ITEM 565.200100SU - REPLACE ANCHOR BOLTS

DESCRIPTION
The work under this item shall consist of core drilling through the bearing sole plate and/or masonry plate around the existing anchor bolt into sound concrete of the pedestal and/or bridge seat, at bearing locations and depths shown on the plans, for removal of the existing deteriorated bearing anchor bolt. After the core is removed, the diameter of the cored hole shall be determined in the field and a replacement anchor shall be sized so that no more than 1/8” of annular space shall exist between the new threaded stud/anchor bolt and the side of the cored hole wall. The diameter of new anchors shall be approved by the Engineer in Charge and the manufacturer’s printed installation instructions for the hole size created and the chemically curing anchoring material used. If reinforcing steel is encountered it shall be cut with the core drill. The work shall also include providing load test equipment and load testing of anchors designated by the Engineer.

MATERIALS

- **Threaded Studs/Anchor Bolts.**

  Threaded stud/anchor bolts shall meet the requirements of ASTM F568 Class 8.8, or ASTM A449, or they be manufactured from steel meeting the requirements of ASTM A576, Grades 1020 through 1050 inclusive having a minimum yield strength of 50ksi per NYSDOT Standard Specification Section 723-60.

  Threaded stud/anchor bolt diameter shall be determined once cored hole size is field measured by contractor as described above and per the product manufacturer’s recommendations based on the final diameter of the drilled hole. Minimum embedment shall be as shown on the plans or as ordered by the Engineer.

- **Nuts and Washers.**

  A steel plate washer is to be supplied per ASTM A36, a hex nut, lock washer and flat washer shall be supplied with each anchor bolt and be manufactured in accordance with ASTM A325 and lock washer in accordance with Table 730-22-I Steel Fasteners per section 723-60 of the NYSDOT Standard Specifications.

  The steel plate washer, nuts, washers and top 12” of the threaded stud/anchor bolt shall be galvanized in accordance with the requirements for Type II or Type V galvanizing as stated in Section 719-01, Galvanizing Coatings and Repair Methods.

- **Chemically Curing Anchor Material.**

  Chemically Curing Anchor Material used for this application shall be one of the following products: Hilti Inc. - RE 500, Dayton Superior – Sure Anchor I (J-51), Simpson Strong-Tie – ET-HP or SET Anchoring Adhesive or approved equal and shall conform to NYSDOT Standard Specification Section 701-07, Anchoring Materials – Chemically Curing.
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The Contractor is hereby notified that not all approved Chemically Curing Anchor Material have the same bond strength nor compatible with all concretes nor are they suitable for use in a core drilled hole.

Therefore, it is the Contractor’s responsibility to assure the Concrete-Chemically Curing Anchor Material compatibility by pretesting a number of anchors to their test load before starting production grouting. The number of anchors to be pretested to assure Concrete-Chemically Curing Anchor Material compatibility shall be as recommended by the Chemically Curing Anchor Material manufacturer. It shall also be the contractor’s responsibility to assure the chemically curing anchor material is suitable for use in a core drilled hole and provide the manufacturers written recommendations on maximum annular void between cored hole and threaded stud/anchor bolt for the diameter anchor proposed for use.

CONSTRUCTION DETAILS

The Contractor shall remove the existing deteriorated anchor bolts to the depths shown on the plans or slightly greater than the embedment length of the existing bolt by core drilling through the existing bearing sole plate and/or masonry plate and around the existing anchor bolt with the smallest diameter core bit possible to perform the work and in a manner that will not damage the existing bearing or concrete.

Drilling with a lubricant will not be permitted. Water is not considered a lubricant. Drilling methods shall not cause spalling, or other damage to concrete. Concrete spalled, or otherwise damaged by the Contractor’s operations shall be repaired at no additional cost to the County.

Chemically Curing Anchor Material shall be stored, mixed and placed in strict accordance with the manufacturer’s instructions, unless modified here or elsewhere in the contract documents. No Chemically Curing Anchor Material shall be placed at a temperature below that recommended by the material manufacturer.

Hole Preparation (As shown below or provided by Chemically Curing Anchor Material manufacturer):

- Drill hole to diameter and depth shown on the plans or approved by the Engineer.
- Remove dust from hole with oil-free compressed air for a minimum of 4 seconds. Compressed air nozzle must reach the bottom of the hole.
- Clean hole with nylon brush for a minimum of 4 cycles. Brush should provide resistance to insertion. If no resistance is felt, the brush is worn and must be replaced.
- Remove dust from hole with oil-free compressed air for a minimum of 4 seconds. Compressed air nozzle must reach the bottom of the hole.

Filling Hole (As shown below or provided by Chemically Curing Anchor Material manufacturer):

- Fill hole 1/2 to 2/3 full, starting at the bottom of the hole to prevent air pockets. Withdraw nozzle as hole fills up.
- Insert clean, oil-free anchor, turning slowly until the anchor contacts the bottom of the hole.
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- After insertion of the anchor, all excess Chemically Curing Anchor Material shall be struck off flush with concrete face.
- Should the Chemically Curing Anchor Material fail to fill the hole after bolt insertion, additional Chemically Curing Anchor Material shall be added to the hole to allow a flush strike-off.
- Do not disturb anchor until fully cured (see cure schedule for specific Chemically Curing Anchor Material used)

Note: Nozzle extensions may be needed for deep holes.

After Chemically Curing Anchor Material has reached design strength, the oversized hole in the sole plate and/or masonry plate shall be covered over by a steel plate washer, as shown in the plans between the flat washer and sole plate and/or masonry plate and the nuts shall be tightened down.

Rusted and/or corroded surfaces of base plates and bearings at the area of anchor bolt replacement shall be abrasive blasted and prime coated in accordance with Item 573.01nnnn, “Structural Steel Painting Field Applied – Total Removal”, cost to be included in this item. This work shall be completed prior to anchor placement and shall be performed in the proper containment per item 570.15nnnn.

If any bearing pedestal or bridge seat concrete repairs are performed prior to the drilling and installation of threaded stud/anchor bolts, the adhesive manufacturer’s recommendations should be followed in regards to concrete curing time and/or concrete strength.

The Contractor may increase the embedment length beyond that required by the Contract Documents if approved by the Engineer. The increase shall be done at no additional cost to the County. The bottom of the hole shall be at least 1 ½ in. from the nearest free surface of a structural element unless otherwise shown in the contract documents.

A. Acceptance of Anchor Installations

A number of anchors in each lot shall be randomly chosen by the Engineer for load testing. The number to be load tested in each lot shall be in accordance with Table 1. A lot size is determined by the Contractor, but must meet the following criteria:

1. A lot size shall not exceed 600 anchors.
2. All anchors in a lot must be installed within a two-month period.
3. Any anchors installed beyond the two-month period set forth in 2 above shall be part of another lot.
4. A lot shall only include anchors grouted with a single product.
5. A lot shall only include anchors of the same type, diameter and embedment depth.

Testing of anchors in a lot shall not begin until all the anchors in the lot are installed.

Table 1 indicates for each lot size, the initial number of anchors required for testing (N1) and the number of anchors required for additional testing (N2).
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Table 1

<table>
<thead>
<tr>
<th>LOT SIZE</th>
<th>N1</th>
<th>N2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-30</td>
<td>All the anchors in the lot</td>
<td>--</td>
</tr>
<tr>
<td>31-50</td>
<td>30</td>
<td>--</td>
</tr>
<tr>
<td>51-75</td>
<td>38</td>
<td>--</td>
</tr>
<tr>
<td>76-100</td>
<td>44</td>
<td>21</td>
</tr>
<tr>
<td>101-200</td>
<td>49</td>
<td>26</td>
</tr>
<tr>
<td>291-300</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>301-600</td>
<td>55</td>
<td>30</td>
</tr>
</tbody>
</table>

If all of the N1 anchors selected for testing pass the load test, the lot shall be accepted.

If the lot size is 75 or less and one of the N1 anchors fails the load test, all the remaining anchors in the lot shall be tested.

If the lot size is 76 or greater and an N1 anchor fails the load test, the Engineer shall immediately add the appropriate N2 number of anchors to the N1 anchors being tested. If any additional N1 or any of the N2 anchors fails a load test, all of the remaining anchors in the lot shall be tested.

B. Testing Equipment

The equipment shall consist of a load cell, jacking system, a frame to distribute the jack load, couplers to connect the jack to the anchors, and appropriate safety devices. Prior to starting the testing, the Contractor shall supply the Engineer with a certificate of calibration for the load cell performed within the previous six months by an independent testing agency.

Supports for the frame used to distribute the jack load shall be located outside a circle centered at the anchor. The circle shall have a diameter equal to 2 inches plus twice the anchor embedment length, but need not exceed 24 inches. The frame and jack shall be positioned so that the load is applied along the axis of the anchor. Chains or cables shall be used to connect the various pieces of the tensioning system so that free flying projectiles will not be created by the failure of an anchor coupling or other portion of the testing system.

C. Test Load

The test load for anchor bolts shall be 90% of the ASTM proof load, unless otherwise specified in the contract documents. When no proof load is given in the ASTM specifications for an anchor bolt steel, use the yield strength. The test load for rebars shall be 90% of the yield strength unless otherwise specified in the contract documents. Listed below are the test loads for the most commonly used anchor bolts and rebar steels, and anchor types.
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TEST LOADS

ASTM F568M Property Class 8.8 ANCHOR BOLTS
Or ASTM A449 (Coarse-Threaded Full Length)

<table>
<thead>
<tr>
<th>Diameter (inches)</th>
<th>Test Load (kips)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>11</td>
</tr>
<tr>
<td>5/8</td>
<td>17</td>
</tr>
<tr>
<td>3/4</td>
<td>26</td>
</tr>
<tr>
<td>7/8</td>
<td>35</td>
</tr>
<tr>
<td>1</td>
<td>46</td>
</tr>
<tr>
<td>1 1/8</td>
<td>51</td>
</tr>
<tr>
<td>1 1/4</td>
<td>65</td>
</tr>
</tbody>
</table>

Anchors shall be deemed to pass if the specified test load is attained without permanently displacing the anchors.

NOTE: THIS LOAD TESTING IS DESIGNED TO BE NON-DESTRUCTIVE. LOADING SHALL BE STOPPED AS SOON AS THE TEST LOAD IS REACHED.

D. Repairs

Concrete spalled or otherwise damaged by the load testing shall be repaired in a manner satisfactory to the Engineer and in accordance with item 582.05, “Removal of Structural Concrete - Replacement with Class A Concrete”. Such repair shall be done at the Contractor’s expense. All anchors which fail a load test, or are otherwise damaged, shall be replaced at the Contractor’s expense. All such replaced anchors shall be load tested.

METHOD OF MEASUREMENT

The quantity to be paid for will be the number of anchor bolts replaced as shown on the plans or as ordered by the Engineer. No payment will be made for anchors which fail load tests.

BASIS OF PAYMENT

The unit price bid per each bolt shall include the cost of furnishing all labor, materials and equipment necessary to complete the work including removal of any existing grout, if necessary.