FHWA/SHRP2 Precast Concrete Pavement Implementation Assistance Program Projects

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Presentation Focus

• Presentation will provide details related to several precast concrete pavement (PCP) projects funded under the FHWA/SHRP2 Implementation Assistance Program (IAP)

• The completed projects are located in Georgia, Hawaii, Kansas and Texas.

• Projects to be constructed during 2016 and 2017 are located in Alabama, Florida, Louisiana, and Pennsylvania.

• The PCP applications include intersections, bus pad and highway ramp rehabilitation.
Highway Agencies Receiving SHRP2 PCP Implementation Awards in 2014 and 2015

2014: HI, KS, TX & WI
2015: AL, CT, DC, FL, IN, LA, PA & VA
FHWA IAP & HfL Supported Projects

- Wisconsin: Madison Bypass (David Layton)
- Hawaii: Honolulu H-1 rehab
- Kansas: Fort Leavenworth area – intersections and bridge approach slab
- Texas: Heavily truck-trafficked rural intersection

- Louisiana: Shreveport - Entry ramp onto I-20
- Pennsylvania: Norristown intersection
- Alabama: Mobile - I-165 SB Exit Ramp
- Florida: Chipley bridge approach slab along I-10
Precast Concrete Panels for Intersections and Approach Slab
US-73 Leavenworth, KS
KANSAS PCP DEMO PROJECT

Reconstruction of US-73 on the North side of Leavenworth, KS

- Two intersections at Fort Leavenworth and one approach slab
- Over 67,000 yd\(^2\) pavement (4,555 yd\(^2\) PCP)
- 294 Panels (Fort Miller system), 100% grind
- Precast panel thickness: 9 1/8 in.
- Precast panel length: Varies (6-13 ft)
- Precast panel width: Varies (6-16 ft)
- Base: 4 in. thick cement treated base
- Bedding layer over base: Cemented granular material
The Project
Concrete Mix Design

• **Forterra (precaster) Priorities**
  – 3000 psi at 16 hours, 4000 psi at 28 days
  – 6 to 8 in. slump (HRWR & MRWR)

• **KDOT Priorities**
  – Air Content at point of placement > 5%
  – Spacing Factor < 0.008 in.
  – Low Permeability
Panel Production/Installation

![Graph showing cumulative panels cast and placed over time with annotations for 32 Days and 96 Days, and a note on placement rate: Avg. 12 panels/night.](image)
Panel Cost

Bid Price, $/sq. yd.

Precast Panels: $355.87
8 in. to 10 in. HE PCCP: $581.62
Panel Fabrication
Panel Installation

Lane closures ranged from 7:00 PM – 5:00 AM
Completed Project
Lessons Learned

- Cost is not prohibitive
- Construction sequence/planning is critical
- Can meet KDOT and Precast mix design requirements
- Crews pick up on installation quickly
- Continuous grind is not a substitute replacement for precision placement
Hawaii SHRP2 R05 IAP Funded Project

- Along the eastbound section of Hawaii H1 (morning rush hour traffic to Honolulu area)
- A 200 ft section had settled and had been feathered overlaid with AC (max. settlement about 3 to 4 in.) across all six lanes
Hawaii H1 PCP Project – (2015)

- 14 panels/lane for 6 lanes (continuous)
- Constructed March to May 2015
- Work delayed due to shortage of bedding grout
Project Details

- Use of the Rapid Roadway Pavement system with Barra Glide dowels and Gracie lift system
- Panel thickness: 8 in.
- Panel width: 12 ft
- Panel length: 12 ft
- Total panels: 84 (168 ft long section)
- Standard Rapid Roadway system panel details
- Panels installed at night – typical lane closures from about 8 pm to 5 am
Rapid Roadway Pavement System
Barra Glide Load Transfer System & Gracie Lift Device
Developed in 2013
Contractor Panel Fabrication

- Contractor fabricated panels near the project site, using wood/plywood forms
Hawaii H1 PCP Demo Project
Some Daytime Activities after Morning Rush Hour

Completed Section – Sept. 2015
Texas Energy Sector Intersection Application

The Challenge: Excessive rutting in AC pavements due to heavy truck traffic
The Intersection Demo Site
Texas Intersection PCP Demo
(April/May 2016)
(Rehab of intersections damaged by energy trucks)

Bid/Cost Data
$425/SY for Intersection Construction = $1,550,000
Estimated cost of precast panel: $200/SY
Preliminary panel cost: $180 to $225 SY
Texas Panel Details

- Base layer: compacted subgrade and 4” HMA layer
- Panels placed directly over HMAC layer
- “Generic” Panel Design
- 12” Thick Panels
- Panels pre-tensioned in the long direction.
- Doweled on all interior sides.
- Grout holes for filling voids beneath panels.
- Exterior panels anchored thru base layers.
Texas April 2016 Installation
Exit 2 Ramp on I-165 to US 90
Mobile, Alabama
Exit 2 Ramp from I-165 to US 90

- Heavy Truck Traffic
  - Headed to Port of Mobile
- Excessive rutting requiring frequent maintenance
Mobile Intersection Rehab Project
(I-165 SB Exit Ramp at New Bay Bridge Road)
Mobile Intersection Rehab Project
(I-165 SB Exit Ramp at New Bay Bridge Road)
The Shreveport PCP Demo Project
(In preparation for possible use of PCP for a major rehab along I-20 in the Shreveport area)
The Shreveport Precast Pavement Project
The Shreveport Precast Pavement Project
Norristown, PA Intersection Rehab Project
(Main and Markley Streets)

➢ Rehabilitate the intersection with least impact on users
Norristown Intersection Rehab Project
(Main and Markley Streets)

➢ Rehabilitate the intersection with least impact on users
Florida – Bridge Approach Slab Replacement, Chipley

- Location - I-10 west bound over Apalachee North Railroad, on the east end of the west bound bridge.
- Year Built = 1976; ADT Total = 9,300; Truck % = 30
- Condition: Slab cracking and slab settlement
- Slab layout/size: Skew at abutment; length: ~ 25 to 28 ft; 2 lanes and two shoulders, possibly requiring 4 panels as a minimum
The I-10 Bridge Approach Slab
The I-10 Bridge Approach Slab

Preliminary option being considered: 4 prestressed panels, about 30 ft long, with bedding grout support over a stabilized base.

Steps:
1. Prepare abutment seat – over two nights
2. Place shoulder panel and lane panel, each night (2 nights)
3. Postensioned in the transverse direction – longitudinal joint faces epoxy-coated and under stress
Summary

- PCP performance to-date indicate that well-designed and well-constructed PCP systems can be installed rapidly and can be expected to provide long-term service.
- Precast concrete pavement technology is an implementable technology and continues to evolve.
- And, more highways agencies are finding PCP technology to be an important strategy for rehabilitating distressed highway pavements.

Thank You!