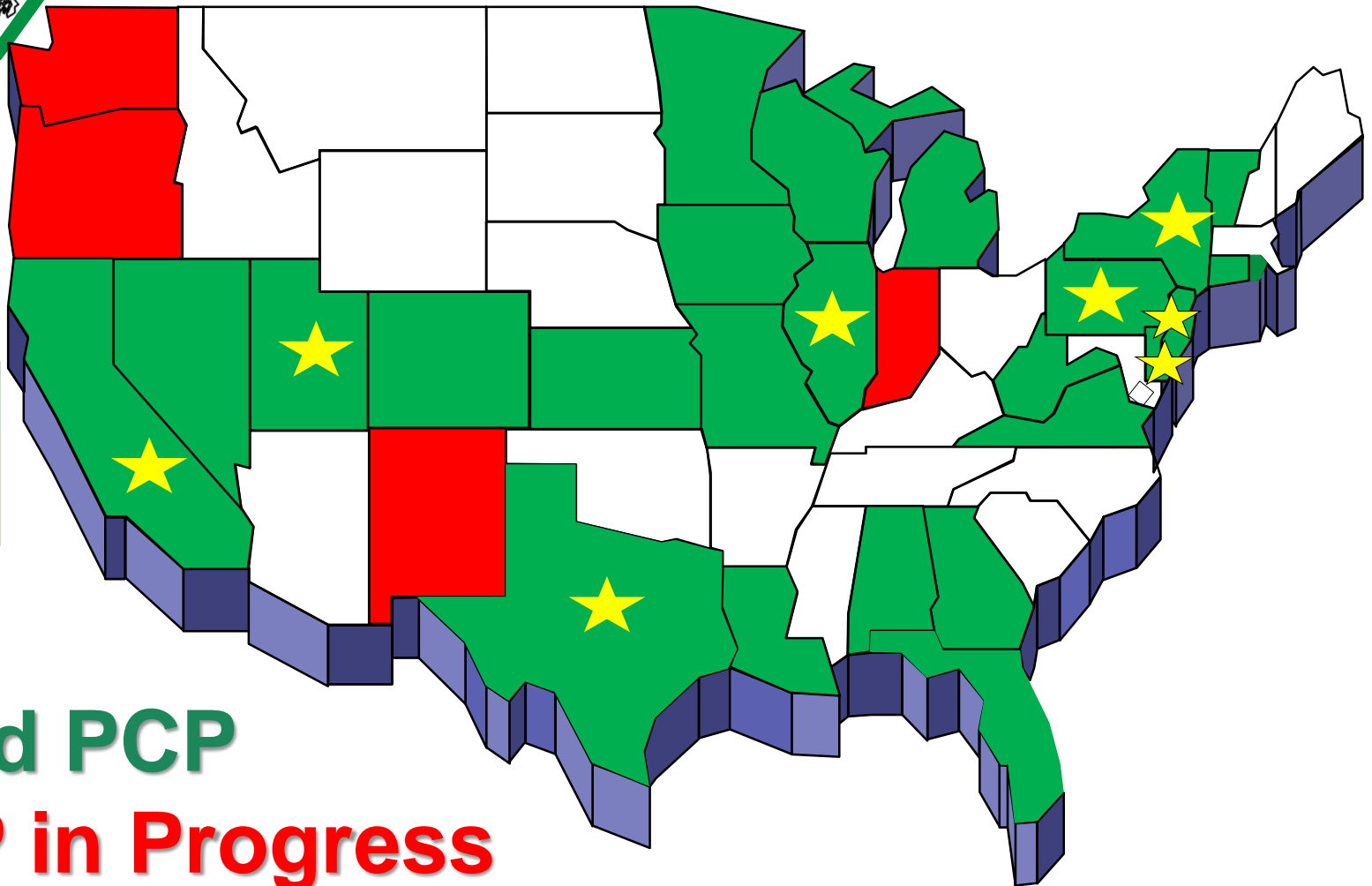


Precast Concrete Pavement – Rapid Repair and Rehabilitation of High Traffic-Volume Concrete and Asphalt Pavements

**Arizona Pavements/Materials Conference
November 15-16, 2018
Tempe, Arizona**

***Samuel Tyson, P.E.
Federal Highway Administration
Headquarters – Washington, DC***

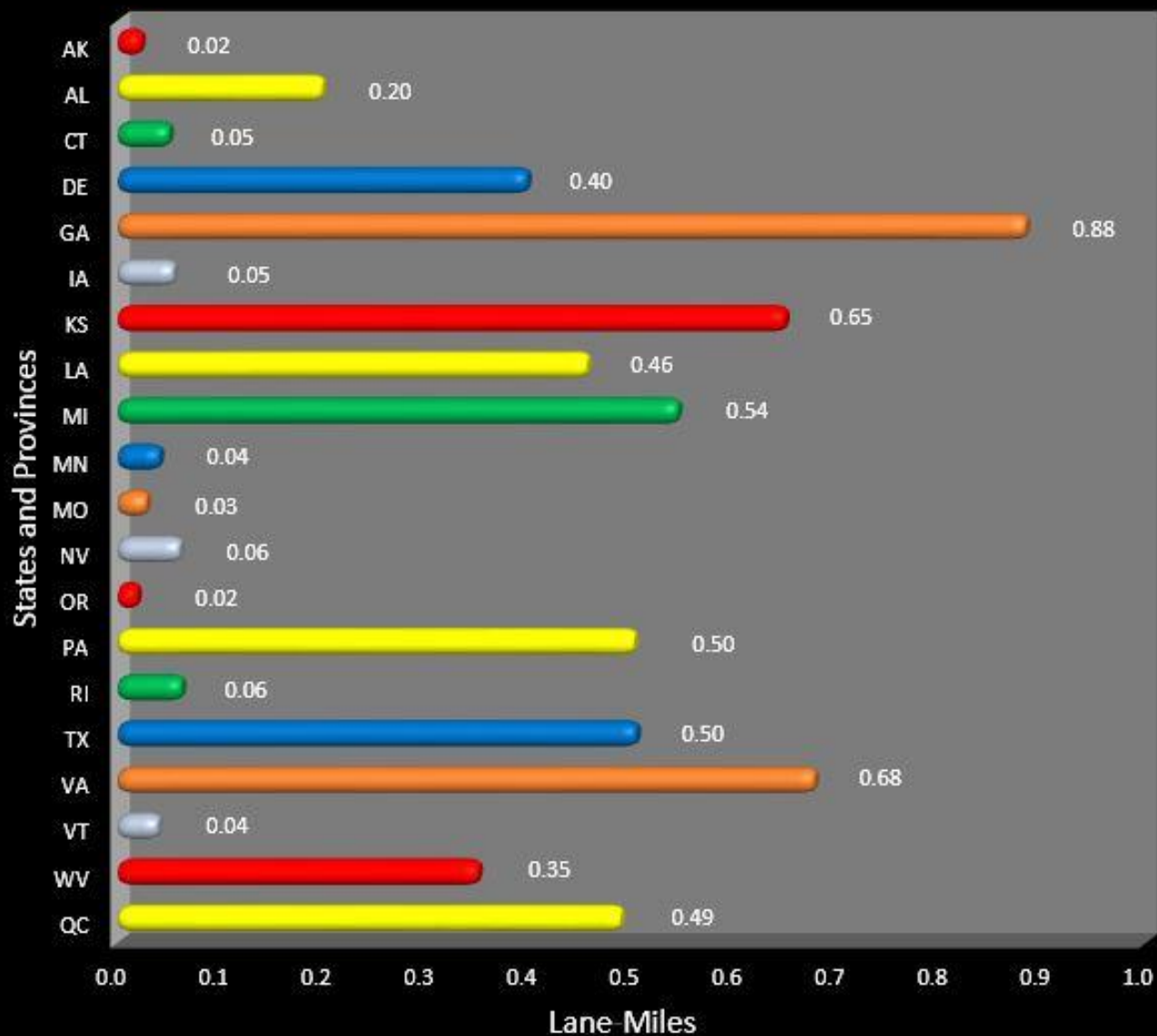
Highway Agencies in USA



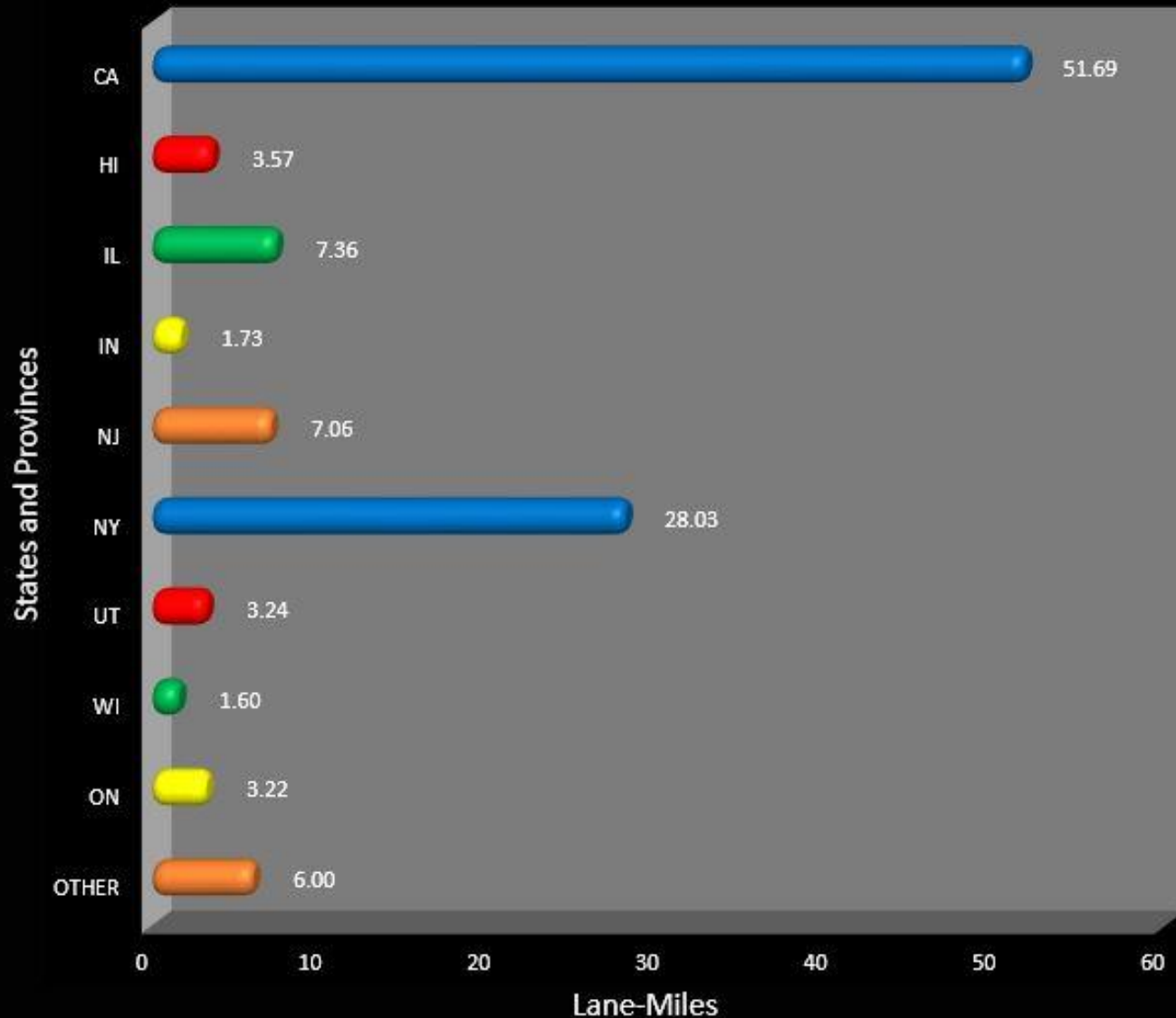
Used PCP

PCP in Progress

States and Provinces with Under 1 Lane-Mile of Jointed Precast Slabs (6 Lane-Miles as of September 30, 2018)



States and Provinces with Over 1 Lane-Mile of Jointed Precast Slabs (107.5 Lane-Miles as of September 30, 2018 - Compared to Other States & Provinces).



Precast Concrete Pavement (PCP)

- High Traffic Volumes
- Alternate Route Availability
- Rapid Renewal
- Lane-Closure Times
- Work-Zone Safety
- Opening to Traffic
- Concrete Quality
- Long-Life Performance

Reinforcement & Prestressing

- Nominal reinforcement (0.12-0.15 %) for handling stresses & to control potential cracking.**
- Pre-tensioning by fabricator allows reduced panel thickness.**
- Pre-tensioning also for wider and longer panels (e.g., two-lane width).**
- Post-tensioning applied on site to connect a series of panels.**

Bedding Support for PCP Systems

Uniform support key to PCP performance

- **Existing base graded & re-compacted**
- **New base material**
 - **Cement-treated or granular**
 - **Rapid-setting lean concrete**
- **Undersealing**
 - **Rapid-setting grout**
 - **Polyurethane**

Trimmed base with 0.5-inch (12-mm) bedding layer of cemented fine-grained granular material



Panel Leveling

- **Trimming of Stabilized Base – Time-consuming activity.**
- **Thin Shims – Typically requires lifting of panels to adjust shims.**
- **Polyurethane Foam Injection – Specialized equipment required.**
- **Fast-Setting Lean Concrete – Partial removal of base and screeding.**
- **Leveling Bolts – Rapid and accurate.**

Typical Leveling Bolts



Leveling Bolt & Grout Ports During Concrete Placement



Load Transfer Slots & Dowels for Jointed PCP Systems



Continuous Applications – Jointed



Dowel slots top/bottom for load transfer

Post-Tensioned Continuous


Florida DOT – Precast
Concrete Overlay on US 92





**Left-Turn
Lane**

**Delaware DOT –
Outside Lane and
Shoulder/Right-Turn
Lane**



**Virginia DOT –
3 Lanes and
Outside
Shoulder/Rush-
Hour Lane**

LEFT
LANE
HOV-2
ONLY
3-7 PM
MON-FRI

National
Firearms
Museum
Exit 57A

Typical Uses/Nighttime Work

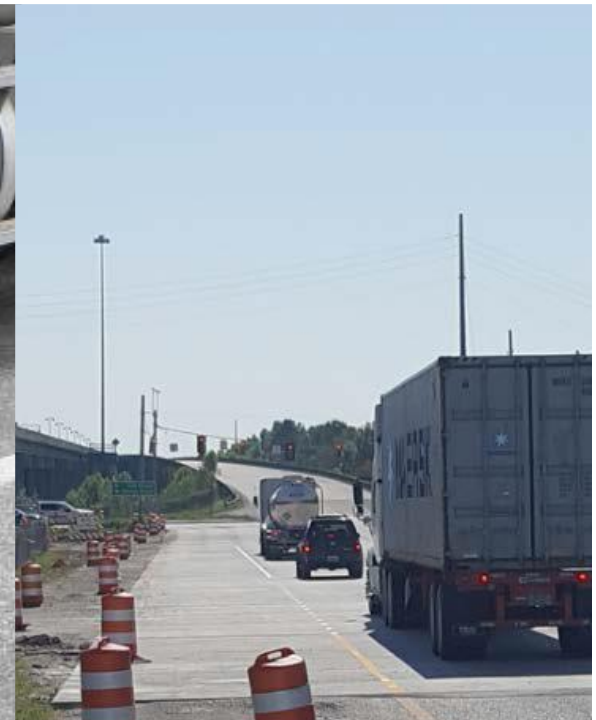
- **Principal Uses –**
 - **Heavily-trafficked interstate & primary roadways.**
 - **Interstate & urban ramps with no convenient alternate routes.**
 - **Intersections – Resists rutting/shoving.**
 - **Bridge approaches – Smooth transition from pavement to bridge.**
 - **Bus pads – Avoid disruption of service.**
 - **Airfields – A developing application.**

Hawaii DOT – Full-Depth Repair of 5 Lanes and Outside Shoulder/Right-Turn Lane on H-1





**Virginia DOT –
Outside Lane of
Exit Ramp from I-66**



Alabama DOT – Replace Asphalt Ramp from I-165

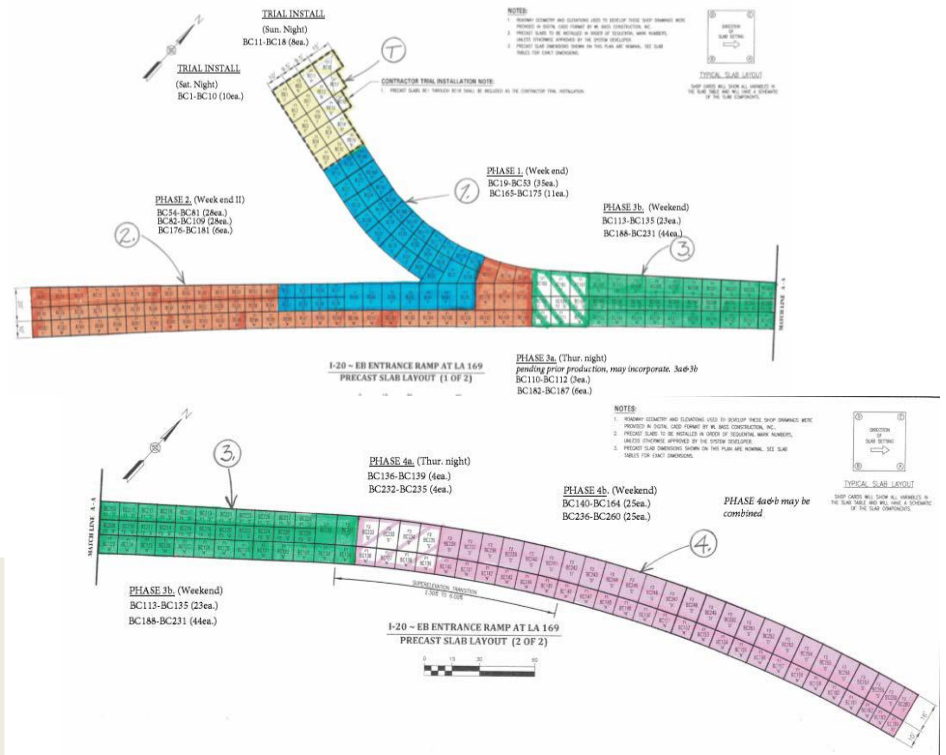


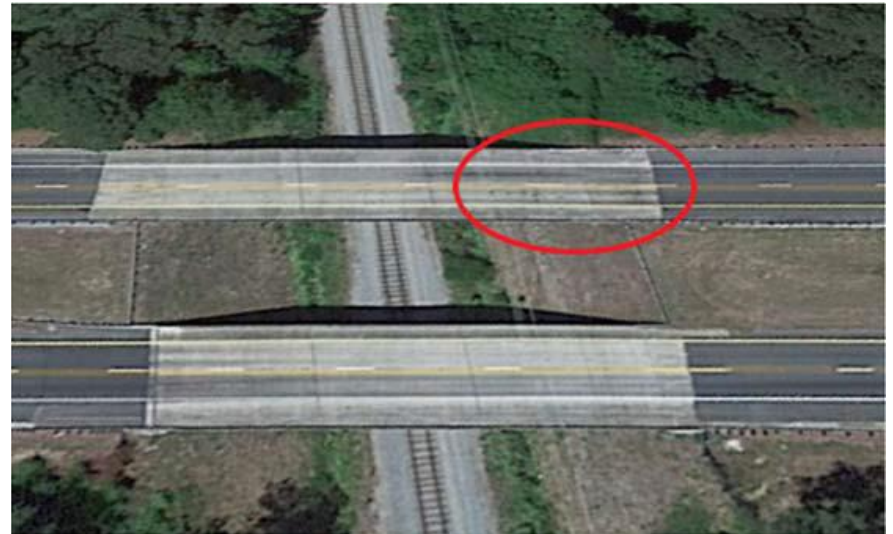
Texas DOT – Reconstruction of Asphalt Industrial Intersection in Energy Sector



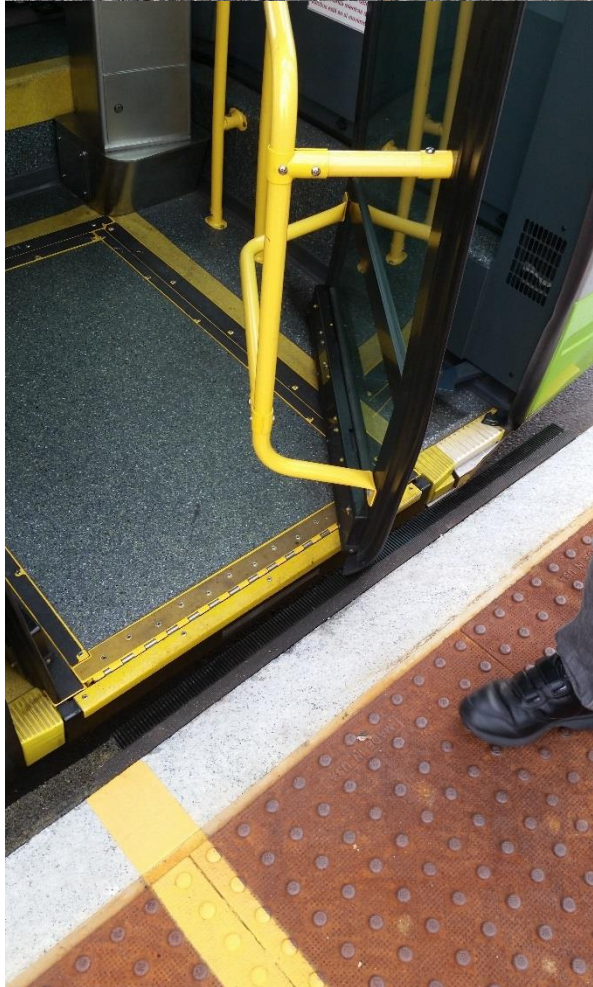


Louisiana DOTD – Access Ramp to I-20





**Florida DOT –
Bridge Approach
Slabs on I-10**



**Connecticut
DOT Bus Pad**



**Continuity of longitudinal steel in
repair of continuously reinforced
concrete pavement (CRCP)**

**Precast concrete panel on left with
18 inches of threaded No. 10 bars**

**Existing CRCP on right with grouted
threaded No. 10 bars (0.8% steel)**



Illinois Tollway

**Fiber-Reinforced Ultra High-
Performance Concrete (UHPC)
4,000 psi at 4 hours**

Panel Fabrication/Installation Rates

- **Panel fabrication rate –**
 - Inside plant; 10 panels/day.
 - Pre-stressing bed; 30 panels/day.
- **Panel installation rate –**
 - Repair; 20 panels/night.
 - Continuous; 50 panels/night.
- **Inventory – Several weeks (or months) of panel production is needed before installation on project can begin.**

Precast Panel Fabrication



**Typical Reinforced
Panel Production**



**Outdoor Prestressing Bed for
Multiple Panel Production**

Summary

- **Experience in the USA with PCP systems is limited to 17 years.**
- **PCP systems are rapidly installed.**
- **PCP systems provide long-term performance following satisfactory design, fabrication and installation.**
- **Fabricators & contractors having no prior experience are producing and installing panels satisfactorily.**