TEST PROCEDURE FOR HYDRO-INSENSITIVITY OF HIGH DENSITY POLYURETHANE GROUT – BARREL TEST

GEOTECHNICAL TEST PROCEDURE
GTP-8
Revision #1

AUGUST 2015
GEOTECHNICAL TEST PROCEDURE:
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BARREL TEST

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STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL ENGINEERING BUREAU

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Hydro-Insensitivity of High Density Polyurethane Grout - Barrel Test Data Sheet .... A-1
1. SCOPE

1.1 This procedure is used to demonstrate that the expanding polyurethane material is hydro-insensitive, i.e. it will not be significantly compromised when injected into water.

2 APPLICABLE DOCUMENTS

2.4 NYSDOT Geotechnical Test Procedure (GTP-9) Test Procedure for Hydro-Insensitivity of High Density Polyurethane Grout – Panel Test.

3 TERMINOLOGY

3.1 **Slabjacking** is used to correct settlement and stability problems associated with concrete slabs positioned over unstable ground materials. As defined in *Ground Improvement Technology Manual, FHWA DP-3* (1996), slabjacking procedures include:

- Raising or leveling;
- Under-slab void filling (no raising);
- Grouting slab joints; and
- Asphalt subsealing.

Proprietary methods for slabjacking utilize chemical grouts to create a reaction to fill the void, seal the crack, or create uplift pressure to realign the slab.

3.2 **Hydrophilic** chemical grouts can produce either closed cell foam or a non-cellular gel when mixed with water. Hydrophilic chemical grouts attract water and is able to bond to wet surfaces. This product seeks out water as it reacts and allows the resin to work its way into water filled pores. Hydrophilic chemical grouts are flexible and resilient after full cure and will allow movement to occur in the structure without damaging the seal or bond.

3.3 **Hydrophobic** chemical grouts require a catalyst that is blended into the resin prior to installation. The dosage of catalyst added to the resin controls the reaction time and the volume of foam produced. Hydrophobic chemical grouts repel water after activation. Hydrophobic resins cure rigid and do not recover from compression. Hydrophobic chemical grout is low viscosity and permeates loose and non-consolidated soils readily.

4 SUMMARY OF METHOD

4.1 This is a visual verification test procedure to ensure that the High Density Polymer Material is Hydro-Insensitive. Hydro-insensitivity is the inherent chemical property of a material to be unaffected by water (i.e. to behave in such a manner as if there was no
water present). For hydro-insensitive polyurethanes (hydrophobic), the reacting components will polymerize even in the presence of water.

4.2 A useful tool for determining the extent to which a material is hydro-insensitive is to inject the reacting polymer directly into water. By doing this the reacting polyurethane is presented with the worst possible conditions for proper cross linking of the molecules; far greater interaction with water than typically seen in real world field conditions.

5 SIGNIFICANCE AND USE

5.1 Polyurethane grouting is a grouting technique that employs a high density expanding polymer used as fill to densify and stabilize low-density compressible soils. The process may be used to fill voids beneath concrete slabs, or behind walls, or may be used to cutoff water flow through concrete joints. The grout, injected through predrilled injection ports, or “packers”, expands under reaction to fill the crack or void. Polyurethane grouts can be single or multi-component grouts and can react when coming in contact with water or require a reactant.

6 APPARATUS

6.1 Provide a 55 gallon drum filled with 40 gallons (±1 gallon) of potable water. Ensure the water temperature is 70° F (±1° F).
6.2 Provide copper tubing of sufficient length to inject polyurethane material into the water near the bottom of the barrel.

7 TEST SETUP

7.1 Remove lid from 55 gallon drum.
7.2 Fill 55 gallon drum with 40 gallons (± 1 gallon) of potable water.
7.3 Record water level in drum.
7.4 Water temperature shall be 70° F (± 1° F) immediately prior to injection of test material.
7.5 Record water temperature.
7.6 Record ambient air temperature.

8 PREPARATION OF MATERIAL

8.1 Verify desired control panel pressures of A & B chemicals.
8.2 Record control panel pressures of A & B chemicals.
8.3 Verify that pre-heaters and line heat have heated the material to the desired temperature.
8.4 Record temperature of material at tip of injection gun.
8.5 Inject material into test bag to visually check for desired reactivity, if reactivity is as desired, continue, if not, make necessary adjustments and return to 8.1.
9 INJECTION OF MATERIAL INTO DRUM OF WATER

9.1 Attach copper tubing to tip of gun of sufficient length so that the end of the tubing will be a minimum of 75% below the top water level in the drum.

9.2 Record the time at the beginning of injection.

9.3 Inject material through the tubing to the minimum 75% depth in a continuous stream of material until approximately 10 pounds of material have been injected.

9.4 Stop injection and remove the tubing from the drum of water.

9.5 Record the time at the end of injection.

9.6 Record the actual number of pounds injected into the water.

9.7 At 15 minutes after the injection was complete, remove the material from the drum for analysis.

9.8 Record post injection water level in the drum.

10 DOCUMENTATION - MATERIAL ANALYSIS

Report the following:

10.1 Material Analysis – PASS – Good Cell Structure
   10.1.1 Small/Fine Tight Cells
   10.1.2 Minimal Friability
   10.1.3 Homogeneous Appearance
   10.1.4 No Glassiness or Coarse Cell Structure
   10.1.5 Minimal Striation or Elongation of Cells
   10.1.6 Minimal Voiding

10.2 Material Analysis – FAIL – Bad Cell Structure
   10.2.1 Large Cells
   10.2.2 Excessive Friability
   10.2.3 Heterogeneous Appearance
   10.2.4 Glassy Cells
   10.2.5 Visible Striation or Noticeable Elongation of Cells
   10.2.6 Large Voids
Hydro-Insensitivity of High Density Polyurethane Grout -
Barrel Test Data Sheet

Project__________________________________________________________

PIN ___________ Contract No. _______________ County __________ Region____

Polymer Type & Manufacturer __________________________________________

Lot # & Date on Component Containers____________________________________

TEST SETUP

_________ Depth of Water (in.)

PREPARATION OF MATERIAL

_________ Chemical A Pressure (psi)

_________ Temperature of Water (°F)

_________ Chemical B Pressure (psi)

_________ Ambient Air Temperature (°F)

_________ Temperature at Tip of Gun (°F)

_________ Reactivity Acceptable

INJECTION OF MATERIAL INTO DRUM OF WATER

_________ Time at Beginning of Injection (HH:MM:SS)

_________ Time at End of Injection (HH:MM:SS)

_________ Pounds Injected in Drum of Water

_________ Depth of Water (in.) – Post Injection.

MATERIAL ANALYSIS

Pass – Good Cell Structure  Fail – Bad Cell Structure

_________ Small/Fine Tight Cells  ___________ Large Cells

_________ Minimal Friability  ___________ Excessive Friability

_________ Homogeneous Appearance  ___________ Heterogeneous Appearance

_________ No Glassiness or Coarse Cell Structure  ___________ Glassy Cells

_________ Minimal Striation or  ___________ Visible Striation or Noticeable

Elongation of Cells  Elongation of Cells

_________ Minimal Voiding  ___________ Large Voids

Remarks__________________________________________________________

____________________________________________________________________

Contractors Technician___________________ Inspector _________________ Date_________