

**SEALING UNDERGROUND UTILITY SYSTEMS WITH POLYURETHANE MATERIAL**  
**SOIL DENSIFICATION WITH POLYURETHANE MATERIAL**

As provided by Uretek

**General.** This specification describes the materials and methods for sealing underground drainage systems including Manholes, Utility Vaults, Storm and Wastewater Systems, and densification of surrounding soils.

**1.0 Description.** This work shall consist of sealing, undersealing, raising, or filling voids at underground manholes, utility vaults, slip-lined pipes, storm and wastewater structures and pipes, or densification of surrounding soils by furnishing, hauling and injecting polyurethane material at utility piping, utility structures, concrete or into the base soils at locations shown on the plans or as directed by the engineer.

**2.0 Material Requirements.**

2.1 The material used for sealing and soil densification at underground storm and wastewater structures and pipes shall be water blown, closed cell, hydro-insensitive, high density polyurethane system with the following physical characteristics and properties.

<b>Technical Property</b>	<b>Requirement</b>
Density, min., per ASTM D1622 (air rise)	3.69 lbs / ft <sup>3</sup>
Compressive strength, min., per ASTM D 1621	60 psi
Density, max., per ASTM D1622 (air rise)	4.2 lbs / ft <sup>3</sup>
Volume Change, max. shrinkage (10 years)	5.0 percent
Curing Rate	90 percent of compressive strength within 15 minutes after injection

2.2 The material used shall be a high-density polyurethane material, such as URETEK 486 STAR or equivalent, as approved by the engineer. The material shall be a polyurethane-forming mixture, having a water insoluble diluent, which permits the formation of polyurethanes in excess water. The presence of these water insoluble diluents provides polyurethane foam with improved dimensional stability properties. This formula and these characteristics must be certified by the manufacturer.

2.3 All stored polyurethane material shall be sealed and protected from contamination of dust or any foreign material.

**3.0 Contractor Pre-Qualification Requirements.**

3.1 The contractor shall have a minimum of three years of experience in performing this type of work and a minimum of 50 projects on which the contractor has successfully done this type of work.

**4.0 Equipment Requirements.** The contractor shall provide at a minimum, the following equipment:

- (a) A vehicle-mounted pumping unit capable of injecting the high density polyurethane material beneath the concrete slabs. The pumping unit shall be equipped

with a dial gauge in increments of 1/10 pound (45 g) and shall be capable of controlling the rate of flow of material as well as the rate of rise of the pavement.

(b) Pressure and temperature control devices capable of maintaining proper temperature and proportionate mixing of the polyurethane component materials.

(c) Pneumatic or electric drills capable of efficiently drilling 9/16 to 3/4-inch (14-19 mm) diameter injection holes through the pavement without damaging the structural integrity of the existing pavement.

(d) Laser levels or dial indicator devices capable of monitoring and verifying that the pavement is raised to an even plane and to the required elevation.

(e) All necessary electric generators, compressors, heaters, hoses, containers, valves and gauges to efficiently conduct and control the work.

(f) Personnel safety apparatus including harnesses, lanyards, man-hoists, breathing masks, gas monitoring equipment, vent blowers, hazardous material suits, etc., as necessary

## **5.0 Construction Requirements.**

5.1 As necessary, polyurethane material shall first be injected through a series of 5/8" drilled holes until all known or encountered voids under the structures and pipes are filled. Depending on the diameter, location and accessibility of the repair area, the repair may be made from within the pipe or from grade (outside the pipe). The rate and amount of material injection shall be determined by the contractor.

5.2 Injection nozzles shall prevent leakage during injection and shall be removed at completion of the injection or driven into the injection hole to a minimum of 3/4 inches below the surface. Any excessive material on the pavement surface shall be removed from the area and the holes shall be sealed with polyurethane material or a non-expansive cementitious grout approved by the engineer.

5.3 All drill tailings, excess polyurethane material and other debris shall be cleaned up and removed at the end of each working day. All removed material shall be disposed of in an environmentally acceptable manner in accordance with all federal, state and local regulations.

5.4 For sealing underground utility structures and piping, or soil densification and compaction of unconsolidated base soils, stabilization of asphalt and composite pavement, a series of 5/8" – 3/4" holes (as required for tube placement) shall be drilled at approximately 3-4 foot spaced intervals through the area requiring soil remediation. The polyurethane material shall then be injected through injection tubes inserted into the drilled holes to the proper depth or depths as required. The exact location, spacing, hole size and depth shall be selected by the contractor. The rate and amount of material injected shall be determined by the contractor to obtain proper densification of the base and sub-base soils.

5.5 The Polyurethane material shall be injected through injection tubes inserted into the drilled holes to the proper depth or depths as determined by on-site soils analysis, or dynamic cone penetrometer testing. The rate and amount of material injected shall be determined by the contractor.

5.6 Continuous laser level or dial indicator micrometer readings shall be in place and monitored by the contractor during injection as a means of determining sufficient material usage and soils densification as indicated by surface movement of 1-2 mm. Material will be injected until surface movement, predetermined quantity calculations, or as determined by onsite project foreman.

5.7 The contractor will be responsible for any structure or pavement blowouts, excessive lifting or damage that may occur as a result of the contractor's work. The contractor shall repair any subject areas to the satisfaction of the engineer at the contractor's expense.

**6.0 Method of Measurement.** Polyurethane material will be measured to the nearest tenth of a pound.

**7.0 Basis of Payment.** The quantities of polyurethane material injected will be paid for at the contract unit price.