1. SCOPE

This test method covers acceptance tests for Concrete Grouting and Anchoring Material (NY Standard Specification Item 701-05). The method includes tests for setting time, expansion/contraction, compressive strength, resistance to freeze-thaw, rebar pullout strength, chloride content, and sulfate content.

2. REFERENCED DOCUMENTS

2.1 AASHTO Standards
   M 201 Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in Testing of Hydraulic Cements and Concretes
   T 22 Compressive Strength of Cylindrical Concrete Specimens
   T 105 Chemical Analysis of Hydraulic Cement
   T 106 Compressive Strength of Hydraulic Cement Mortar (Using 50-mm or 2-in. Cube Specimens)
   T 131 Time of Setting of Hydraulic Cement by Vicat Needle
   T 162 Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
   T 260 Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials by Procedure B (Acid-Soluble Chloride Ion by Atomic Absorption)

2.2 ASTM Standards
   C 1090 Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout
   C 1107 Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

2.3 NYSDOT Standards
   Test Method 502-3P Freezing and Thawing, Portland Cement Concrete Cores Standard Specifications - Construction and Materials
3. APPARATUS

3.1 Apparatus is as specified in Referenced Documents with the following exceptions:
   3.1.1 The 50mm (2") cube mold assembly may be fabricated of high density polyethylene or Teflon.
   3.1.2 Mortar mixing apparatus is as specified in AASHTO T 162 except the bowl positioner is adjusted to allow for the largest size aggregate in the mixture being tested.

3.2 Universal Testing Machine with a 130 kN (30,000 pound) capacity able to maintain a load rate of 22 kN/min (5000 lb/min).

4. PROCEDURE

4.1 Mixing of Grouting or Anchoring Material - Premix dry components to ensure uniformity. Mix the material in accordance with the manufacturer’s mixing instructions using water/grout ratio specified in the Laboratory Request Memo. If no mixing instructions are specified, add the specified amount of water to the mixing bowl of the apparatus described in AASHTO T 162, add material and mix at slow speed for 3 minutes. Briefly stop mixer (not over 15s) during first minute of mixing to scrape into the batch any grout that may have collected on the side of the bowl.

4.2 Setting Time - Determine the setting time according to AASHTO T 131 except place the material in the mold immediately after mixing and store the specimen at ambient conditions instead of in the moist cabinet. Begin taking Vicat readings immediately. Obtain additional readings at 2 minute intervals for materials whose initial set is expected to be 15 minutes or less. Obtain readings at 5 minute intervals if the initial set is expected to be greater than 15 minutes.

4.3 Expansion/Contraction - Determine expansion or contraction according to ASTM C 1090 using moist cabinet storage conditions. Obtain measurements at 1, 3, and 7 days.

4.4 Compressive Strength - The compressive strength at a specified curing time is the average compressive strength of three 50mm (2") compression cubes. Cast the cubes in cube molds following the procedures of AASHTO T 106 for compressive strength except omit the use of a cover plate. Remove from the molds after 24 hours and cure in lime water inside the moisture cabinet until they are to be broken. Follow manufacturer’s curing instructions if material is not portland cement based. Break the cubes in compression as described in AASHTO T 106.

4.5 Freeze-Thaw - Cast one set of three 50mm (2") cubes in cube molds following procedures of AASHTO T 106 for compressive strength except omit the use of a cover plate. Remove from the molds after 24 hours and cure in lime water inside the moist cabinet for six additional days. Follow manufacturer’s curing instructions if material is not portland cement based. Test the set of cubes according to NYSDOT Test Method 502-3P except as a container use a 300mm (12") x 150 mm (6") plastic
cylinder mold cut to a height of 100mm (4"). The three cubes are then placed in one container and soaked in solution for 24 hours before beginning the first cycle.

4.6 Rebar Pullout Strength

4.6.1 Cast six 150mm (6") x 300mm (12") cylinders from a batch of concrete conforming to the control batch as detailed in NY Test Method 711-4F. Remove the molds after 24 hours at ambient conditions. Cure for a minimum of fourteen days under conditions specified in AASHTO M 201. Test two cylinders according to AASHTO T 22 to ensure that the batch of concrete has a compressive strength of at least 17 MPa (2500psi).

4.6.2 Drill into the flat end on the centerline of four cylinders a 22mm (7/8") diameter x 150mm (6") deep hole. Do not use any lubrication during the drilling process and avoid spalling or other damage to the concrete. Return the cylinder to moist curing conditions. After 48 hours remove the cylinders from the moist curing conditions and allow to air dry. Be sure the hole in each cylinder is dry and clean of foreign and loose material.

4.6.3 Grout a 760mm (30") long No.5 reinforcing bar into the hole in each cylinder, two in a vertical orientation and two in a horizontal orientation, as follows. **Mix the grouting material according to the testing memo.** Place enough grout into each hole to ensure complete filling of the hole after insertion of the rebar. Insert the rebar to the bottom of the hole and manipulate the rebar in order to be sure that it is completely coated with grouting material within the hole. Strike off excess grouting material flush with the concrete surface. Should the grouting material fail to fill the hole after insertion of the rebar, add enough grouting material so as to be able to strike off the material flush with the concrete surface. When inserting the rebar in the horizontal position take care to prevent it from changing position prior to the setting of the grouting material. This may be done by blocking and shimming the rebar extending outside the cylinder. Note whether the consistency of the grouting material is suitable or unsuitable for horizontal grouting.

4.6.4 After curing the grouted cylinders in their original position for 24 hours, continue to cure under conditions specified in AASHTO M 201 for six more days.

4.6.5 Using the universal testing machine determine the tensile load needed to pull each rebar out of the grouted hole. Secure an 8.5" diameter swivel head, which has a 1.5" hole passing through its center, to the cross head of the testing machine so that the rebar protruding from the concrete cylinder will pass through the swivel head and cross head. Grip the rebar in the opposing cross head of the testing machine. Load the specimen so that the rebar is loaded in tension while the concrete cylinder is held stationary against the swivel head. Apply the load at a rate of 22 kN/min (5000 lb/min). Note the maximum load and mode of failure.

4.7 Chlorides - Determine Chloride content according to AASHTO T 260 Procedure B.

4.8 Sulfates - Determine Sulfate content according to AASHTO T 105 section 15.1.
5. REPORT

5.1 Batch weights with water amount (w/g ratio)
5.2 Initial Setting Time (minutes)
5.3 Expansion or Contraction (%)
5.4 Compressive Strength (MPa and/or psi)
5.5 Freeze-Thaw loss (%)
5.6 Pullout Strength (MPa and/or psi) with description of failure
5.7 Chloride (%)
5.8 Sulfate (%)