

Overnight Repairs of Pavement and Infrastructure Problems Using Polymer Technology

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I. Premise: Budgets are based on a structure's design-life. When structures experience premature base deterioration, the whole structure deteriorates prematurely. Polymer technology extends the design life of structures, pavements and infrastructure by rebuilding its deteriorated base.

II. Introduction: Your public depends upon public works agencies to assure freedom of movement. Public works agencies are responsible for managing, engineering, repairing or building roadways, highways, or other pavement related areas such as parking facilities, airport facilities and mechanically stabilized earth structures. You are also responsible for underground utility infrastructure.

You plan for each of your structures to last a certain length of time. Your maintenance budget reflects design-life. When any of your structures experience premature base deterioration, the whole structure deteriorates prematurely and your budget has to adjust.

III. Causes of Premature Pavement Deterioration

The usual reasons:

1. unusual environmental effects,
2. unforeseen vehicle load frequency,
3. unforeseen vehicle load weight,
4. less than ideal construction

It's usually a combination of reasons centered on one problem: **Water**

What does water do to the pavement base?

When water gets into the base, the pavement starts to move, deflect, settle, shift, fault, separate, vibrate, slide, crack, flex, pump, pothole, corner break, washboard, or spall.

IV. What have we done to repair premature base deterioration in the past?

- A. **Tear out and rebuild** is usually the first solution to consider.
- Budget restraints usually motivate looking for other options.
 - Community disruption concerns are keys to finding the right solution.
 - Environmental concerns come into play frequently.
- B. Throw some **asphalt** over it:
- It's a temporary surface fix to a problem down below.
 - The public knows it's temporary.
 - It results in additional expense and work zone delays later.
- C. The **“Mud Jacking”** Solution:
- Cementitious grout is pumped under concrete slabs:
 - Requires a contained hydraulic force to lift
 - Shrinks as it dries
 - Offers little tensile strength
 - Average repair life is 4 years
 - Rarely cures to full strength before opening to loads
 - 2 inch holes on 3 foot grid weakens the slab
 - Mudjacking is not “public friendly”:
 - It's loud and requires heavy equipment
 - Must be done during the day in urban areas
 - No warranty standard in the industry

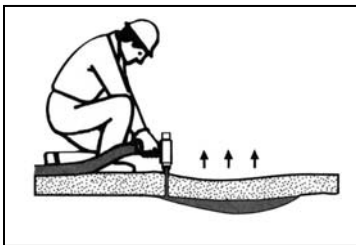
V. What is the latest technology for base rehabilitation?

Polymer Technology:

- Up to 50% savings over replacement cost
- 5-10 times faster to implement
- 10-year material guarantee
- It's a repair which can double design life

VI. Three Common Uses for Polymer Repair of Base Material.

A. Overnight Slab Jacking Applications – Concrete Slabs: Settled Bridge Approach Slabs; Highway Misaligned Joints



1. **The pavement:** Pavements are not damaged by the process. The repair will be done with little or no lane closure beyond the actual work period because of the fast curing time of the materials and process simplicity.
2. **The process:** The slab's profile is measured with lasers. String lines are usually pulled to indicate the lift needed to restore the proper profile. Small holes (5/8" diameter) are drilled through the pavement at strategic points. A liquid polymer is injected through the holes. The liquid polymer finds voids and fills them as it expands. A controlled pressure of between 5 and 35 p.s.i. is exerted in a 3 to 5 feet area around the injection point which expands to lift, realign, under-seal, and fill the voids.

3. The polymer material: Polyurethane is a thermosetting two-part resin. URETEK USA uses: (a) Polyether polyol blend—a proprietary mixture and (b) MDI. The two components combine in the injection gun. The resulting chemical reaction forces the substance to expand and form a permanently hard, dense substance. The chemical reaction begins within 30 seconds, expansion is complete within two minutes, and hardens to 90 per cent strength in 15 minutes.

General Polymer Specifications of “3 lb Hardened Material”

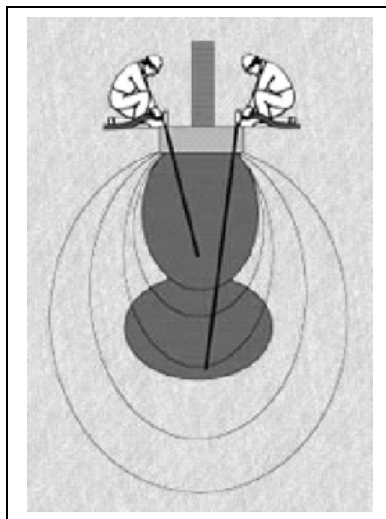
Free Rise Density	ASTN D1662	3 lb/ft ³
Compressive Strength	ASTN D1621	40 psi
Tensile Core	ASTM D1623	70-100 psi
Shear Strength	ASTM C273	40-85 psi
Closed Cell Content	ASTM D2858	50%

B. Overnight Precast Panel Replacement: Rebuilding a pavement with fully cured concrete.



Full depth pavement section replacement using precast concrete panels is now a reality because of the use of injection methods to lift and level the panels to match the profile of surrounding pavement. URETEK’s Stitch-In-Time process will provide load transfer.

C. Overnight Deep Injection Process restores a soil’s load capacity, seals infrastructure leaks, and lifts structures.



Polymer components are used to void fill, strengthen base soils, and encapsulate loose or open aggregates. The method eliminates the need to excavate and repair, thereby saving replacement cost of the pavement itself, and eliminating the roadway closure problem. Many repairs can be completed overnight. URETEK polymers, injected near an infrastructure leak, flows into the leak itself and expands to seal it. The polymer does not bond to the structure as an adhesive, but it does bond cohesively. It binds the non-bonded particles of the soil to provide an impenetrable solid to water and soil movement. The polymer seals the leak and strengthens the soil mass around the

structure. By both strengthening the soil around the structure and permanently sealing the leak, the design life of the structure is significantly increased.

VII. Who is using polymer technology today?

24 countries, with country-wide annual contracts in France, Great Britain, and Italy. 50,000 successful projects worldwide, 10,000 completed projects in USA since 1991. Used in most states – 10 with state-wide annual contracts.

Cal Trans now includes the polymer process in their Special Provision Specifications. Texas DOT, New Mexico DOT and at least thirty other states are now using this technology (many with state-wide service contracts) to more effectively and economically maintain safe, smooth pavements.