Item 426
Post-Tensioning

1. DESCRIPTION
Furnish, store, and handle post-tensioning materials and perform post-tensioning of cast-in-place and precast structural units.

2. MATERIALS
Furnish materials that meet requirements of the most current versions of the following documents unless indicated otherwise: Post-Tensioning Institute’s Guide Specification for Grouted Post-Tensioning (PTI/ASBI M50) and Post-Tensioning Institute’s Specification for Grouting of Post-Tensioned Structures (PTI M55).

2.1. Prestressing Steel. Furnish prestressing steel strand conforming to one of the following types:
- Seven-wire steel strand meeting DMS-4500, “Steel Strand, Uncoated Seven-Wire Stress Relieved and Low Relaxation for Prestressed Concrete,” or
- Grade 150, high strength, coarse thread bars meeting ASTM A722.

2.2. Post-Tensioning System. Furnish a post-tensioning system following the minimum requirements for Protection Level 2 (PL-2) in accordance with PTI/ASBI M50. Prequalify post-tensioning systems using tests on complete tendons for compliance with the requirements of PTI/ASBI M50. The following exceptions apply.
- The embedded parts of the anchorage are not required to be galvanized or epoxy coated, unless otherwise noted on the plans.
- Provide pre-packaged grouts in accordance with DMS-4670, “Grouts for Post-Tensioning” and Class C grout per PTI M55. Do not use grouts that exceed the manufacturers’ recommend shelf life or 6 months, whichever is less.
- Provide unbonded single strand tendons in accordance with PTI M10.2-00: “Specification for Unbonded Single Strand Tendons.”

3. EQUIPMENT
3.1. Stressing Equipment. Provide hydraulic jacks, pressure gauges, and other stressing equipment that meets PTI/ASBI M50.

3.2. Grouting Equipment. Provide grout mixing, testing, and pumping equipment that meets PTI M55.

4. CONSTRUCTION
The requirements of Item 420, “Concrete Substructures,” and Item 422, “Concrete Superstructures,” will govern for cast-in-place construction. Item 424, “Precast Concrete Structural Members (Fabrication),” will govern for precast concrete units or members.

4.1. Qualifications of Personnel. Perform all work for post-tensioning, including duct and hardware installation, strand insertion, and tendon or bar stressing, under the direct supervision of an individual certified as a PTI Level 2 Bonded PT Field Specialist. Perform all grouting operations under the direct supervision of an individual who has received a Grouting Technician Certification from the American Segmental Bridge Institute (ASBI).
4.2. **Required Submittals.** Submit information required in this Section for post-tensioned elements, in addition to forming and falsework plans required by Item 420, "Concrete Substructures," and Item 424, "Precast Concrete Structural Members (Fabrication)." Include all necessary construction information in these submittals for cast-in-place and precast construction including, but not limited to the information required in this Section.

4.3. **Design Calculations.** Provide design procedures, coefficients, allowable stresses, tendon spacing, and clearances in accordance with the AASHTO LRFD Bridge Design Specifications and PTI/ASBI M50 unless otherwise shown on the plans. Submit sufficient calculations to support the proposed system and method of post-tensioning including friction loss diagrams. When the required jacking force for a particular type of tendon, duct, and configuration is furnished on the plans, design calculations are not required except to adjust for conditions different from those shown on the plans.

4.3.1. **Post-Tensioning Details.** Provide drawings with details that meet the requirements of PTI/ASBI M50 and this specification.

4.3.2. **Grouting Plan.** Submit for approval written grouting procedures at least 4 weeks before the start of the element's construction. Include items required by PTI M55.

Include the names of people responsible for PT installation and grouting operations, with the foreman of each grouting crew certified as a PTI Level 2 Bonded PT Field Specialist and ASBI Certified Grouting Technician.

4.4. **Packaging, Storing, and Handling of Post-Tensioning Components.** Package, store, and handle post-tensioning steel, grout, duct, and other accessories in accordance with PTI/ASBI M50 and PTI M55 unless otherwise indicated. Acceptance and rejection criteria for strand will follow PTI/ASBI M50 and PTI M55.

The following exceptions apply:

- Grout storage onsite will be limited to 30 days unless approval by the Engineer is given in advance of material delivery.
- Install grout caps and ensure vents are closed at all times so that water and other contaminants cannot enter the duct before strand installation.
- Do not flush ducts at any time.

4.5. **Duct and Prestressing Steel Installation for Post-Tensioning.** Follow PTI/ASBI M50 for duct and prestressing steel installation procedures and requirements unless otherwise specified. Verify that concrete strength requirements on the plans are met for stressing and staged loading of post-tensioned structural elements.

Stress the tendons within 7 days of installing the strand in the ducts unless otherwise approved in advance. Follow the tensioning procedure noted in the approved post-tensioning details.

4.6. **Grouting.** Grout in accordance with PTI M55.

Grout within 14 days of tendon stressing unless otherwise specified or approved. Obtain approval to extend the grouting time before stressing tendons.

Do not allow the grout temperature to exceed 85°F during mixing and pumping. Do not grout when the ambient temperature is below 35°F. Field-test the grout in accordance with Table 1 during grout installation. Perform field-testing by trained personnel at the Contractor's expense while witnessed by the Engineer. Pump at the lowest pressure possible that will maintain a continuous flow of grout.
Table 1

<table>
<thead>
<tr>
<th>Test</th>
<th>Frequency</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schupak Pressure Bleed Test (ASTM C1741)</td>
<td>1 per day</td>
<td>per DMS-4670</td>
</tr>
<tr>
<td>Fluidity test (Tex-437-A, Method 2)</td>
<td>2 every 2 hr.</td>
<td>per DMS-4670</td>
</tr>
<tr>
<td></td>
<td>2 min. per day</td>
<td></td>
</tr>
<tr>
<td>Compressive Strength test (3” x 6” cylinders)</td>
<td>1 per day</td>
<td>per DMS-4670</td>
</tr>
<tr>
<td>Mud Balance test (Tex-130-E, Part II)*</td>
<td>2 per day</td>
<td>per DMS-4670</td>
</tr>
</tbody>
</table>

*1. Take one sample from the mixer and one sample from the farthest duct outlet.

5. **MEASUREMENT AND PAYMENT**

The work performed, materials furnished, equipment, labor, tools, and incidentals will not be measured or paid for directly but will be subsidiary to pertinent Items.