SECTION 02 55 00

DEEP LOCK METHOD OF VOID FILL, STABILIZING SOIL AND LIFTING PAVEMENT OR CONCRETE STRUCTURES WITH HIGH DENSITY POLYURETHANE FOAM THROUGH INJECTION PIPES OR TUBING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Driving injection pipes or tubing into place

B. Stabilizing loose soil and filling voids with polyurethane foam.

C. Monitoring structures and / or soil for lift.

D. Removing injection pipes or tubing.

E. Repairing concrete and patching drill holes.

1.2 REFERENCES

A. ASTM D-1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics

B. ASTM D-1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics

C. ASTM D-638 – Standard Test Method for Tensile Properties of Plastics

D. ASTM D-1042D – Standard Test Method for Linear Dimensional Changes of Plastics Caused by Exposure to Heat and Moisture

E. NSF/ANSI 61-5 – Drinking Water System Components – Health Effects

1.3 SUBMITTALS

A. Submit under provisions of specification.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products.

B. Installer Qualifications: Minimum 5-year experience installing similar products.

C. Test Section: Provide a test section for evaluation of injection techniques and application workmanship.
   1. Finish areas designated by Engineer.
   2. Do not proceed with remaining work until workmanship is approved by Engineer.
   3. Refinish test section as required to produce acceptable work.

1.5 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to starting work of this section.

1. Review the latest Technical Data Sheets, Safety Data Sheets, and instructions from manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Keep lids on tightly to prevent moisture from entering containers. Avoid direct contact with product. Use caution when opening as pressure may build up inside containers.

C. Handling: Handle materials to avoid damage.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Alchatek; 4508 Bibb. Blvd Suite B5, Tucker, GA 30084. Tel: (404) 618-0438. Fax: (678) 805-4783. Email: info@alchatek.com. Web: www.alchatek.com.

B. Substitutions: Not permitted.

2.2 PRODUCT SPECIFICATIONS

A. Product: AP Lift 475 as manufactured by Alchatek.

B. Material:
1. 1/2” outside diameter tubing, 3/8” NPT pipe, or other injection piping as approved by engineer.
2. Accessory: AP Pump Flush.
3. Accessory: AP Flush 125.
4. Accessory: Injection pipes or tubing.
5. Accessory: AP Fast Repair 850

C. Physical Properties 77 degree F (25 degree C) – Liquid:
1. Mix Ratio A:B = 1:1 by volume.

D. AP Lift 475 Physical Properties – Cured Free Rise:
1. Compressive Strength (ASTM D-1621): 100 psi or 14,000 psf
2. Tensile Strength (ASTM D-638): 100 psi
3. Expansion (unconfined): 14-16 times
4. Shrinkage (ASTM D-1042/D): Less than 2%.

E. AP Lift 475 Reaction Times:
1. Initial Reaction: 9 seconds.
2. Full expansion: 40 seconds.
3. 90% Strength: 15 minutes

F. AP Fast Repair 850 Physical properties:
1. Shore D Hardness @77F: 80

2. Reaction Time: 60-90 seconds

G. Environmental Safety
1. Polyurethane foam must have been tested and certified to meet NSF/ANSI 61-5 – Drinking Water System Components – Health Effects to ensure the product is safe for the environment.

PART 3 EQUIPMENT

3.1 PROPORTIONER

A. Hydraulic, pneumatic, or electric proportioner shall be used.
1. Proportioner shall be capable of generating pressures of 1,500 psi minimum and pressure shall be adjustable.
2. Proportioner shall be capable of heating A and B components to different temperatures using separate controllers in accordance with Alchemy-Spetec specifications.
3. Proportioner shall have temperature controlled dispense hoses with a separate temperature controller.
4. Proportioner shall have a cycle counter to track material usage.
5. Proportioner shall have a pressure balance control mechanism to help prevent material from being injected off-ratio.

B. Contractor shall provide engineer with a letter from the resin supplier confirming pounds per cycle specific to the make and model of Hydraulic Proportioner and to the resin being injected.

3.2 INJECTION GUN

A. Injection gun shall be impingement style gun such as the MixMaster Pro by Alchemy-Spetec.

3.3 MONITORING EQUIPMENT – One or more of the following shall be used as approved by engineer:

A. Rotary Laser level with remote receivers.

B. Dial indicator micrometer.

C. Zip level or other calibrated remote level device.

3.4 PENETROMETER

A. Hand cone penetrometer rod with relative density dial.

B. Pagani DPM 30-20 is an acceptable alternate.

PART 4 EXECUTION

4.1 PREPARATION

A. Investigate job site.
1. Locate all utilities and drainage pipes. Inspect drainage pipes before and after job to ensure there are no cracks or defects that foam material can enter. Use sewer inspection camera if necessary. Locate and mark any in-slab electrical conduits and avoid these areas when drilling.
2. Investigate soil conditions using one of Penetrometers listed in Section 3.4. Minimum of two points on every side of a structure or every 50 feet (whichever provides the

greatest number of test points).

B. Injection Equipment: Plural component 1:1 mix ratio proportioner capable of generating pressures of 1,500 psi minimum. A and B primary heaters controlled separately. Heated hoses. Impingement mix gun such as MixMaster Pro from Alchemy-Spetec.

C. Monitoring Equipment: A combination of laser levels, zip level, survey equipment, string lines, and / or dial indicators shall be used to monitor movement of concrete slabs.

D. Condition material overnight to 60 degrees to 90 degrees F (15 degrees to 32 degrees C).

E. Protect surfaces from foam that can blow out of injection holes, cracks, and joints. Use AP Flush 125 as a stain block on concrete and other surfaces during injection.

F. Sawcut joints if necessary prior to injection to prevent or release slabs from binding.

G. Repair cracks in concrete with AP Spall Repair 850 prior to or after injection (site specific decision).

H. Personal Protection: Use safety goggles, face shield, impermeable gloves, long sleeves and pants.

I. Use in well ventilated areas. Open doors and windows. In confined areas use mechanical ventilation to keep vapor concentrations low. Prevent direct contact with skin and eyes. Refer to SDS.

4.2 INSTALLATION

A. Drive pipe to lowest depth to be injected.
   1. Install a loose-fitting carriage bolt or expendable drive point in bottom of pipe or tubing to prevent soil from clogging pipe. Tape lightly as necessary to prevent tip from falling out.
   2. Space pipes 4’ to 6’ o.c.
   3. Drive pipes or tubing with an electric hammer drill with ground rod driver attachment or pneumatic post driver to ensure positive contact with surrounding soil and prevent foam from rising along the surface of the pipe or tube.
      a. Water jetting pipes will not be permitted unless approved by the engineer.
      b. Air jetting pipes will not be permitted unless approved by the engineer.
   4. Pull the pipe up 1-2 inches to allow room for the carriage bolt to disengage from the pipe when pressurized.
   5. Extract the pipe or tubing as it is being injected. Inject predetermined amount of resin at each depth per engineer’s requirement. Do not stop or pause injection for more than 5 seconds or material will cure in the pipe or tubing.
   6. Stop injection at approximately 3 feet from the surface to prevent foam from escaping to the surface.
   7. Continuously monitor for movement of any slab, structure, or soil using appropriate and approved monitoring device listed in Section 3.3. STOP IMMEDIATELY when lift is over 1/8”, or 1/16” as verification of void fill only.

B. If injecting through concrete:
   1. Drill 5/8” injection holes. Spacing shall be determined on site and adjusted as necessary, but typically every 4’ to 6’ o.c.
   2. Drive 1/2” tubing through drilled holes.
   3. Set heater controllers for Part “A” and Part “B” and Hose Heat to temperatures as indicated on top of material drums.
   4. Inject resin according to manufacturer’s recommendations.
   5. Monitor movement of slabs. Do not lift more than 1/8" at a time per hole to avoid

cracking the slab. Do not lift more than 1/16” to verify void fill. Holes can be re-drilled and re-injected several times.

6. Ensure that all voids beneath the slab are filled. Drill 3/8” holes as necessary and inject through the slab using a 3/8” adapter for the injection gun (MixMaster ports).

C. If injecting directly through the soil, follow instructions above with the exception that no holes will need to be drilled.

D. Mixing: None required. Keep lid tightly sealed when not in use and avoid splashing water into material containers.

E. Cured material is chemically inert and safe to dispose of in landfill. Cleanup any spilled liquid resin and place in a suitable sealed container. Dispose of in accordance to applicable environmental regulations.

4.3 DRESS OUT

A. In concrete, remove injection ports and fill holes with AP Fast Repair 850. In asphalt, remove injection ports and fill holes with a fast setting hydraulic cement manufactured by DRYLOK, or equal.

B. Grind excess resin from face of concrete with wire brush or cup wheel if necessary but avoid scarring concrete.

C. Cut off any pipes that were locked up in the ground a minimum of 6 inches below grade.

4.4 CLEAN-UP

A. Flush injection equipment with AP Pump Flush when necessary. Remove cured material from metal components by soaking in AP Soak 130.

B. Clean off skin with soap and water.

4.5 PROTECTION

A. Protect adjacent work area using plastic sheeting if necessary.

B. Spray concrete around injection holes, defects, cracks, and joints with AP Flush 125 to act as a barrier between the concrete and the foam and prevent staining of the concrete.

END OF SECTION