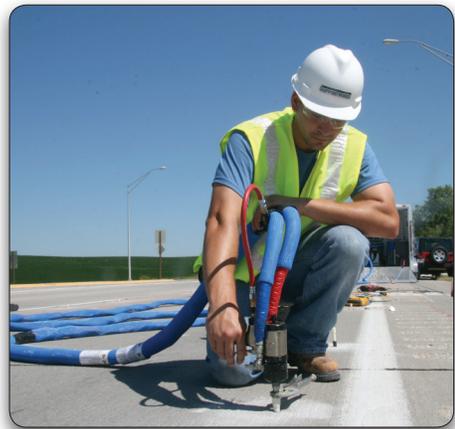


# FOUNDATION NATION

FSI NEWSLETTER FOR DESIGN PROFESSIONALS



## BENEFITS AND USES OF PolyLEVEL®



Bob Waldron • PolyLEVEL® Product Line Manager

The Foundation Supportworks (FSI) PolyLEVEL System is a two-part urethane polymer that expands into rigid, structural foam to fill voids, stabilize and lift concrete, and offer solutions to a wide range of geotechnical and structural applications. Polyurethane has been used beneath slabs for several decades, and it has proven to be a viable solution compared to traditional methods of mudjacking and concrete replacement for a number of reasons.

- **Accurate Lift** – Calculated reaction time of the PolyLEVEL foam allows for a targeted, precise lifting operation.
- **Waterproof** – PolyLEVEL is fully waterproof so it cannot washout. In addition, because it cannot take on water, it is not impacted by the freeze / thaw cycle. Finally, PolyLEVEL can be used to under-seal slabs and stop a variety of infrastructure leaks.
- **Non-Invasive** – The equipment used to install PolyLEVEL can be used in very limited access areas, is far less messy than other methods, and can be installed more quickly.
- **Cure Time** – Quick cure time allows for immediate loading, even heavy traffic, within 30 minutes after injection.
- **Compressive Strength** – The in-place compressive strength of commercial grade PolyLEVEL material is minimally 11,000 pounds per square foot but can also significantly exceed 15,000 pounds per square foot.
- **Consolidates Soil** – As the PolyLEVEL foam exerts the energy to lift the slab, it is placing an equal amount of pressure on the soil under the slab. This process not only fills the void and raises the slab but also densifies the soil beneath the slab.



*PolyLEVEL Installation Allows for a Controlled Lift*

- **Lightweight** – PolyLEVEL weighs approximately 4-6 pounds per cubic foot when installed. This is significantly less than 120-140 pounds for typical fill material and means there is minimal additional load being added to the supporting soils.
- **High Capacity** – The lifting action is a result of the expansion of the polymer, allowing for lift on much higher loads than typical mudjacking which relies on hydraulic pressure being contained under a slab.

PolyLEVEL is ideal for interstates and highways, but it is also very suitable for applications such as concrete parking lots, warehouse floors, office buildings, grain bins, playgrounds, factory floors, loading docks, schools, railroad crossings, airport runways, city pools and many, many more.

The remainder of this publication will explore four unique applications of the PolyLEVEL system. The concrete in each of the three commercial case studies was raised using PL400-H injected beneath the slab. PL400-H is FSI's commercial grade, four pound product specifically formulated to work in either dry or full water placements. The residential case study highlights the use of another PolyLEVEL formula - PL100SS.



- **New Construction and Retrofit Helical Piles**
- **Helical Tiebacks**
- **Helical Soil Nails**
- **Hydraulically Driven "Push" Piers**
- **Wall Stabilization Systems**
- **PolyLEVEL® Polyurethane Foam Injection**
- **StableFILL™ Cellular Concrete**

**Distribution Checklist**

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# CASE STUDIES - POLYLEVEL

**Project:** Soil Stabilization for Timber Pile Repair ● **Location:** Port St. Joe, FL  
**PolyLEVEL® Installer:** Alpha Foundation Specialists, Inc.

**Challenge:** The two-story, wood-frame home was built in 1999. Light loads from the first floor construction were reportedly supported by the slab-on-grade floor system with monolithic thickened edges and interior footings. The second floor and roof loads were supported by exterior timber piles founded in clean fine sand. The condition of the wood piles had deteriorated over the 15 years since construction due to the combination of high moisture conditions, high oxygen content, and fluctuating groundwater levels within the near-surface soils. Wood rot was generally observed from grade to roughly two to three feet below grade.

Another foundation repair contractor proposed to repair the timber piles and resupport the structure by severing the timber piles and installing a helical pier and retrofit, side-load bracket. This solution eliminated any remaining axial and lateral support provided by the timber pile and then left the pile in a laterally unbraced condition. The contractor gathered equipment and left the site when the homeowner questioned the repair completed on the first timber pile.

**Solution:** Alpha Foundation Specialists proposed to repair the deteriorated timber piles with a jacket and epoxy system. Excavations were then required around the piles to depths extending below the wood rot. However, cuts through loose, flowing sand could potentially undermine the concrete floor slab. PolyLEVEL® 100SS (PL100SS) single-part polyurethane resin was injected into the sand around the timber piles and beneath the concrete slab-on-grade. PL100SS migrates through loose soil and into voids and reacts as it comes in contact with moisture in the soil to essentially glue the soil matrix together. The low viscosity and slow reaction time of PL100SS makes it an ideal product for stabilizing sands and other loose soil strata. With the surrounding sands stabilized, clean, vertical cuts were made to allow repair of the timber piles.

## Residential



**Project:** Gwynedd Train Station ● **Location:** Ambler, PA  
**PolyLEVEL® Installer:** Foundation Supportworks® of New Jersey

**Challenge:** SEPTA (Southeastern Pennsylvania Transportation Authority) had settlement issues on two rail lines at a road crossing in Ambler, Pennsylvania. The 14 inch thick concrete slabs supporting the track had settled in areas as much as 1-7/8 inches. For passenger trains, safely navigating this area of the tracks required a 40 mile per hour reduction in speed. SEPTA's main concern was for the safety of their passengers, as continued settlement could lead to derailment. Additionally, minimizing the disruption to train schedules during repairs would require keeping one of the two tracks in service at all times.

Slab replacement was not an option due to the expense, time and disruption it would cause to both street traffic and SEPTA trains. Previous attempts to lift settled rail slabs with mudjacking were not precise and were prone to washouts over time.

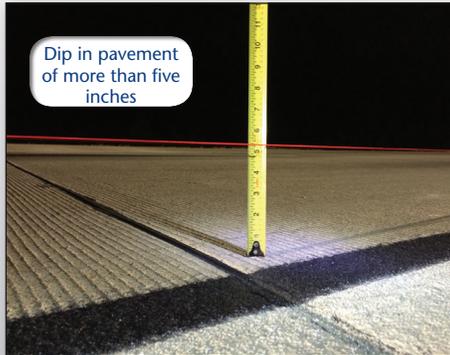
**Solution:** SEPTA chose Foundation Supportworks® of New Jersey and the PolyLEVEL® Polyurethane Injection System to resolve the problem. The installation of PolyLEVEL® began by drilling 5/8 inch injection holes into the concrete slab. Next, using specialized equipment, approximately 500 pounds of PolyLEVEL® was injected below the slab through 96 injection ports. The rail elevation was monitored continuously with surveying equipment, and both the rail and slab were returned to their original elevation. The project was completed in eight hours over the span of two days, and the road and tracks remained open to traffic. Two hours after the track was lifted, it was proof rolled with a large road-rail dump truck fully loaded with track ballast (rock). No movement was observed visually or with surveying equipment.

## Commercial

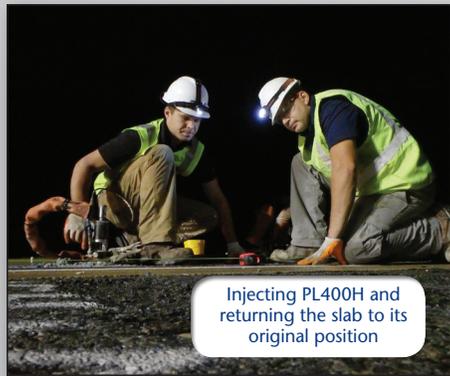


# POLYURETHANE INJECTION SYSTEM

## Commercial



Dip in pavement of more than five inches



Injecting PL400H and returning the slab to its original position

**Project:** Delaware SR1 Pavement Leveling ● **Location:** Wilmington to Dover, DE  
**PolyLEVEL® Installer:** DryZone, LLC.

**Challenge:** The Delaware Department of Transportation (DelDOT) observed that three section-lengths of the southbound lanes of the Korean War Veterans Memorial Highway (SR1) had settled as much as six inches. These dips or sags in the pavement were as much as 200 feet long and extended across the entire two and three lane widths of the highway. The SR1 is the main north-south thoroughfare in Delaware and the most traveled roadway in the state. Therefore, DelDOT required that the road remain open throughout the repair process and work be completed during off-peak traffic hours (6 p.m. to 6 a.m.). The cause of the roadway settlement was unknown, but suspected to be due to separations in deep storm sewers (DelDOT planned to seal any leaks) or consolidation of weak native soils beneath the roadway fill. With the depth, thickness and expansiveness of the suspected weak native soils, deep injection of polyurethane would not have been a practical or economically feasible option for soil and roadway stabilization. It was then reasoned that should the road sections continue to settle, periodic pavement re-leveling with shallow injections would still likely be more economical. Even with the suspected deep issues, DelDOT required the top several feet of the subgrade soils beneath the pavement be evaluated and stabilized as necessary. The pavement structure consisted of eight inches of concrete, eight inches of a granular drainage layer, and six inches of cement-treated base. The drainage layer could not be contaminated with polyurethane during the repair.

**Solution:** After review of the Dynamic Cone Penetrometer test results, DelDOT determined that the subgrade soils were competent and deeper subgrade stabilization was not required. The settled sections of roadway were lifted using PolyLEVEL® PL400H hydrophobic polyurethane. PL400H is often selected for roadway stabilization and lifting projects because of its ability to react and perform even in wet environments. Injection ports were used to strategically place the PolyLEVEL® below the cement-treated base to prevent contamination of the drainage layer. The lift of the roadway was monitored with both surveying equipment and string lines and the road was lifted back to a level position. The work was completed during 15 night shifts where 35,575 pounds of PolyLEVEL® were injected, less than the budgeted amount of 40,000 pounds.

## Commercial



Highway slab before lift



Injecting PolyLEVEL® and raising slab

**Project:** NDOR Highway Slab Lift ● **Location:** Gretna, NE  
**PolyLEVEL® Installer:** Foundation Supportworks® by Thrasher

**Challenge:** The Nebraska Department of Roads (NDOR) commissioned the repair of a 24-foot wide, 100-foot long section of Highway 6 near the intersection with Giles Road. This area of poured concrete road had settled 1.5 inches at its mid-span, creating a dip or sag in the highway that affected both ride quality and safety. Voids were also likely beneath the pavement at the joints. The NDOR specified that the concrete be lifted back toward level, voids be filled between the pavement and subgrade, and the entire project be completed in one day to minimize traffic disruption and inconvenience to the public. Although restricted, traffic flow had to continue throughout the project duration.

**Solution:** The NDOR selected PolyLEVEL® polyurethane injection to fill the voids and lift Highway 6 back toward its original position. The two northbound lanes affected by the settlement were each repaired independently of the other to allow continued traffic flow. Due to the quick-set nature of PolyLEVEL®, the first restored lane of highway was reopened to traffic a mere 20 minutes after injection. This allowed crews to quickly close and begin work on the adjacent northbound lane. A total of 2,358 pounds of PolyLEVEL 400 were injected through 90 injection ports laid out in an approximate 5-foot grid. The expanding PolyLEVEL® foam filled the voids and lifted the sag in the highway 1.5 inches. The entire project was completed in seven hours.



# COVER ARTICLE

## Benefits and Uses of PolyLEVEL

“Polyurethane has been used beneath slabs for several decades, and it has proven to be a viable solution compared to traditional methods.”



PolyLEVEL Installation Allows for a Controlled Lift

### FEATURED CASE STUDIES:

Soil Stabilization for Timber Pile Repair - Port St. Joe, FL

Gwynedd Train Station - Ambler, PA

Delaware SR1 Pavement Leveling - Wilmington to Dover, DE

NDOR Highway Slab Lift - Gretna, NE

# UPCOMING WEBINAR OPPORTUNITIES

### An Introduction to Helical Foundation Systems

1st Wednesday of every month 11:30am(CST) and 1:30pm(CST)

### An Introduction to Polyurethane Foam Injection

2nd Wednesday of every month 11:30am(CST) and 1:30pm(CST)

### An Introduction to Hydraulically Driven Push Pier Systems

3rd Wednesday of every month 11:30am(CST) and 1:30pm(CST)

To sign up email us at [training@foundationsupportworks.com](mailto:training@foundationsupportworks.com) with the following information:

- Name of the firm
- Location of firm
- Approximate number of engineers/architects/GCs that will be in attendance

\*FSI is an approved provider through the AIA, RCEP and the Florida State Board of Engineers for continuing education credits



HelixPro™ Design Software is a state-of-the-art program that allows you to calculate bearing and uplift capacities of FSI helical piles as well as tension capacities of FSI helical tiebacks as they pertain to specific site and soil parameters.



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