

# EXPECTED IMPLEMENTATION JANUARY 2015

## 938 POST-TENSIONING GROUT – LABORATORY TEST. (REV 6-9-14) (FA 7-28-14) (1-15)

SUBARTICLE 938-4.2 is deleted and the following substituted:

**938-4.2 Laboratory Test:** The grout shall meet or exceed the specified physical properties stated herein as determined by the following standard and modified ASTM and FM test methods conducted at normal laboratory temperature (65°F-78°F) and conditions. Conduct all grout tests with grout mixed to produce the minimum time of efflux. Establish the water content to produce the minimum and maximum time of efflux.

| Property                                             | Test Value                                                        | Test Method    |
|------------------------------------------------------|-------------------------------------------------------------------|----------------|
| Total Chloride Ions                                  | Max. 1.0 lbs/yd <sup>3</sup>                                      | FM 5-516       |
| Fine Aggregate (if utilized)                         | 99% passing the No. 50 Sieve (300 micron)                         | ASTM C136*     |
| Hardened Height Change @ 24 hours and 28 days        | 0.0% to + 0.2%                                                    | ASTM C1090**   |
| Expansion                                            | ≤ 2.0% for up to 3 hours                                          | ASTM C940      |
| Wet Density - Laboratory                             | Report maximum and minimum obtained test value lb/ft <sup>3</sup> | ASTM C185      |
| Wet Density - Field                                  | Report maximum and minimum obtained test value lb/ft <sup>3</sup> | ASTM C138      |
| Compressive Strength 28 day (Average of 3 cubes)     | ≥7,000psi                                                         | ASTM C942      |
| Initial Set of Grout                                 | Min. 3 hours<br>Max. 12 hours                                     | ASTM C953      |
| Time of Efflux                                       | ***                                                               | ***            |
| (a) Immediately after mixing                         | Min. 20 Sec.<br>Max. 30 Sec.                                      | ASTM C939      |
|                                                      | or<br>Min. 9 Sec.<br>Max. 20 Sec.                                 | ASTM C939****  |
| (b) 30 minutes after mixing with remixing for 30 sec | Max. 30 Sec.                                                      | ASTM C939      |
|                                                      | or<br>Max. 30 Sec.                                                | ASTM C939****  |
| Bleeding @ 3 hours                                   | Max. 0.0 percent                                                  | ASTM C940***** |
| Permeability @ 28 days                               | Max. 2,500 coulombs at 30 V for 6 hours                           | ASTM C1202     |

\*Use ASTM C117 procedure modified to use a #50 sieve. Determine the percent passing the #50 sieve after washing the sieve.

\*\*Modify ASTM C1090 to include verification at both 24 hours and 28 days.

\*\*\*Adjustments to flow rates will be achieved by strict compliance with the manufacturer's recommendations. The time of efflux is the time to fill a one liter container placed directly under the flow cone.

# EXPECTED IMPLEMENTATION JANUARY 2015

D

R

A

F

T

| Property | Test Value | Test Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |            | <p>****Modify the ASTM C939 test by filling the cone to the top instead of to the standard level.</p> <p>****Modify ASTM C940 to conform with the wick induced bleed test as follows:</p> <ul style="list-style-type: none"><li>(a) Use a wick made of a 20 inch length of ASTM A416 seven wire 0.5 inch diameter strand. Wrap the strand with 2 inch wide duct or electrical tape at each end prior to cutting to avoid splaying of the wires when it is cut. Degrease (with acetone or hexane solvent) and wire brush to remove any surface rust on the strand before temperature conditioning.</li><li>(b) Condition the dry ingredients, mixing water, prestressing strand and test apparatus overnight at 65 F to 75°F.</li><li>(c) Mix the conditioned dry ingredients with the conditioned mixing water and place 800 ml of the resulting grout into the 1,000 ml graduate cylinder. Measure and record the level of the top of the grout.</li><li>(d) Completely insert the strand into the graduated cylinder. Center and fasten the strand so it remains essentially parallel to the vertical axis of the cylinder. Measure and record the level of the top of the grout.</li><li>(e) Store the mixed grout at the temperature range listed above in (b).</li><li>(f) Measure the level of the bleed water every 15 minutes for the first hour and hourly for two successive readings thereafter.</li><li>(g) Calculate the bleed water, if any, at the end of the 3 hour test period and the resulting expansion per the procedures outlined in ASTM C940, with the quantity of bleed water expressed as a percent of the initial grout volume. Note if the bleed water remains above or below the top of the original grout height. Note if any bleed water is absorbed into the specimen during the test.</li></ul> |