

PRECAST CONCRETE PAVEMENTS – ISN'T IT ABOUT TIME?

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ABSTRACT

Precast concrete has been around for more than half a century and is used everyday in the bridge and building industries. So why not for pavements? This is the question that the Federal Highway Administration (FHWA) is making vast strides to resolve through precast pavement “demonstration projects” constructed throughout the country. Why demonstration projects? These projects offer a State Department of Transportation (DOT) an opportunity to examine precast pavement technology and allow local contractors to become more familiar with the technology. While most demonstration projects are located in rural areas where interference with traffic can be minimized, the ultimate goal for FHWA and the DOTs is to implement the precast concrete pavement technology on a large scale in urban areas where it is needed the most.

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BENEFITS OF PRECAST PRESTRESSED CONCRETE PAVEMENT

Why use precast prestressed concrete pavement? There are a number of potential benefits, some of which are described in the following paragraphs.

REDUCED CONSTRUCTION TIME

The primary reason for FHWA's investigation of precast concrete pavement was the need for construction techniques that will allow state highway agencies "get in, do it right, get out, and stay out." One of the problems with conventional PCC pavement is the curing time required for the pavement to reach adequate strength to open it to traffic. Precast concrete panels are cast and cured prior to installation, ensuring that they will have the necessary strength to open to traffic immediately after placement. This benefit allows construction to take place during overnight or weekend operations, minimizing the disruption to the public.

IMPROVED PERFORMANCE

It's not enough just to have a pavement solution that permits rapid construction and opening to traffic. The solution must also be long lasting so that State DOTs can "stay out" of the public's way. Any rapid pavement repair/rehabilitation solution should provide at least the same design life as the surrounding pavement, and any solution for new construction should provide a minimum 30- to 40-year design life with minimal maintenance. While the precast prestressed pavements constructed to date are only a few years old, several cast-in-place prestressed pavements have demonstrated the long-term performance benefits of such pavements. Most notably, a cast-in-place post-tensioned pavement constructed on Interstate 35 near Waco, Texas, has demonstrated excellent performance for more than 30 years under very heavy truck traffic.

REDUCED USER COSTS

The primary economic benefit of precast concrete pavement will be realized through savings in user costs. User costs are costs incurred by the users of the roadway due to construction activities and pavement conditions. User delay costs are accumulated when construction activities cause traffic congestion. These costs can be substantial, as demonstrated by the original FHWA feasibility study for precast / prestressed pavements, which estimated daily user delay costs to be as high as \$383,000/day for a 24-hour/day lane closure versus only \$1,800/day for a nighttime lane closure. Precast pavement permits nighttime construction. Likewise, user costs resulting from poor pavement condition can be substantial.

REDUCED SLAB THICKNESS AND BASE PREPARATION

In addition to improving pavement performance, a prestressed concrete pavement also has a significant reduction in slab thickness compared to conventional jointed plain slip-formed concrete pavements. The stresses in a thinner pavement slab can be reduced to that of a much thicker slab by putting the slab into compression during construction

through pretensioning and/or post-tensioning. This provides a significant reduction not only in materials, but also in the thickness of the pavement section, which is beneficial for replacing pavements under bridges or other structures where overhead clearance is limited.

Prestressed pavement also permits placement over non-ideal base materials. Prestressed concrete panels are able to span over small voids and unsound (“soft”) base materials. This permits installation of precast pavement panels over a base that may not be perfectly flat and over a base material that may not be ideal in terms of support characteristics.

EXTENSION OF CONSTRUCTION SEASON

An additional benefit that should not be overlooked is the ability to install precast pavement under non-ideal weather conditions. The extreme hot and cold temperatures that would normally prohibit cast-in-place pavement construction will not inhibit precast pavement construction, potentially extending the paving construction season significantly.