Precast Concrete Pavement

Phillip Sturdivant, P.E.
Louisiana Department of Transportation and Development
What is Precast Concrete Pavement?

- Precast concrete pavement is what it says it is. Similar to other precast concrete products (boxes, pipes, piles, etc.) but this product is used for concrete roadways.
What is Precast Concrete Pavement?

• Precast concrete pavement systems are fabricated/cast off-site, transported to the project site and installed on a prepared foundation (existing base or a re-worked foundation).
• The system components require minimal field curing time to achieve strength before opening to traffic (bedding grout & dowel pocket grout).
• These systems are application-ready for rapid repair, rehabilitation or reconstruction of concrete pavements.
Why Precast Concrete Pavement?

• One word: Time.
  – The use of precast concrete panels on a project will dramatically reduce the amount of time needed to re-open a roadway to traffic.
  – Works well in urban/high traffic areas where lane closure times are limited.

• Other advantages:
  – Better finished product than high early strength concrete.
  – Fewer early age failures.
  – Most precast panels are relatively heavily reinforced (for transportation and lifting), as a byproduct of this reinforcement they perform better over their lifetimes.
Where is Precast Pavement Typically Used?

- **Primary Construction Applications**
  - Heavily traveled main-line interstate/arterials & urban roadways.
  - Interstate ramps

- **Special Construction Applications**
  - Intersections – Where traffic must be maintained
  - Bus pads – bus pad locations can be replaced overnight and put back into use the next day.
Where is Precast Pavement Typically Used?

- Primary Maintenance Applications
  - Intermittent/Spot Repairs
  - Shorter length Rehabilitations
Precast Concrete Production Comparison

- **Precast Concrete Panels**
  - Panel fabrication rate
    - 5 – 8 panels per day (depends on plant size/production capacity)
  - Panel installation rate
    - Spot repairs – 15 to 20 repairs per night
    - Continuous panels – 30 to 40 panels per night (500 to 600 ft)

- **Traditional Cast-in-Place Concrete**
  - Installation rate - 500 yd$^3$ to 1,000 yd$^3$ per day

- **High Early Strength Concrete**
  - Installation rate – 100 yd$^2$ to 500 yd$^2$ per day
Precast Concrete Cost Comparison

• Precast Concrete Panels
  • H.012193 Louisiana bid price - $554/yd² (includes qualifying a system, furnishing engineering submittals, equipment, labor, materials, tools and all incidentals)
  • Note – this is the 1st project in Louisiana and a relatively small one, and we hope the costs will improve with time

• Traditional Cast-in-Place Concrete
  • Average Louisiana bid price - $80/yd²

• High Early Strength Concrete
  • $130/yd² – patching from recent I-49 PCC Patching Project
There are different precast concrete pavement vendors who have developed different system designs and patented them.
For the DOTD’s demonstration project, we are going to be using the Fort Miller Super Slab System.

System Design Requirements of PCPS Specifications:
- Provide at least four (4) lifting points per panel
- Top and bottom reinforcement was a requirement.
- Prestressing of the panels at the precast plant by pretensioning was acceptable.
- Must be a grout supported system that is capable of being adjusted to grade using a set of leveling bolts and supported by those bolts during placement of bedding grout.
- Dowel & tie pockets must open at the bottom of the panel.
H.012193 (I-20: EB Entrance Ramp at LA 169)

- Throughout this project (both design & construction phases) the FHWA has provided supplemental funding and subject matter expertise.
H.012193 (I-20: EB Entrance Ramp at LA 169)

Existing Ramp Damage
H.012193 (I-20: EB Entrance Ramp at LA 169)

- Precast Concrete Pavement System (PCPS) Spec Requirements:
  - Contractor must select a qualified system developer (as defined by the specs) or go through the system developer approval process themselves.
  - System Fabricator shop drawings and panel layout must be developed and approved.
  - Contractor must submit Trial Installation plan, have it approved and then do a trial installation to prove competency and pass evaluation criteria.
  - Upon completion of these tasks, the contractor can proceed with installation of the precast concrete panels.
H.012193 (I-20: EB Entrance Ramp at LA 169)

Proposed Panel Layout
Panel Casting
Install Procedure (California Project)

Saw-cut existing pavement

Remove existing pavement

Grade existing base
Install Procedure (California Project)

Compact existing base

Install lean concrete base

Lift panel from truck
Install Procedure (California Project)

Lower panel into place

Install panel

Jack leveling lifts in preparation for grouting
Install Video (California Project)
Questions???