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FHWA PROJECT R05 IAP FUNDED PROJECT CASE STUDY

FLORIDA I-10 PRECAST CONCRETE BRIDGE APPROACH SLAB DEMONSTRATION PROJECT

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16. Abstract
Repair and rehabilitation of the aging highway infrastructure continues to be a challenging endeavor for U.S. highway agencies. Thousands of miles of highway pavements and hundreds of bridge approach slabs need rehabilitation along highways that carry over 100,000 vehicles/day, including a large percentage of trucks. Extended lane closures on these highways must be avoided to prevent compounding congestion—which means rehabilitation work must be completed rapidly. While many projects have been completed using rapid-setting concrete, results have been inconsistent. Use of precast concrete (PC) panels have shown to be promising alternatives

The production use of PC panels has come a long way since the first production project was constructed in New York State in 2001. The technology is gaining wider acceptance in the U.S. for rapid repair and rehabilitation of concrete pavements as well as for heavily trafficked asphalt concrete pavements, ramps, and intersections. PC panels are also being used to rehabilitate bridge approach slabs. Several U.S. highway agencies have implemented the PC panel technology, and other agencies have constructed demonstration projects. In the U.S., the PC panel technology is being used for intermittent repairs (full-depth joint repairs or full panel replacement) of concrete pavements and for continuous applications (longer length/wider area rehabilitation) of both asphalt and concrete pavements with service life expectations of at least 20 years for intermittent repairs and at least 40 years for continuous applications, without significant future corrective treatment.

The Strategic Highway Research Program 2 (SHRP2) Project R05 was conducted from 2008 to 2012 to develop technical information and guidelines that would encourage the rapid and successful application of PC technology to rehabilitate asphalt and concrete pavements. In 2013, the SHRP2 Implementation Assistance Program (IAP) was created to help highway agencies and metropolitan planning organizations deploy SHRP2-developed products to deliver more efficient, cost-effective solutions to meet the challenges facing transportation agencies. On August 7, 2015, the Federal Highway Administration, in partnership with the American Association of State Highway and Transportation Officials, announced the selection of 21 transportation agencies receiving implementation and technical assistance awards as part of Round 6 of the SHRP2 IAP. The Florida Department of Transportation, one of the agencies selected as a lead adopter of Project R05 technology, received an award of $300,000 to help offset the cost of constructing a PC project. This case study report provides details of the 2018 project that used PC panels for rehabilitation of the east-side bridge approach slab along westbound I-10 near Quincy, Florida.

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MODERN METRIC CONVERSION FACTORS

Conversion factors both to and from the modern metric International System of Units (SI) can be found at: http://www.fhwa.dot.gov/publications/convtabl.cfm.

ABBREVIATIONS AND ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ACEF	American Consulting Engineers of Florida, LLC
BAS	Bridge approach slabs
DOT	Department of Transportation
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
IAP	Implementation Assistance Program
PC	Precast concrete
PCP	Precast concrete pavement
PPCO	Precast prestressed concrete overlay
SHRP2	Strategic Highway Research Program 2

PHOTO CREDITS

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Figures 2, 16, 23, and 29 to 31: Shiraz Tayabji, Applied Research Associates, Inc.
Figures 12 to 15: Jamie Green, FDOT
Figures 21, 22, and 24 to 28: Timothy Barnard, FDOT

INTRODUCTION

Repair and rehabilitation of the aging highway infrastructure continues to be a challenging endeavor for U.S. highway agencies. Thousands of miles of highway pavements and hundreds of bridge approach slabs (BAS) need rehabilitation along highways that carry over 100,000 vehicles/day, including a large percentage of trucks. Extended lane closures on these highways must be avoided to prevent compounding congestion—which means rehabilitation work must be completed rapidly. While many projects have been completed using rapid-setting concrete, results have been inconsistent. Using precast concrete (PC) panels has shown to be a promising alternative.

The production use of PC panels has come a long way since the first production project was constructed in New York State in 2001. The technology is gaining wider acceptance in the U.S. for rapid repair and rehabilitation of concrete pavements as well as for heavily trafficked asphalt concrete pavements, ramps and intersections. PC panels are also being used to rehabilitate BAS. Several U.S. highway agencies have implemented the PC panel technology, and other agencies have constructed demonstration projects. In the U.S., the PC panel technology is being used for intermittent repairs (full-depth joint repairs or full panel replacement) of concrete pavements and for continuous applications (longer length/wider area rehabilitation) of both asphalt and concrete pavements with service life expectations of at least 20 years for intermittent repairs and at least 40 years for continuous applications, without significant future corrective treatment.

Over the years there have been many advances in the design, panel fabrication, and panel installation aspects of precast concrete pavement (PCP) technology, and presently this technology can significantly reduce traffic impacts of roadway repair and reconstruction projects, particularly on heavily traveled routes. The technology is applicable to small segments, enabling flexibility in construction phasing, as well as for use in corridor-wide pavement reconstruction.

SHRP2 PROJECT R05 BACKGROUND

Because the information on PC panel technology was not well documented, the Strategic Highway Research Program 2 (SHRP2) initiated Project R05 in 2007 to develop technical information and guidelines that would encourage the rapid and successful adoption of this technology. The Project R05 study was conducted from 2008 to 2012. The final report, Precast Concrete Pavement Technology, is available at http://www.trb.org/main/blurbs/167788.aspx. The study demonstrated that PCP technology is ready for wider implementation and that many of the PCP systems available in the U.S. can meet the needs of highway agencies for rapid renewal of their highway systems. The following products were developed under SHRP2 Project R05:

- Overall findings related to viability of the PCP technology.
- Findings based on SHRP2 field testing.
- Guidelines for PCP project selection.
- Guidelines for PCP system acceptance.
- Guidelines for design of PCP systems.
- Guidelines for PCP fabrication.

- Guidelines for PCP installation.
- Implementation plan for PCP technology.
- Long-term monitoring plan for PCP projects.
- Model specifications.

With the success of early PCP implementation, many highway agencies have also started using PC panels for BAS rehabilitation.

SHRP2 PROJECT R05 PRODUCT IMPLEMENTATION PROGRAM

In 2013, the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) created the SHRP2 Implementation Assistance Program (IAP) to help State departments of transportation (DOT), metropolitan planning organizations, and other interested organizations deploy SHRP2-developed products to deliver more efficient, cost-effective solutions to meet complex challenges. Seven rounds of the IAP were offered between February 2013 and April 2016.

On August 7, 2015, FHWA—in partnership with AASHTO—announced the selection of 21 transportation agencies receiving implementation and technical assistance awards as part of Round 6 of the SHRP2 IAP. The Florida Department of Transportation (FDOT), one of the agencies selected as a lead adopter of Project R05 technology, received an award of $300,000 to help offset the cost of constructing a PCP or a BAS project using PC panels to provide a learning environment for operations such as fabricating panels, setting panels, grouting under panel areas, and other related activities needed to implement precast panel installations for transportation infrastructure applications in Florida.

This case study report provides details of the 2018 project that used PC panels for rehabilitation of the east-side BAS along westbound I-10 near Quincy, Florida. The BAS was rehabilitated during April to June 2018.

FDOT PRECAST CONCRETE RELATED ACTIVITIES

In 2011, FDOT was awarded a grant by FHWA under the Highways for LIFE program to support the construction of a precast prestressed concrete overlay (PPCO). The 24-foot-wide (7.32-m-wide) PPCO was located along a section of SR 600/US 92 in Volusia County and was constructed in early 2012. A total of 66 panels, 12 feet (3.65 m) long and 24 feet (7.32 m) wide, were installed over an asphalt concrete interlayer placed over the existing distressed jointed concrete pavement. The panels were prestressed in the transverse direction at the precast plant. At the site, groups of 22 panels were posttensioned. An expansion joint was installed between adjacent posttensioned sections. The PPCO has performed well over the last 6 years.

In early 2015, FDOT began to investigate production implementation of the PCP technology for rapid rehabilitation of distressed pavements. In September 2014, the FHWA sponsored a 1-day workshop, “PCP Technology: State of Practice and Applications,” in Gainesville, Florida. The workshop provided attendees with the most up-to-date information on the best practices related to precast pavement technology and provided guidance on selecting candidate projects for PCP applications, developing project-specific design and construction requirements, and PCP system acceptance. The workshop was followed the next day with a meeting between the FHWA PCP Implementation Team members and senior FDOT staff and a site visit to the SR 600/US 92 PPCO project.

Subsequently, in August 2015, Florida received the SHRP2 IAP award of $300,000 to help offset the cost of constructing a project that would require use of PC panels. FDOT elected to apply the SHRP2 IAP award to the rehabilitation of the east side BAS at the bridge over Apalachicola North Railroad in Gadsden County, along westbound I-10. The BAS rehabilitation project was under the jurisdiction of FDOT's District 3, with headquarters in Chipley.

During April 2016, the FHWA PCP Implementation Team members met with the FDOT District 3 staff in Chipley to review the I-10 project details and the preliminary plans for the I-10 BAS project. The meeting was followed by a visit to the BAS site. The detailed preliminary plans and specifications for the project were developed in January 2017. The project to rehabilitate the BAS, as part of a larger contract, was let and awarded during June 2017.

PROJECT DETAILS

This project involved the replacement of the existing east-side BAS in the westbound direction at Bridge No. 500077 on I-10 (Florida SR 8) over Apalachicola North Railroad in Gadsden County. See figure 1 for location. The existing cast-in-place BAS, constructed in 1976 as part of the bridge construction, was exhibiting cracking and settlement. Figure 2 shows a view of the existing BAS, and figure 3 shows the condition of the BAS.

Figure 1. Map. Bridge approach slab location along I-10 near Quincy.
(The map is the copyright property of Google® Earth™ and can be accessed from https://www.google.com/earth.)

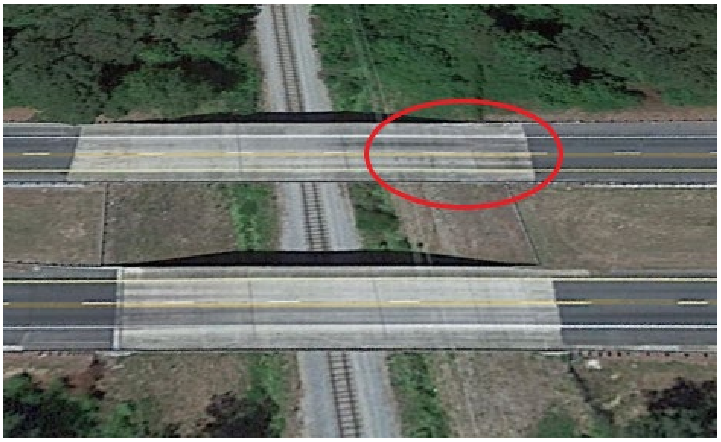

Figure 2. Map. Close-up view of the east-side bridge approach slab of westbound I-10.
(The map is the copyright property of Google® Earth™ and can be accessed from https://www.google.com/earth. The map overlay location shows the location.)

Figure 3. Photo. Condition of the existing bridge approach slab.

To minimize impacts to the interstate highway traffic, FDOT considered using precast panels to replace the existing BAS, which was 20 ft (6.1 m) long and constructed monolithically across the full width of the roadway. The existing full width of the roadway over the BAS consisted of two 12-ft (3.65-m) travel lanes, a 10-ft (3.1-m) outside concrete shoulder (lane to gutter), and a 5.5-ft (1.67-m) inside concrete shoulder (lane to gutter). The two shoulders incorporated barriers, 16.5 inches (406 mm) thick at the base. The existing cross-section of the BAS is shown in figure 4.

The BAS rehabilitation plan required removal of the existing two travel lanes and two shoulder lanes, one lane at a time, and use of the four precast panels that were to be transversely posttensioned to form a monolithic BAS. The segments were to be divided along the existing lane and shoulder lanes. The panels were to be installed over four phases of construction along the existing alignment using nighttime lane closures. The project also involved 70 feet (21.3 m) of roadway reconstruction adjacent to (approaching) the BAS.

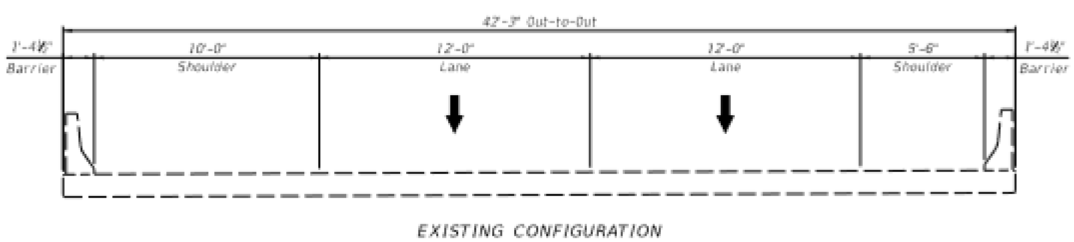

Figure 4. Diagram. Cross-section of the bridge approach slab.

PROJECT DESCRIPTION

The bridge approach slab rehabilitation work consisted of fabricating, furnishing, and installing PC panels in accordance with the project plans and specifications. The work included performing a site visit, preparing the required submittals, removing the existing bridge approach slab, grading and compacting the new 10 inches (250 mm) of new base layer and a geogrid placed between the subgrade and the base, placing panels, setting panels at the designated elevation using leveling lifts, placing grout bedding under the panels and along the longitudinal joints, applying transverse posttensioning across the four panels, filling the posttensioning ducts with a wax-based filler, and performing finishing activities.

The project work was to be phased as follows:

1. Removal of the outside shoulder portion of the BAS and installation of the precast panel (Panel A) for the outside shoulder.
2. Removal of the inside shoulder portion of the BAS and installation of the precast panel (Panel B) for the inside shoulder.
3. Removal of the inside lane portion of the BAS and installation of the precast panel (Panel C) for the inside lane.
4. Removal of the outside lane portion of the BAS and installation of the precast panel (Panel D) for the outside lane.
5. Transverse posttensioning across all four panels and filling of posttensioning ducts with a wax-based filler. Also, longitudinal joint grouting and under slab grouting.

Panels A and B had reinforcement for the barrier walls installed at the precast plant. The precast panels for each segment were nominally 30 ft (9.1 m) long and trapezoidal in shape to match the skew alignment at the bridge backwall.

The project details are as follows:

- FDOT Contract No.: C-9J37.
- Project owner: FDOT (District 3).
- Prime contractor: M & J Construction Company of Pinellas County, Inc., Tarpon Springs, Florida.
- Project plans and specifications prepared by: American Consulting Engineers of Florida, LLC (ACEF), Pace, Florida.
- Panel precaster: Dura-Stress, Inc., Leesburg, Florida.
- Posttensioning subcontractor: Freyssinet, Inc.
- Field inspection service for FDOT: RS&H CS, Quincy, Florida.

Figure 5 shows the layout of the four PC panels and of the transverse posttensioning ducts.

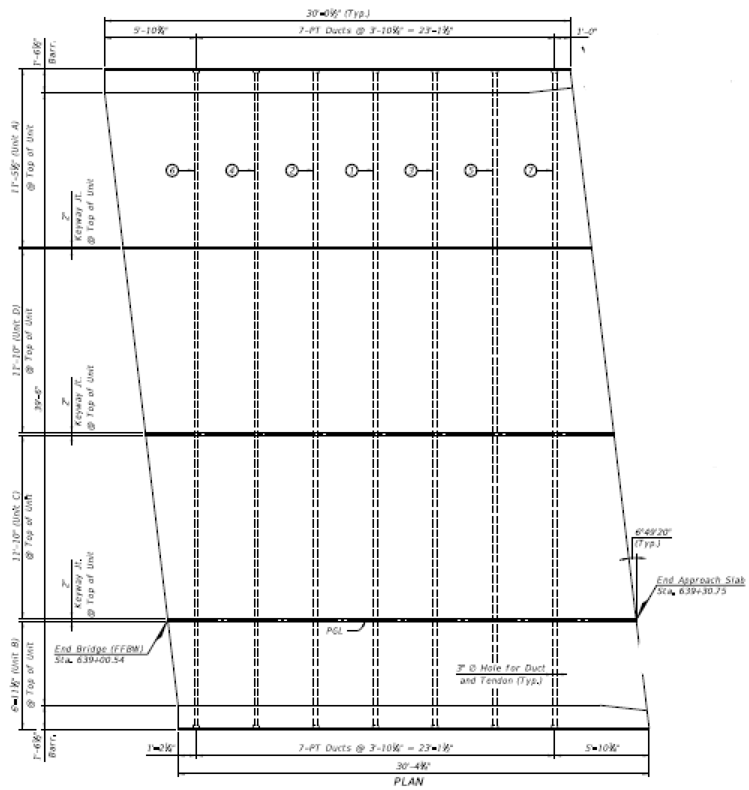

Figure 5. Diagram. Panel layout at the I-10 bridge.

KEY SPECIFICATION AND PLANS REQUIREMENTS

The following are the key requirements incorporated in project plans and specifications for the BAS precast concrete panels:

1. Concrete.
    a. Class IV concrete, 28-day compressive strength of 5,500 psi (37.9 MPa).
    b. Concrete cover: 2.5 inches (64 mm) at the top, 3 inches (76 mm) at the bottom.
2. Longitudinal joint (keyway) grout.
    a. Non-shrink grout meeting FDOT specification Section 934 for high-performance grout or Section 926 for epoxy grout.
    b. Minimum 28-day compressive strength of 5,500 psi (37.9 MPa).
    c. Minimum opening to traffic strength of 2,500 psi (17.2 MPa).
    d. Minimum strength for posttensioning operation of 5,500 psi (37.9 MPa).
3. Under slab (bedding) grout.
    a. Non-shrink grout meeting FDOT specification Section 934.
    b. Minimum 28-day compressive strength of 5,500 psi (37.9 MPa).
4. BAS panel fit-up: Perform a test installation at the precast yard to demonstrate constructability and fit-up for the four panels.
5. Traffic control: Traffic control to be always maintained, with at least one lane of traffic to be maintained during the panel installation work.
6. BAS precast panel installation activities order.
    a. Remove and repair the backwall seat. Drill holes for anchors in the backwall seat.

b. Install leveling lift bearing plates at designated locations for the panel to be installed.
c. Place the panel, maintaining a 0.5-inch (12-mm) gap at the panel bottom between adjacent panels.
d. Install a foam backer rod within the keyway joints between adjacent panels.
e. Install a continuous length of 1.5-inch (38-mm) ID corrugated pipe or a steel pipe in each transverse 3-inch-diameter (76-mm-diameter) hole in the panel for the posttensioning tendons. In the final plans, the use of the 1.5-inch (38-mm) pipe was eliminated. The 3-inch-diameter (76-mm-diameter) hole was formed using a HDPE smooth pipe.
f. Fill the longitudinal joint with the approved grout. The grout is to achieve a minimum compressive strength of 5,500 psi (37.9 MPa) before commencing posttensioning operations.
g. Grout the gap under the panels using the approved grout. The grout was actually placed after the posttensioning operations were completed.
h. Perform the posttensioning operation, beginning at the central tendon and alternately progressing to tendons towards each longitudinal end.
    i. Each posttensioning bar to have to have an initial force of 10,000 pound-force (44.5 kN-force) and final force of 57,800 pound-force (257 kN-force).
    ii. After all posttensioning operations have been completed, fill the 1.5-inch (38-mm) corrugated duct with an approved wax-based fill and grout the space between the duct and the 3-inch-diameter (76-mm-diameter) hole with an approved grout. As noted above, the use of the inner duct was eliminated in the final plans.

BRIDGE APPROACH SLAB DETAILS

The BAS details are as follows:

- Total number of precast concrete panels installed: 4.
    - Panel thickness: 15 inches (381 mm).
    - Panel widths:
        - Panel A (outside shoulder lane): 11 feet 5.5 inches (3.5 m).
        - Panel B (inside shoulder lane): 6 feet 11.5 inches (2.1 m).
        - Panels C and D (two mainline lanes): 11 feet 10 inches (3.6 m).
    - Length of panels: 30 feet (9.1 m) nominal (actual 30 feet 0.5 inch to 30 feet 4.75 inches (9.2 to 9.3 m).
    - Panels to be set over the prepared base using leveling lifts incorporating bearing plates placed over the base.
    - Leveling lift system (see figure 6 for details).
        - Two plates per panel, positioned near mid-panel and at end opposite to the bridge backwall.
        - Three 2-inch-diameter (50-mm-diameter) threaded leveling bolts per plate, equally spaced along the width of the plate.
        - Plate thickness: 1 inch (25 mm).

- Plate width: Full width of each panel. Full-width panels were used to reduce the bearing stress on the base.
- Plate length: 4 feet (1.2 m).

- Base for the BAS
  - Removal of the existing base and grading and compaction of new granular base. Geogrid placed between the new base and subgrade.
  - Two layers of 12 mil (0.31 mm) plastic placed over the graded and compacted base.
- Longitudinal joint grout: A minimum compressive strength of 2,500 psi (17.2 MPa) before the panels are open to traffic and a minimum 28-day compressive strength of 5,500 psi (37.9 MPa) at 28 days.
- Panel bedding grout: A minimum 28-day compressive strength of 5,500 (37.9 MPa) psi at 28 days.
- Transverse posttensioning system:
  - Posttensioning bar diameter: 1 inch (25 mm).
  - No. of bars: 7.
  - Bar spacing: 3 feet 10.25 inches (1.17 m).
  - Final applied load per bar: 57,800 pound-force (257 kN-force).
  - Posttensioning duct filler: Wax-based filler.

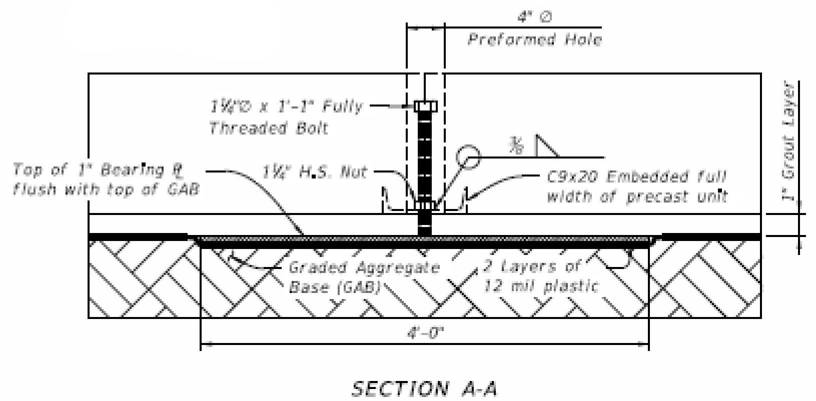

Figure 6. Diagram. Leveling lift details.

Reinforced Precast Panels

Panels were designed as structurally reinforced panels. The reinforcement details for the four panels are shown in figure 7 for Panel A, in figure 8 for Panel B, and in figure 9 for Panels C and D. The keyway details for the longitudinal joints between panels are shown in figure 10. The details of panel anchoring to existing bridge backwall are shown in figure 11.

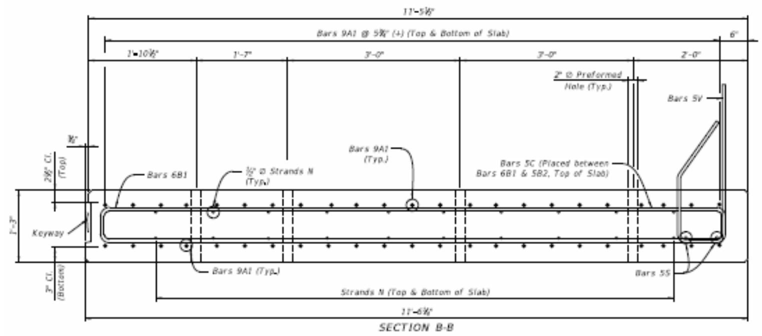

Figure 7. Diagram. Reinforcement details for Panel A.

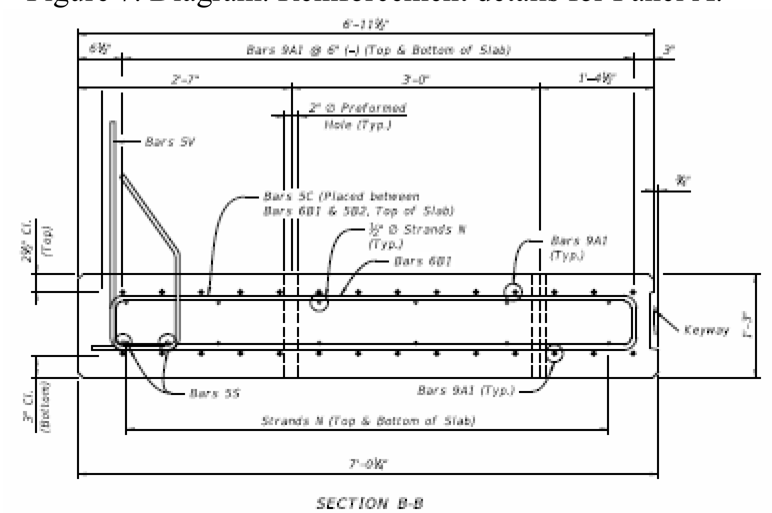

Figure 8. Diagram. Reinforcement details for Panel B.

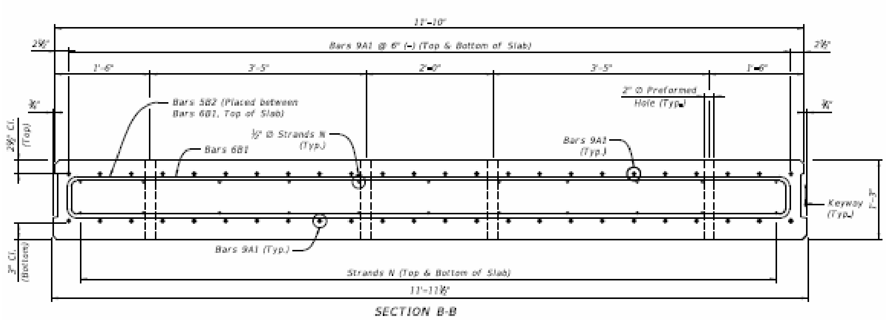

Figure 9. Diagram. Reinforcement details for Panels C and D.

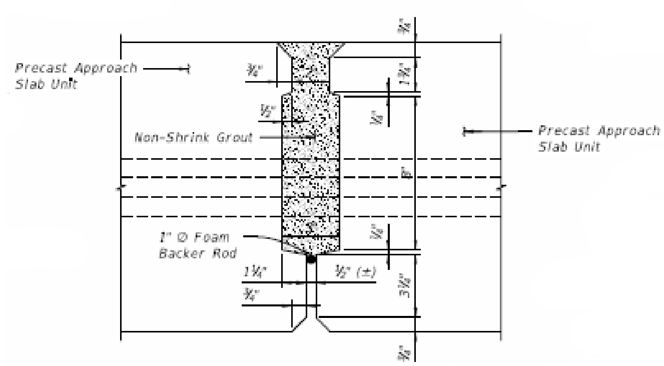

Figure 10. Diagram. Longitudinal keyway details.

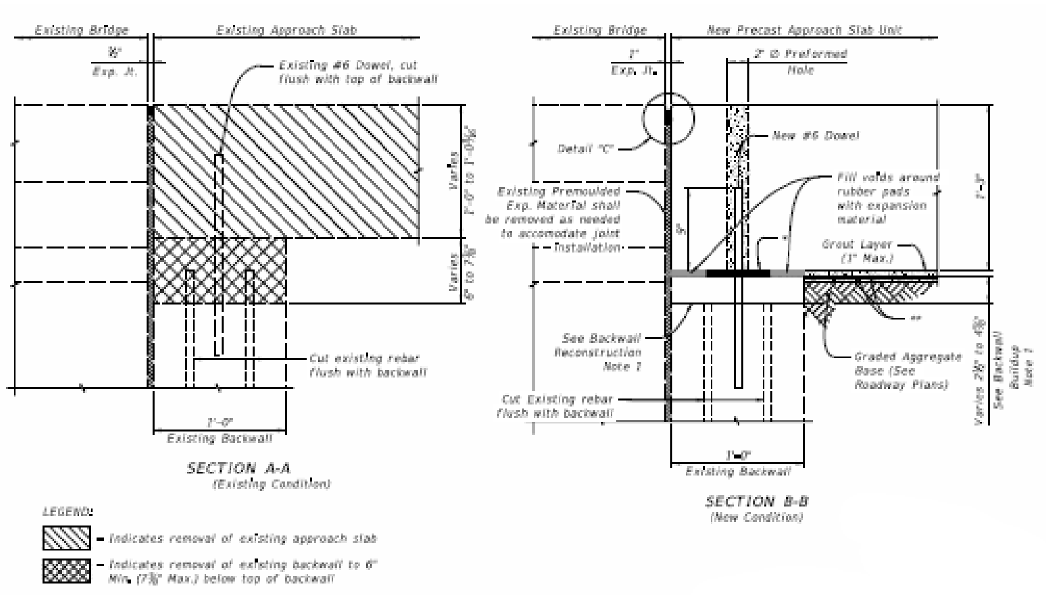

Figure 11. Diagram. Details of panel anchoring to existing bridge backwall.

PANEL FABRICATION

The panels were fabricated based on shop drawings prepared by ACEF and approved by FDOT. The panels were fabricated at the precaster's plant located in Leesburg, Florida, about 250 miles (402.34 km) from the project site. The concrete was produced at the precast plant. As part of the panel fabrication process, the concrete was regularly tested for fresh properties and for strength.

As required by the project specifications, a panel fit-up test installation was carried out at the precast plant on March 27, 2018, to demonstrate constructability and fit-up for the four panels. The objective of the fit-up installation was to demonstrate how the panels would be installed using the equipment and processes to be used at the project site. However, the panels were fit together using available equipment. The four panels fitted together at the precast plant are shown in figure 12. Figures 13 and 14 show the longitudinal joint details. Figure 15 shows the posttensioning anchorage and the tendon duct details.

Figure 12. Photo. Mock setup of the four panels at the precast plant.

Figure 13. Photo. Longitudinal joint detail.

Figure 14. Photo. Close-up detail of the longitudinal joint at the tendon duct location.

Figure 15. Photo. Posttensioning anchorage and the tendon duct details.

CONSTRUCTION STAGING AND TRAFFIC-RELATED REQUIREMENTS

Panels were shipped from the precast plant located in Leesburg, Florida. The panels were stored at the precast plant and delivered to the project site a few days before the planned installation of each panel. At the project site, the panels were stored in the median area adjacent to the BAS. Figure 16 shows Panels A and B stored in the median area.

Figure 16. Photo. Panels A and B stored along the median.

The contract specifications required at least one lane to be opened to traffic while the panels were being installed. The temporary traffic control plans for each panel installation are shown in figures 17 to 20. These figures show the phasing looking east. The phasing shown for Panels C and D was developed for panel installation to be completed at night and with two travel lanes operational during the daytime.

Before the panel installation work started, FDOT conducted public awareness activities related to possible disruption to nighttime traffic traveling westbound along I-10 near Quincy.

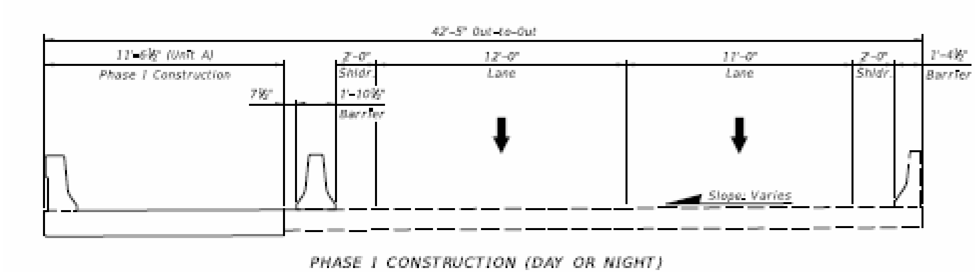

Figure 17. Diagram. Traffic management plan for Panel A installation (Phase 1 construction).

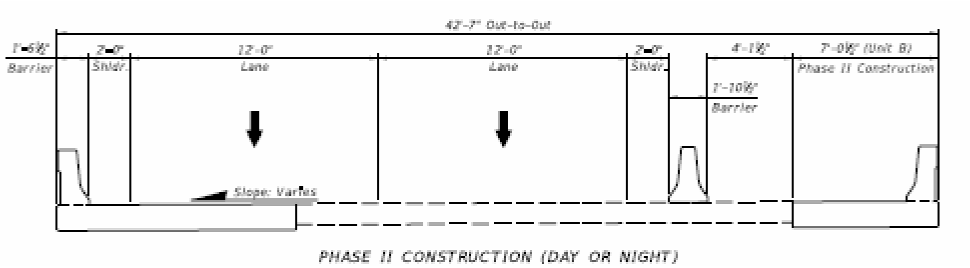

Figure 18. Diagram. Traffic management plan for Panel B installation (Phase 2 construction).

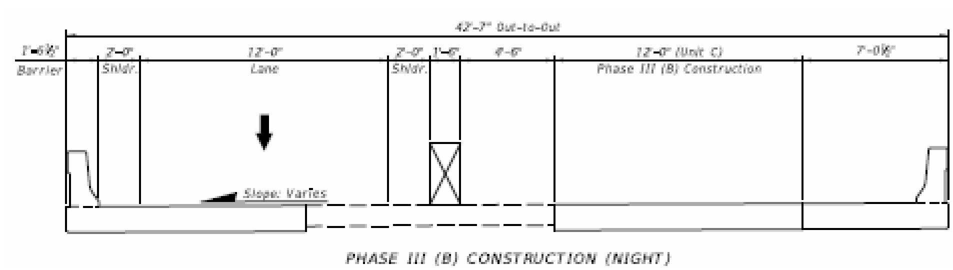

Figure 19. Diagram. Traffic management plan for Panel C installation (Phase 3 construction).

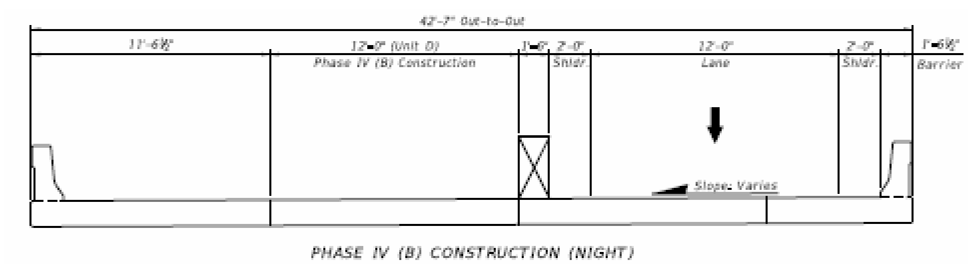

Figure 20. Diagram. Traffic management plan for Panel D installation (Phase 4 construction).

PANEL INSTALLATION

Panel installation was begun in April 2018 and was completed during June 2018. The planned installation had to be postponed on several occasions due to inclement weather.

The following are the installation steps for the BAS panel system used at the project for each phase of the panel installation:

1. Remove existing bridge approach slab section for the lane being replaced.

2. Remove the existing base.
3. Repair the backwall seat using a high early strength patching material and drill holes along the repaired backwall seat for the anchor rods, as shown in figure 21. Place neoprene pad over the backwall seat.
4. Grade and compact the subbase and place geogrid, as shown in figure 21, over the subbase.
5. Place new base, compact and grade. See figure 22.
6. Place the polyethylene sheet over the base.
7. Place the leveling lift bearing plates over the polyethylene sheet. Figure 23 shows the bearing plates placed over the polyethylene sheet.
8. Place the panel, supported at the backwall seat and over prepared base layer using the leveling bolts positioned over the bearing plates.
9. Maintain the longitudinal joint widths as specified.
10. Adjust the elevation of the panel, using leveling bolts, to specified surface elevation.
11. Install and grout anchor bolts (dowels) along the backseat wall seat.
12. Perform finishing activities.
13. Open to traffic.

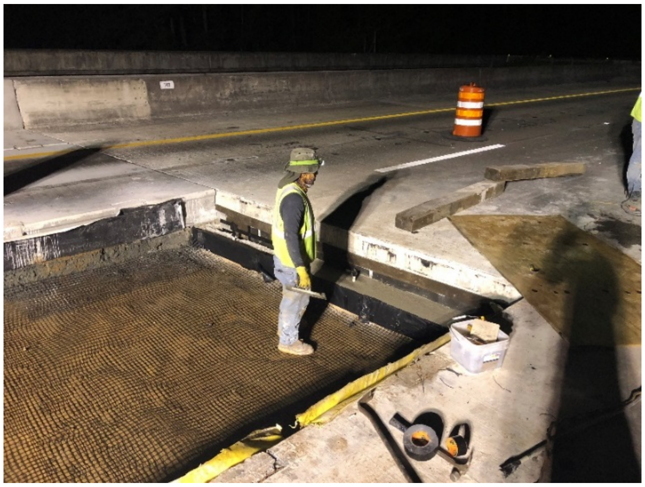

Figure 21. Photo. Backwall seat repair.

Figure 22. Photo. Base preparation.

Figure 23. Photo. Bearing plates placed over the polyethylene sheet.

For the mainline panel installation, a lane-wide 2-ft (0.6 m) length of the existing BAS was removed first to allow repair of the backwall seat. The hole was to be covered up using steel plates during the next day's traffic operation. However, the contractor was allowed to continue to work during the daytime and to proceed with removal of all concrete in the affected lane and preparing the base.

Phase 1 (Panel A) Installation

Panel A for the outside shoulder was planned to be installed during the night of April 17, 2018. However, during a safety review of the crane operation, it was determined that the crane was under-capacity by about 4, 000 lb (1,814 kg), considering the actual panel weight and the swing distance from the median, where the crane was positioned, to the outside shoulder location. As a result, panel placement was postponed pending the availability of a larger capacity crane. Panel A was subsequently installed during the night of April 21, 2018, using a 220,000-lb (99,790-kg) capacity crane. Figure 24 shows Panel A being installed.

Figure 24. Photo. Panel A being installed.

Phase 2 (Panel B) Installation

Panel B for the inside shoulder was installed during the night of May 7, 2018. Figure 25 shows Panel B being installed.

Figure 25. Photo. Panel B being installed.

Phase 3 (Panel C) Installation

Panel C for the inside travel lane was installed during the night of June 5, 2018. Figure 26 shows Panel C being installed.

Figure 26. Photo. Panel C being installed.

Phase 4 (Panel D) Installation

Panel D for the inside shoulder was installed during the night of June 17, 2018. Figure 27 shows Panel D being installed.

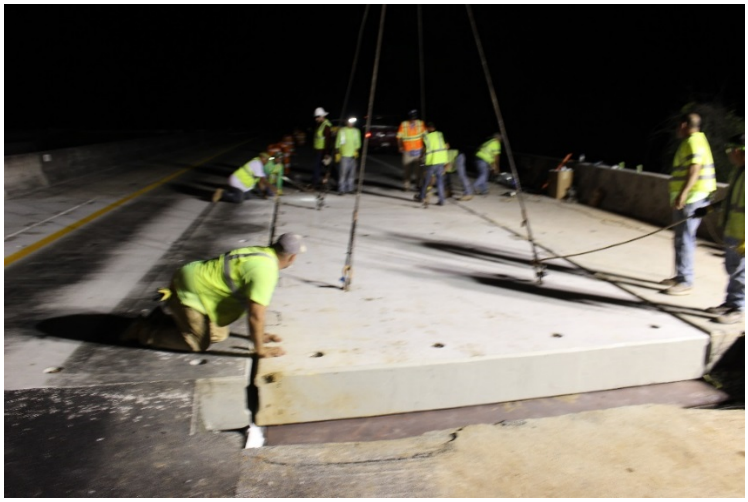

Figure 27. Photo. Panel D being installed.

Phase 5 Activities

Several activities were performed during Phase 5.

Longitudinal double keyway joints were filled with high-strength grout, as shown in figure 28.

Figure 28. Photo. Longitudinal joint grout installation.

Next came posttensioning of the tendons. The contract specification required a mockup testing to verify that the tendon duct system was leakproof and that the ducts would be fully grouted with the wax-based filler to ensure adequate corrosion protection to the tendons. Figure 29 shows the mockup to simulate the ducts in the panels and the grouting process.

Figure 29. Photo. Mockup to simulate the ducts in the panels and the grouting process.

The mockup testing was conducted on June 26, 2018. The tendons were posttensioned on June 27, 2018. Figure 30 shows the posttensioning jack applying load at an anchor plate.

Figure 30. Photo. Posttensioning jack applying load at an anchor plate.

The bedding grout was installed under the panels after the posttensioning operation was completed.

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After all finishing and cleanup activities were completed, a coating of high molecular weight methacrylate was applied over all four panel surfaces to seal the concrete surface.

LESSONS LEARNED

This project was an important first step in the implementation of precast panel use for BAS rehabilitation. Based on the experience gained at the I-10 BAS project, the FDOT expects to review the provisional specifications and plans and incorporate appropriate modifications to improve the efficiency and quality of panel placement. Some of the items that will be addressed are described below. During July 2018, after receiving feedback from several parties involved in the project, FDOT staff identified the following items to avoid delays in construction, minimize the possibility of requests for information, reduce costs, and ensure smoother production of future projects.

1. Clearly describe the mandatory demonstration requirements at the pre-bid meeting. Ensure the contractor is fully aware they will need to use the same equipment that they anticipate using on the project site to perform the staging and placement of the panels. The project site dimensions will be used to verify the contractor can operate within the same limited space that they will experience in the field.
2. Posttensioning system requirements will be coordinated through the Structures Design Office to ensure the contractor can meet FDOT's specifications and gain approval before the slabs are produced in the precast yard.
3. Incorporate adequate barrier wall quantities to ensure protection for contractor's staging and storage areas.
4. Anticipate all possible crane operating locations to limit or eliminate picks over traffic (include rolling road blocks if needed and have pay items in the plans to give the contractor all options.)
5. Verify there will be clearance around the leveling bolt heads to fit a socket or other tool to adjust the leveling bolts.
6. Clarify the method desired for preparing the surface prior to applying the high molecular weight methacrylate.
7. Field verify the alignment of the security clips between the existing and new slabs to ensure no cracks or unsound concrete would require a field modification.
8. Treat such projects different from traditional projects giving more direction in the method of installation. Allow the contractor to offer other methods if they have a more efficient or easier approach.
9. Do not use the temporary steel riding plate and allow the contractor up to 24 hours to carry out the travel lane panel replacement portion of the project.
10. Let the contract in the late summer to have the construction fall into early fall, including the procurement period for the BAS precast panels.
11. Ensure the contractor builds up the backwall or wing walls to match the actual field measurements of the slab and not the thickness required by the plans.
12. Ensure the available grout on the approved list can be poured in one lift at the required depth and reach strength in the time required to place the panels and open the lanes back to traffic. Possibly require contractor to demonstrate their ability to produce needed strength using the same methods and materials they will mix in the field.
13. Be sure to coordinate with resurfacing jobs in the area to see if it would be appropriate to connect the new asphalt pavement to the bridge approach slab project limits.

14. Ensure that there are enough parallel barrier wall units during the shoulder panel installation to allow for equipment to enter and exit the work area.
15. Require straight joint edges verses chamfered on longitudinal joints to ensure grout will not spall shortly after filling the joint with grout.
16. Specify a higher class of concrete for traffic railing to get high early strength.
17. Ensure inside edges of existing bridge barrier wall and the new approach slab barrier wall have a flush alignment (taper edge of new wall if needed).
18. Ensure strength tests are specified for all materials that are used, either spelled out in ASTM or other industry standards.
19. Specify the minimum material strengths requirements for all materials before lanes can be open to traffic (e.g., grout in joints, backwall repair material, anchor hole grout).

According to the FDOT project staff, the overall goal of the project to reduce daytime lane closures on I-10 was accomplished despite the issues encountered during construction. Traditional BAS projects have 14 days of lane closures, while this approach only had 2.5 days to allow for continuous construction during the travel lane panel placements.

SUMMARY

The use of PC panels to rehabilitate a distressed BAS along I-10 was an important step for FDOT. This was the DOT's first use of precast panels for rehabilitation of a BAS, and they expect to use the experience and findings from this demonstration project to refine specifications and plans for production use of precast panels at future BAS rehabilitation projects along roadways with high traffic volumes, where work can only be performed during short lane closures and where treatments need to provide long-life service.

The I-10 BAS rehabilitation project is considered a successful implementation of the new technology on a production basis by an agency that had not previously used precast panels to rehabilitate distressed BAS. Florida DOT is currently planning several BAS rehabilitation projects that will use precast panels and will incorporate findings and experience from the I-10 project to refine the plans and specifications and improve efficiency of panel installation.

The completed BAS is shown in figure 31.

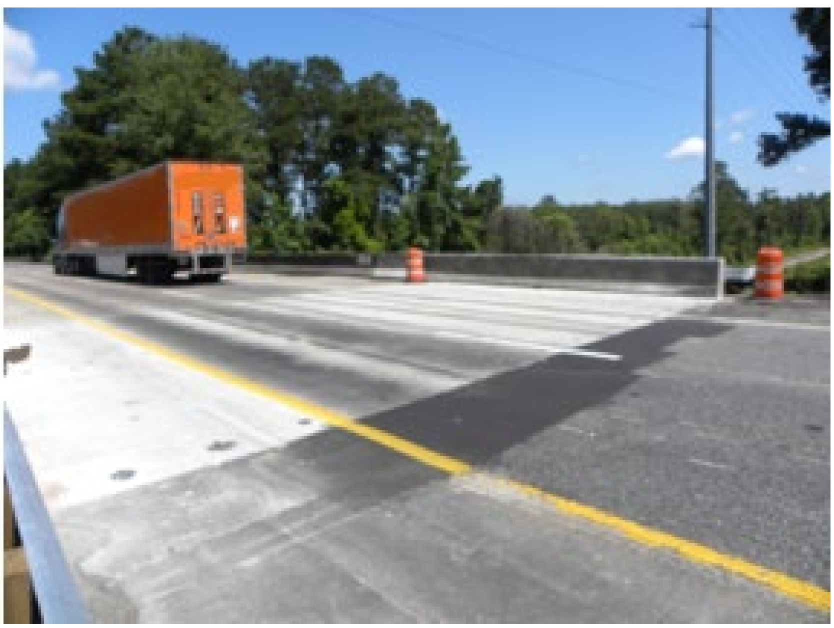

Figure 31. Photo. Completed bridge approach slab.

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