As part of Indiana’s “Next Level Roads” initiative, a 20-year, fully-funded program created in 2017 to upgrade roads across the state, the Indiana Department of Transportation (INDOT) undertook their first installation of Precast Concrete Pavement (PCP) on a segment of US 40 running through the city of Richmond in Eastern Indiana in 2017. The project provides an opportunity to evaluate how precast pavement technology may contribute toward more durable and cost-effective applications for concrete pavement repair and sub-surface utility repairs, especially in areas with high traffic volumes, limited detour options, or multiple utilities beneath the pavement, such as in urban districts.

### History of PCP Systems
Precast Concrete Pavement technology was first utilized on airport runways outside of the U.S., mainly in Japan and Russia. Highway applications in the U.S. began in the early 1970’s in Michigan and Virginia, addressing pavement repair using steel reinforced concrete panels.

### ISSUE:
INDOT had two issues, speed of installation and easier access to utilities while lowering the life-cycle cost.

### SOLUTION:
INDOT selected a precast panel system which enabled the panels to be manufactured ahead of time, this combined with over-cable excavator provided a win for the project with lower life cycle costs as well.
The technology developed rapidly in the U.S. between 2000 and 2010 as FHWA, AASHTO, academia and industry studied needs and developed proprietary and non-proprietary systems to meet those needs.

**INDOT’s Objective**
For several reasons, INDOT decided they needed to look into how PCP may benefit the Department’s pavement operations. They wanted to test implementation of PCP as a concrete pavement option, and especially with regard to full-depth patching where high-volume traffic and limited detour options exist.

While initial costs for PCP are higher than conventional concrete pavement, improved durability of the pavement is one of several anticipated benefits. Controlled fabrication and curing conditions of precast panels provides improved quality control. Other anticipated benefits include speed of installation, a thinner pavement section, and the convenience of removing and reinstalling precast panels for utility repair when necessary; all of which would contribute toward a reduction in life-cycle cost. INDOT is also interested in how PCP technology can improve the quality and turn-around time on concrete patching on interstate highways.

**Candidate Location Sought for Prototype PCP**
INDOT considered several locations across the state for this initial PCP installation. They ultimately selected this project that was already scheduled for letting and construction.

The project called for reconstruction of nearly two miles of southbound US 27 and over one mile of eastbound US 40, where both segments traverse downtown Richmond. The US 40 segment was redesigned for over 12,000 square yards of precast concrete pavement (about 1100 panels) and the US 27 segment remained as an asphalt section.
In addition to pavement replacement, the scope also included new water mains, drainage upgrades, new traffic signals, ADA ramps, and assorted streetscape amenities in partnership with the City of Richmond.

**Precast Systems Considered**
Precast suppliers had to meet a strict set of guidelines to be selected as the preferred supplier for this project. The Fort Miller, Inc. Super Slab System was approved by FHWA and selected by INDOT for this project. The removable panels of this proprietary system will facilitate future utility work or repairs as needed. INDOT also developed their own PCP specifications using generic technology for further trial and evaluation in the future.

**Precast Production**
Precast panels were cast by Norwalk Concrete in Norwalk, Ohio and delivered to the site in their planned sequence. Indiana ACPA member contractor, E&B Paving, Inc., a sub-contractor to prime contractor, Gradex, Inc., planned ahead for their first PCP installation and ended up exceeding their anticipated production rate, setting up to 50 panels/day before they were finished.

The panels are 9.5” thick PCP using Type I cement. Compressive strength averaged 7980 psi against a 7000 psi requirement and air averaged 7.3%. Panels typically contain two reinforcement mats and utility cutouts where required.

**Construction**
The subgrade treatment is 12” of compacted #53 stone (Type 1C) beneath a modified base; 4” of #43 stone capped with a manufactured sand to a 1/8” tolerance (super graded). Precast panels are placed once the final grade is established.

They deployed an “over-capable” excavator so they could manage the panels, weighing up to 18,000 lbs. each, with safety and precision. One lane of traffic was maintained through the job and detours on pre-approved routes were designated, as necessary. Access was maintained to all businesses throughout the duration of the project and work schedules were set up so as not to interfere with school bus traffic.

All aspects of this project required daily coordination and precise execution at every turn. Once the panels were set, grouting operations commenced. Dowel grouting was performed first, and bedding grout was done once the dowel grout had cured. Joints were widened and sealed, and the entire surface was profile ground to ensure a uniform, safe, and smooth surface.

A ribbon cutting ceremony in the summer 2019 was held to celebrate the opening of the project. This was a successful first effort by INDOT, E&B Paving and First Group Engineering. Purdue University also developed a research paper on this project providing additional detail for future reference.

Clearly, Precast Concrete Pavement has a place in the infrastructure catalogue and INDOT has exhibited an interest in building their level of experience and expertise in this technology in order to be able to respond to system needs for the long-term.

*Patrick Long is Director of Marketing and Government Affairs at Indiana Chapter ACPA. He can be reached at plong@pavement.com*
Indiana’s “Next Level Roads” Initiative

American Concrete Pavement Association

9450 W BRYN MAWR AVE., SUITE 150 | ROSEMONT, IL 60018, USA