Changing How We Build Highways and Bridges in America

Highways for LIFE

Accelerating innovation for the American driving experience

Byron N. Lord
Program Coordinator
Highways for LIFE

U.S. Department of Transportation
Federal Highway Administration

More cars and trucks

Old highways and bridges

Too many crashes and injuries

What if we built :

Faster?

With less congestion?

With better safety and quality?

At lower cost?

What's different?

Setting performance goals

Seeking the best solutions

Demonstration Project
Performance Goals

- Focus on user
- Set at a high level
- Define end results
- Significantly improve how we build highways

Highways for LIFE

Long Lasting

Innovative

Fast Construction

Efficient and Safe

Highways for LIFE

Accelerate innovation by:

- Incentive Funding for Demonstration Projects
- Technology Transfer
- Technology Partnerships
- Communication

Vanguard Technologies

- Prefabricated Bridge Elements and Systems
- Road Safety Audits
- Making Work Zones Work Better
- Precast Concrete Pavement Systems
- The Safety Edge

Highways for LIFE

Demonstration Projects

- Incentive Funding ($1 million)
- Performance goals for safety, quality, construction congestion and user satisfaction
- Innovations to achieve goals

Highways for LIFE
Demonstration Projects

One-day workshop

Building a successful HfL application

Seeking the Best Solutions

- ✓ Performance Goals
- ✓ Innovations to achieve goals
- ✓ Opportunity for "out of box" thinking

Highways for LIFE

Accelerate innovation through:

Technology transfer

Technology partnerships

Technology Transfer

- **Workshops/open-houses/showcases**
- **Videoconferences**
- **Webinars (NHI Innovations)**
- **Toolkit DVD's (PBES, HfL)**
- **Marketing Plans**
- **Peer to Peer exchanges**
- **Technical support and assistance**

Highways for LIFE
Technology Transfer

Two-day workshop

Performance Contracting

- ✓**Performance Contracting Framework**
- ✓**Performance Goals**
- ✓**Preparing your contract**

Highways for LIFE
Technology Transfer

Two-day workshop

Accelerated Bridge Construction

- ✓**Customized to meet States needs**
- ✓**Technical support and assistance**

Highways for LIFE
Technology Transfer

Two-day Training course

NHI Training Course: Accelerating the Adoption of Innovation

For additional information:
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Technology Partnerships

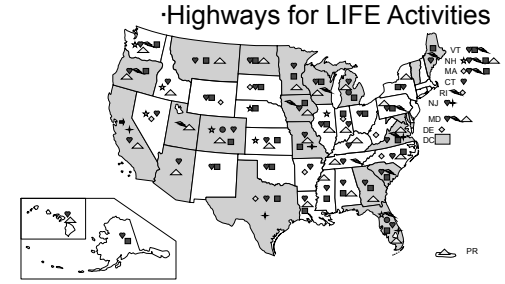
"Financial impetus to accelerate commercialization of promising innovations."

- **7 Projects Awarded**
- **Award range $200-500k**
- **3rd solicitation to expand outreach for FY-2009 this summer**

Communications

- *Innovator* newsletter
- Articles and presentations
- Open houses and workshops
- www.fhwa.dot.gov/hfl

·Highways for LIFE Activities



Key:

- Demonstration Project Recipient
- Demonstration Project 2008 Selectee (not awarded)
- Seeking the Best Solutions Workshop
- "Leap not Creep" NHI Course
- Performance Contracting for Construction Workshop
- Road Safety Audits Activities
- Making Work Zones Work Better
- Accelerated Bridge Construction
- Precast Concrete Pavement Systems
- Technology Partnership Sponsor

Maryland 2007

Innovations:

- Full road closure
- Precast, prestressed bridge elements
- Integral abutments
- Innovative contracting

Benefits:

- Project complete within 60 days versus 1 year

Virginia 2007

Innovations:

- Precast concrete pavement systems (both pre-stressed and jointed systems)
- Innovative contracting
- Elaborate MOT technologies (ITS)
- I-66 & US 50 Ramp

Benefits:

75% reduction in construction impacts to traffic

California 2007

Innovations:

- Precast concrete pavement systems
- CA4PRS Software
- Dynameq Software

Benefits:

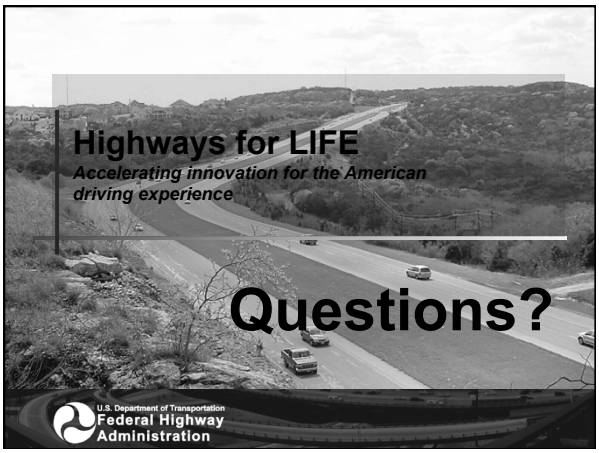
- Longer lasting pavement
- Optimize construction sequence, reduce impact to users

Utah 2007

Innovations:

- Total prefab bridge
- Self propelled modular transporter
- Construction manager contractor
- Work zone traffic technologies
- Silica fume concrete deck

Benefits: Traffic was interrupted for 48 hours only


Highways for LIFE
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Questions?
U.S. Department of Transportation
Federal Highway Administration


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Contact your Division Office or
www.fhwa.dot.gov/hfl
U.S. Department of Transportation
Federal Highway Administration

Federal Highway Administration Precast Concrete Pavement Program

Suneel Vanikar, Office of Pavement Technology
VDOT Highways for LIFE Showcase
September 22-23, 2009

U.S. Department of Transportation Federal Highway Administration

Why Precast Concrete?

- **Proven construction technique for bridges, commercial buildings and parking structures.**
- **High-performance durable concrete from controlled manufacturing facilities.**

Maintenance of Traffic

- **Expedited Construction**
- **Nighttime and Weekend Hours**

FHWA's Precast Concrete Pavement Program

Supports the advancement of precast concrete pavement applications through research, technology transfer, innovation, and increased product knowledge.

Precast Concrete Pavement –

Vision for Implementation

Rapid repair, rehabilitation, and reconstruction of asphalt and portland cement concrete (PCC) pavements on high-volume roadways.

Overview of FHWA Activities

2000 – Feasibility Study, Univ. of TX/Austin
2002 – Pilot Project, Georgetown, TX
2004 – Demonstration, El Monte, CA
2006 – Demonstration, Sikeston, MO
2006 – Demonstration, Sheldon, IA
2009 – Demonstration, Newark, DE
2009 – Highways for LIFE, Fairfax, VA
Current – Design & Construction Support
Current – Guidance Document Development

AASHTO Technology Implementation Group

June 2008 – Documents completed:

- *"Generic Specification for Precast Concrete Pavement System Approval"*
- *"Guidance & Considerations for Design of Precast Concrete Pavement Systems"*
- *"Generic Specification for Fabricating & Constructing Precast Concrete Pavement Systems"*

Strategic Highway Research Program (SHRP 2) Project R05, Modular Pavement Technology

- *Focus on tools that public agencies can use for design, construction, installation, maintenance, and evaluation of modular pavement systems.*
- *Phase I Report, February 2009 – Review of modular pavement systems; agency and industry experience; identification of successful strategies, promising technologies, and future needs.*

Technical Organization Activities

- *American Concrete Institute – Document summarizing technologies and case studies.*
- *American Concrete Pavement Association – Creating paving industry awareness.*
- *Precast/Prestressed Concrete Institute – Guidance document development.*
- *National Precast Concrete Association – Guidance document development.*

Developments Outside the U.S.A.

- *France – Hexagonal shaped precast concrete panels used for "removable urban pavement" (RUP) to facilitate access to underground utilities and other maintenance operations.*
- *Indonesia – Currently embarked upon the design and construction of a 22-mile precast prestressed concrete pavement that will be the longest in the world.*

Developments Outside the U.S.A.

- *Japan – Applications of precast pavement include bases for high speed rail; airport aprons and runways; and roadways in tunnels, at intersections, and other locations.*
- *The Netherlands – A precast concrete structural system, ModieSlab, can have a relatively thin and durable top layer for noise reduction or a porous surface can be incorporated to reduce tire-pavement noise and to diminish wet weather spray effects.*

Developments Outside the U.S.A.

- *Russia – A long history of precast pavement includes: highway and airport applications; temporary roads in permafrost environments; heavy industrial traffic applications; as well as urban traffic applications in Moscow.*

Future Activities

- ***Further development and refinements of precast concrete pavement systems.***
- ***SCAN – 2011 with AASHTO and NCHRP.***
- ***Major projects – Planning, design, and construction.***
- ***Specifications, guidance documents, and incorporation in routine practice.***

Questions ?

Further information –

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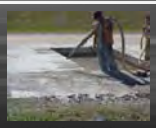
  Phone: 202-366-0120
- ***Sam Tyson***
  sam.tyson@dot.gov
  Phone: 202-366-1326

National Overview of Jointed Precast Concrete Pavement Slabs

VDOT I-66 Showcase, Sept. 22, 2009
Peter J. Smith, P.E.
The Fort Miller Co., Inc.

Michigan Method
(Michigan State University & FHWA)


Cutting Slots

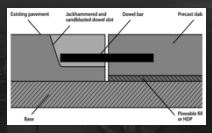

Sand Blasting Slots


Placing


Slots Ready to Fill

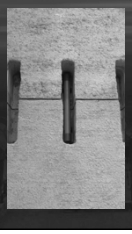
Roman Road System

Thomas Montalbine
Roman Stone Construction Company
631-667-0566
tmontalbine@romanstoneco.com

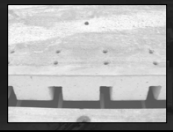


Illinois State Toll Highway (ISTHA) Precast Pavement System

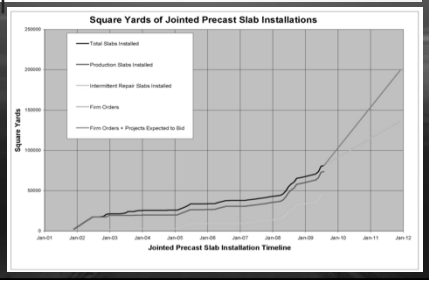
Illinois State Toll Highway Authority
Stephen Gillen
(630) 241-6800
sgillen@getipass.com



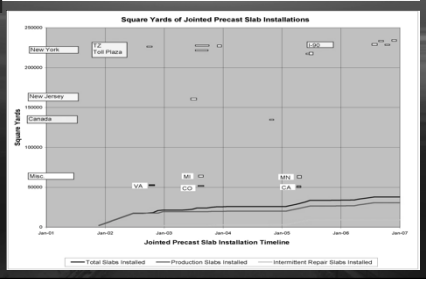
Super-Slab®
"Slab-on-Grade System"



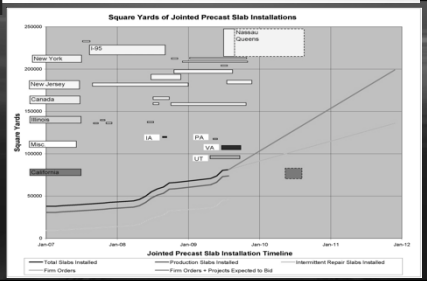
Rate of Implementation (2001 – 2009)



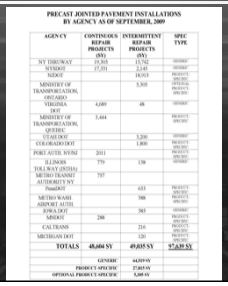
Rate of Implementation By State 2001 - 2007



Rate of Implementation By State (2007-2009)



Implementation by Agency



PRECAST JOINTED PAVEMENT INSTALLATIONS
BY AGENCY AS OF SEPTEMBER, 2009

AGENCY	CONTINUOUS REPAIR PROJECTS (SY)	INTERMITTENT REPAIR PROJECTS (SY)	SPEC TYPE
NY THRUWAY	19,305	11,742	
NYSDOT	17,331	2,145	
NJDOT		18,913	
MINISTRY OF TRANSPORTATION, ONTARIO		5,305	
VIRGINIA DOT	4,089	48	
MINISTRY OF TRANSPORTATION, QUEBEC	3,444		
UTAH DOT		3,200	
COLORADO DOT		1,800	
PORT AUTH. NY/NJ	2011		
ILLINOIS TOLLWAY (ISTHA)	770	150	
METRO TRANSIT AUTHORITY NY	737		
IllinoisDOT		633	
METRO WASH AIRPORT AUTH		300	
IOWA DOT		393	
MDOT	200		
CALTRANS		216	
MICHIGAN DOT		126	
TOTALS	**45,666 SY**	**45,035 SY**	**91,630 SY**
	GENERIC	64,810 SY	
	PRODUCT-SPECIFIC	27,055 SY	
	OPTIONAL PRODUCT-SPECIFIC	5,765 SY	

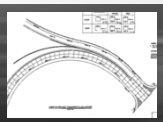
Toll Plaza, Tarrytown, NY

This
(3,000 SF Per Eight Hour Shift)
(Within ± 3 mm)
In 2001 and 2002

While Maintaining
This
(135,000 Vehicles per Day)

Ramps

Chicago, Il



Plan View Tarrytown

Brooklyn, NY

Tarrytown, NY

Intermittent Rehabilitation

Albany, NY

Philadelphia, PA

Ogden, Utah

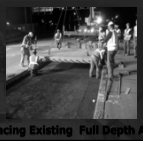
I-95, New Rochelle, NY

Intersections


Rotterdam, NY - 2006


Brooklyn, NY - 2009


Complex Geometry


Replacing Existing Full Depth Asphalt

Bridge Approach Slabs – Iowa & NY


Denver, Iowa (2008)


Binghamton, NY (2009)


Iowa DOT


NY State DOT

Airport Taxiways


LaGuardia - 2002


Dulles - 2002


Weekend Installation


Overnight Installation

Mainline I-15 Ontario, CA (2010)

Installing Test Slabs

Tested 1.5 Years

4.3 Million Cycles

200,000 VPD

(719 Slabs – 13, 150 SY - 2010 Construction)

Installed Costs (What We Know So Far)

- Intermittent Repair Slabs
  - About $ 432 to $ 585 per SY
  - Similar to cost for rapid-set concrete (in some states)
- Continuous Installations
  - About $ 350 to $ 401 per SY
  - Tend to be up to 20% less than intermittent repair slabs
- Varies greatly with
  - Length of work window
  - Size of project
  - Local labor rates

Average Bid Prices

Project	Type of Project	Bid Date	Pavement Thickness (in)	Project Quantity (sf)	Precast Bid Price per SY	Removal Bid Price per SY	Fine Grade Bid Price per SY	Total Price per SY
I-95 New England Thruway	Production		9.99	71,958	$382.28	$66.89	$35.12	$484.28
Nassau-Queens (Long Island)	Production	Mar-08	8.85	252,784	$376.26	$125.42	$16.72	$518.40
Route 21 Newark, NJ	Production	Jan-08	8.75	44,100	$472.50	Included	Included	$472.50
I-280 Newark, NJ	Production	Apr-08	8.75	35,237	$657.00	Included	Included	$657.00
I-15 Ontario, CA	Production	Dec-09	8.00	118,404	$349.50	Included	Included	$349.48
NJDOT Route 130 (SB)	Production	Jun-09	8.75	2,106	$496.00	Included	Included	$496.00
I-15, Ogden, Utah	Production	Feb-09	8.75	27,000	$435.48	Included	Included	$435.48
VDOT I-66	Production	Apr-09	8.75	42,204	$350.00	Included	Included	$350.00
PennDOT I-676	Production	May-09	12.00	5,699	$505.00	Included	Included	$505.00
				Avg.	$447.11		Wtg. Avg.	$474.24

Trends in Developing Specifications

- Product-specific specifications still used
  - Allow the owner maximum control
  - Mobilizes System Designer's expertise and support
- More states are developing generic specifications
  - Based upon a systems approach
    - Requires proven fabrication and installation details
  - Requires proof of performance of each system
  - Allows all systems to participate
- Some states desire to develop "standard" systems
  - Risky to make a "standard" before details are proven
  - Proof of performance should still be required

Trends in Acceptance and Implementation

- A few states are fully convinced
  - Evidenced by multiple projects
- Several states have tried the concept
  - Some are planning future projects
- Most contractors embrace the concept
  - Some (in Midwest) do not!

Summary

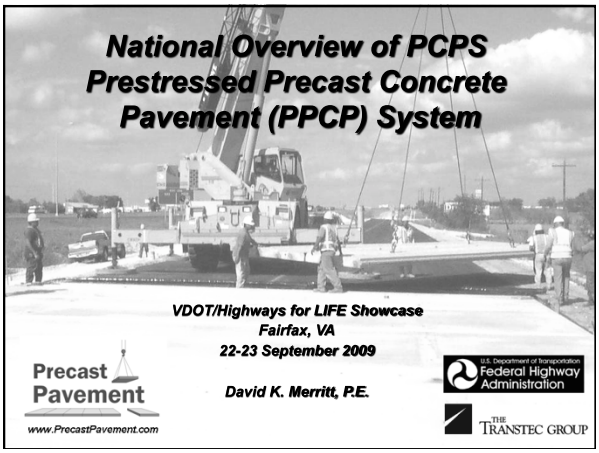
- Jointed precast pavement slabs now in 11 states
  - Plus two Canadian Provinces
- Jointed slabs used successfully in a multiple of applications
- Contractors are becoming more proficient at installation
- Fabricators prove capable of making accurate slabs
  - In three dimensions
- Jointed precast pavements are performing
  - Some in place over 8 years

Keys to Success
(Still More to Learn)

Good engineering

Open minds

Real partnering



Overview

- PPCP Description
- **Benefits**
- **FHWA Demonstration Projects**
- **Demonstration Project Outcomes**

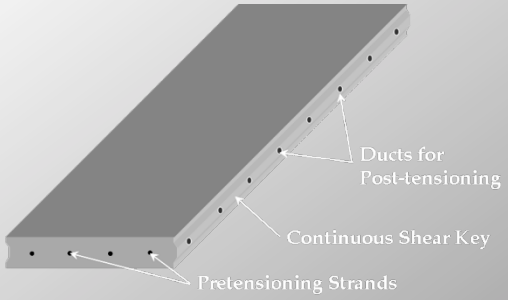
What is PPCP?

- *Precast* Prestressed Concrete Pavement
  - "Standardized" full-depth precast panels
  - Keyed panel joints for vertical alignment during assembly
  - Constructed over a prepared base (HMA, LCB, Aggregate Base, Pervious PCC, etc.)

What is PPCP?

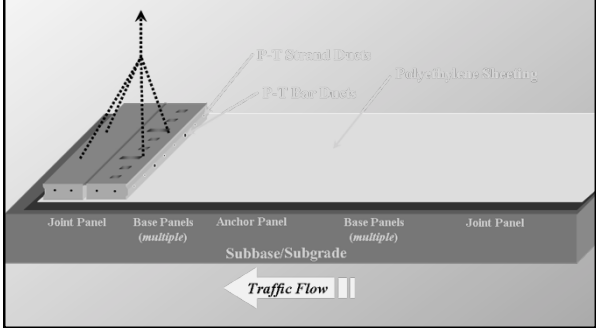
- Precast *Prestressed* Concrete Pavement
  - 2-way prestressing
  - Combination of pretensioning/post-tensioning
  - 2-way post-tensioning
  - Bonded/grouted P-T system

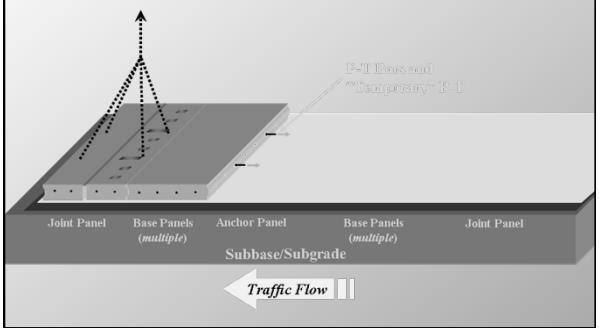
Typical PPCP Panel

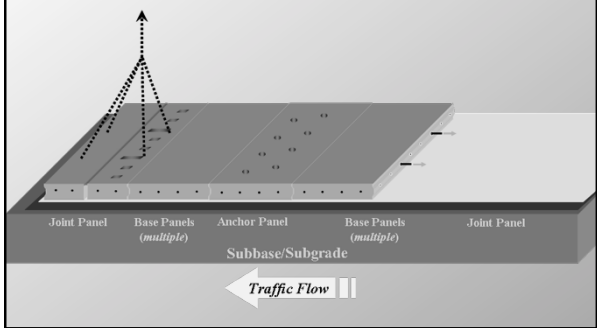


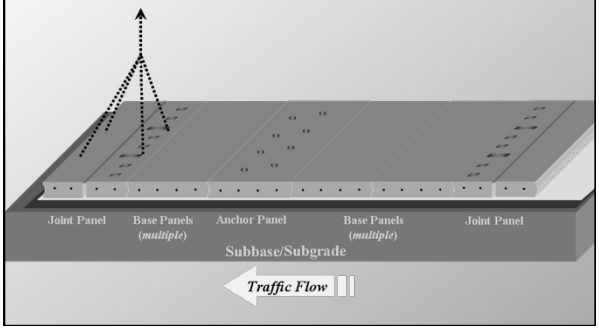
PPCP Panel Installation

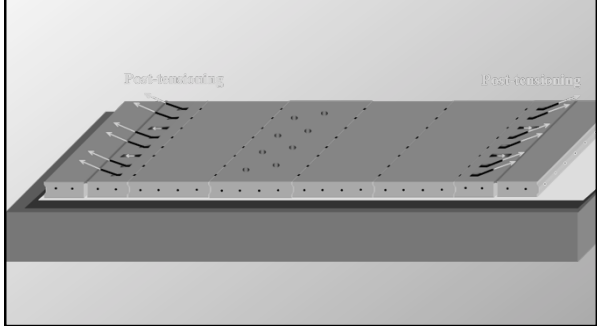
(*Current Concept*)

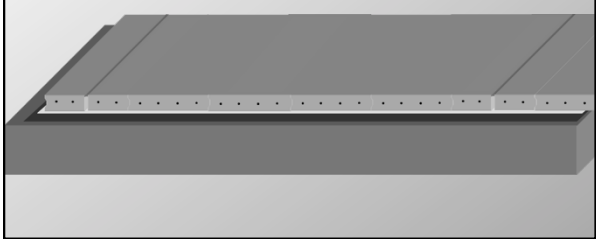












PPCP Panel Installation

(*Current Concept*)

PPCP Panel Installation

(*Current Concept*)

PPCP Panel Installation

(*Current Concept*)

PPCP Panel Installation

(*Current Concept*)

PPCP Panel Installation

(*Current Concept*)

Overview

- **PPCP Description**
- Benefits
- **FHWA Demonstration Projects**
- **Demonstration Project Outcomes**

Benefits

- Benefits of *Prestressed* Precast Concrete
  - Reduces/eliminates slab cracking (maintenance)
  - Reduced number of joints (maintenance/smoothness)
  - Reduced Slab Thickness (8" vs. 12")
    - Material savings
    - Allows for replacement of pavement in-kind
  - Ability to span voids/unsound support layers
  - Proven Long-Term Performance
    - 6" CIP post-tensioned pavement constructed in 1985 (near West, Texas)
    - Virtually no maintenance in 24 years

Overview

- **PPCP Description**
- **Benefits**
- FHWA Demonstration Projects
- **Demonstration Project Outcomes**

Texas Demonstration Project

- Completed 2002
- 2,300 ft of frontage road pavement along Interstate 35 just north of Georgetown, Texas.
- Full-width (36 ft x 10 ft) AND Partial-width (16 ft + 20 ft x 10 m) panels
- 8" thick precast panels
- Panels installed over 2" HMA leveling course
- 339 panels total

California Demonstration Project

- Completed 2004
- Widening of Interstate 10 near El Monte, CA
  - 27 ft traffic lanes + 10 ft shoulder
- Night construction
- Precast Panel Dimensions
  - 37 ft long x 8 ft wide, 10" - 13.1" thick
- 248 ft total project length (2 sections @ 124 ft)
- Panels installed over lean concrete base
- 31 Panels total

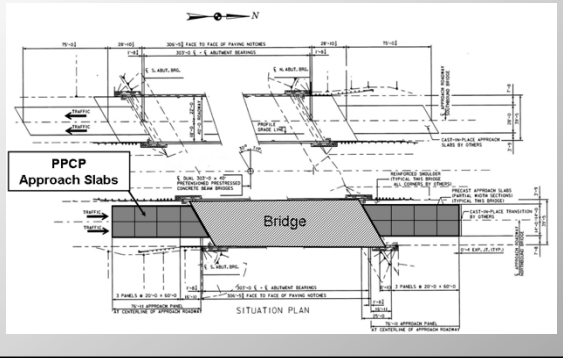
Missouri Demonstration Project

- Completed 2005
- Replacement of 40+ yr. old Interstate JRCP
- 1,010 ft total length (4 sections @ 250 ft)
  - 2 lanes plus shoulders: 38 ft wide
  - Pavement crown incorporated into panels
- Installed over permeable asphalt-stabilized base
- End Stressing for Post-Tensioning
- Panels: 10 ft x 38 ft x Variable thickness
- 101 panels total

Iowa Demonstration Project

- Completed 2006
- Precast Prestressed Bridge Approach Slabs
  - 77 ft at either end of a skewed bridge (16 panels)
  - Tied to an integral bridge abutment
- 2-way Post-Tensioning
- Partial-width panels (lane-by-lane construction)
- Installed over crushed limestone base
- Panels: 14 ft x 20 ft x 12 in.
- 16 panels total

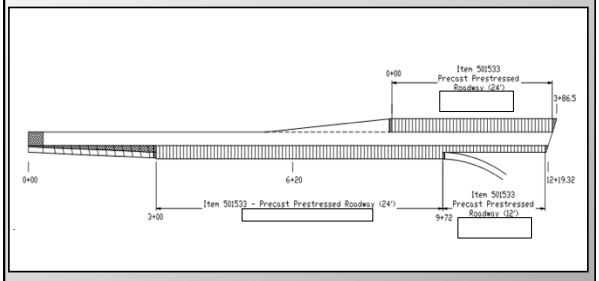
Iowa Demonstration Project



Delaware Demonstration Project

- Completed July 2009
- Replacement of ASR-affected JCP
- Left turn and right turn/thru lanes at approach to intersection
  - Single lane (12') PPCP and double lane (24') PPCP
- Night construction only (7:30pm – 5:30am)
- Installed over pervious concrete base
- Panels: 10' x 12' and 24' ft x 8 in.
- Threaded P-T bars used for temporary P-T during construction (and as final tendons)
- 130 panels total

Delaware Demonstration Project



Other Projects:

Red Dog Mine, Alaska (2002)

Overview

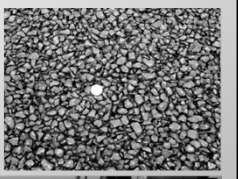
- **PPCP Description**
- **Benefits**
- **FHWA Demonstration Projects**
- Demonstration Project Outcomes

What Has Been Demonstrated?

- Feasibility of PPCP Construction
  - Full-width construction
  - Partial-width (lane by lane) construction
- Night Construction
  - Opening to traffic each day


What Has Been Demonstrated?

- Use of various bases
  - Hot-mix asphalt
  - Lean concrete
  - Crushed aggregate
  - Pervious concrete

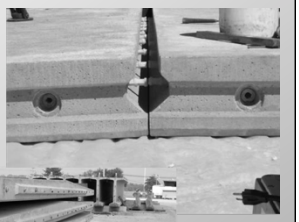


What Has Been Demonstrated?

- Use of prestressing for precast pavement
  - Combination of pretensioning/post-tensioning
  - 2-way post-tensioning
  - Threaded bars for temporary P-T


What Has Been Demonstrated?

- Variable cross-slope


What Has Been Demonstrated?

- Construction on horizontal an vertical curves


What Has Been Demonstrated?

- Various expansion joints



Potential Future Applications

- Potential FHWA Demonstration Projects
  1) Weigh-in-Motion Installations
  2) Intersections
  3) Unbonded Overlays
  4) Temporary Pavement/Crossovers
  5) Thinner pavement sections beneath bridges
  Others……
  FHWA is providing design and construction support for demonstration projects.

Virginia Department of Transportation

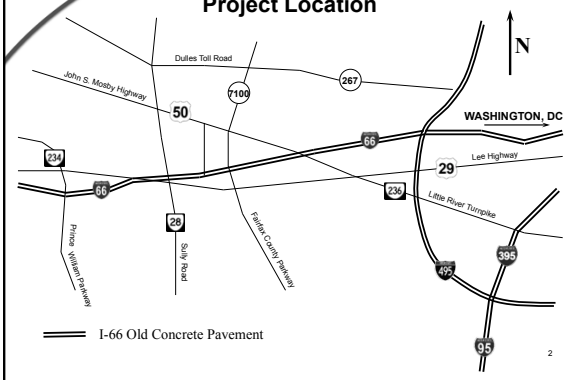
I-66 Highways for LIFE Showcase
Fairfax, Virginia

Karen L. Consiglio, P.E.
Area Construction Engineer

David P. Shiells, P.E.
District Materials Engineer

September 22, 2009

Project Location



2

I-66 Highways for LIFE

Existing Pavement Structure

- 9" JRCP built in early 1960s
- 6" of plain aggregate sub-base
- 6" cement stabilized sub-grade
- Lot of joint problems and mid-slab spalling

3

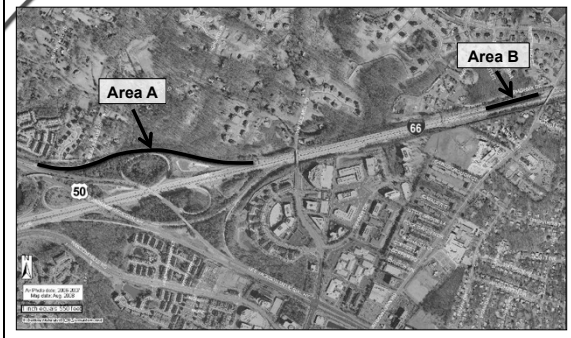
I-66 Highways for LIFE

Site Selection

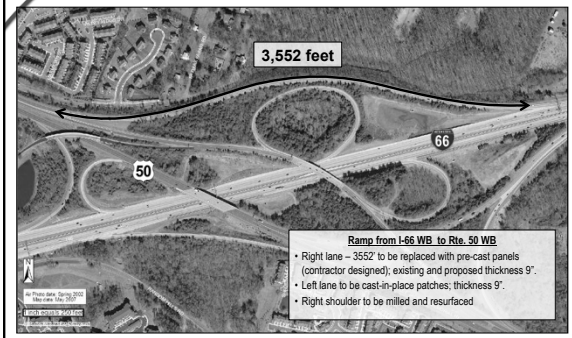
- Based upon condition of pavement
- Available working space (barriers, drainage inlets, etc.)
- Overhead clearances
- Utilities (loop detectors, etc.)
- Curved sections

4

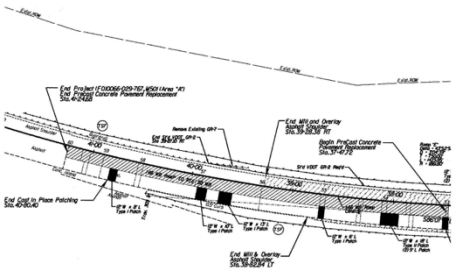
I-66 Highways for LIFE



Highways for LIFE: Area A



Ramp: Pre-cast Concrete Panels and Cast-in-Place Patches

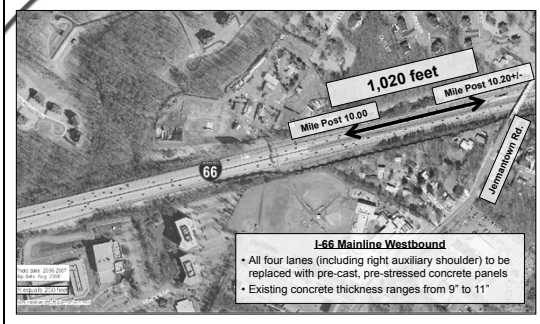


7

Ramp: Right Lane to be Replaced with Pre-cast Concrete Panels

8

Highways for LIFE: Area B



I-66 Mainline Westbound

- All four lanes (including right auxiliary shoulder) to be replaced with pre-cast, pre-stressed concrete panels
- Existing concrete thickness ranges from 9" to 11"

9

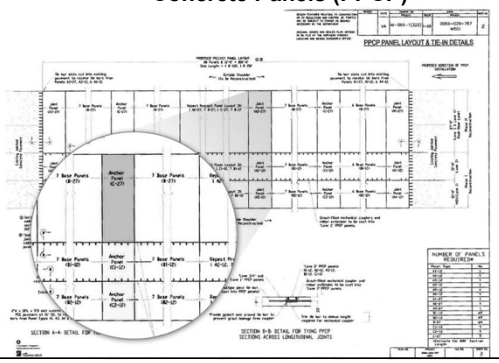
I-66 Mainline: Pre-cast, Pre-stressed Concrete Panels (PPCP)

10

I-66 Mainline: Pre-cast, Pre-stressed Concrete Panels (PPCP)

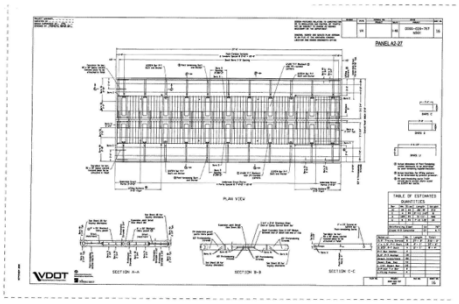
11

I-66 Mainline: Pre-cast, Pre-stressed Concrete Panels (PPCP)



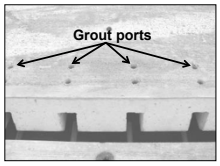
12

I-66 Mainline: Pre-cast, Pre-stressed Concrete Panels (PPCP)



13

Proprietary PCP Systems: Super Slab® System



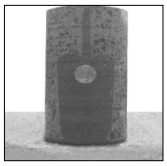


Photo source: The Port Miller Company

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Project Challenges and Solutions

Challenges

- Differing thicknesses of ex. concrete along mainline (transverse)
- Proprietary PCP systems
- Smoothness of final pavement surface
- Estimating costs and fitting to available funding

Solutions

- Cost for #10 coarse aggregate included in PPCP bid item
- Special provisions for PPCP and PCP (based on AASHTO TIG); approved list for PCP systems; trial installation required prior to production; FWD testing for 80% joint load transfer efficiency
- Diamond grinding included for all PPCP and PCP panels (+ 50' run-on and run-off); ride-ability specification (no incentives or disincentives)
- Innovative bidding

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Bid Results

Section	Lane Construction	Fort Myer	General Excavation
0001	All	All	All
0002	All	All	All
0003	All	All	All
0004	3,140 SY	2,100 SY	1,373 SY
Total	$4.97 M	$5.00 M	$4.99 M

CIP (9") – $225/sy
PCP (9") - $350/sy
PPCP (8") - $410/sy

16

Maintenance of Traffic

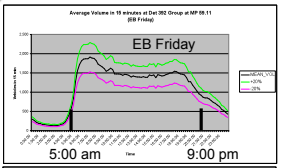
Extremely High Traffic Volumes

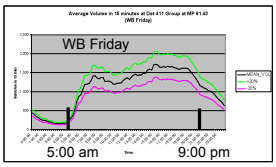
- ADT_{2008} = 184,000 vpd (5% trucks)
- Shoulder use 5:30 am to 11 am EB; 2 pm to 8 pm WB

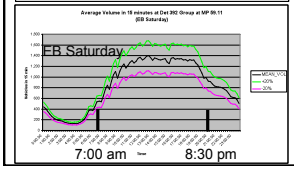
17

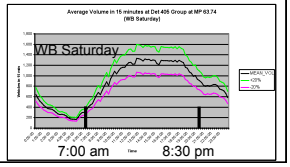
Maintenance of Traffic

Hourly Traffic Volumes

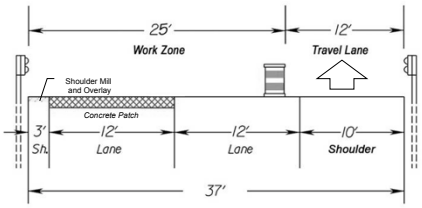








Area "A" Phase I
2-Lane Ramp



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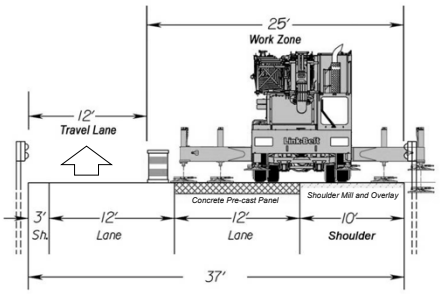
Area "A" Phase II



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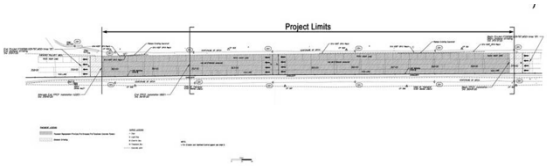
I-66 Highways for LIFE
Area "B" PPCP



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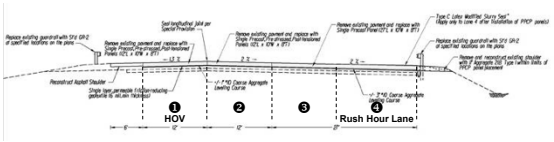
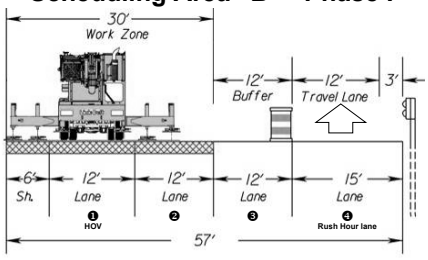
MOT - Lane Closure and
Scheduling Options for Area "B"



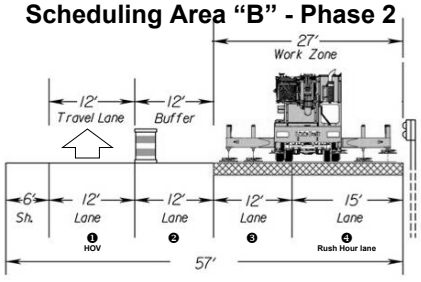
22

MOT - Lane Closure and
Scheduling Area "B" - Phase I



23

MOT - Lane Closure and
Scheduling Area "B" - Phase 2



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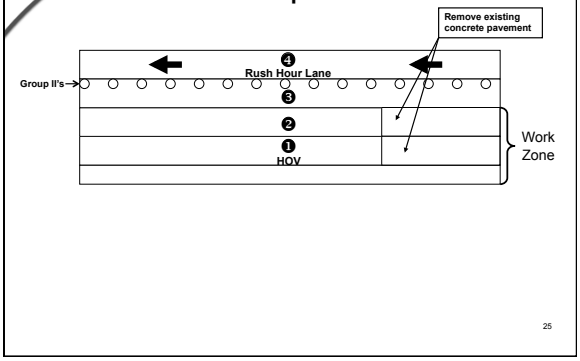
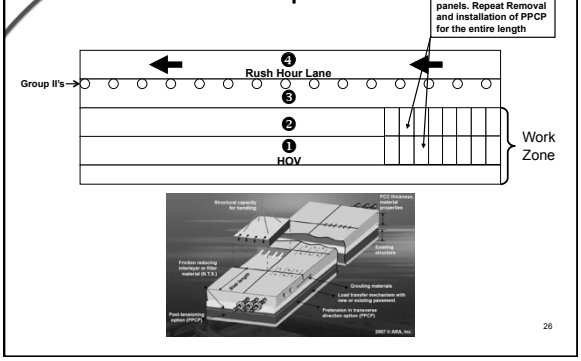
Area "B" - Phase I Step 1



25

Area "B" - Phase I Step 2



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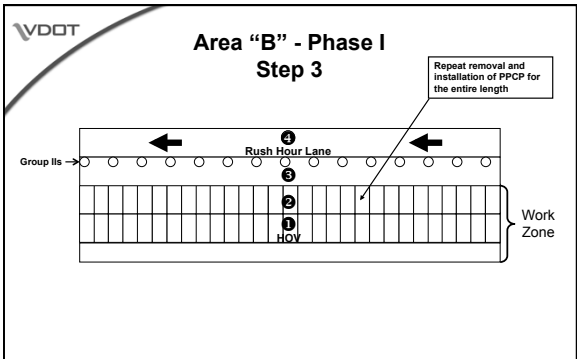
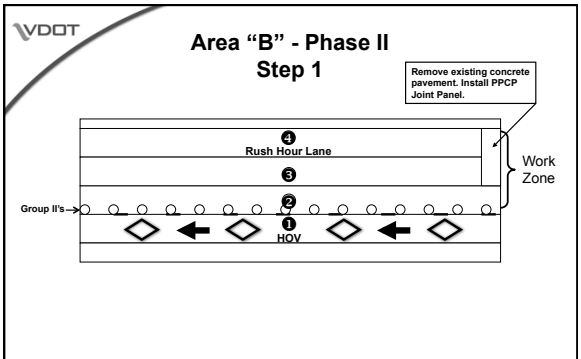
Area "B" - Phase I Step 3



27

Area "B" - Phase II Step 1



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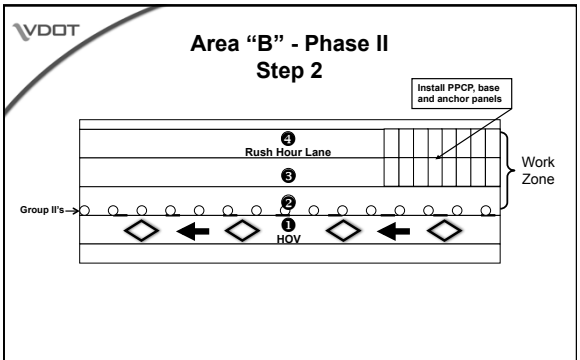
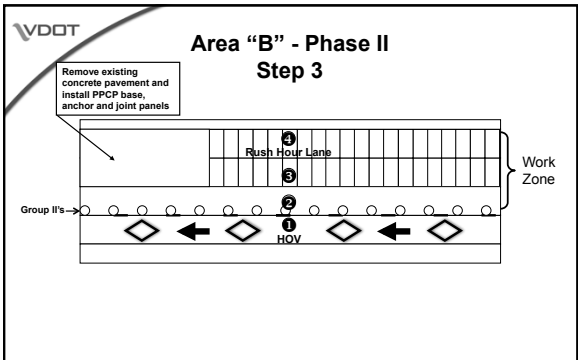
Area "B" - Phase II Step 2



29

Area "B" - Phase II Step 3



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Lessons Learned

Lead Time for Shop Drawings/Submittals/Trial Installations
- Specify *off-site* prior to construction

Staging Area
- Critical for deliveries, etc.

Trial Installations
- Specify *off-site* prior to construction
- Trial batches for grouts (hardware and underslab)
- Falling weight deflectometer testing;cores

Closure Pour
- Necessary for PPCP

Existing Conditions are Variable !
- Variability of existing pavements (cast-in-place)
- Tolerances for pre-casting
- Difficult to predict; especially at tie-ins

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Project Goals

Comparison of Technologies (CIP, PCP, PPCP)
- Costs
- Construction issues
- Availability of systems/qualified contractors
- Proprietary issues
- Time (design, shop drawings, casting, construction)
- MOT requirements
- Inspection requirements
- Long term performance

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Questions ?

33

THE LANE CONSTRUCTION CORPORATION
Since 1890
A Commitment to Excellence

I-66 Concrete Paving Repairs –Precast and Prestressed Panels Demonstration Project

Project Status

Project Overview

- Project Consists of:
  - 520 SY of Cast In Place Concrete
  - 5,780 SY of Prestressed Post Tensioned Panels
  - 4,690 SY of Precast Concrete Panels
- Current Status:
  - Cast In Place Concrete has been completed
  - 50% of the Prestressed Panels are completed
  - 45% of the Precast Panels are completed

What's Happening Now

- Overview of tonight's site visit
  - Two work areas
    - I-66 WB - Prestressed Panels
    - I-66 WB to Rte. 50 WB Ramp – Precast Panels

I-66 WB – Prestressed Post Tensioned Precast Concrete Panels

- Work in this area:
  - Post Tensioning of Panels
  - Post Tensioning Duct Grouting
  - Underslab Grouting
  - Misc. Support Operations

I-66 WB to Rte 50 WB Off Ramp – Precast Concrete Panels

- Work in this area:
  - Removal of Existing Concrete Panels
  - Drilling & Installation of Longitudinal Tiebars
  - Installation & Grading of Stone Dust Subbase
  - Installation of Concrete Panels
  - Dowel & Underslab Grouting
  - Misc. Support Operations

Why did Lane bid this project?

- We were interested in the New Technology
  - We had worked with the Fort Miller System previously @ Dulles Airport
- Good opportunity to gain experience in a potential new market of concrete paving

Considerations & Concerns @ Bid Time

- TRAFFIC
  - High Volume Roadway with limited space & access.
  - Time restriction offer a small work window.
- Schedule
  - How many panels can be placed per shift? (No historical data.)
  - How fast can panels be precast?

Considerations & Concerns @ Bid Time (cont.)

- Panel Installation
  - Would existing subgrade be suitable?
  - How do we match new panels to the existing pavement?
  - What do we do if we can't get panels installed in time to open roadway to traffic?
- Precasting
  - Accuracy & Production Concerns
  - Delivery of Material
  - Location of Precaster

Questions & Answers

PROJECT SAFETY

Personal Protective Equipment (PPE)

- Long Pants, Shirts with Sleeves, Jackets, etc.
- Work Boots/Shoes – No sneakers or tennis shoes.
- Hard Hat
- Reflective Safety Vest
- Personal Items (Medications, Food, etc.)
- Hearing Protection - will be provided by Lane if requested.
- Restrooms are available on site.

Site Conditions

- Active Work Zone
- Tight area with multiple activities.
- Always be alert and stay clear of equipment.
- Night Work – Areas are illuminated however visibility is still impaired.
- Traffic is a major Hazard – Stay Alert and Stay Away
- Ask for an escort if you would like to view an activity closer up.
- Always stay clear of Panels when they are being lifted into place.
- Stay in designated area.

What You Will See Tonight

I-66 Project

Fairfax, VA

September 22, 2009

The Super-Slab™ System

A

Slab-on-Grade

System

Super-Slab® is a patented system

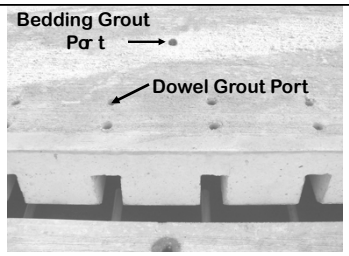
Super-Slab™

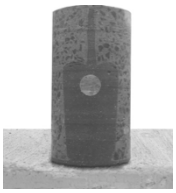
The Product

Features:

High Performance Concrete
Embedded Dowels
Embedded Tie Bars
Matching Inverted Dovetail Slots

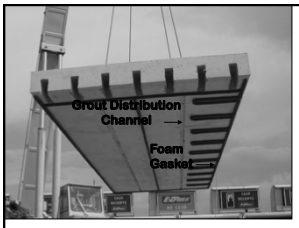
Thickness as Required
Length and Width as Required





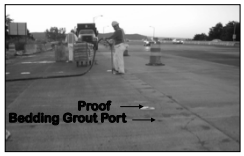
Transverse Dowel Connection

- Slots on the bottom Protects Grout From De-Icing Chemicals
- Mechanical Resistance to Dowel Pop-out

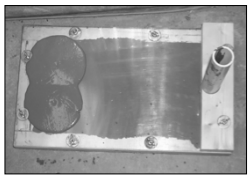


Bedding Grout

- To fill any voids
- Flow rate = 17 - 20 seconds
- 2 MPa in 12 hrs.



Pumping Bedding Grout

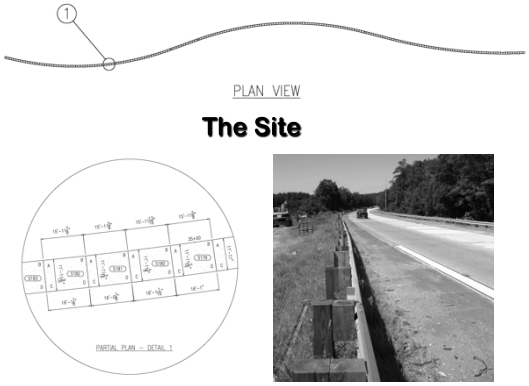


Grout Flow Test Chamber

Two Types of Slabs (and Subgrade Surfaces)

- **Single Plane**
- **Warped Plane**
- **8 ¾" thick to replace 9"**
- **New slabs match existing edge**

The Site



The Site

Engineering

Collection of Field Data

- Collect "x", "y", "z" of existing surface
  - At matching longitudinal joint
  - At right hand edge of existing ramp
  - At theoretical panel points
- Data used to develop surface model
  - Profiles are smoothed out wherever possible
- New slabs are designed and fabricated to fit design surface model

Layout

- Lay out leading corners
  - Requires surveying
- Use correct lay length
  - = theoretical length of the slab + ¼"
  - Provides for ½" maximum joint width

Layout

Slabs Are Set To Leading Edge Panel Point.

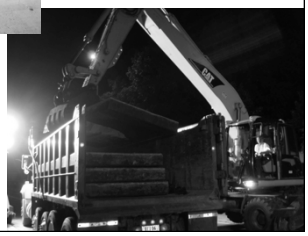
Panel Point Layout with Total Station

Removal of Existing Pavement

Slab Crab Bucket Removal

Existing pavement cut previous nights

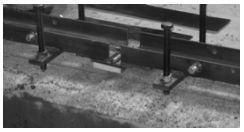
Sometimes in More Than One Piece



Precision Grading (Super-grading)

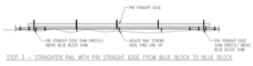
Setting Rails for Hand Operated Grader

Set Couplings Over Panel Points (to grade)



Coupling Over Panel Point

Drop Rails in Couplings



Use Pin Straight Edge to Straighten Rails

Pin Straight Edge

First Pass (1/4" high)

Compaction

Super Grading With H.O.G.

Three Steps

Last Pass (done)

Installing Dowels and Tie Bars

Drilling for Tie Bars

Mark Out and Drill (accurately)

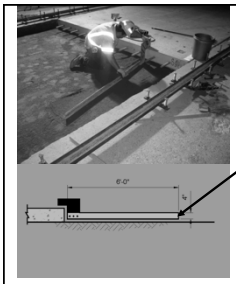
to Fit Inverted Dovetail Slots

Use Proper Epoxying Technique

Placing Slabs

Prior to Placing Slabs

- Make a final grade check around edges
- Install at least shims
  - At least one at each corner of previously-placed slab
- Apply bond breaker to edges previously set
  - (requires spray can of form oil)



Checking and Trimming Edges

Depth Gage for Checking Edges

Use it to make sure slabs will fit

Edge Trimmer

Install Transverse Joint Shim

At least one per corner

Apply Bond Breaker

Spray (form oil)

Placing Slabs

- Use proper size crane
  - Do not place outrigger on slab corners!
- Rig properly
  - So all four corners hit at once
- One man in each corner
- Set slabs to leading edge marks
- Check for match
  - Correct if necessary before setting next slab

Placing Slabs

One man in each corner

Crane outrigger off pavement

Setting slabs to panel point marks

Grouting

Dowel Grout

- Required properties
  - Non-shrink, high strength, fast setting, freeze thaw durable
  - Must be pumpable
  - Must reach 2500 psi in 2 hours
- Dayton Superior HD-50
  - Standard bagged grout with our specified amount of water
- Pro-Spec
  - Use water shown on the bag

Installing Dowel Grout

Chem Grout Mixer/Pump

Filling Dowel Grout Ports

Contractor-Designed Joint Dam

(Montreal Project)

Bedding Grout

- Mixture of Cement, Water & Admixture
  - Flow rate of 17 - 20 seconds
  - Must flow into thin voids
- Reaches 2 MPa ± in 12 hours
- Use Proper Nozzle
- Keep Holes filled

Proof

(keep ports full)

Bedding Grout

Flow Rate

17 – 22 Seconds

How About Smoothness?

- Small differences between slabs are to be expected
  - There are tolerances allowed (by necessity) in the slabs
  - There are tolerances allowed in the grading
- Super-Slab® specifies finished surfaces ± 3 mm
  - In many cases this is acceptable
- For best International Roughness Index - grind
  - Grinding is a known and accepted practice

Keys to Job Site Success
(Still More to Learn)

- ***Good Training***
- ***Working Together***
- ***Real Partnering***

THE LANE CONSTRUCTION CORPORATION
OVER 100 YEARS
A Commitment to Excellence

I-66 Pavement Repairs Demonstration Project

Contractor Perspective of Precast Panel Replacement

Presented By: Erich R. Brown, P. E.

Two Innovative Concepts

- Prestressed Post Tensioned Concrete Panels
- Precast Concrete Panels

Planning Challenges

- TRAFFIC
  - I-66 WB is a High Volume Roadway
  - Time Restrictions Limited the Amount of Production per Shift.
- Access to the Work Zone
  - Limited time did not allow for a large mobilization operation
  - Staging area for equipment and materials
  - Small work area limits work force size

Planning Challenges (cont.)

- Existing Conditions
  - Condition of existing subgrade
  - Condition of existing concrete
  - Removal of slabs without damaging subgrade
- Preparation of Subgrade to Match Existing Conditions
  - Plan alignment vs. Actual
  - What methods do we use to place subgrade matl.

Planning Challenges (cont.)

- Material Deliveries
  - Staging vs. Timing delivery of Panels
  - Storage & transport of Misc. Material
- Weather
  - What happens if it starts to rain?

Strategies (and did they work?)

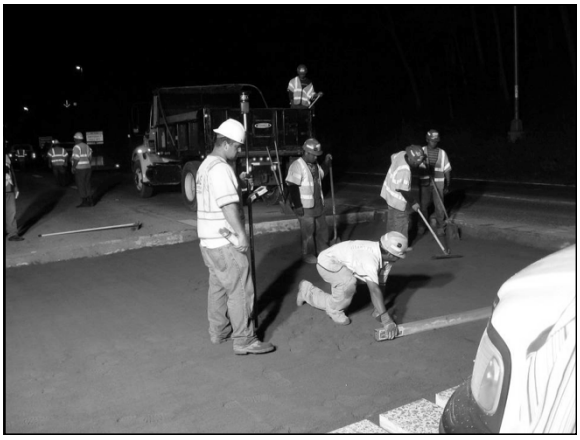
- TRAFFIC
  - Procurement of appropriate materials
  - Practice MOT Prior to beginning work
- Access to the Work Zone
  - Set up to use self mobilizing equipment which was staged at a nearby off site location
  - Kept crew size to a minimum – prevented crowding of work zone
  - Performed as many operations ahead of time as possible (Saw Cutting, Drilling for Slab Removal, ect.)

Strategies (cont.)

- Existing Conditions
  - Condition of subgrade was Good
    - Had it been poor – undercutting would have severly impacted production
  - Existing concrete removal performed with a rubber tired excavator w/ slab bucket attachment
- Preparation of Subgrade to Match Existing Conditions
  - Asbuilts of both work areas were taken
    - This was required for the Precast Panel Design
    - This was convenient for the Prestressed Panel Installation

Strategies (cont.)

- Preparation of Subgrade to Match Existing Conditions (cont.)
  - Methods used for Grading
    - Hand Operated Grader (HOG) (Precast Panels)
    - Laser Screed (Prestressed Panels)
    - Straight Edge (Prestressed Panels)
- Material Deliveries
  - Panel Delivery
    - Prestressed Panels were delivered directly to the work zone
    - Precast Panels were staged and brought out at night
  - Other misc. material was staged off site and brought out as needed



Strategies (cont.)

- Weather
  - If we have a hole in the ground and it starts to rain we keep going.

Construction Issues & Lessons Learned

- There is a difference between plan grades and existing grades.
  - In order to open this to traffic after each shift you have to match existing conditions.
- It takes constant effort and accurate precasting to maintain Prestressed Panel alignment.
- Existing concrete may not be in suitable condition to tie into.
- There is a method for laying out the Precast Panel Longitudinal Tiebars.

Construction Issues & Lessons Learned (cont.)

- Precasting Accuracy is a must for proper post tensioning duct alignment as well as panel alignment.
- Make sure to leave yourself room between existing and new pavement for temporary post tensioning at the end of each shift.
- Prestressed panels tend to grow.
- Post Tensioning Ducts leak when grouted.

Facts & Figures

- Prestressed Panels
  - Overall work window of 8hrs on I-66
    - 2hrs for traffic (1hr on either end)
    - Total of a 6hr work window
  - Actual Peak Production in a 6hr window
    - 12ea 10' x 12' Panels
    - Equals 120 Lane Feet or 160 SY of surface area

Facts & Figures (cont.)

- Precast Panels
  - Overall work window of 7hrs on Off Ramp
    - 1hr for traffic (1/2hr on either end)
    - Total of a 6hr work window
  - Actual Peak Production in a 6hr window
    - 12ea 16' x 12' Panels
    - Equals 192 Lane Feet or 256 SY of surface area

Facts & Figures (cont.)

- Cast In Place
  - Overall work window of 8hrs on Off Ramp
    - 2hr for traffic (1hr on either end)
    - Total of a 6hr work window
  - Actual Peak Production in a 6hr window
    - Allow 3-4 hrs for Cure Time
    - 40 Lane Feet or 53 SY of surface area

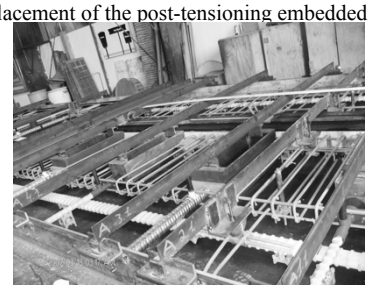
Questions?

HIGHWAYS FOR LIFE
I-66 AND RT. 50
CHANTILLY, VA

By : Carla A. Ramo
Mid-Atlantic BD Manager

HIGHWAYS FOR LIFE…

- First Part of the Work → Casting Yard
  - Coordinate with Smith Midland the delivery and placement of the post-tensioning embedded parts.



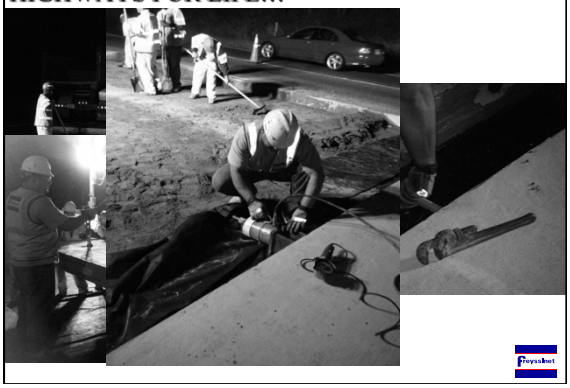
HIGHWAYS FOR LIFE…

- Challenges :
  - Get deliveries on time to avoid delaying casting of panels. Fast paced project. No delays allowed.
  - Risky - By the time of ordering the material:
    - No contract signed
    - No approved drawings
    - Conditional Letter of Intent
  - Coordinate with Precaster to ensure proper installation of PT embedded items.

HIGHWAYS FOR LIFE…

- Scope of Work – Main Lane
  - "Temporary" Post-Tensioning Bar Tendons:
    - Installation - After Lane prepares sub-base and places friction lining and while they are moving the panels into place, Freyssinet inserts the PT bar and engages the coupler that attaches the bar to the bar in the next panel.
    - Temporary Stressing – After two consecutive panels are in place, the two bars in each panel are stressed to 18.3 Kips simultaneously with 2 each 60 ton center hole rams.

HIGHWAYS FOR LIFE…



HIGHWAYS FOR LIFE…

- Challenges – Bars were cut to 10Ft. each considering they could be slid to either end for coupling and stressing, but due to the space constraints the couplers would hang in the joints and bars would not come out far enough.
- Resolution – Added a 1Ft. Piece of bar at the first joint of each segment so that the bar would protrude enough at each joint.
- Final Stressing – After the strand tendons are placed in each segment, all bars are stressed to the permanent load of 43.9 Kips at the joint panel.

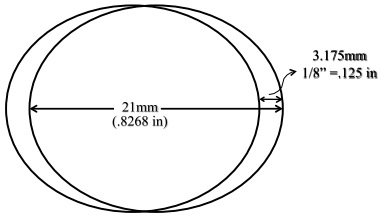
HIGHWAYS FOR LIFE…

- Permanent Post-Tensioning Strand Tendons
  - Installation - Tendon length varies from 94.33Ft. to 154.33Ft. Normally, hand pushing tendons would be achievable for these lengths.
  - Challenge #1 - Due to space constraints and misalignment at the joints, the strands would not go in manually or drill assisted.
  - Challenge # 2 – Removal of epoxy material on the area where the wedges bite strand. Causes slippage after strand is stressed.

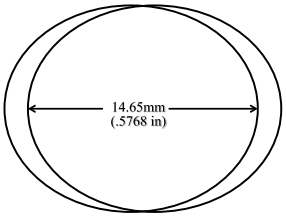
HIGHWAYS FOR LIFE…

- Resolutions
  - Strands had to be pre-threaded and then pulled in with the use of a pick up truck.
  - More methodical epoxy stripping with the use of a stripping machine.
- Once a joint panel is reached, strands are installed and stressed to 43.9 Kips.

HIGHWAYS FOR LIFE…



HIGHWAYS FOR LIFE…



7 – Wire Strand without the coating is 0.6" in diameter !!!
THEORETICALLY, PHYSICALLY AND MATHEMATICALLY IMPOSSIBLE!

HIGHWAYS FOR LIFE…

- Transverse Tendons
  - Installation – It was initially intended to install the entire 51Ft. of strand across the three lanes after all pavement slabs were in place.
  - Challenges – Because of the grout leaks from other operations, the ducts for the transverse tendons were getting blocked with grout.
  - Resolution – The transverse strand installation and grouting operations were divided in two. The strand for the first two lanes will be installed first from one side, and later, the wider lane will be installed from the opposite side.

HIGHWAYS FOR LIFE…

- Post-tensioning Tendon Grouting –
  - Procedure –Grout tendons (Sika Grout 300PT) from one end. Seal intermediate vents as grout travels to and out of vents toward the far end.
  - Challenges – Due to a poor seal at the joints, grout leaks into the void between and beneath the panels.
  - Resolution – No real solution in hand for the leaks. The tendon grouting became a priority to avoid a weaker cement product "invading" the space of the pt grout.

HIGHWAYS FOR LIFE…

- Ramp Super Slab
  - Dowel Grout
    - Challenges – Rapid set grout / Extra fast work pace
  - Underslab Grout
    - Challenges – Achieving manufacturer's suggested strength and fluidity.

HIGHWAYS FOR LIFE…

- Recommendations:
  - Match Casting
    - Will allow the use of couplers for better seal.
  - Cast bigger duct. Insert smaller duct with mechanical coupler for the strand.
  - QUESTIONS?

HIGHWAYS FOR LIFE…

THANK YOU!

SMITH-MIDLAND
EXCELLENCE IN PRECAST CONCRETE

I-66 Precast/ Pre-stressed Concrete Pavement Slabs

Presented by:
Matthew I. Smith,
Vice President, Sales and Marketing
And
Jimmy Dean,
Vice President, Project Management

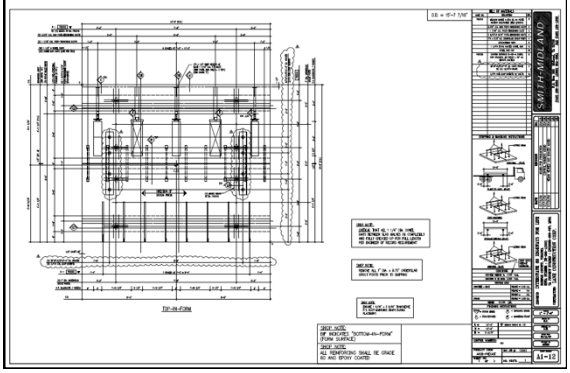
Challenges/ Strategies

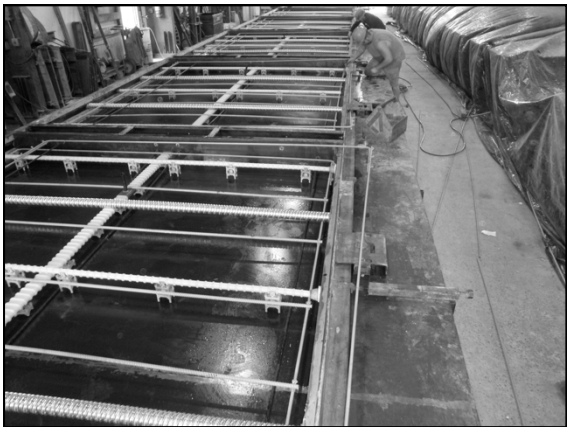
- Aggressive Delivery Schedule
- Extremely Tight Tolerances
- Original design did not allow for proper concrete coverage.
- Keeping Conduits and Ducts clear of debris and Concrete Paste

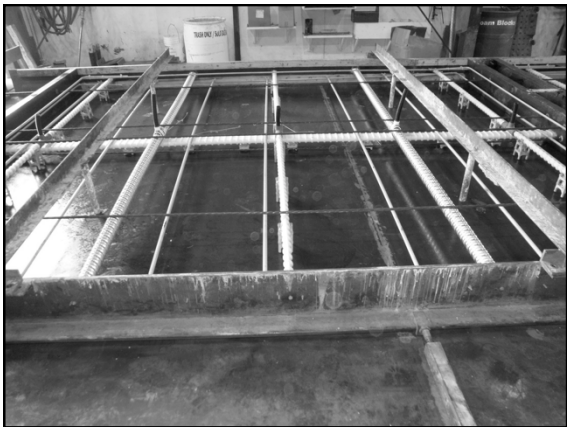
Construction Issues and Lessons Learned

- Add ½" thickness to slab to fit all of the material and maintain proper coverage
- Worked extremely close with Lane Construction, VDOT and Freyssinet to ensure all details were addressed up front.
- Redesigned Panels to accommodate matching strand patterns to meet the aggressive delivery requirements.

Typical Shop Drawing







SMITH-MIDLAND®
EXCELLENCE IN PRECAST CONCRETE

For more information,
please contact:

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Vice President, Sales and Marketing
(540) 439-3266 or
MSmith@SmithMidland.com
www.SmithMidland.com

AASHTO TIG

Precast Concrete Pavement Systems Lead State Team

VDOT Demonstration Showcase
Fairfax, VA
September 22, 2009

What is T.I.G. ?

- AASHTO's standing **T**echnology **I**mplementation **G**roup
- Group reports to the Standing Committee on Highways (Chief Engineers)
- Purpose is to "champion" the **accelerated** implementation of **proven** innovation
- Since 2000, has focused on 3-5 each year
- Uses "Lead State Team" concept

TIG Lead States Team on PCPS

(8 states, 3 toll auth, 9 inds, 2 acad.)

Lead State Team members (27)

- Neeraj Buch, Ph.D.
- Thomas Kazmierowski, P.E.
- Tom Pyle
- Benjamin Timerson, P.E.
- Tommy Nantung
- Celik Ozyildirim, Ph.D., P.E.
- Donald Klugo
- Scott Mureli, P.E.
- Leif Wathne, P.E.
- Shiraz Tayabji, Ph.D., P.E.
- Mark Dunn
- Mike Brinkman, P.E
- Sam Tyson
- Tom Gemmiti
- John Donahue
- Peter Smith
- Malcolm Lee
- Timothy LaCoss, Chair
- Mark Snyder
- Brent Barron
- David Merritt, P.E.
- Peter Melewski, P.E.
- David Thomas
- Butch Marcelle
- Ernest Barenburg, Ph.D.
- Steven Gillen
- Keith Platte

PCPS Team Mission

To promote the **broader** and **accelerated** use of Precast Concrete Pavement Systems for the Repair, Rehabilitation and Reconstruction of PCC Pavements to transportation agencies and owners nationwide.

AASHTO TIG SUCCESSES

- Developed a nationally recognized forum for PCPS
- Identified various PCPS Systems, their attributes, their applications and their history.
- Developed generic specifications and guidelines for PCPS, where none existed.
- Developed relationships with ACI, PCI, NPCA, ACPA, SHRP and other national organizations and programs to help promote the deployment of PCPS
- Developed and submitted an application for the FHWA/AASHTO 2011 International Scanning Tour on PCPS Applications.
- Developed and implemented a Marketing Plan for PCPS to focus our outreach efforts and have partnered with FHWA's Highways for Life Program to further the outreach efforts nationwide

Marketing Plan for PCPS Deployment

- Develop documents for technology transfer
- Hold webinars on PCPS
- Support PCPS Demonstration Showcases

☆ ☆ ☆

Variety of PCPS Systems?

Jointed System -Ft. Miller SuperSlab™

Prestressed Precast Concrete Pavement

Kwik Slab™

Uretek USA™

FDR/DBR

AASHTO TIG SPECIFICATIONS & GUIDELINES FOR PCPS

1. Guidance and Considerations for the Design of Precast Concrete Pavement Systems
2. Generic Specification for Fabricating and Constructing Precast Concrete Pavement Systems
3. Generic Specification for Precast Concrete Pavement System Approval
4. Precast Concrete Pavement Systems for Rapid Pavement Repair and Replacement: Basic Information and Commentary

Available at WWW.AASHTOTIG.ORG under the PCPS dropdown menu

www.aashtotig.org
What's available on-line?

- Detailed information about each of these 5 Precast Paving Systems
- Design Guideline Specifications
- Construction Guideline Specifications
- Approval Guidelines for PCP Systems
- Research Reports
- Case Histories
- Proven Agency Specifications (9 states)
- Marketing Plan for PCPS Deployment

Agency Partnerships

Federal Highway Administration
Highways for Life
Accelerating Innovation for the American Driving Experience

DRIVING INNOVATION FOR TRANSPORTATION
TIG
http://aashtotig.org
AASHTO TECHNOLOGY IMPLEMENTATION GROUP

Contact Information

Gary L. Hoffman
Principal Engineer
Applied Research Assocs., Inc.
(717) 691-7625
ghoffman@ara.com

To find out more details about Precast Concrete Pavements look at WWW.AASHTOTIG.ORG

www.aashtotig.org
What's available on-line?

- Detailed information about each of these 5 leading Precast Paving Systems.
- Design Guideline Specifications
- Construction Guideline Specifications
- Approval Guidelines for PCPS
- Research Reports
- Proven Agency Specifications
- Marketing Plan to Deploy PCPS

AASHTO TIG SPECIFICATIONS & GUIDELINES FOR PCPS

1. Guidance and Considerations for the Design of Precast Concrete Pavement Systems
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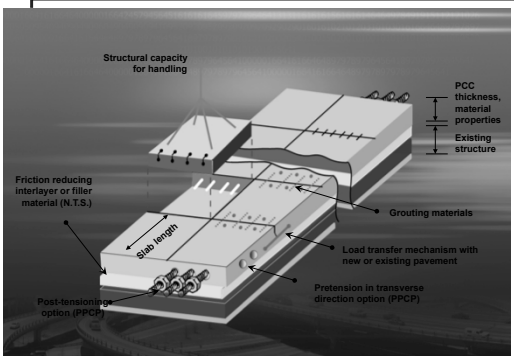
PCPS General Terminology



Paving and Pavement Rehabilitation Applications

- Continuous Paving
- Intermittent Full Depth Repairs of PCC Pavements
- Applications: airport runways & taxiways, heavily traveled highways, ramps, toll plazas, intersections, crosswalks, ports-docks, bus pads, smart-sensor embedment's, bridge approach slabs, pavement under bridges – vertical clearance

Snapshot of Precast Concrete Pavement Systems in the USA (2006)

- **Precast Prestressed Concrete Pavement System**
  - **Precast/Prestressed Concrete Paving System** (non-proprietary)
    - Pre-stressed/Post-tensioned Panel system
    - FHWA Sponsored (CPTP program)
- **Conventionally Jointed Precast Concrete Pavement Systems**
  - **Uretek USA System** (proprietary)
    - Precast Panels on HDP foam with 'Stitch in Time' load transfer device
  - **Kwik Slab System** (proprietary)
    - Slab on grade, full load transfer, grout bed
  - **Ft. Miller – Super-slab System** (proprietary)
    - Slab on grade with full load transfer, grout bed
  - **Michigan - Precast Full Depth Replacement/DBR** (non-proprietary)
    - Slab on flowable fill or HDP – dowels on top

Should Precast Concrete Pavement Systems be considered a threat to my business?

- PCPS provides another acceptable pavement treatment for rigid pavements
- Proven to work in shortened work windows = reduced risk
- Economically comparable to RSC/HES treatments
- Providing another alternative solution for owner-agencies to avoid and curtail the "HMA overlay" paradigm for the rehabilitation of rigid pavements

Paving and Pavement Rehabilitation Applications

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Benefits of PCPS

- Cast under ideal conditions
- Long life expectancy with low maintenance
- Placement in a short time frame – congestion & safety
- Less Risk to owner/contractor
- Growing documentation of performance history
- Established industry, method and technology
- Staged construction is possible
- Installation not affected by adverse weather conditions
- Supported by FHWA, AASHTO, ACPA, NPCA, PCI
- Reduced Work Zone timeframe
- Choice of surface Textures
- Pre-approval of PCPS System is possible
- Pre-existing specifications are available
- Generic specifications are available
- Economically competitive with alternative PCC pavement treatments

Variety of PCPS Systems?

Ft. Miller - SuperSlab™

Prestressed Precast Concrete Pavement

Kwik Slab™

Uretek USA™

FDR/DBR

PCPS Projects in 2008 & 2009

- NYSTA I-95 (CT-State line/Mamaroneck River to Cross Bronx Expressway)
- NYSDOT – Nassau-Queens Expressway, Staten Island-West shore Expressway, Approach to Alexander Hamilton Bridge
- NY City DOT- Approach to Brooklyn Bridge
- NJDOT I-280 & Rt.21 (Newark)
- Toronto, Canada (Downtown, Hwy 427)
- Iowa DOT (precast bridge approaches)
- DELDOT, intersection Rt.896 & Rt. 40 (Bear, DE) ☆
- Highways for Life Projects
  - Virginia DOT I-66 Mainline & Interchange Ramp ☆
  - Florida DOT (Daytona) - Intersections
  - CALTRANS I-15 - Mainline ☆
  - NYSDOT I-88 Bridge Approach Slabs (Central NY)

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- Economically comparable to RSC/HES treatments
- Provides another alternative solution/tool for owner-agencies

NPCA

Precast ... The Concrete Solution

Highways for LIFE PCPS Showcase
September22-23, 2009
presented by Evan Gurley

National Precast Concrete Association (NPCA)

- International trade association founded 1965 (over 1100 members)
  - Producers (800+)
  - Associates
  - Professionals
- Promotes the use of precast and prestressed products
  - Use
  - Quality
  - Knowledge
  - Value to our members

NPCA Answers the Industry's Call

NPCA Establishes The PCPS Product Committee (6/08)

Members:

Peter J. Smith, PE (Chairman) – Fort Miller Co. Inc.
Philip Burkhart (Board Liaison), Utility Concrete Products LLC
Mike Brinkman, NYDOT
Steve Gillen, IL State Toll Authority
Tom Heraty, Utility Concrete Products LLC
Timothy LaCoss, FHWA NY Division
Stephanie Loud, Mountain West Precast
Gene Martin, Terre Hill Concrete Products Inc.
Thomas Montalbine, Roman Stone Construction Co.
Martin Rohn, Durisol
Robert Sauber, NJDOT
Shiraz Tayabji, Fugro Consultants, Inc.
Mark Voiselle, Jensen Precast
NPCA Staff

Note: BOLD denotes a producer member

NPCA Answers the Industry's Call

PCPS Committee Progress:

- Agreed in principle to support AASHTO-TIG Guidelines
  - Promotes quality of installation, fabrication, and design
  - Performance based specification and guidelines
- Developing PCPS web site information for producers and specifiers
  - Case studies/project profiles of completed and in-progress projects
  - PCPS Promotional/Technical Brochures
  - Developing "What Agencies Want to Know" materials
- Develop educational materials
- Continued collaboration with AASHTO-TIG

Benefits to Producers

- Sets standard of quality for all manufacturers
- Learn new ways to improve processes, efficiency, and products
- Industry self regulation starts here
- Recognition of quality conscious producers
- Marketing opportunities and support
- Levels the playing field for all producers wishing to supply products to the DOTs or other specifying agencies (product neutral)

Benefits to Agency Owners

- Industry-Wide Body of Producers to Interface With
- Partners in Developing Standards of Quality
- Resource for Producer Capabilities
- Repository for Information on Fabrication and Installation Practices
- Support for Technical and Informational Forums
- Forum for Resolving Specification and Production Issues in the Interests of Reducing Costs and Improving Quality

NPCA Plant Certification Program

- Comprehensive third party certification program
- Promotes quality
- Easily understood by plant workers
- *Process* not product focused
- Assures consistent quality throughout operation
- Revenue neutral to our members
- 370+ plants to date

NPCA Plant Certification Program

Precast

- Introduced in 1987
- 30 State DOTs approve …and growing
- Accepted, proven and credible in eyes of other regulating agencies
- Cost effective: $3450.00/yr

Prestressed

- Introduced in Feb ’08 in support of our members
- 8 State DOTs approve (7 more pending)
- Third party verified as equivalent or exceeds other industry programs
- Cost effective: $12,000.00/yr (precast and or prestressed)

NPCA
Precast … The Concrete Solution

Thank You!

Questions?

- For additional information please contact:

Evan Gurley
Technical Services Engineer
NPCA
Phone: 800-366-7731
Email: egurley@precast.org

Precast Concrete Pavement Systems: ACPA Perspective

VDOT/Highways for LIFE Showcase
I – 66 & Route 50, Fairfax, VA
September 22 - 23, 2009

Leif Wathne

Highways for LIFE

- ACPA supportive of the program!
- 2005 resolution BOD

  "American Concrete Pavement Association supports the Highways for L.I.F.E. initiative and will join FHWA in bringing the goals of the program into practice in the highway community"


RESOLUTION

BOARD OF DIRECTORS
AMERICAN CONCRETE PAVEMENT ASSOCIATION

TITLE: Resolution in Support of Federal Highway Administration's (FHWA's) Highways for L.I.F.E.[1] initiative.

WHEREAS, The American Concrete Pavement Association (ACPA) is the technical, promotion, and legislative advocacy organization of the concrete pavement industry, and

WHEREAS, Concrete pavements have long been recognized as the long-life, durable pavement structure, and

WHEREAS, ACPA, since its founding in 1963, has fostered the safety benefits and improved construction methodologies for concrete pavements, and

WHEREAS, ACPA has pursued innovative ideas throughout its history, such as econocrete subbases, fast-track construction, and ultra-thin overlays, and

WHEREAS, ACPA continuously seeks to advance the concrete pavement industry with its agency partners through mutually-beneficial programs, and

WHEREAS, Highways for L.I.F.E. is a proposed pilot program to build and rehabilitate the U.S. highway infrastructure safer, faster, and better, and with less imposition to the driving public.

NOW THEREFORE, be it resolved this 14 day of July, 2005, that the American Concrete Pavement Association supports the Highways for L.I.F.E. initiative and will join FHWA in bringing the goals of the program into practice in the highway community.

Dan Keys
2005 ACPA Chairman

Peter Deem
2005 ACPA 1st Vice Chairman

Pat Nolan
2005 ACPA 2nd Vice Chairman

Gerald F. Voigt, PE
ACPA President & CEO

[1] Highways for L.I.F.E. is an initiative that promotes Long-lasting, Innovative, and Fast construction of Efficient and safe highway infrastructure.

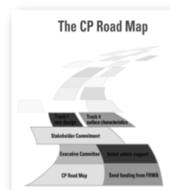
Highways for LIFE

- ACPA continues to be engaged…
- Goals are consistent with ACPA's emphasis on "*long-lasting highway solutions that present as little imposition on the driving public as possible.*"
- ACPA is also very supportive of research and implementation of innovative approaches to meet these goals

- Track 7 of the CP Roadmap,

  High-Speed Concrete Pavement Rehabilitation & Construction
- Subtrack 2

  Precast and Modular Pavement Systems



Precast Pavement Systems…

- One solution to address these challenges!
- Particularly where:
  - Tight time constraints
  - Long term durability is paramount
- Off-site casting
  - Controlled environment
  - Careful quality control acceptance
  - Lower risk…

Precast Pavement Systems…

- Get in, get out, stay out!

- Another option available to the agencies

Precast Pavement Systems…

- ACPA will continue to stay engaged
- Support advancements in technology that healthy competition enables…
- Provide highway user with the

  High Quality, and

  Long Lasting

  solutions they expect and deserve.

Precast Pavement Systems…

- As with any innovation… there will be challenges
- ACPA is excited about being part of bringing this technology into practice in the highway community!

Early Experiments in Transportation

Questions?

lwathne@acpa.org

Precast/Prestressed Concrete Institute (PCI)

Highways for LIFE
Fairfax, Va
September 2009

William Nickas, P.E.
Director, Transportation Systems
Precast/Prestressed Concrete Institute
Chicago, IL

Precast Concrete Pavements

Agenda

FHWA/AASHTO and Accelerated Construction Techniques and Technologies (ACTT)

PCI Plant Certification

Cooperative Agreement with FHWA and PCI

PCI

FHWA - AASHTO SCANNING PROGRAM - 2004

Prefabricated Bridge Elements and Systems

SCAN MISSION

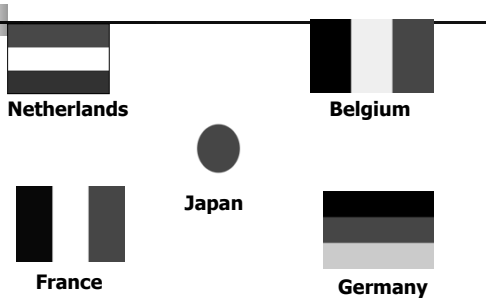
To investigate and document the applications and experience with prefabricated bridges in Japan and selected European countries, with emphasis on:

- Routine bridges with 20 ft – 140 ft spans
- Innovative systems
- Replacement and new highway and railroad bridges
- Including seismic considerations and emergency work

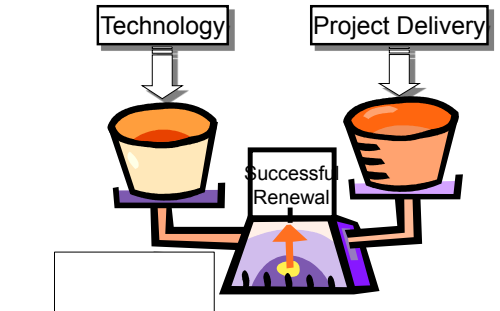
TOPICS OF INTEREST

- Minimized traffic disruption (Congestion)
- Improved work zone safety
- Minimized environmental impacts
- Improved constructibility
- Improved product quality
- Lower life-cycle costs

SCAN COUNTRIES



Integrated approach



About PCI

- PCI is an international trade association and Technical Institute
  - Promotes technical understanding and use of high-quality precast and prestressed concrete
  - Full staff of technical and marketing specialists


About PCI

- Over 350 Producer Member plants
  - Architectural, structural, and specialty precast concrete products and structures
  - Every U.S. PCI Producer Member plant must be PCI Certified
  - PCI Membership is not required to be PCI Certified
  - Over 80 Technical Committees

About PCI

- Approximately 200 Supplier Associate Members
- 100 Erector Associate Members
  - PCI Qualified/Certified Erector Program
- Over 1,300 Professional Members
  - Academics, design professionals, and other industry stakeholders
  - Provide much of the technical knowledge contained in PCI design guides and other technical publications

About PCI

PCI Publications

- Design Manuals and Guidelines
- Quality Control Manual
- PCI Journal, Ascent, and Aspire Magazines


About PCI

- Codes and Standards
  - PCI works very closely with code bodies, such as ACI, ICC, ASTM, AASHTO, etc.
- Industry Events
  - PCI works with FHWA in producing the National Bridge Conference

U.S. Department of Transportation
Federal Highway Administration

About PCI

- Research & Development
  - DSDM Seismic Project
  - FHWA Precast Pavement Project

About PCI

- PCI Regional Representation
  - 11 Regional Associations Affiliated with PCI
  - Mid-Atlantic Precast Association (MAPA)

PCI Certification Programs

PCI has 3 Different Certification Programs:

- Plant Certification Program – 1967
- Personnel Training & Certification – 1985
- Erector Qualification and Certification - 1999

PCI Plant Certification

Program History:

- Plant Certification Program established in 1967
- Began with 36 Plants
- Voluntary membership until 1991
- Mandatory for PCI Producer Members after 1991 – PCI Membership is not required
- Approximately 300 Plants Currently Certified

PCI Plant Certification

Purpose:

- Provide a means for project owners/ specifiers to select producers who demonstrate compliance to nationally recognized standards of engineering, production and quality control
- To permit certified producers to distinguish themselves from non-compliant/non-participating producers

PCI Plant Certification

Product Groups and Categories:

A — Architectural Products (MNL-117)

B — Bridge Products (MNL-116)

C — Commercial (Structural) Products (MNL-116)

G — Glass Fiber Reinforced Concrete (GFRC) Products (MNL-130)

PCI Plant Certification

Product Groups and Categories:

- Supplemental, Non-Prestressed, Non-Architectural Products
- MNL-118 will be released and program launched in 2009

PCI Plant Certification

Program Recognition

- AIA MASTERSPEC
- Unified Facilities Guide Specifications (UFGS)
  - A joint effort of the U.S. Army Corps of Engineers (USACE), the Naval Facilities Engineering Command (NAVFAC), the Air Force Civil Engineer Support Agency (AFCESA) and the National Aeronautics and Space Administration (NASA)
- US Department of Agriculture – FSIS

PCI Plant Certification

Program Recognition

- US Department of Transportation - Federal Aviation Agency
- Federal Bureau of Prisons
- General Services Administration (GSA)
- Federal Highway Administration
- 31 state Departments of Transportation
- Houston, Las Vegas, Phoenix, Seattle, and Portland

PCI Plant Certification

State DOT-Specific Certification

- PCI Working with other DOTs in developing programs specifically tailored to their needs
- Auditors will provide a special report specifically addressing DOT-specified criteria
- IL DOT, TX DOT, Mass Highways

PCI Plant Certification

QC Criteria

- Detailed quality control and audit criteria
- Drawings and Calculations Reviewed
- Comprehensive Tolerance Manual
- Detailed Quality System Manual (QSM) must be approved by PCI

PCI Plant Certification

Program Oversight

- Overseen by a diverse and balanced Quality Assurance committee
  - design professionals, consultants, producers, and materials suppliers.
- Further oversight provided by PCI Technical Activities Committee

PCI Plant Certification

Audits and Auditor Qualification

2-day, twice per year audits

- All audits unannounced
- IAS Accredited
- Audit firm has over 40 years of experience

Conclusion

- PCI wrote the book
- PCI has 40+ year track record for precast and precast / prestressed quality control and quality assurance programs
- PCI will work to tailor the program to each states' needs

Precast Concrete Pavements

Engaging Industry –
A Cooperative Approach

Precast Concrete Pavements

Precast/Prestressed Concrete Institute (PCI)

Federal Highway Administration (FHWA)

Precast Concrete Pavements

PRECASTING PLANTS

A manufacturing operation…

…not off-site construction!

Precast Concrete Pavements

PCI-FHWA Cooperative Agreement

"Advancement of Precast Prestressed Concrete Pavement System through Technology Transfer and Development of Industry Guidance for Design and Engineering"

PCI-FHWA Cooperative Agreement

This is a 4 year PROGRAM

Part A: Strategy for technology transfer

- agency/owner
- industry communities

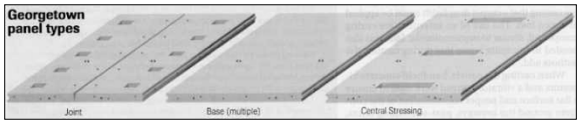
Part B: Development of industry guidance for design and engineering

PCI-FHWA Cooperative Agreement

- **The Transtec Group**
  - **David Merritt**
    - **TxDOT Demonstration Project**
    - **Was also involved with the CalTrans I-10 in El Monte, CA**

PCI-FHWA Cooperative Agreement

- **Non-Proprietary**
- **Manufactured in PCI-Certified Plants**
- **"Precast Prestressed Concrete Pavements" (PPCP)**



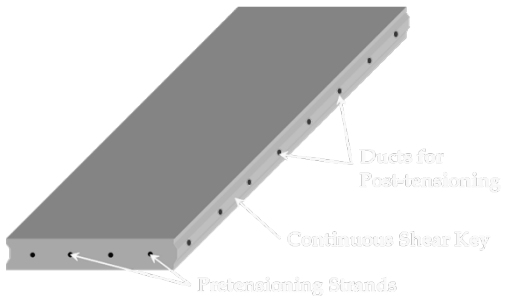
What is PPCP?

- ***Precast*** **Prestressed Concrete Pavement**
  - **"Standardized" full-depth precast panels**
  - **Keyed panel joints for vertical alignment during assembly (generally, not match-cast)**
  - **Constructed over a prepared base (HMA, LCB, Aggregate Base, etc.)**

What is PPCP?

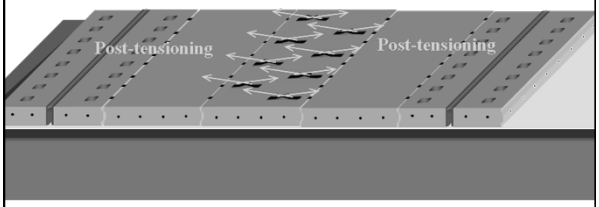
- **2-way prestressing**
- **Combination of pretensioning/post-tensioning**
- ***Or*** **2-way post-tensioning**
- **Bonded/grouted P-T system**

Typical PPCP Panel



Precast Concrete Pavements

Typical PPCP Panel Layout



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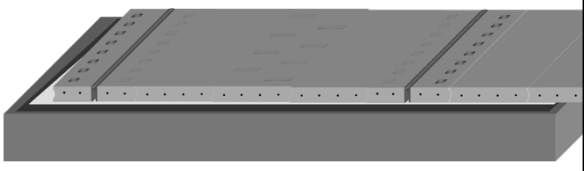
Precast Concrete Pavements

Typical PPCP Panel Layout



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Precast Concrete Pavements

Benefits

WHY PRESTRESSED CONCRETE?

- **Reduces/eliminates slab cracking (maintenance)**
- **Reduced number of joints (maintenance/ smoothness)**
- **Reduced Slab Thickness (8" vs. 12")**
  - Material savings
  - Allows for replacement of pavement in-kind
- **Ability to span voids/unsound support layers**
- **Proven Long-Term Performance**
  - 6" CIP post-tensioned pavement constructed in 1985 (near West, Texas)
  - Virtually no maintenance in 23 years

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Precast Concrete Pavements

Picture of Connection details

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Precast Concrete Pavements

Getting ready to post tension the PC pavement

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Precast Concrete Pavements

PCI-FHWA Cooperative Agreement

- **Program Activity 1**
  - Create contacts lists
  - ETG
- **Program Activity 2**
  - Create the "The National Center for Prestressed Concrete Highway Pavements"
  - Board of Advisors
- **Program Activity 3**
  - Informational Literature
- **Program Activity 4**
  - Showcases and workshops

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- Program Activity 5
  - Guidance Documents, Sample Plans, Specifications
- Program Activity 6
  - PCI Pavement Committee
    - Develop "action items"
    - Develop a detailed timeline
    - Industry "guidance" documents for "design and engineering" of the PPCP System

Four "Guidance Documents"

1) Selecting Applications for Precast Concrete pavements
2) Design, Layout and Maintenance of Precast Concrete Pavements
3) Precast Pavement Panel Fabrication Recommendations
4) Construction Recommendations for Precast Concrete Pavements

Selecting Applications for Precast Concrete Pavements (Volume1 of 4)

- Considerations for Selection
- Types of Applications
- Site Selection
- Agency Considerations
- Resources
- Appendix - Projects

Design, Layout and Maintenance of Precast Concrete Pavements (Vol. 2 of 4)

- Key Features
- Design Considerations
- Pavement Management Considerations
- Performance Monitoring
- Appendix – Details and Specifications

Precast Pavement Panel Fabrication Recommendations (Vol. 3 of 4)

- Producer Qualifications
- Formwork
- Materials
- Prestressing
- Expansion Joints
- Concreting
- Lifting/Handling
- Acceptance Testing

Construction Recommendations for Precast Concrete Pavements (Vol. 4 of 4)

- Installation-Staging
- Base Preparation
- Materials
- Installation-Equipment & Methods
- Post-Tensioning
- Final Surface Finish
- Final Inspection

Precast Concrete Pavements

PCI-FHWA Cooperative Agreement

Cooperative Effort to Engage Industry and Agencies

PCI

Precast/Prestressed Concrete Institute (PCI)

Highways for LIFE
Fairfax, Va
September 2009

William Nickas, P.E.
Director, Transportation Systems
Precast/Prestressed Concrete Institute
Chicago, IL