In the past five years, the use of precast, prestressed concrete pavement (PPCP) has been advancing rapidly. Completed projects in Texas, California, Missouri, and Iowa have shown that PPCP is not only viable and cost competitive, especially when life-cycle costs are considered, but also possesses some distinct advantages. A new project involving bridge approach slabs in Iowa shows the concept has even more versatility.

First and foremost among PPCP’s benefits is speed of construction. Highways can be opened to traffic as soon as the panels are installed, without waiting for the concrete to reach its specified strength, as would be required for conventional cast-in-place construction. The installation also can be done at night and during nonpeak traffic hours, without having to rely on favorable weather conditions. Experience has shown that the construction season can be extended in northern states.

**Prestressing Adds Benefits**

Pretensioning the panels in the plant and post-tensioning on-site induces compression in the concrete, effectively preventing cracking. Prestressing also provides significantly thinner slab sections. A recent project in Texas used precast panels as thin as 8 in., compared to 14-in.-thick conventional cast-in-place concrete pavement.

The thinner sections require less material, which saves costs and permits “in-kind” replacement of existing pavement. Being lighter, the panels provide easier handling; being thinner, they reduce the overall thickness of the pavement sections, which provides greater clearances beneath underpasses. Prestressing also permits longer sections of pavement to be constructed between expansion joints, requiring fewer expansion and contraction joints overall.

Because the panels are fabricated under plant-controlled conditions, the products offer high quality, resulting in pavements that are strong, durable, long lasting, and virtually maintenance free. All these benefits combine to create a highly cost-effective project when costs are considered over the full life cycle. Although initial costs may be higher, the lifetime costs will be significantly lower.

The potential of PPCP has not gone unnoticed. The Federal Highway Administration (FHWA) has already funded four PPCP demonstration projects and several more are on the drawing boards. Also, the Precast/Prestressed Concrete Institute (PCI) has established a technical committee on PPCP. In October 2006, it conducted sessions on PPCP from the viewpoint of both the owner and the precaster at the PCI Convention in Grapevine, Texas.

**Iowa Approach Slab Project Underway**

The latest application of PPCP, which focuses on bridge approach slabs, is currently underway with the sponsorship of the FHWA and the Iowa Department of Transportation. Instrumentation and monitoring are being carried out by researchers at Iowa State University at the Bridge Engineering Center in Ames, Iowa. The project is one of several demonstration projects being conducted as part of the FHWA Concrete Pavement Technology Program.

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**Iowa Highway 60 / O’Brien County, Iowa**

**SPONSORS:** Federal Highway Administration, Washington, D.C.
Office of Bridges and Structures, Iowa Department of Transportation, Ames
Iowa Highway Research Board, Ames (instrumentation and monitoring)

**RESEARCHER:** Iowa State University Bridge Engineering Center, Ames
The demonstration project in O’Brien County, Iowa, uses precast, pretensioned and post-tensioned concrete approach slabs.

The cost of casting the panels for the Iowa DOT project was approximately $190,000, or $44 per ft² compared to $13 per ft² for cast-in-place double reinforced approach pavement. This higher cost was anticipated, however, due to the experimental, small-scale nature of the project. As contractors become more familiar with precast paving techniques, and as the projects become more plentiful, the initial cost will steadily decrease—and the true value of this system will be seen in the life-cycle benefits.

The performance and evaluation of the precast and cast-in-place slab sections will be monitored by the Iowa State University Bridge Engineering Center. The final results of the Iowa study will not be known for some time but it is expected that the precast system will provide a viable solution for rapid reconstruction of bridge approach slabs.

For More Information
A comprehensive report on a PPCP project in California by David K. Merritt, B. Frank McCullough, and Ned H. Burns was published in the PCI Journal, Vol. 50, No. 2, March-April 2005, pp. 18-27. The article is titled “Design-Construction of a Precast, Prestressed Concrete Pavement for Interstate 10, El Monte, California.” Copies are available from PCI at wwwpci.org or info@pci.org.

For more information on this or other projects, visit www.aspirebridge.org.
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