Using Super-Slab® for

Rapid Repair and Replacement Of Concrete Pavements

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Peter J. Smith, P.E.
V. P. Market Development and Product Engineering
The Fort Miller Co., Inc.

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 ±4 mm
- Techniques for Precision Grading
  - Correct in three dimensions - to ±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™

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

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**Reinforcing Options**

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

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**Precision Grading**

“SuperGrading”

The process of grading fully-compacted bedding material to a surface accurate to ± 3 mm

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**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

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**SuperGrader™**

Compact, Laser-Controlled

(For Single or Warped Planes)

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**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 Grout
Inverted Dovetail Slot

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

Grout Distribution Channel
Foam Gasket

Proof
Pumping Bedding Grout

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

Rehabilitation of The Tappan Zee Toll Plaza
Tarrytown, NY

Precast Concrete Pavement Slabs-on-Grade

135,000 Vehicles per Day

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
Traffic All Around (Taking 2-3 Lanes)

While Maintaining This (135,000 Vehicles per Day)

Interruption Full-Depth Highway Repairs (Patching) (During Off-Peak Hours)

Lincoln Tunnel The Port Authority of NY & NJ Friday Night - Saturday

I-90 Albany, NY (2004) 105,000 Vehicles per Day Work Done 10:00 PM To 6:00 AM Contractor Value Engineered Super-Slab™ Over Rapid Set Concrete
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)

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

I-90 Albany, NY
378 Slabs in 47 Nights (48,000 SF)
In Half the Time Required for (Rapid Set) Cast-In-Place
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

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

The Fort Miller Co., Inc.
P.O. Box 98
Schuylerville, NY 12871

Tel. (518) 695-5000
Fax. (518) 695-4970
www.fortmiller.com