

## Using Super-Slab® for **Rapid** Repair and Replacement Of Concrete Pavements

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# Rapid!

55 Hour Weekend Closures  
8 Hour Night (or Daytime) Closures  
**5 HOUR** Night Closures

### Materials Currently used for **Rapid** Full Depth Repairs

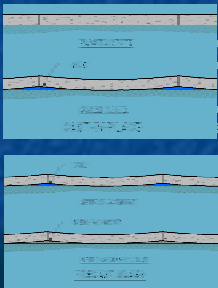
- Asphalt
  - Fast - but usually don't last "long"!
- Rapid Set Concretes
  - Still requires cure time

### Precast Concrete Slabs- A Long-Considered Alternative

- For **Rapid** Installation!
  - Get in (at night)
  - Get out (at dawn)
- For **Long** Life
  - Stay out (for many years)

### The Case for Long Life

- High Performance Concrete
- Stresses From Curing Minimized
  - Cast indoors and in a form
- Ultimately Supported in Pre-Curled Position
- Stainless Steel or Zinc Coated Dowels May be Used



## The Super-Slab™ System

A  
**Slab-on-Grade**  
System

*(Super-Slab™ is a Patented System)*

## Super-Slab® is:

- Not a Competitor to Cast-in-Place
  - But a tool for **rapid** repair – to keep pavement “white”
- Not Re-invented Concrete Pavement
  - But an innovative combination of
    - High performance materials
    - Proven design details

## The System Consists of:

- Precision Precast Slabs
  - Correct in Three Dimensions – to  $\pm 4$  mm
- Techniques for Precision Grading
  - Correct in three dimensions - to  $\pm 3$  mm
- Interlocking Dowels and Tie Bars
  - Accessible From Top of the Slab
- A Bedding Grout Distribution System to Insure Complete Support
  - Accessible From Top of the Slab

## Super-Slab™

### The Product



### Features:

- High Performance Concrete
- Embedded Dowels
- Embedded Tie Bars
- Matching Inverted Dovetail Slots
- Thickness as Required
- Length and Width as Required

### Bedding Grout Distribution System

Channels and Gaskets



### Dovetail Dowel Slots On The Bottom

Protects Grout From De-Icing Chemicals



## Two Types of Slabs (and Subgrade Surfaces)

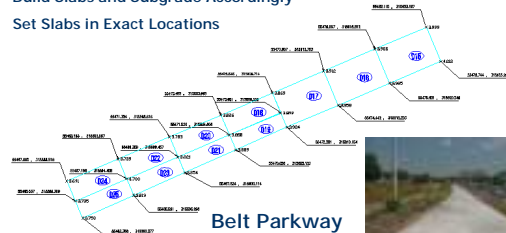
- Single Plane



- Warped Plane

## Three Dimensional Surfaces (General Case)

- Compute “X”, “Y”, “Z” of Every Corner of Every Slab
- Build Slabs and Subgrade Accordingly
- Set Slabs in Exact Locations



Belt Parkway  
Jamacia, NY



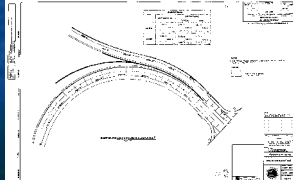
## Slab Design

**Same as for Un-reinforced Pavement Design**

- Thickness & Strength of Concrete
- Finish
- Load Transfer Devices
- Sub-Grade
- Joint Seals

**Geometric Design**

- Slab Layout
- Vertical & Horizontal Curvature
- Superelevation Design
- Reinforcing



## Reinforcing Options

- None
  - Except for handling
- Steel Reinforcing for Temperature and Shrinkage (ACI)
- Fibers for Temperature and Shrinkage
- Pre-stressing
- Post Tensioning

## Precision Grading

**"SuperGrading"**

The process of grading fully-compacted bedding material to a surface accurate to  $\pm 3$  mm

## Why SuperGrading?

- Eliminates adjusting slabs after they are set
  - Simplifies and speeds up production
  - Slabs are set only once
- Provides "nearly complete" subgrade support without grout
  - Allows early opening to traffic
- "Precise" subgrade/slab contact completes bedding grout distribution system
- Minimizes volume of bedding grout required

**SuperGrading Large Areas**

**Supergrader™**

Compact, Laser-Controlled  
(For Single or Warped Planes)





**SuperGrading Small Areas**  
Hand Operated Grader (H.O.G.)  
Using adjacent concrete (or rails) for grade control  
(Under development)



**Grouting Tie and Dowel Bars**  
(2500 psi Before Opening to Traffic)

**Core Taken Through Transverse Dowel**  
(Load transfer capacity verified by FWD tests)



Grout Port →  
Dowel →  
Inverted Dovetail Slot →



Grout Distribution Channel →  
Foam Gasket →

**Bedding Grout**  
(To fill any voids)  
(750 psi 24 hrs.)

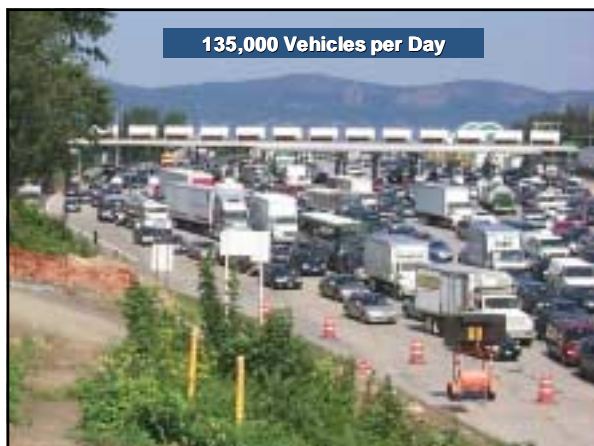


**Proof** →

Pumping Bedding Grout

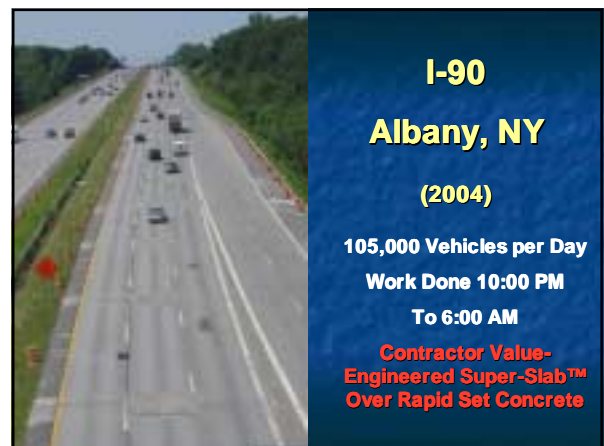
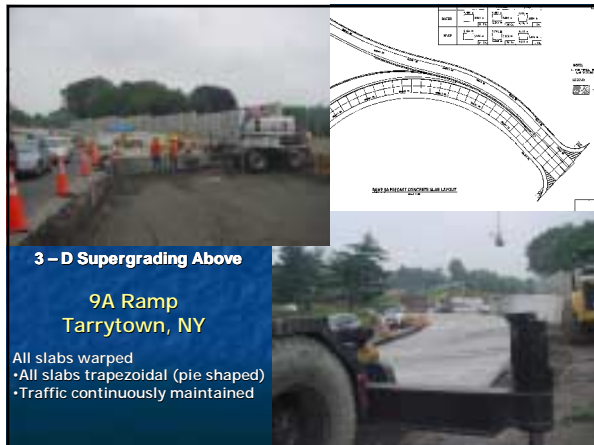
**Continuous Full-Depth Replacement**  
(During Off-Peak Hours)

**Rehabilitation of The Tappan Zee Toll Plaza Tarrytown, NY**  
(2001 – 2002)  
Precast Concrete Pavement Slabs-on-Grade




**Project Particulars**

- 183,000 SF Pavement (4 Acres)
- 135,000 Vehicles Per Day
- Replace Pavement During Off-Peak Closures
- Must be Open to All 13 Lanes of Traffic by 6:00 AM Each Day
- \$ 1300 per Minute Penalty After 6:00 AM




**Drilling For Dowels**

**Two Bit Hydraulic Gang Drill**



**Precision Grading**

**Working on Rails**  
(Notice Wheel Ruts)



**Setting Slabs**

**10 to 15 Slabs Per 8 hour Shift**



**5 to 7 Slabs Per 5 hour Shift**



**Under Bridges**



**Open to Traffic**

**By 6:00 AM**  
(UngROUTed)



**Next Day**  
(UngROUTed)

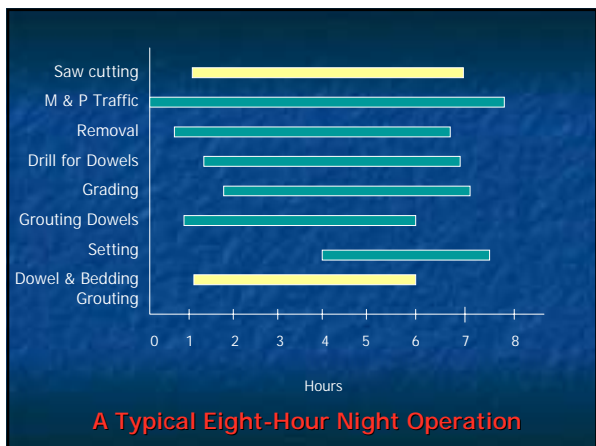


**I-90**  
**Albany, NY**

**378 Slabs In 47 Nights**  
(48,000 SF ±)



**In Half the Time Required for (Rapid Set) Cast-in-Place**

**Lessons Learned About Intermittent Patching**

- Make Standard Sized Slabs – Cut (Accurate) Holes to Match
- Faster to Leave Existing Subgrade Alone and Install Slightly Thinner Slabs
- Existing Pavement Surface Difficult to Match
  - Because of wheel ruts and faulted slabs
- Slabs Can be Opened to Traffic Without Grout for a Short Period of Time

## So Far

- 4.3 Lane Miles of Super-Slab® in Service
  - On 11 projects
- 2.5 Miles in Service for Three Years
- 85% Servicing over 100,000 VPD

## Summing it Up

- It Works!
- Contractors are skeptical
  - Until they do it
- Pre-construction training a must!
  - For contractor's workmen, inspectors & owners
- Development and Enforcement of specifications - challenging
  - You get what you inspect – not what you expect!
- Agencies need to discover how to
  - Justify it
  - Specify it

## Candidates for Super-Slab™

- Toll Plazas
- Heavily Traveled Highways
- Ramps
- Pavement Under Bridges
- Bridge Approach Slabs
- Intersections
- Airport Runways and Taxiways
- Pedestrian Cross Walks
- Structure Footings (Buildings, Bridges)
- Joint Replacements
- Weigh-in-Motion Stations

## Keys to Success (Still More to Learn)

- *Good Engineering*
- *Open Minds*
- *Real Partnering*



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