ITEM 650.5000NN17 – FURNISH AND INSTALL PRECAST CONCRETE CULVERT FOR BOX JACKING

DESCRIPTION
This work consists of furnishing a precast concrete box culvert and performing a trenchless installation of the culvert by box jacking. Box jacking involves installing a culvert through the ground from a launch pit to a reception pit. The culvert is propelled by jacks located in the launch pit and the jacking force is transmitted through the culvert to the face of the excavation. The excavation is progressed manually or mechanically and protected by a cutting shield on the front of the culvert. Both the excavation and spoil removal processes require workers to be inside the culvert during the jacking operation. The jacking operation shall be performed by an experienced contractor, in a continuous manner, using methods that will minimize disturbance to overlying active facilities such as railroads or roadways, and achieve the alignment tolerances described herein and in the contract documents.

The furnishing and installation of sections of the box culvert not requiring box jacking are also included in this specification.

MATERIALS
Precast concrete box culverts shall meet the requirements of Section 706-17 Precast Concrete Box Culverts. Additionally, the Contractor shall ensure that the design of the culvert and joint material is adequate to withstand the estimated jacking loads without damage, and that the size, location, and number of ports are appropriate for lubrication and post-grouting operations.

Grout components shall meet the following requirements:

<table>
<thead>
<tr>
<th>Material</th>
<th>Requirement</th>
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<tbody>
<tr>
<td>Portland Cement, Type 1 or Type 2</td>
<td>701-01</td>
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<tr>
<td>Grout Sand</td>
<td>703-04</td>
</tr>
<tr>
<td>Water</td>
<td>712-01</td>
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<tr>
<td>Bentonite (Optional)</td>
<td>There are no material requirements for bentonite except that it shall be supplied in powdered form.</td>
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</tbody>
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CONSTRUCTION DETAILS
Furnish and install a precast box culvert of the length and size specified in the contract documents to the alignment and profile shown on the plans. Deviation from the proposed vertical profile shall not exceed 2 inches. Deviation from the proposed horizontal alignment shall not exceed 1% of the jacked length. For an installation under a railroad, work shall be carried out under the joint supervision of the Department and the railroad company, as per §105-09 Work Affecting Railroads.

A. Submittals

1. Precast Concrete Box Design – Submit structural design and all details necessary for construction meeting to the DCES for approval. The design submittal shall
conform to the requirements stated in the Prestressed Concrete Construction Manual (PCCM) except that grout holes shall have a maximum spacing of 4 feet longitudinally and transversely, unless otherwise approved. Review and approval time will be as described in the PCCM.

2. **Jacking Design** – The Contractor shall submit a box jacking design package to the Engineer. The submittal shall be signed and sealed by the Lead Designer. Installations under railroads shall be jointly approved by the Department and the railroad company. The Engineer will forward the proposed work plan to the DCETS, and to the Chief Engineer of the appropriate railroad company for review. The DCETS requires 20 working days from the date of receipt to perform the review. Railroad companies may require additional review time, as described elsewhere in the Contract Documents. NYSDOT and railroad review will run concurrently. Approval will remain in force only as long as all conditions set forth in the approval are met and satisfactory results are obtained. In the event that unsatisfactory results and/or damage occurs, the Contractor will stop work, modify the methods of installation, and submit them for review and approval.

Include the following:

a) All logs and reports from additional site characterization tests (i.e. vertical or horizontal subsurface explorations, probes, geophysical tests, etc.) performed at the Contractor’s option.

b) Narrative summary describing major phases of work, including: proposed sequence of construction, ground improvement (if any), quality control measures including steering procedures and tracking equipment, post-grouting procedures, and other key measures taken to ensure successful installation and minimal risk to overlying facilities. Include and clearly indicate contingency procedures and modifications to methods which will be implemented to mitigate excessive settlement or heaving, should either occur.

c) Plans showing the work zone equipment configuration at both ends of the bore, staging areas, storage areas, mud pits or tanks, and locations of slurry, cuttings and spoil handling areas. When installation occurs near a railroad, the face of all pits shall be located beyond the minimum required distance from the centerline of adjacent track as shown on the Plans.

d) Entrance and exit pit excavation support drawings and calculations, including shoring elements, bracing, entry/exit seals, etc. Retaining walls shall be designed for American Railway Engineering and Maintenance-of-Way Association (AREMA), Manual for Railway Engineering loadings and standards where appropriate.

e) Jacking system and appurtenances design details and supporting calculations, including: thrust block reactions, jack pressures, jacking frame, head and bracing designs, end and joint cushioning materials and dimensions, lubrication fluid types and allowable injection pressures, and design of guide rails, rollers and cradles. Hydraulic jacks shall be individually controlled and distribute load to the jacking frame such that pressure is evenly distributed to
the culvert.

f) Cutting shield dimensions and bracing design. The cutting shield design shall allow for the attachment of temporary louvers in case collapsible soil conditions are encountered. The shield shall conform to and not exceed the outside dimensions of the structure being installed by more than 1 inch at any point on the periphery, unless otherwise approved.

g) Description of excavation methods and sequences, allowable over-excavation limits, and spoil conveyance system. Unsupported excavation in front of the cutting shield will be no greater than 1.5 inches at any time, unless otherwise approved.

h) Post-grouting procedures and sequences including grout mix design and minimum and maximum grout pressures.

i) Equipment list including make, model number and specifications (catalog cuts) of all major equipment proposed for use.

j) Materials list and material safety data sheets for all materials proposed for use, including but not limited to bentonite, bentonite additives, and other drilling fluids.

B. Construction

Precast box sections will be inspected at the construction site to determine any damage during shipment. An additional inspection will be made prior to jacking to determine any damage during storage.

The Contractor shall have an approved On-Site Supervisor present during all jacking and grouting operations.

To reduce the risk of the box becoming firmly set in the ground, the jacking operation shall be progressed on a 24-hour basis without stoppage (except for adding culvert segments and passage of trains) until the leading edge of the culvert has reached the receiving pit. Post-grouting work shall commence immediately following completion of jacking.

Direct all jacking operations using steering and tracking systems capable of meeting the required alignment and profile tolerances. The control system shall provide continuous inclination and directional readings. Longitudinal forces shall be continuously monitored during advancement of the box culvert to prevent damage. Provide the Engineer access to all measuring, gauging, and steering instruments as per 105-11, Inspection of Work.

Monitor ground movements throughout the preparation, box jacking, and post-grouting processes in accordance with the provisions of the contract documents. If ground movements beyond the Shutdown Value occur, stop work and immediately stabilize the area of concern. If it is determined during the installation process that the required displacement or installation tolerances cannot be achieved, stop work. The Contractor shall then modify the methods of installation and submit them for review and approval as stated in this specification, A.3. Corrective stabilization actions shall be at the
Contractor’s expense.

Upon completion, dispose of any cuttings and excess drilling fluids in a manner consistent with local and State regulations.

The precast manufacturer shall have a representative available to assist in the installation of the non-jacked portion of the box culvert. Precast box sections shall be installed, true to line and grade, in accordance with the contract plans.

**METHOD OF MEASUREMENT**
Measurement will be one for each culvert satisfactorily installed in accordance with the contract documents.

**BASIS OF PAYMENT**
The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily furnish and install a culvert by conventional means and by box jacking, including: progressing through all subsurface conditions (earth and rock) and any obstructions encountered (boulders, concrete, etc.), performing and supporting temporary excavations for entrance and exit pits (including dewatering if required), performing and supporting excavations for the installation of the box culvert ends, supervision by the precast manufacturer’s representative, and other ancillary work.

Surveying and monitoring for ground movements during the installation shall be paid for under its respective item number.

NN = Serialized number identified on the plans.