

NOTE: The specifications referred to in this section are detailed in the *Occupancy and Work Permit Specification Diagram: Encased Gas Pipelines Under Pavement & Adjacent Authority Property* available from the Division Permit Coordinator.

A. STATEMENT OF REQUIREMENT

1. All underground crossings of Mainline pavement and shoulders, including water, sewer, gas and petroleum pipe lines, electric lines, telephone lines, etc., shall be encased in a larger encasement pipe (casing) so that repairs to, or replacements of, the facilities (carrier) transmitting the commodity may be made with minimal disturbance to the traffic lanes.

   Exceptions may made where the Permittee demonstrates to the satisfaction of the Authority that crossings without casing pipe can be made in accordance with the standards established in Design and Construction Requirements for Unencased Gas Pipelines (TAP-421E).

   Pipes carrying oil, liquified petroleum gas, natural or manufactured gas, and other flammable products shall conform to the requirements of all current industry standards:

   - American National Standards Institute (ANSI) Standard Code for Pressure Piping:

     - Power Piping, ANSI B31.1.0;
     - Petroleum Refinery Piping, ANSI B31.3;
     - Liquid Petroleum Transportation Piping Systems, ANSI, B31.4; and,
     - Gas Transmission and Distribution Piping Systems, ANSI B31.

   - American Petroleum Institute (API) for pipeline crossings under railroads and highways; as well as all applicable State and Federal regulations, codes and rules, including but not limited to:

     - National Electrical Safety Code; Title 16 NYCRR Chapters II and III;
     - USASI Publications B31.1, B31.4, B31.8;
     - 49 CFR of USDOT Rules and Regulations; and,
     - Public Service Commission (PSC) codes, Part 255.

   NOTE: When a Permit application is submitted for the construction of a liquid or gas pipeline, an emergency response plan is also required. The emergency response plan must, at a minimum, identify appropriate protective devices, and shall be subject to approval by the Authority Division Director or designee.

Pipelines carrying non-flammable substances shall be of acceptable material and construction as approved by the Authority. Joints for carrier line pipe operating under pressure shall be of a mechanical or welded type.

2. Requests for longitudinal Occupancy Permits involve special circumstances requiring several agency reviews and the satisfaction of additional conditions. While specific requirements must be met for such Occupancy Permits, requests for longitudinal Occupancy Permits are considered on a case-by-case basis.

B. MATERIALS

The encasement pipe shall be made of steel, concrete or other durable material properly protected from chemical and electrical deterioration in accordance with the applicable safety codes, so as to virtually preclude any necessity for disturbing the traffic lanes in the future.

C. LENGTH

All applicable requirements for encasement and carrier pipe under pavements shall extend for a minimum of 50 feet from the centerline of pavement, measured at right angles to the centerline, or to the Authority Property line, as directed by the Authority.

D. PRESSURE GROUTING

All thirty six (36) inch or larger diameter encasement pipe sleeves (steel, concrete or tunnel liner plates) shall be provided with grouting plugs to meet industry standards, spaced along the entire circumference of the sleeve. Upon completion of the boring and jacking operation or as the tunnel liner plates are installed, the borehole annulus voids shall be filled under pressure with a cement grout that meets the requirements of NYSDOT Standard Specifications Section 650, Subsection 2.02 B. A complete grouting plan must be submitted to the Authority Division Director or designee for all pressure grouting, including a subbase contamination prevention plan in accordance with NYSDOT Standard Specifications Section 650, Subsection 3.01 B. 1. f.

Pressure grouting from the ground surface shall be performed for encasement sleeves less than thirty six (36) inches in diameter whenever required by the Authority Division Director or designee. A complete grouting plan must be submitted for review in accordance with the NYSDOT Standard Specifications noted above.

If approved by the Authority, alternative industry approved methods other than pressure grouting may be utilized.

E. SEALING

Encasement pipes shall be sealed at the ends to prevent flowing water and debris from entering the annular space between the casing pipe and carrier.

F. DRAINAGE

Encasement pipes shall be properly vented and drained.

G. VENTS AND MANHOLES

Vents and access manholes shall be at least thirty (30) feet from the edge of the traffic lanes, preferably at the Authority Property line, and manholes shall be flush with the surrounding terrain.

H. VALVES

Shut off valves, preferably automatic, shall be installed in pressurized pipe lines so that the crossing may be isolated within a reasonable distance. The location and description of shut off valves should be clearly marked on the design plans with the distances from the Authority Property line noted. Valves should be located in an accessible area outside of Authority Property, for emergency use by Authority personnel.

I. DEPTH OF BURIAL

Underground installations shall be placed at the following minimum depths below the pavement (as measured from the top of the pavement surface to the top of the encasement pipe):

1. For Horizontal Directional Drilling (HDD) Installations, the minimum depth shall be ten feet (10) and, prior to drilling, the contractor shall submit calculations to the Division proving that their pressurized drill fluid will not fracture into the subbase or adjacent drainage facilities for the proposed depth.

2. For all other trenchless installation methods, the minimum depth shall be as follows:

   Gas Underground Crossings – At least four (4) feet below the bottom of the subbase or six (6) feet below the pavement surface, whichever is greater. In areas outside of the roadway but on Authority Property, the depth shall be at least three (3) feet below finished grade.

3. All other Underground Crossings – At least five (5) feet below the pavement surface. In areas outside of the roadway but on Authority Property, the depth shall be at least three (3) feet below finished grade.

J. UTILITY MARKING REQUIREMENT

All underground and aerial crossings shall be properly identified with markers at both Authority Property lines. Vent stand-pipes may serve as markers where appropriate. Markers shall include the type of installation (water line, gas pipeline, etc.) and the name of the Utility or agency responsible for repair of the installation. This marking must be durable and secure, and be approved by the Authority.

K. CATHODIC PROTECTION DEVICES

For all underground crossings, design plans shall include requirements and provisions for cathodic protection devices, and the requirements and provisions for the cathodic protection devices shall be reviewed by the Authority Division Director or designee.