Super-Slab® Precast Pavement System

FORT MILLER
THE FORT MILLER CO., INC.

*Precast Concrete
Solutions*

**Joint Transportation Research Project
Precast Concrete Pavement Forum**

Indianapolis, Indiana

August 11, 2016

The Fort Miller Co., Inc.

Dan E. Moellman, P.E.

The Fort Miller Co., Inc.

- Located in **upstate** New York
- Transportation products
 - Highway barrier
 - Precast retaining walls
 - Bridges
 - Precast pavement slabs
- **Specializing in accelerated bridge construction**
- **Developer of the Super-Slab® Precast Pavement System**

Precast Concrete Pavement Slabs = Overnight Repairs

145,000 ADT
I-287, Tarrytown, NY

200,000 ADT
I-15, Ontario, CA

180,000 ADT
I-66, Fairfax, VA

What Does High ADT's Mean For Pavement Repair & Maintenance?

- Heavily-deteriorated pavement
 - Too much traffic for long-term durable repairs
 - Often repaired with fast-setting non-durable materials
- Very short work windows
 - 8 – 5 hour night work windows
 - 55 hour weekend closures
- Real need for durable repairs
- **Summary - Premium pavement required - overnight!**

Precast Pavement Emulates Cast in Place

- Full Bedding Support
- Load transfer Dowels
- Slab Surface Geometry

Jointed Precast Pavement in the US

- **Full-scale implementation began in 2001 with introduction of the Super-Slab® System**
- **Can be installed rapidly – overnight**
- **Versatile**
 - **Intermittent repair, full lane replacement, bridge approach slabs, ramps, intersections**
- **Proven**
 - **Numerous FWD tests**
 - **Accelerated load (HVS) tests in 2005 – 2006**
- **Cost effective – compared to fast-track concrete repairs**

Super-Slab® System – Bottom Slots

- Simple slab-on-grade system
- Standard dowels and tie bars (JRCP)
- Built-in bedding grout distribution
- Precision grading equipment
- Warped and planar surfaces
- 25,000+ slabs & 2,800,000+ SF INSTALLED

**100+ projects, 43 lane-miles completed in 17 States + ON & QC,
29 Owner Agencies**

Cumulative Super-Slab Installations

**(107 projects, 43 lane-miles in 17 States + ONT & QUE, 29 Agencies)
(25,000 Slabs +/- = 311,000 SY +/-)**

Super-Slab® Installations

43 Lane Miles , 2.8+ Million Sq Ft, 25,000+ Slabs
100+ projects in 17 States and 2 Provinces, 29 Agencies

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Super-Slab® Load Transfer Dowel System

- Dowels engage slots in adjacent slab
- Pump dowel grout into ports
 - Grout reaches 2500 psi
in about 2 hours
- Fill slots and joint between slabs
- Dove-tail slot resists bar pop out

Dove-tail-shaped slot

Two Slab Types

Single Plane

- Slopes of opposite sides are equal

Warped Plane

- Slopes of opposite sides are not equal

Controlled Fabrication Conditions

Accurate Forms

Roller Screed - Accurate Top Surface

Accurate Piece Drawings

**Ideal Finishing (and curing)
Conditions**

Achieving Full and Complete Bedding A Two - Step Process

Grade control
rails placed to
survey marks

Precisely-Graded (to $\pm 1/8''$)
and Compacted Fine
Aggregate Material

Chorded Slab
Surface

Grout Distribution
Channel
Foam Gaskets

Proof

Bedding Grout Fills Any Voids

Small Scale Grading Rail Supported and Hand Operated

Auger H.O.G.

Hand Operated Grader (H.O.G.)

Mini-H.O.G

Shutter Screed

Large Equipment Precision Grading Laser/Robotic Controlled Planar and Non-Planar Slabs

I-78 Interchange 14C Toll Plaza – NJTA Jersey City, NJ – Baker / GPI

Use Correct Template

16 holes – 12 minutes

Drilling for Dowels

Drilling and Setting Rail

Shipping and Placing

- **Size slabs for shipping**
 - 12' Max. width
 - Special permits
- **Slabs delivered in adjacent lane**
- **One man in each corner**
- **Set slabs to panel point mark**
- **Check for match (the Super-Slab Shuffle)**
- **Average setting rate – 10 slabs per hour**

Installing Dowel Grout

Fill Dowel Slots and Joints

Contractor-Designed Joint Dam

Indicators for Long Life

Full scale load testing in California

Falling Weight Deflectometer

Test results
show
no cracks or
distress

Heavy vehicle simulator

**143 Million ESALs (100 KN
Load)**

4.3 Million Cycles

**Result - 38 year life
expectancy**

Intermittent Repairs (CPR)

**I- 90
Albany, NY**

**I-676 Vine St
Expressway
Philadelphia,
PA**

**I-15 Salt Lake
City, Utah**

I-95, New Rochelle, NY

I-295 Pav't Repair, Burlington Co., NJ

NJDOT 2007 to date: 14 jobs = 4500+ slabs

Continuous - Tappan Zee Bridge Toll Plaza

3,000 SF / 8 Hour Shift
(Within $\pm 1/8''$)
2001 - 2002

**Open for Rush
Hour**
(135,000 ADT)

Continuous - Mainline Placement

Mainline I-15, Ontario, CA
(200,000 VPD)

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Ramps

Oak Brook, IL

Brooklyn, NY

Plan - Tarrytown Ramp A

Tarrytown, NY

NJDOT Bridge & Approach Slabs US 46 Over Broad St. - Clifton, NJ

- **Bridge replaced over two weekends - April 2011**
- **Two-span (40.2', 40.2') continuous, 28.76° skew**
- **Precast Approach Slabs - tied to prefabricated bridge units**

Brooklyn Bridge Approaches 2010 – 2013

URS & Weidlinger

Grading

Placing

Looking toward Manhattan

Looking toward Brooklyn

Alexander Hamilton Bridge W. Approach, 2011 – 2013 Jacobs

Lower Level —

Contractor Gets One Lane
To Replace The Same Lane

I-94 MDOT Low-Clearance Bridges, Kalamazoo, MI

Installation

Two Lanes

Bus Pad, Hollywood & Santa Monica Blvd. North Hollywood, CA

Grading

Placing

Last Slab

Finished, Next Day

Lincoln Tunnel – NJ Approach

The Port Authority of NY & NJ

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VDOT I-66 WB Ramp to US 50 WB FHWA Highways for LIFE - 2009

- 184,000 ADT, 5% Trucks
- (3) Repair Types:
CIP, JPCP & PPCP
- Rt. Lane Super-Slab®
224 Slabs: 12'x16'x8.75"

I-676 Vine St. Expy. Philadelphia, PA – 2009

PennDOT District 6-0 85 slabs

Challenge - Maintaining Quality Pavement on Heavily-Traveled Urban Streets and Arterials Over Multiple Utilities

First Avenue, New York City

**Cross Bronx
Expressway, NYC**

Non-durable materials – no load transfer – poor workmanship

Goals

- Up-grade subgrade and subgrade drainage
- Install long-lasting durable concrete pavement materials (concrete)
- **Maintain traffic during the process**
- Use a modular pavement system or materials that are **easily removed and replaced** to maintain utilities below
- If concrete, to use dowels for load transfer
- Be able to **restore** pavement to original (equivalent or better) condition after a utility repair event
 - In appearance and functionality

Removable Urban Pavements (RUP) - A New Tool For Consideration

- **Pavement that can be removed and replaced rapidly**
 - **To original condition (in appearance & functionality)**
- **Durable concrete precast concrete pavement slabs**
- **Slabs may be (relatively) light weight**
 - **For ease of handling**
 - **To keep disturbed footprint to a minimum**
- **Vertically-removable (and replaceable) units**
- **Full load transfer between slabs**

Two Approaches to Servicing Underlying Utilities

Cut, Remove and Replace Randomly

**Size Slabs to Access Utilities
Below – Cut at Joints for
Access Below**

Replacing Pavement

Asphalt Repair

**Precast Pavement
– a Better Repair**

Case Studies of Urban Arterials Replaced with Precast Pavement

- **NYSDOT Route 7 – Nott Street Intersection, Crosstown Connection, Rotterdam, NY - 2006**
- **Nassau-Queens Expressway, Rockaway Boulevard, Jamaica, NY - 2009**
- **GDOT Broad Street, Winder GA – 2013**
- **Kansas DOT Route 73, Leavenworth, KS – 2015**

NY 7 Crosstown Connection Nott Street Intersection

Precast Pavement – Center Part of Intersection Only

Undercut and Replace with Dense Aggregate Base

Undercut 1' – Backfill with Dense Aggregate Base

Geofabric Separation Layer

Grading Bedding Material and Placing Slabs

Grade Controlled by Rails

Each Slab Set To a Mark

Maintenance of Traffic

Undercuts Traffic Never Stopped Replaced in 17 Nights

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Finished Street View

**Completed in 17 Nights
158 Slabs – 28,500 SF**

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Rockaway Blvd., Jamaica - Queens, NY 2009 – 2010 Installation

- 2390 slabs
- 29,000 SY
- Replaced full-depth asphalt
- 300 lane-ft in 8-hour shift

Intersection Approaches

Farmers Blvd.

Guy R. Brewer Blvd.

Gannett Fleming

*Excellence Delivered **As Promised***

Brookville Blvd. to Eastern Project Limit

**½ Mile of Rockaway Blvd. - Full Depth Asphalt
Replaced with Precast Concrete**

Gannett Fleming

*Excellence Delivered **As Promised***

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Night Construction

Setting Grading Rails

DGB Compaction

Maintaining Traffic

8 hour (night) work windows

Rockaway Blvd. – Two Years Later (2011)

**One-Half Mile Stretch - Two
Lanes in Each Direction**

**Guy R. Brewer Intersection
Approach**

GDOT Reconstruction Broad Street Winder, GA - 2013

Hills and Curves

Heavy Truck Traffic

Pavement Removal & Subbase Preparation

**Removing Multiple Layers of Old
Pavement**

26 Inches

Installing Aggregate Subbase

**Grading and Compacting
New Aggregate Subbase**

Compaction Test

Installing & Super-Grading Bedding Material

**Installing Bedding
Material Over
Aggregate Base**

(1" max. thickness)

**Super-Grading With Hand Operated
Grader (H.O.G.) to +/- 1/8" Accuracy**

Key Operation!

Installing Slabs – At Night

**Placing First Slab – Notice Gaskets
on Bottom of Slab**

**Crane Occupies Previously
Placed Slabs**

**(18' wide x 11'-3" long x 8-1/2"
thick)**

GDOT Winder - Unique Challenges

Change In Grade – 5" lower on Right

Cross Slope Change & Horizontal Curve

Recipient of Several Awards

Ribbon Cutting 2014

Two Pavement Materials

GDOT Winder, GA

Georgia Engineer - Feb-Mar 2014

Reconstruction Metropolitan Ave. (US-73) Leavenworth, Kansas

- 294 slabs
- 4,555 SY
- 8-hour night work windows
- Part of larger cast in place project

**Two Intersections and
One Bridge Approach**

Re-Construction Metropolitan Ave. (US-73) Leavenworth, Kansas

4th Street Intersection

Slab Layout Drawing

Reconstruction Metropolitan Ave. (US-73) Leavenworth, Kansas

Centennial Bridge Approach

Slab Layout Drawing

Installing Slabs – At Night

**Removing Old Base, Placing New
Cement-Treated Bedding Material**

**Grading Cement-Treated Bedding
Material**

294 Slabs – 24 Nights

Excellence In Paving Award

Presented By
Missouri/Kansas Chapter, ACPA
Kansas Department of
Transportation

- **MILES EXCAVATING, INC.**
- **THE FORT MILLER GROUP, INC.**
- **KANSAS DEPARTMENT OF TRANSPORTATION**
BUREAU OF DESIGN
- **KANSAS DEPARTMENT OF TRANSPORTATION**
BONNER SPRINGS CONSTRUCTION OFFICE
- **GEIGER READY-MIX**
- **CRETEX CONCRETE PRODUCTS, INC.**

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The Super Paver System – a Removable and Reusable Urban Pavement (RUP) System

Demonstrating the RUP Concept Technology Work Shop – Nov. 9, 2011

Each Paver Set to a Mark

**Independent Dowels
Placed in Slots**

Utility Blockout

Initial Placement

Intersection Quarter

Varying Cross Slopes

(Crosswalks of Any Texture – Also Removable)

Slab Removal

Remove Vertically

Grout Plug Removal

**Use Pry Bar To Remove
Grout Plug in Inverted Slab**

Cleanup of Removed Slabs

Slots restored

**Removing Original Bedding
Grout**

**Extracting Half Dowel with
Battery-Powered Drill**

Extracting Half Dowels Left Behind

Reusable Urban Pavement Workshop

Sept. 22, 2015

Removable/Replaceable Longitudinal Joint Tie

Removable/Replaceable Longitudinal Joint Tie

Core and Remove Coupler

Replace Coupler and Headed Tie

Installing Restored Slab

New Super-Dowels and Restored Longitudinal Joint Ties

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Accommodating Utilities

Curb Inlet

CIP Closure Pour

Water Valve – CIP Closure Pour

Drop Inlet CIP Closure Pour

Precast Crosswalk Slabs - Port Jefferson, NY

**Two Methods - Block-outs for Manhole or Cast
Manhole Frame in Slab**

Casting in manhole frame logistically difficult

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NYSTA New England Thruway I-95 Yonkers Construction WSP

Precast Pavement Add-ons – Smart Patching with Super-Dowels

Make The Most of Your Existing Concrete Pavement Assets

Broadway Junction, Brooklyn, NY

Van Sinderen Avenue Preliminary Slab Layout Drawing

167 Slabs – all removable and replaceable, 91 flat, 76 non-planar

Broadway Junction, Brooklyn, NY

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Broadway Junction, Brooklyn, NY

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US 40 Richmond

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INDOT US 40 Richmond

The Fort Miller Co., Inc.

INDOT US 40 Richmond

DATE: July 20, 2016
 IN PROJECT: 77070116 304-15 PH
 PLAN FILE NAME: \\FortM\SuperSlab\Engineering\wayne_S\Indiana\PM Detail Sheets.dwg

*SUPER-SLAB® IS PROTECTED UNDER AT LEAST ONE OF US PATENT NUMBERS: 6,807,329 B2; 6,883,318; 6,709,192; 6,899,495; 6,992,482; 7,004,674; AND 7,487,776 B2 AND CANADIAN PATENT NUMBER: 2,413,810 OTHER U.S. AND FOREIGN PATENTS PENDING. SUPER-SLAB IS A REGISTERED US TRADEMARK OWNED BY THE FORT MILLER CO., INC.

INDOT US 40 Richmond

"SUPER-SLAB" IS PROTECTED UNDER AT LEAST ONE OF US PATENT NUMBERS: 8,807,359 B2, 8,993,315, 8,709,192, 8,996,485, 8,992,482, 7,034,874, AND 7,487,778 B2 AND CANADIAN PATENT NUMBERS: 2,413,610 OTHER U.S. AND FOREIGN PATENTS PENDING. SUPER-SLAB IS A REGISTERED US TRADEMARK OWNED BY THE FORT MILLER CO., INC.

DATE: July 20, 2016
 PLOT DATE & TIME: 7/20/2016 3:28:25 PM
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REVISIONS			
NO.	DATE	BY	DESCRIPTION

REMOVABLE/REUSABLE URBAN PRECAST CONCRETE PAVEMENT					
PAVEMENT REPLACEMENT					
U.S. ROUTE 40					
CITY OF RICHMOND • WAYNE COUNTY • INDIANA					
TITEL: PRECAST SLAB FABRICATION DETAILS - 1					
DRAWN BY:	DATE:	CHK'D BY:	SCALE:	F.I.C. JOB NO.:	DWG. IN-S:
JCS	7/16/16	DEM	NIS		IN-5

Installed Costs (Bid Prices)

- **Installed Cost for Precast Repairs**
 - About \$ 244 to \$ 600 per SY
 - Similar to rapid-set concrete costs (in some states)
- **Varies greatly with**
 - Length of work window
 - Size of project
 - Local labor rates
- **Typically includes excavation, grading, slabs, dowels and tie bars and grout – all installed**

Bad Pavement Over Utility Cuts – Now Preventable

Fordham Rd., Bronx

**I-87 Major Deegan
Off Ramp - Bronx**

Fordham Rd., Bronx

Benefits of Precast Pavement

Reduce construction-related traffic congestion

Longer lasting pavement repairs – Asset Preservation

- 40+ years
- Reduced (long-term) repair costs
- “Get in, get out and stay out”
- “Total Incremental Replacement” – now possible

Reduces field inspection time and cost

- Precast slabs – plant inspected

Pre-engineered, pre-inspected slabs result in a superior finished pavement

Fort Miller Provides

- **Design and engineering support**
- **Super Paver Specifications**
- **Standard and special slabs as required**
- **Specialized grading equipment**
- **On-site technical assistance**
- **Installation guidance**

Presentation Take-A-Ways

- Long-life precast pavement can be installed overnight
- Drainage and subgrade can be up-graded in the process
- **Precast pavement installation - minimum impact on traffic**
- Precast pavement may be designed to be **removable and replaceable** to maintain utilities below
- Precast may be part of CIP project
 - Use precast in most critical areas
- Precast RUP allows **restoration of original** pavement after a utility repair event
 - Preserves appearance and functionality
 - May save cost in the long run

Keys to Success

(Still More to Learn)

Good engineering

Open minds

Real partnering

www.super-slab.com

SUPER-SLAB®

A large, rectangular concrete slab is suspended in the air by several thick black cables. The slab is positioned horizontally and appears to be in the process of being moved or installed. The background is a clear blue sky with scattered white clouds. The bottom of the image shows some green trees and a street lamp.

Thank You

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