I-66 Highways for LIFE
PCI PAVEMENT COMMITTEE
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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
I-66 Highways for LIFE

Site Selection for Precast Pre-stressed Concrete Pavement

• Based upon condition of pavement
• Available working space (barriers, drainage inlets, etc.)
• Overhead clearances
• Utilities (loop detectors, etc.)
• Curved sections
Highways for LIFE: Area A

Ramp from I-66 WB to Rte. 50 WB

- Right lane – 3552’ to be replaced with pre-cast panels (contractor designed); existing and proposed thickness 9”.
- Left lane to be sporadic cast-in-place patches; thickness 9”.
- Right shoulder to be milled and resurfaced
Ramp: Pre-cast Concrete Panels and Cast-In-Place Patches
Ramp: Right Lane to be Replaced with Pre-cast Concrete Panels
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”.
I-66 Mainline: Pre-cast, Pre-stressed Concrete Panels (PPCP)
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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

Lane Closure Restrictions

- Close two lanes at 9 pm; close third lane at 10 pm; open by 5 am
I-66 Mainline: Pre-cast, Pre-stressed Concrete Panels (PPCP)
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Prestressed Panels on I-66
Inside Lanes – Two 12’ Panels

1. HOV
2. Lane
3. Lane
4. Rush Hour lane
Prestressed Panels on I-66 Outside & Shoulder Lanes – One 27’ Panel

1. HOV
2. Rush Hour lane
3. 4.
Panel Alignment
Center joint at crown
Transverse misalignment
Keyway fit
One panel can mess things up
One panel can mess it up – other direction
Joint with existing pavement
Panel alignment
Other Installation Issues

Grout leaking at tendons
- Tendon grout being done first per specification
- Foam gaskets being used at duct openings

Transverse connection
- 1x3 transverse duct along bottom of panels
- .5” strand to be placed across lanes and grouted (strand not tensioned)

Grout popping out at lifting holes
Proprietary PCP Systems: Super Slab® System

Grout ports

Photo source: The Fort Miller Company
Precast Panels on Right Lane of 2-Lane Ramp
Longitudinal joint on ramp
Super Slab
Panel cracks
Super Slab Panel crack down side of panel
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
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 precasting
- Difficult to predict; especially at tie-ins
Concerns/Industry Issues for PPCP

Openness of system and resultant grout leaks
- Need better seal for tendon ducts.

Transverse tie-bars
- Need efficient means of connecting panels in transverse direction or proof that not needed.

Weak points in pavement surface
- Potential future maintenance issues in areas of anchor pockets, tie-in slots, lifting anchor holes, or spalls during construction.

Casting accuracy required
- Casting is key! Can tolerances be improved without significantly increasing cost?

Quality of contractor needed to achieve good product
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
Cast-in-Place on Left Lane of 2-Lane Ramp
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
## Cost Per System

<table>
<thead>
<tr>
<th>Type</th>
<th>Bid Price</th>
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<tbody>
<tr>
<td>CIP (9”)</td>
<td>$225/sy</td>
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<tr>
<td>PCP (9”)</td>
<td>$350/sy</td>
</tr>
<tr>
<td>PPCP (8”)</td>
<td>$410/sy</td>
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Questions ?