

**PAVEMENT TECHNOLOGY ADVISORY
- UNBONDED CONCRETE OVERLAY -
PTA-M2**

WHAT IS AN UNBONDED CONCRETE OVERLAY?

An unbonded concrete overlay is essentially a new concrete pavement constructed over an existing concrete pavement. A flexible interlayer, typically constructed of hot-mix asphalt (HMA), separates the concrete layers, as shown in Figure 1. The flexible interlayer acts as a shear zone, allowing the concrete layers to move independently of each other, and preventing reflective cracking in the concrete overlay. For this reason, the term “unbonded” is used, although the layers do bond in the sense of adhering together.

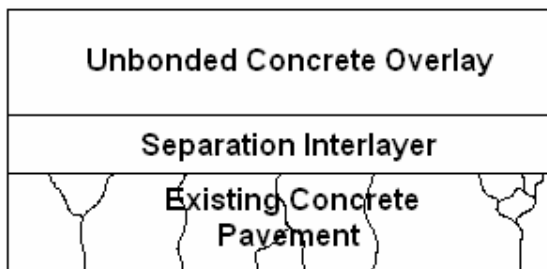


Figure 1: Unbonded Concrete Overlay Cross Section

An unbonded concrete overlay is a viable option for structural rehabilitation of deteriorated HMA-overlaid concrete pavements, and is particularly effective in controlling reflective cracking over unpatched D-cracked pavements. The overlay pavement can be jointed-plain concrete, jointed-reinforced concrete, or continuously-reinforced concrete [abbr. JPC, JRC, and CRC, respectively] (see [PTA-D3](#)). Only CRC unbonded over-

lays have been documented by the Bureau of Materials and Physical Research (BMPR).

STATUS IN ILLINOIS

The Illinois Department of Transportation (IDOT) constructed three unbonded CRC overlays in the late 1960's and early 1970's. The projects were constructed on westbound Interstate 70 (I-70), west of Pocahtontas; Interstate 55 (I-55), south of Springfield; and I-55, north of Springfield. All three overlays performed well for over 20 years before requiring major rehabilitation.

A more recent project was constructed in 1995 on westbound Interstate 74 (I-74), near Galesburg. A detailed account of this project is contained in IDOT [Physical Research Report No.140](#). This unbonded CRC overlay has performed well to date. Low severity transverse cracks, normal for CRC pavements, are the most common pavement distress.

Unbonded CRC overlays were constructed on Interstate 88 (I-88) in Whiteside County, and on I-70 in Clark County in 2001 and 2002, respectively. These pavements are also being monitored and have performed well to date.

THICKNESS DESIGN

Design inputs include the thickness and condition of the existing pavement, design traffic, design life, subgrade support and drainage conditions. A preliminary but reasonable estimate of required overlay

thickness can be determined by subtracting 1-inch from the thickness of a new CRC pavement calculated using Chapter 54 the IDOT [Bureau of Design and Environment Manual](#) and the appropriate design inputs.

IDOT currently recommends the use of unbonded CRC overlays with a minimum thickness of 7 inches. Typical thicknesses are in the range of 9 to 10 inches for most interstate pavements. The design steel percentage should be the same as for new CRC pavements.

In order for the concrete pavements to act independently, the interlayer must be thick enough to allow shear, therefore a minimum HMA interlayer thickness of 4 inches is recommended in Illinois. Existing HMA overlays can be used as the interlayer, but depending on the original pavement type, and the thickness and condition of the existing HMA overlay, additional interlayer thickness may be required. The appropriate interlayer thickness should be determined on a case-by-case basis.

CONSTRUCTION

No special equipment is necessary for constructing an unbonded concrete overlay, but extra care must be taken in surface preparation of the existing pavement. Certain severe distresses such as punchouts, failed patches, and areas of pumping must be repaired prior to the concrete overlay construction.

For unbonded overlays of HMA overlaid concrete pavements, areas of severe rutting exceeding 0.5 inches should be milled or otherwise corrected before placing the concrete overlay. Steel placement and concrete paving are the same as for new concrete construction.

If the concrete overlay is placed between June 15 and September 15, any freshly placed HMA interlayer must be white-washed. The black surface absorbs heat, leading to faster concrete setting times and potential shrinkage cracking in

the concrete overlay. Existing HMA overlays used as interlayers are sufficiently light in color from aging, and thus do not require whitewashing.

SPECIAL CONSIDERATIONS

Grade alignments over at-grade structures and vertical clearance at overhead structures are important considerations for determining if an unbonded concrete overlay as a suitable rehabilitation alternative. Rural sections without overheads are ideal locations for unbonded overlays.

Due to the increase in pavement grade, side slopes must be modified, possibly requiring variances from existing policy. Such variances must be requested from the Bureau of Design and Environment (BDE). An additional consideration is how the overlay will be tied into the adjacent bridge or pavement sections. Terminal treatments ranging from a lug system (see [PTA-D3](#)) to special treatments that taper into existing sections may need to be detailed.

PROJECT DEVELOPMENT

Approval for the use of an unbonded concrete overlay must be obtained from BDE, and an experimental features work plan filed with BMPR. BMPR should be contacted for assistance in developing overlay thickness designs, interlayer thickness requirements, and terminal treatments.

If you have any questions, please contact:

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