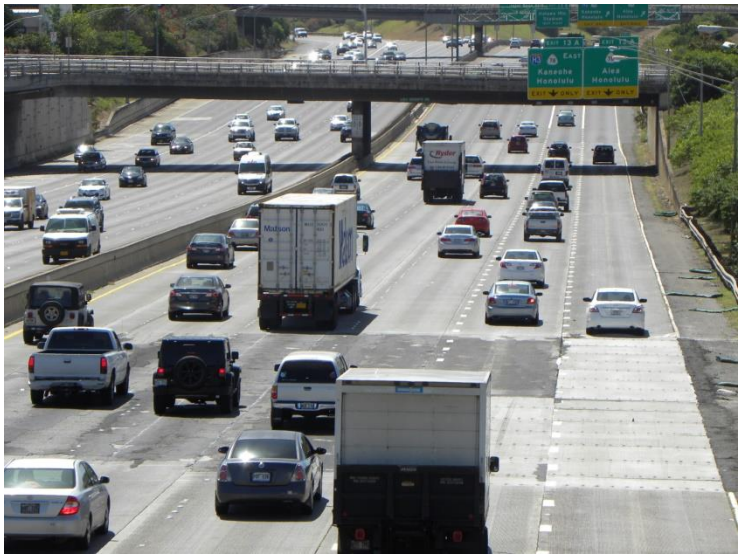
ACI Spring 2016 Convention
Milwaukee, Wisconsin - April 2016

FHWA/SHRP2 Precast Concrete Pavement Implementation Assistance Program Projects



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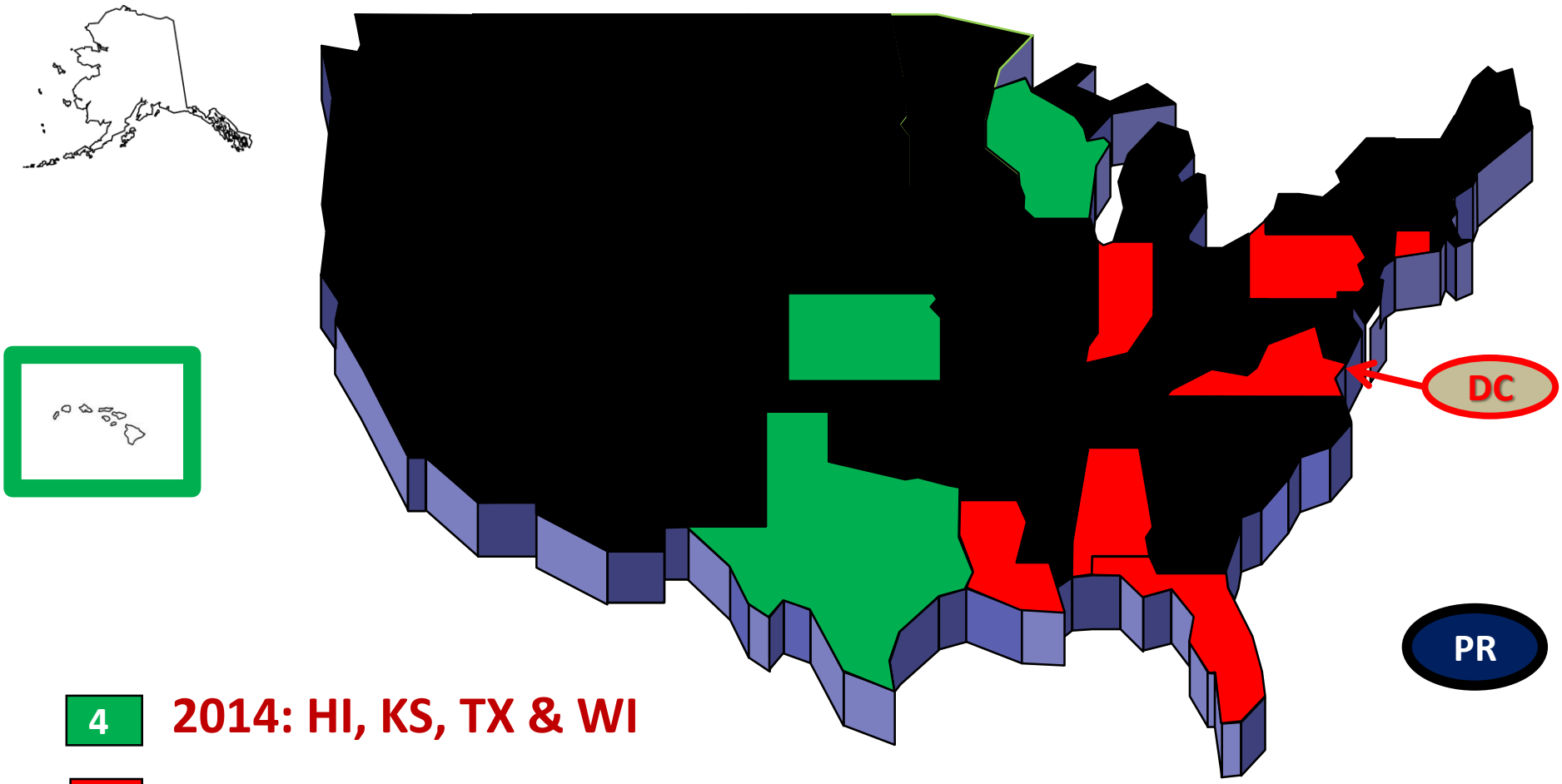
Ellicott City, MD

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



4 2014: HI, KS, TX & WI

8 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**

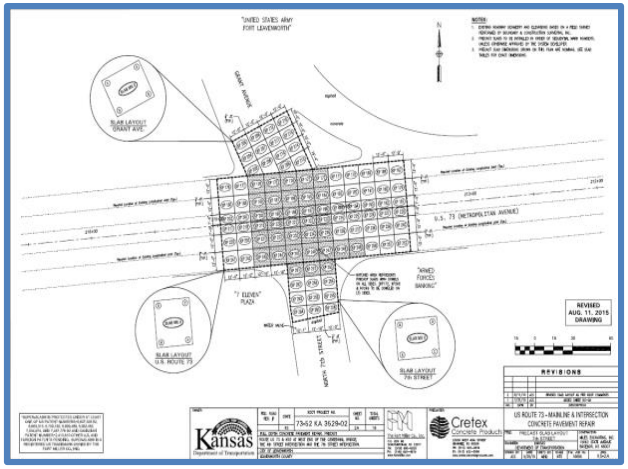
Precast Concrete Panels for Intersections and Approach Slab
US-73 Leavenworth, KS

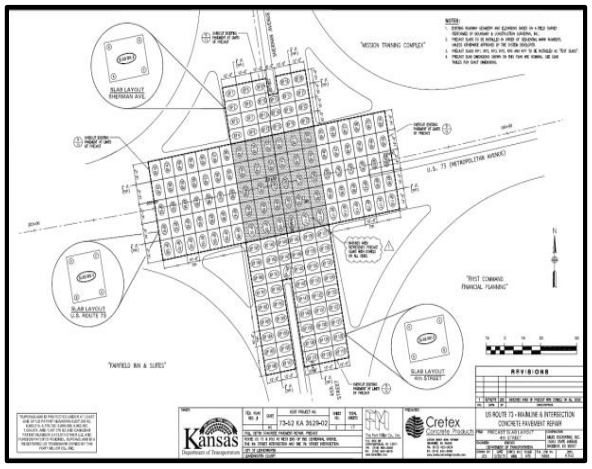
KANSAS PCP DEMO PROJECT

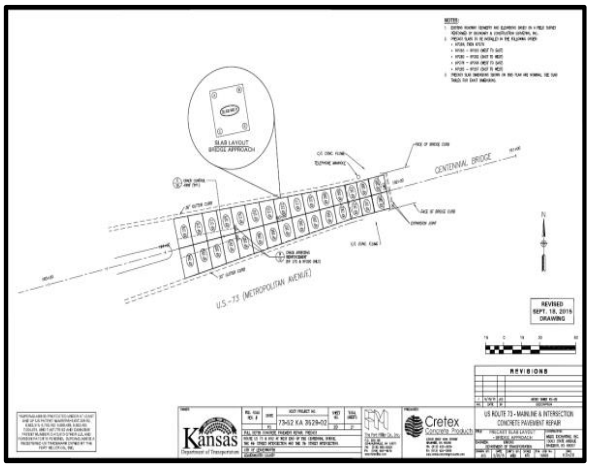
Reconstruction of US-73 on the North side of Leavenworth, KS

- 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


"UNITED STATES ARMY
FORT LEAVENWORTH"
SLAB LAYOUT
GRANT AVE.
SLAB LAYOUT
U.S. ROUTE 73
"I" ELEVEN
PLAZA
"ARMED
FORCES
BANKING"
U.S. 73 (METROPOLITAN AVENUE)
SLAB LAYOUT
7TH STREET
REVISED
AUG. 11, 2015
DRAWING
REVISIONS
Kansas
Department of Transportation
Cretex
Concrete Products
US ROUTE 73 - MAINLINE & INTERSECTION
CONCRETE PAVEMENT REPAIR

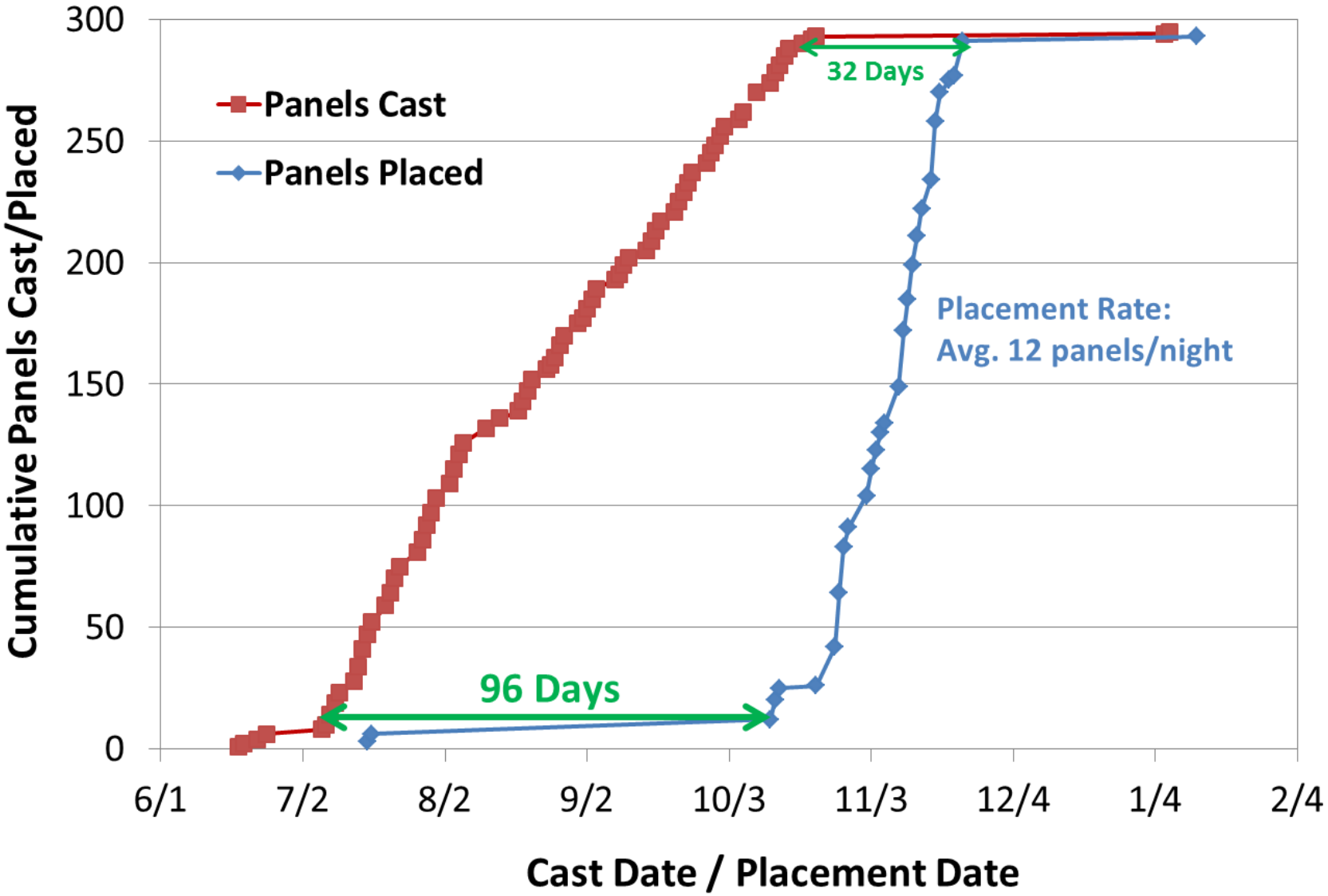

SLAB LAYOUT
SHERMAN AVE.
"MISSION TRAINING COMPLEX"
U.S. 73 (METROPOLITAN AVENUE)
"FIRST COMMAND
FINANCIAL PLANNING"
SLAB LAYOUT
U.S. ROUTE 73
SLAB LAYOUT
4TH STREET
"FAIRFIELD INN & SUITES"
REVISIONS
Kansas
Department of Transportation
Cretex
Concrete Products
US ROUTE 73 - MAINLINE & INTERSECTION
CONCRETE PAVEMENT REPAIR


SLAB LAYOUT
BRIDGE APPROACH
CENTENNIAL BRIDGE
U.S. 73 (METROPOLITAN AVENUE)
REVISED
SEPT. 18, 2015
DRAWING
REVISIONS
Kansas
Department of Transportation
Cretex
Concrete Products
US ROUTE 73 - MAINLINE & INTERSECTION
CONCRETE PAVEMENT REPAIR

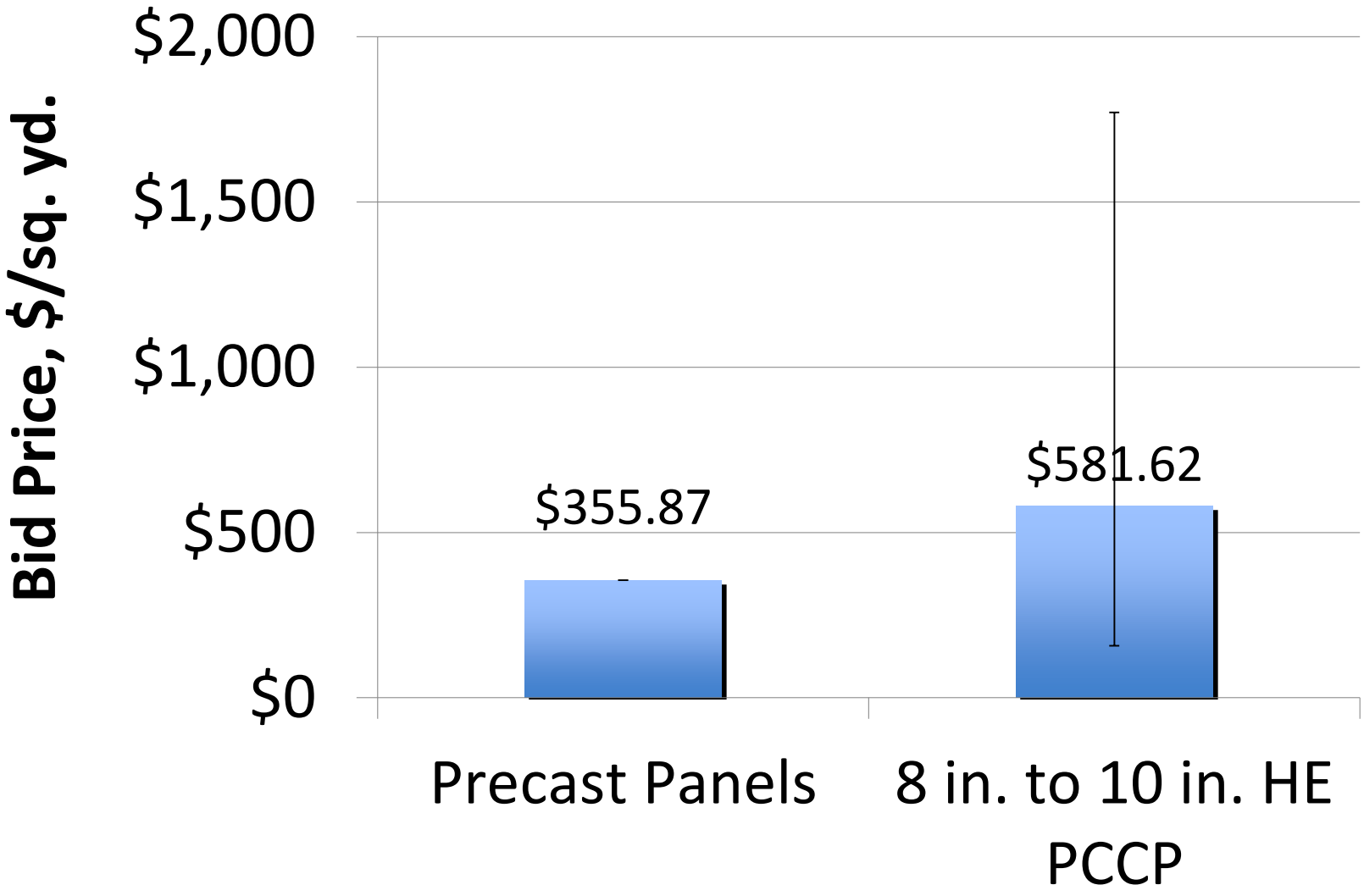
Concrete Mix Design

- **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



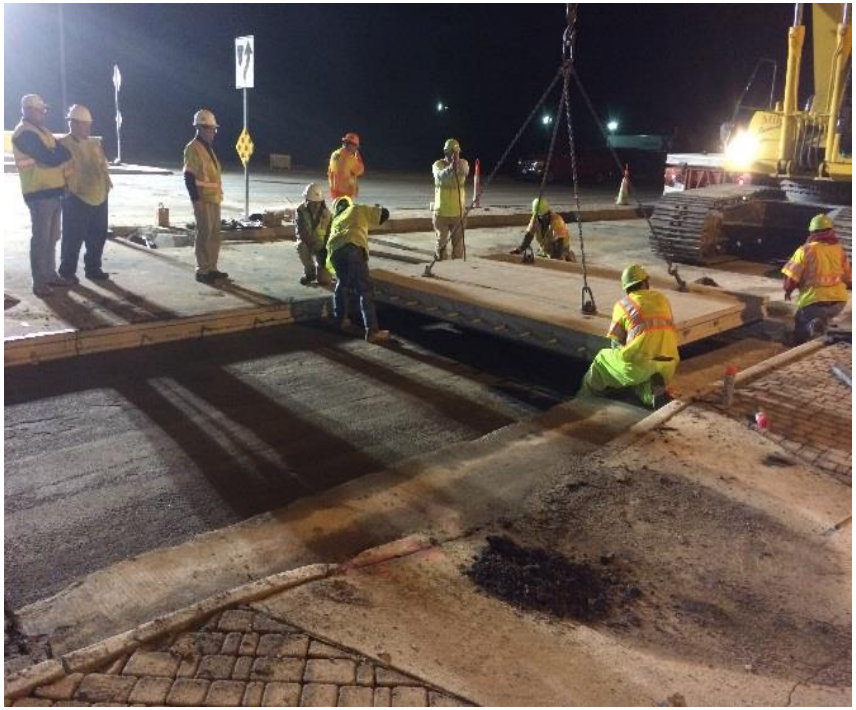
Panel Cost


Bid Price, $/sq. yd.
$2,000
$1,500
$1,000
$500
$0
$355.87
$581.62
Precast Panels
8 in. to 10 in. HE PCCP

Panel Fabrication

Panel Installation

Lane closures ranged from 7:00 PM – 5:00 AM



Completed Project

Lessons Learned

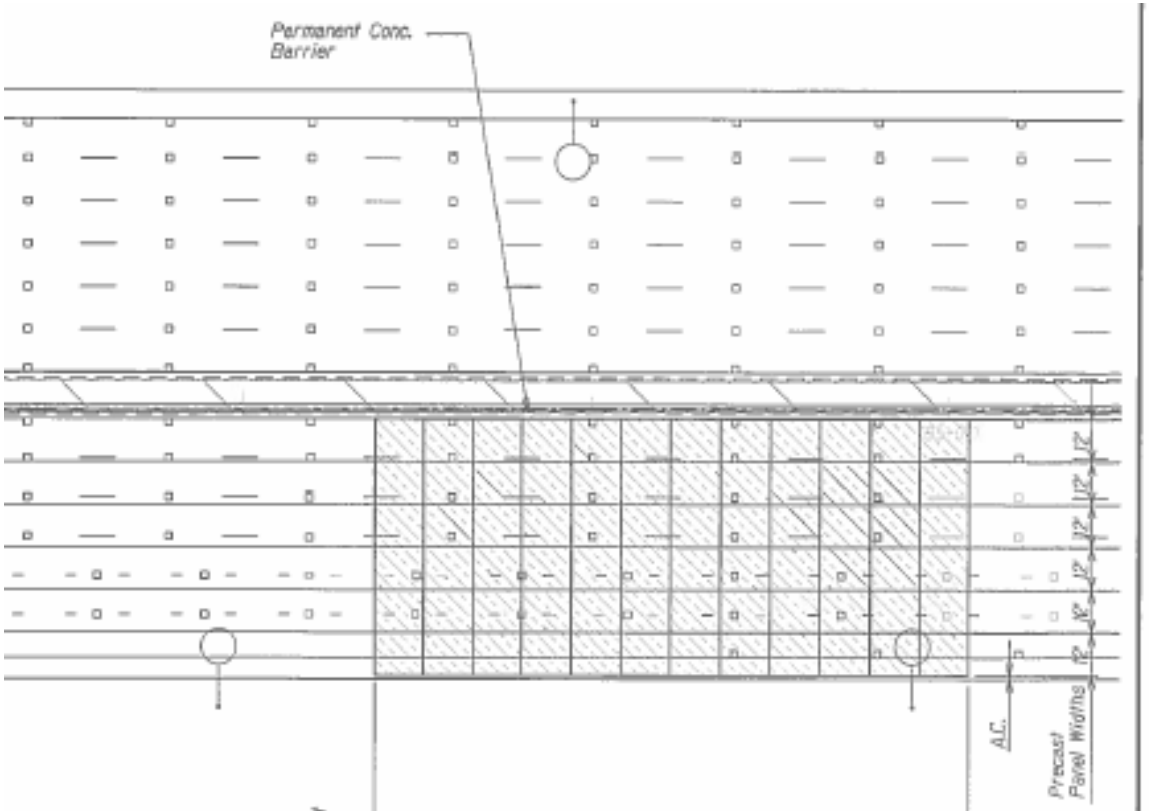
- Cost is not prohibitive
- Construction sequence/planning is critical
- Can meet KDOT and Precast mix design requirements
- Crews pick up on installation quickly
- Continuous grind is not a substitute replacement for precision placement

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

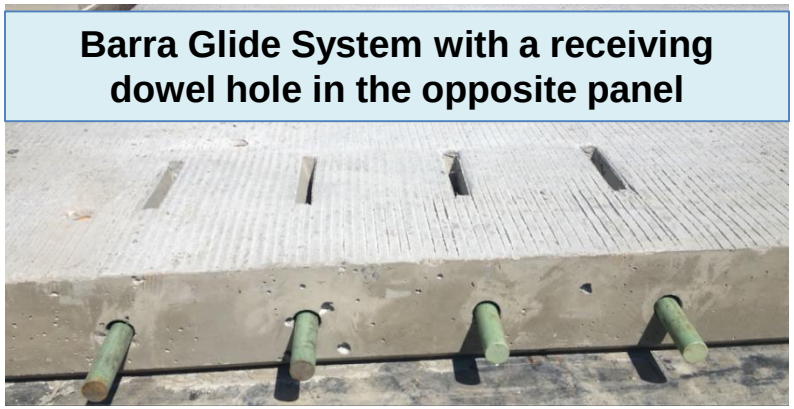


Project Details

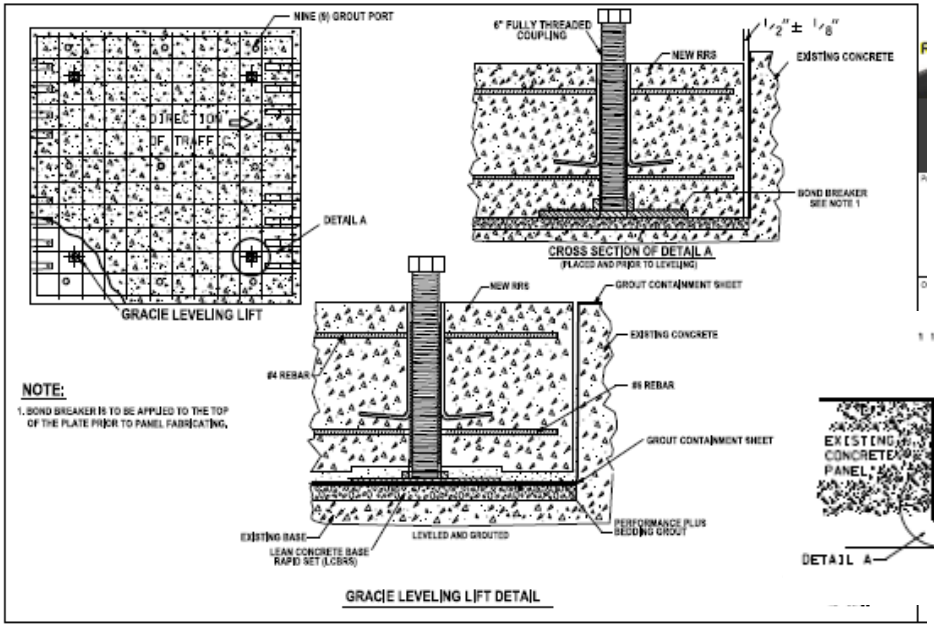
- Use of the Rapid Roadway Pavement system with Barra Glide dowels and Gracie lift system
- Panel thickness: 8 in.
- Panel width: 12 ft
- Panel length: 12 ft
- Total panels: 84 (168 ft long section)
- Standard Rapid Roadway system panel details
- Panels installed at night – typical lane closures from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

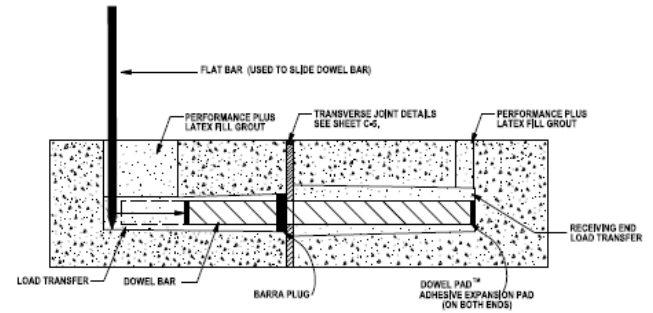
Rapid Roadway Pavement System

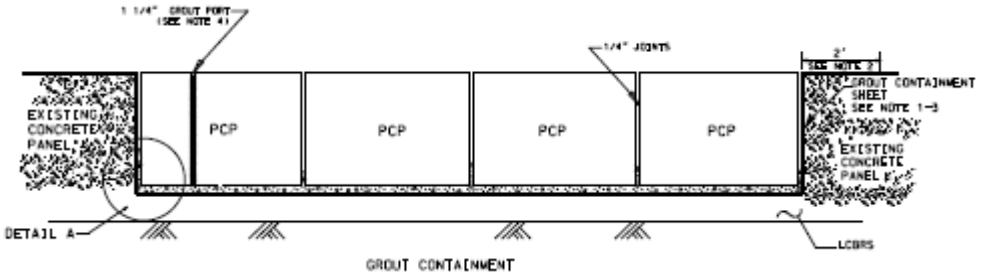
Barra Glide Load Transfer System & Gracie Lift Device Developed in 2013



Barra Glide System with a receiving dowel hole in the opposite panel



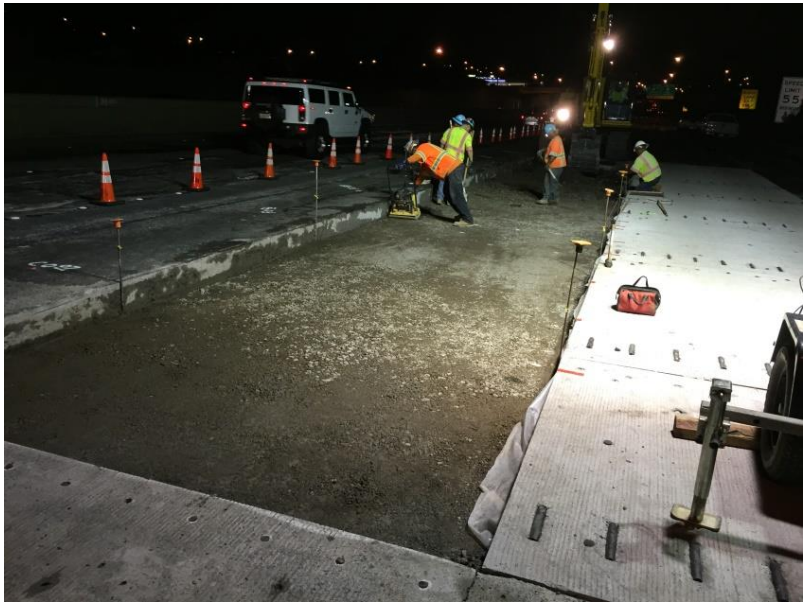


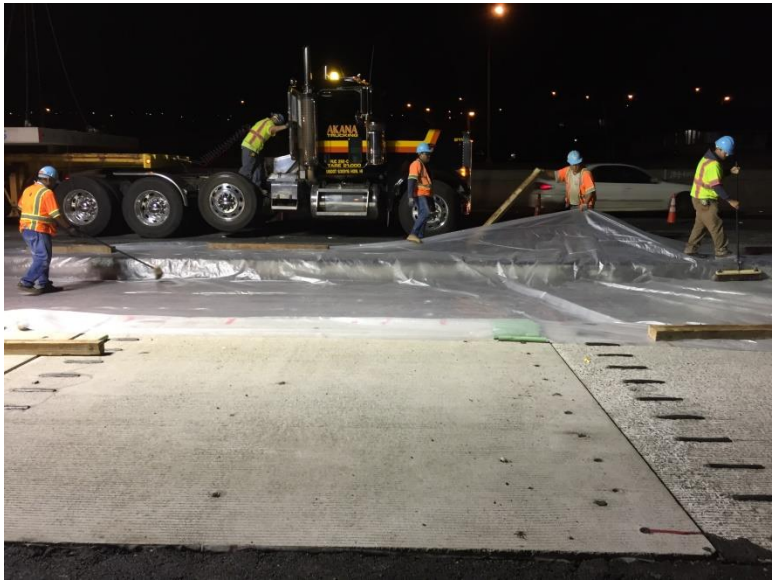


Contractor Panel Fabrication

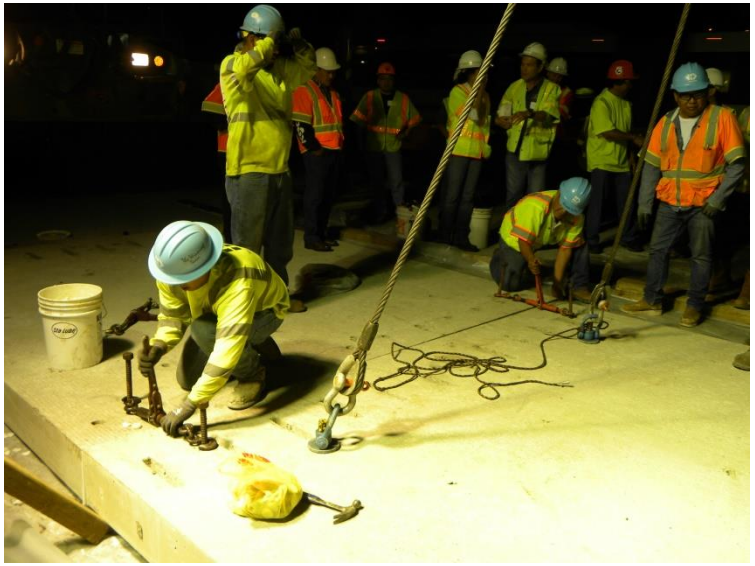
- Contractor fabricated panels near the project site, using wood/plywood forms

Hawaii H1 PCP Demo Project

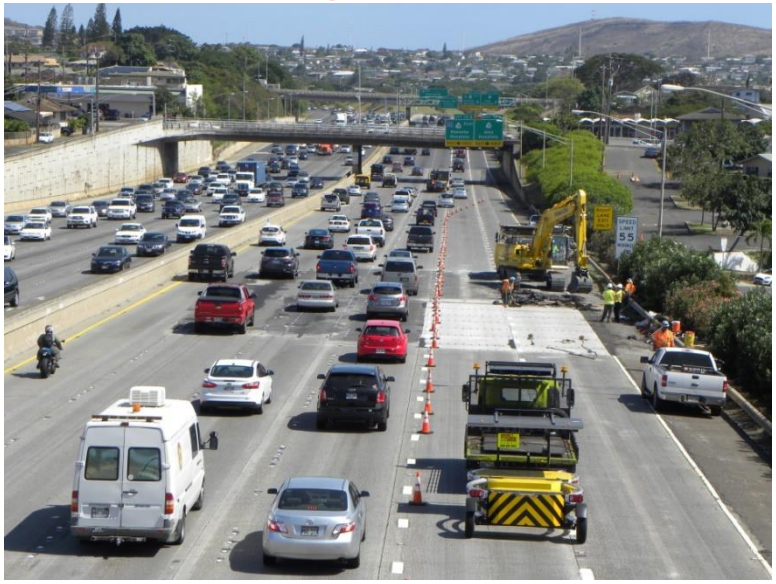




Hawaii H1 PCP Demo Project



Some Daytime Activities after Morning Rush Hour



Completed Section – Sept. 2015

Texas Energy Sector Intersection Application

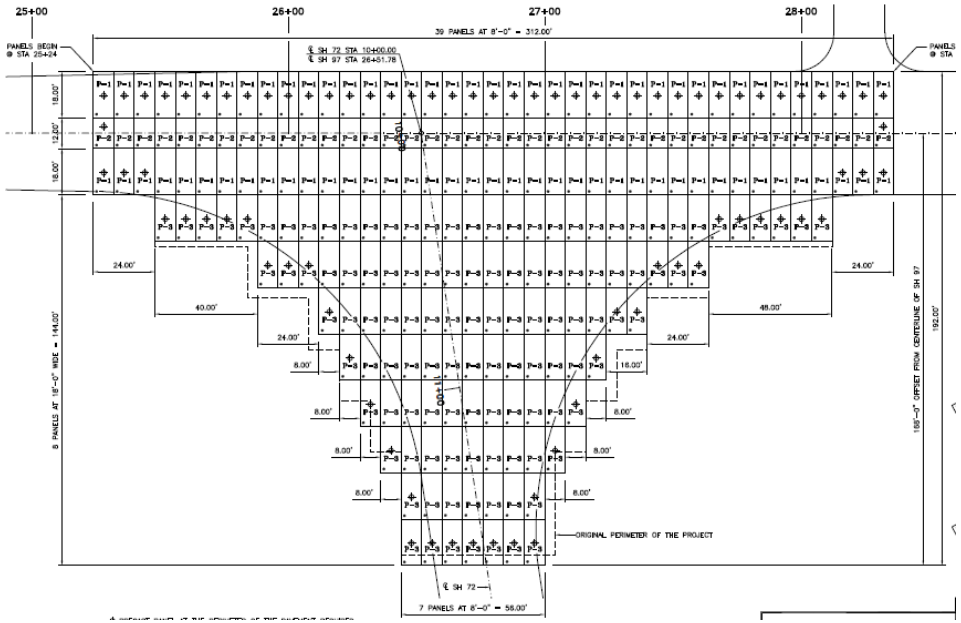
The Challenge: Excessive rutting in AC pavements due to heavy truck traffic

The Intersection Demo Site

Texas Intersection PCP Demo

(April/May 2016)

(Rehab of intersections damaged by energy trucks)

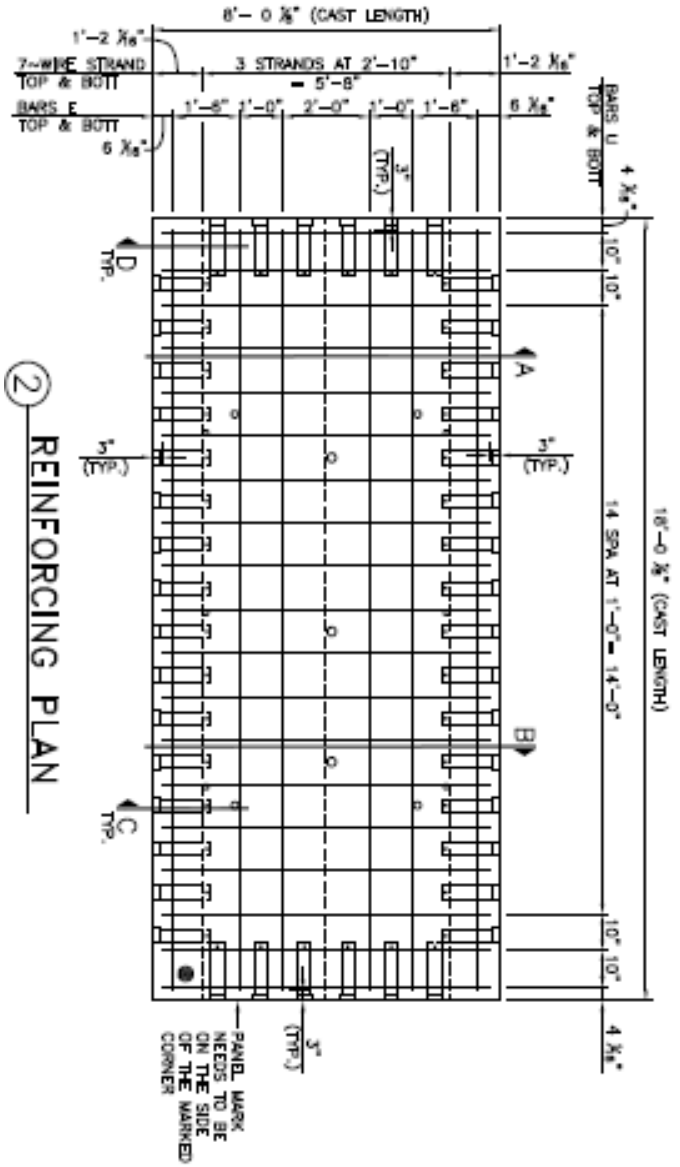


Bid/Cost Data

- **$425/SY for Intersection Construction = $1,550,000**
- **Estimated cost of precast panel: $200/SY**
- **Preliminary panel cost: $180 to $225 SY**

TABLE OF PANEL QUANTITIES

PANEL	SIZE	NO.
P–1	8 x 18	78
P–2	8 x 12	39
P–3	8 x 18	118
TOTAL NO. OF PANELS		235
TOTAL AREA = 31,968.00 SQ.FT.		
TOTAL NO. OF 1½" x14" LONG DOWEL BAR = 4,532		



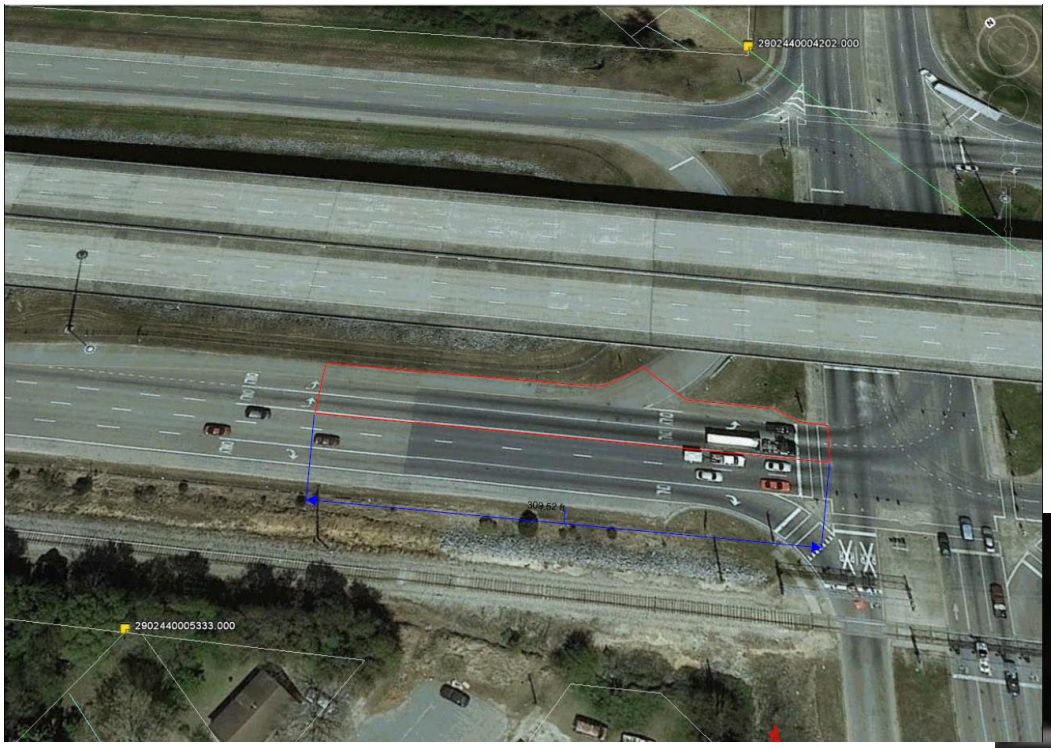
Texas Panel Details

- 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

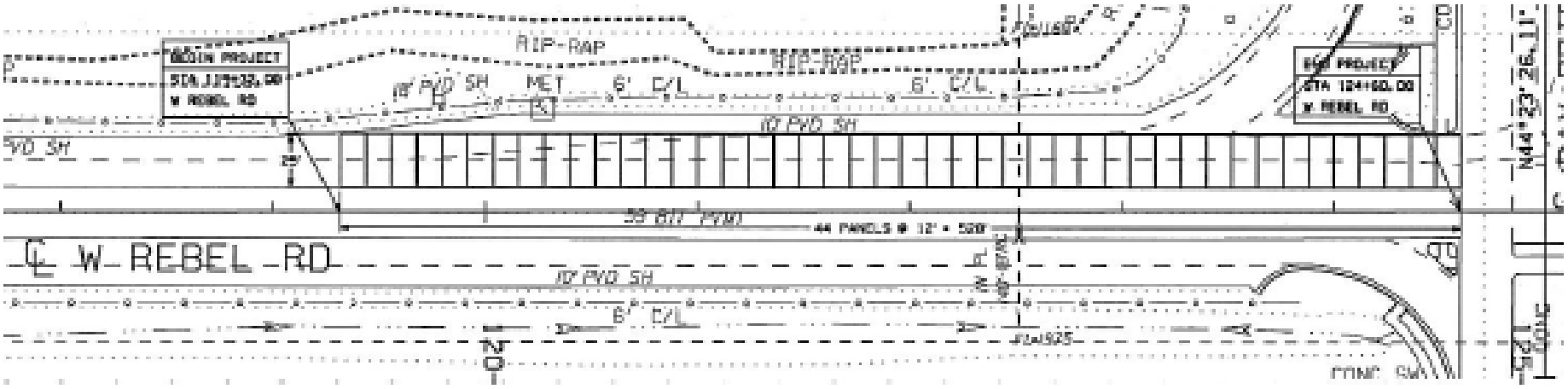
- Heavy Truck Traffic
  - Headed to Port of Mobile
- Excessive rutting requiring frequent maintenance

46	3 - 4
78	4 - 5
346	5 - 6
544	6 - 7
716	7 - 8
603	8 - 9
438	9 - 10
359	10 - 11
384	11 - 12
423	
	- PM -
402	12 - 1
422	1 - 2
401	2 - 3
585	3 - 4
743	4 - 5
753	5 - 6
325	6 - 7
181	7 - 8
123	8 - 9
128	9 - 10
72	10 - 11
41	11 - 12
8188	TOTALS :

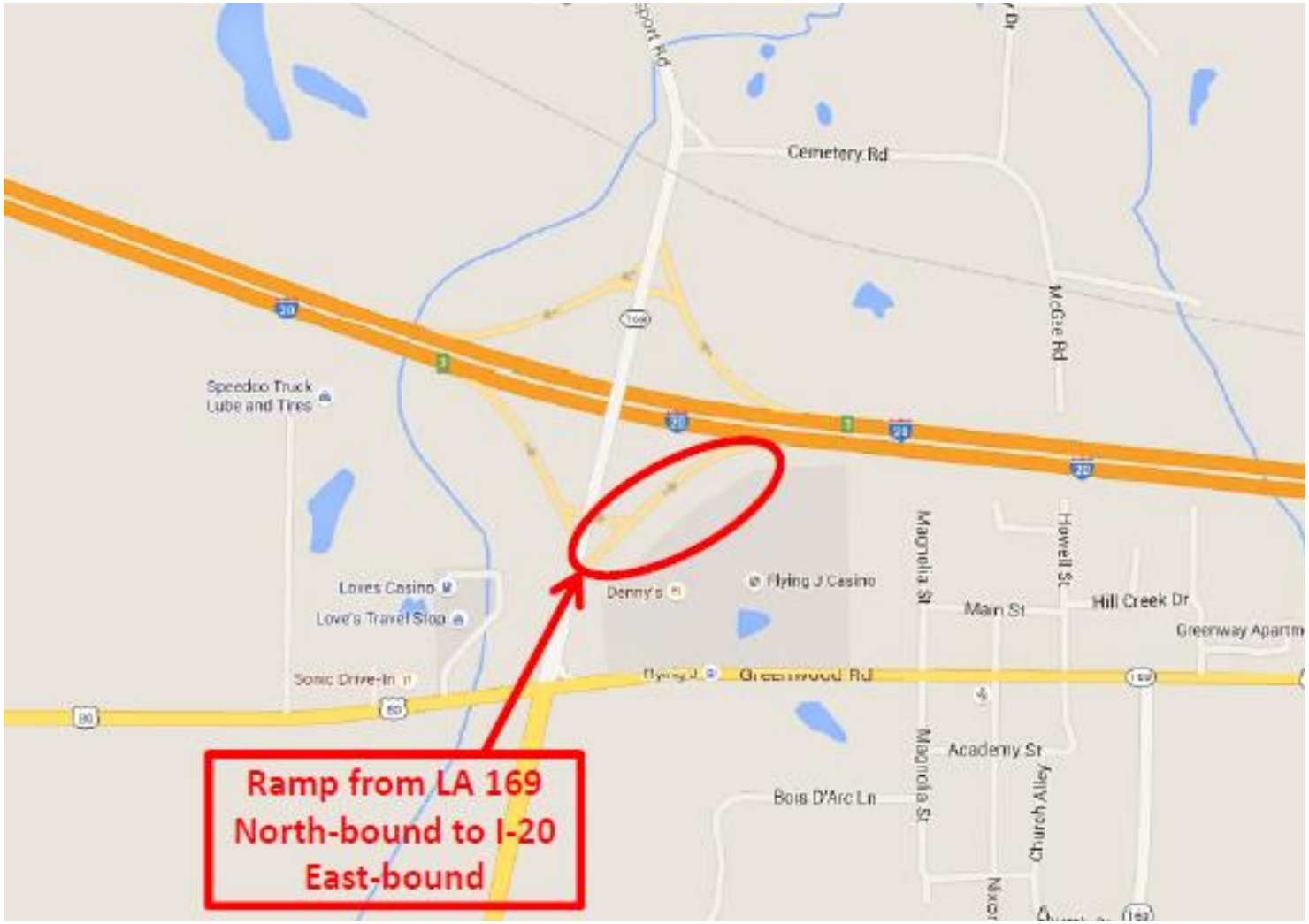
Mobile Intersection Rehab Project

(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

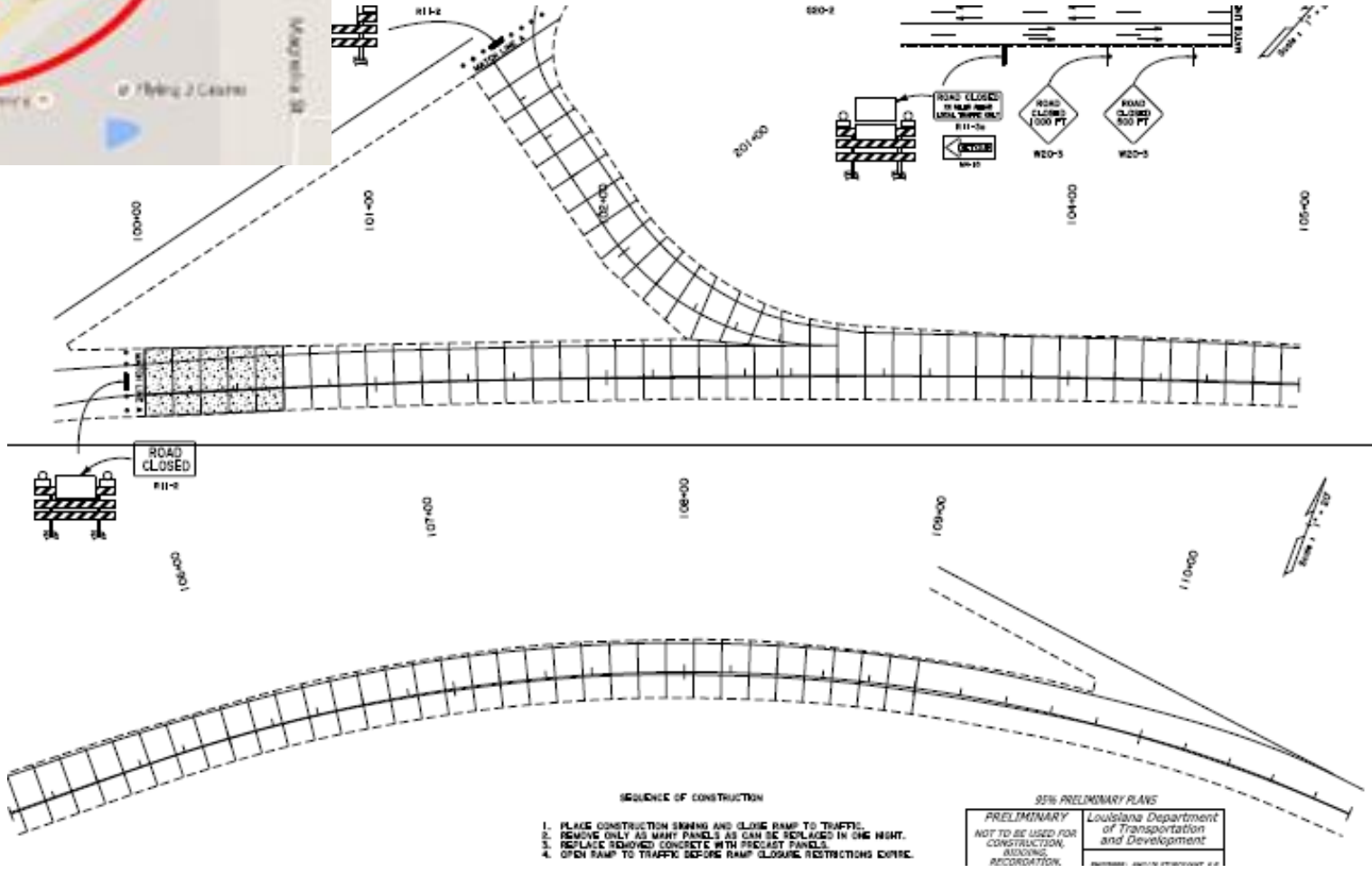






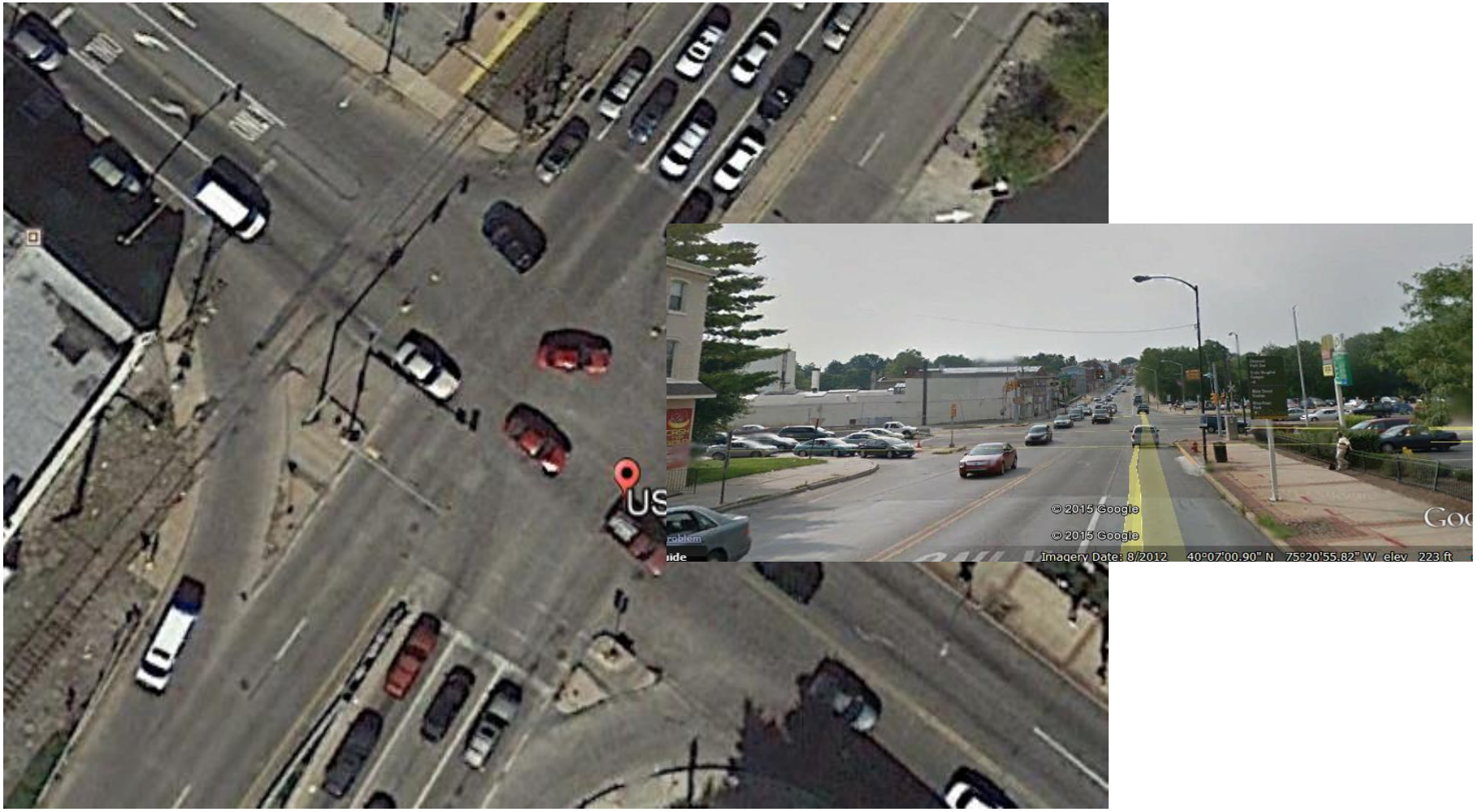



The Shreveport Precast Pavement Project



Norristown, PA Intersection Rehab Project
(Main and Markley Streets)

- Rehabilitate the intersection with least impact on users



Norristown Intersection Rehab Project

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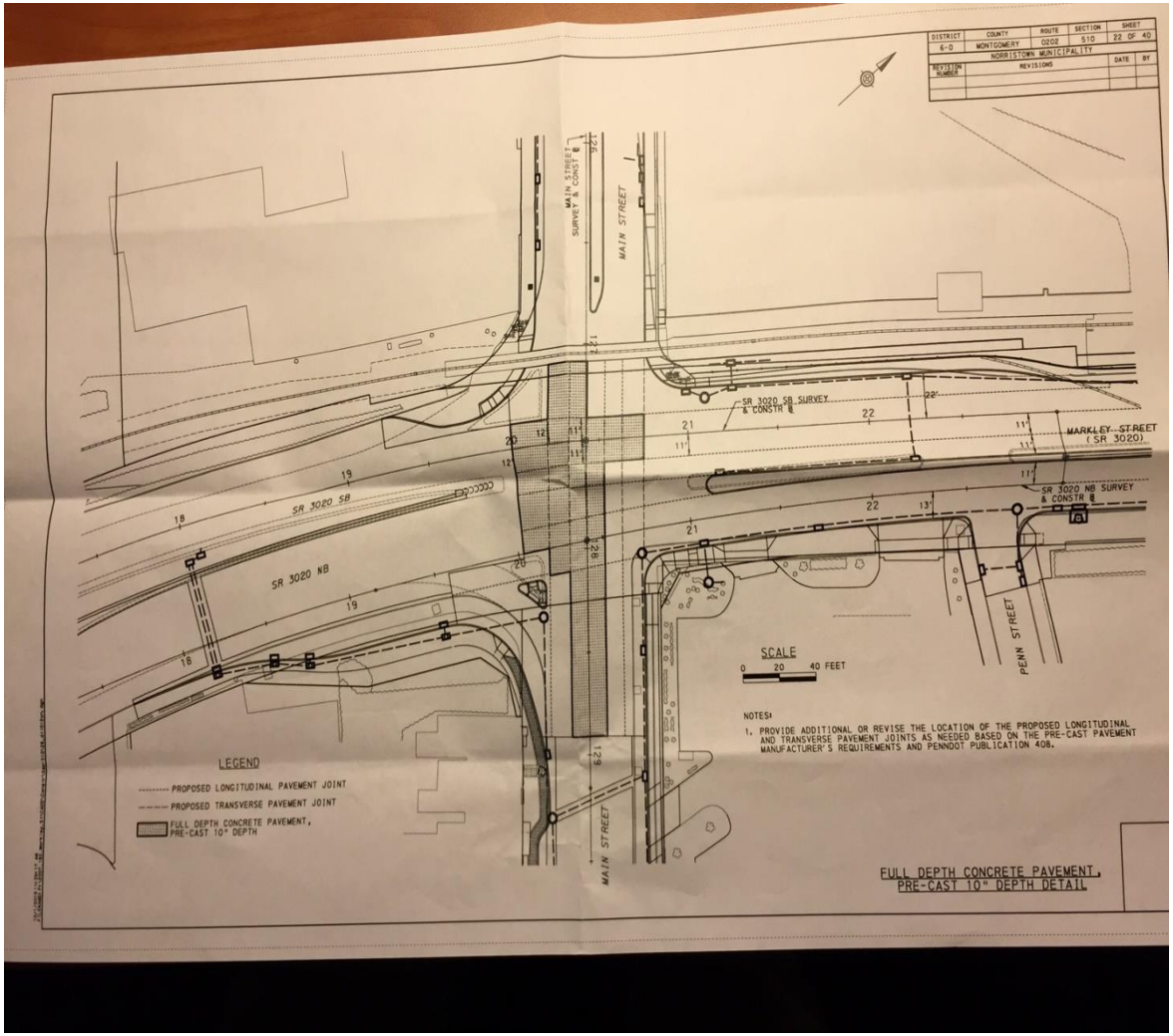


Florida – Bridge Approach Slab Replacement, Chipley

- 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

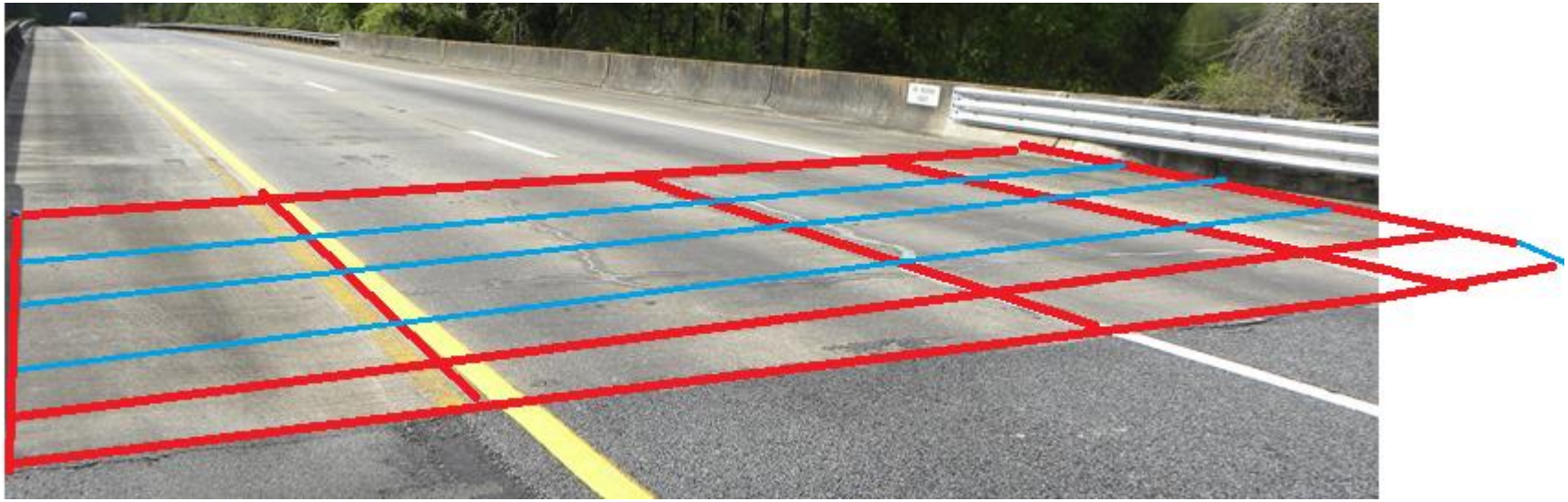
The I-10 Bridge Approach Slab

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.

<u>Steps</u>:

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.