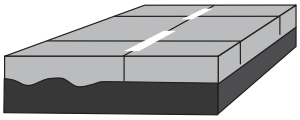
Targeted Overlay Pavement Solutions (TOPS)

Targeted overlays fit the treatment to the condition of the existing pavement.

U.S. Department of Transportation
Federal Highway Administration

Unbonded Concrete on Asphalt



Minnesota

A 6.4-mile-long unbonded concrete overlay was placed on County State-Aid Highway 3 (CSAH 3) in McLeod County, Minnesota, approximately 60 miles west of the Twin Cities. CSAH 3 is a major collector and a primary connection between the city of Glencoe and Trunk Highway 15 (TH 15) to the west; the road services many farm-to-market haulers. Additionally, CSAH 3 features several horizontal curves.

The existing bituminous roadway was 24 feet wide with 8-foot-wide aggregate shoulders. **The overlay project involved milling the existing 9-inch asphalt pavement to a designed profile and cross slope to improve the ride and correct deficient superelevation transitions** associated with the existing horizontal curves. The concrete overlay design consisted of 6 inches of undoweled plain concrete jointed in 6-by-6-foot panels with a tied shoulder, all of which was placed in a single 32-foot-wide operation.

Placing concrete on milled surface *(ACPA)*

CSAH 3 open to traffic *(ACPA)*

Missouri

A 9-mile stretch of I-44 near Rolla, Missouri, part of the main connector between the Lake of the Ozarks and St. Louis, was in need of resurfacing. With the Lake of the Ozarks being a major recreation and vacation destination, construction-related traffic delays were a major concern; therefore, the contract specified 90 calendar days for completion. Two miles of the project involved milling 11 inches of the existing asphalt pavement and inlaying an 11-inch concrete overlay. Seven miles of the project involved placing an 8-inch unbonded concrete overlay using a geotextile fabric as the separation layer. **The contractor paved 219,137 square yards of concrete in 47 days and turned over the project to the State in 66 days.**

Placing second pass of concrete *(ACPA)*

I-44 open to traffic *(ACPA)*

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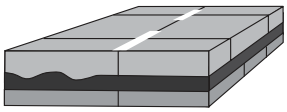
Unbonded Concrete on Composite



Iowa

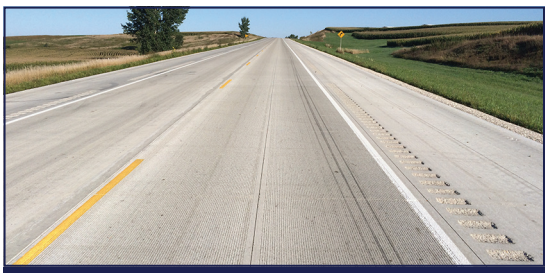
US 59 is a major north-south artery in Iowa. A 12.3-mile section south of Cherokee County that was carrying approximately 6,300 vehicles per day in 2014 was experiencing **thermal cracks, failing joints, severe joint roll-down, and bottom-up cracking**. The original 7.5-inch concrete slab, constructed in 1937, had been overlaid twice with a total of 6.5 inches of asphalt. To remedy the distresses and the associated poor ride quality, the Iowa Department of Transportation let a two-stage project to mill the existing pavement and place 310,000 square yards of a 6-inch unbonded portland cement concrete overlay. The contract allowed 120 working days for the project, with an incentive/disincentive of $7,500 per day.

The pavement cross-section design consisted of two 12-foot-wide lanes with 10-foot-wide concrete shoulders. For staging purposes, the contractor chose to pave in two 22-foot-wide passes. The existing asphalt surface was milled for grade control, and dump trucks placed the concrete for the overlay directly in front of the paver. Six-foot #4 tie bars were stapled transversely to the surface during this operation at the interface between the driving lane and the shoulder. Early-entry saw cutting was used to create 6-by-6-foot joints on the mainline section.

To minimize traffic detours during construction, several operations were conducted using a pilot car and flaggers. These operations included concrete patching, subdrain installation, and milling. A stringline was set for the milling operation to profile the existing roadway and ensure milling accuracy.

Stage 1 construction included 208,000 square yards of concrete paving and involved establishing a detour route. This stage was not to exceed 49 calendar days. Even with 13 inches of rainfall during the operation, however, the closure for Stage 1 was only 35 days, which illustrates a benefit of concrete overlays compared to reconstruction. Stage 2 construction included full-depth turning lanes and intersections phased in with the paving operation and was allowed only 28 calendar days. The 102,000 square yards of concrete paving for Stage 2 was completed in only 19 days. **Only 82 of the 120 working days allowed by the contract were needed, which reduced traffic disruption and inconvenience to the public.**

Placing 6-inch concrete overlay on geotextile *(Iowa DOT)*



US 59 open to traffic *(Iowa DOT)*

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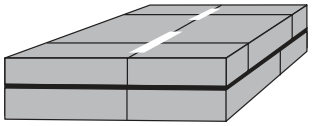
Unbonded Concrete on Concrete



Illinois

An innovative project constructed in 2015 on a 3.2-mile-long section of I-72 just east of Springfield, Illinois, was the **first structural fiber-reinforced unbonded concrete overlay in the State**. This section of I-72 is a main east-west corridor that links Springfield with Decatur and Champaign, Illinois, as it winds east to connect I-74 to Indianapolis, Indiana. Due to the nature of the route, it carries a moderate amount of semitruck traffic transporting local cargo loads. The average daily traffic as noted in the project plans is 14,000 vehicles per day with 21 percent trucks.

The project incorporated a "big-block" design featuring a 6-inch-thick overlay section and 6-by-6-foot joint spacing. The eastbound roadway and shoulders used a classic 1⅜-inch hot-mix asphalt (HMA) separation layer. The westbound section incorporated a geotextile separation layer fastened in place by a simple adhesive system consisting of an emulsion tack coat and concrete fasteners where needed. Cost savings were seen for the westbound geotextile-separated section relative to the eastbound HMA layer section.

Placing overlay on geotextile *(ACPA)*

I-72 open to traffic *(ACPA)*

North Carolina

In March 2007, work began on a **design-build** project on a section of I-77 in Yadkin County, North Carolina. The project involved constructing an unbonded concrete overlay over an existing concrete pavement. The overlay design consisted of a 1½-inch asphalt separation layer and 11 inches of doweled jointed concrete pavement. This design used existing reinforced concrete roadway, thereby maximizing the original pavement investment of the North Carolina Department of Transportation.

Placing 11-inch overlay pavement *(ACPA)*

I-77 open to traffic *(ACPA)*

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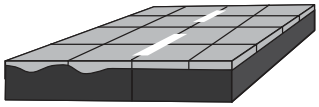
Bonded Concrete on Asphalt



Oklahoma

In 2016, the Oklahoma Department of Transportation (ODOT) designed a 3-inch asphalt overlay to resurface a 5.52-mile section of SH-51 in Blaine County. The project went to bid two times, but because high asphalt oil prices inflated the bid costs and only one bid was received for each letting, ODOT did not accept the bids. Since concrete pavement may last longer than asphalt, and the cost of concrete with fiber may be competitive with the cost of asphalt, ODOT decided to redesign the project as a 5-inch portland cement concrete overlay. Let with the new design, ODOT received four competitive bids. Moreover, by changing this project from an asphalt to a concrete overlay, ODOT received a **pavement that was 2 inches thicker with a projected 20-year lifespan at a more competitive price**.

The final design for the SH-51 Blaine County project called for the placement of a 5-inch bonded concrete overlay with fiber mesh over an existing milled asphalt pavement. The contractor was able to use a trimmer capable of milling or trimming off at least 1 inch of asphalt over a width of 16 feet on a single pass, thus tightly controlling the product yield to a minimal percentage. The project was let and bid on, and contracts were awarded. Construction was completed in roughly 90 days.

Placing concrete on milled surface *(ACPA)*

SH-51, November 2020
(Brent Burwell, OK/AR ACPA)

Illinois

East Carroll Street, a highly traveled one-way street through a residential neighborhood in Macomb, Illinois, is a common route to schools, stores, and restaurants. After years of maintenance, East Carroll Street was in need of serious rehabilitation or reconstruction. In 2013, **to reduce costs and provide a sustainable solution**, a bonded 4-inch composite concrete overlay system was selected for East Carroll Street as an alternative to removing and replacing the pavement. The street width was increased to 23 feet to provide for on-street parking and a bicycle lane. The existing surface was milled at a variable depth to adjust the profile and fix existing cross slopes where possible. The new pavement was structural fiber-reinforced concrete (4 pounds of fiber per cubic yard of concrete) with a 4-foot square saw cut pattern.

Placing 4-inch concrete pavement *(ACPA)*

East Carroll Street open to traffic *(ACPA)*

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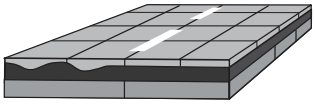
Bonded Concrete on Composite



Iowa

In 2011, the Iowa Department of Transportation constructed its first concrete overlay on a two-lane roadway **while maintaining through traffic**. The project was on an 18.82-mile section of US 18 in northeastern Iowa. The original 1938 concrete pavements that comprised this section were built 18 and 20 feet wide and had received several asphalt overlays totaling 6 inches over the years.

Variable milling to a depth of ½ to 1½ inches was performed to establish a grade profile. To accommodate a wider cross section, existing asphalt shoulders were removed and replaced with full-depth concrete slabs placed monolithically during the paving operation. The paved shoulders were 8 inches thick, and the mainline overlay was 4½ inches thick.

Contract specifications called for work zone lengths of 2 miles for subdrain and patching work. Bridge work was performed using a single lane of traffic controlled by traffic signals. For the overlay paving and shouldering work, a 3.5-mile work zone was allowed with a single lane of traffic and the use of a pilot car.

The project was paved with stringless total station control for the first half-width pass. A safety wedge was used at the centerline for the first pass, with a fabric placed under the wedge to accommodate its later removal. The second pass was paved with one leg up on the newly placed pavement, locked to grade, with stringless total station control on the shoulder side.

Communication was key. Before project paving began, an informational meeting was held for the cities, businesses, and residents affected by the project. Updates regarding upcoming schedules were posted on social media.

Second pass of paving operation *(ACPA)*

US 18 open to traffic *(Iowa DOT)*

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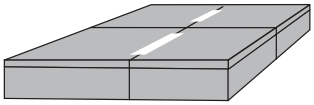
Bonded Concrete on Concrete



Kansas

A mill-and-fill pavement rehabilitation project for an 8-mile stretch of pavement on I-70 two hours west of Kansas City, Kansas, was completed in 2014. The original pavement was a mesh-reinforced concrete slab that was experiencing some delamination due to the placement of large amounts of steel. Alternate bidding was used for the rehabilitation project. Both alternatives included 2 inches of milling, with one alternative being a 3½-inch concrete overlay and the other being a 4-inch asphalt overlay. After milling, the pavement was to be shot blasted to provide a uniform and clean surface for the concrete overlay.

The contractor chose to place a 3½-inch bonded concrete overlay over the existing concrete and used stringless equipment for all of the grade control on the project. Three-dimensional (3D) models were developed to control both the milling and paving operations. Comparing a topographical image of the milled surface to a topographical image of the final placed concrete surface allowed the pavement thickness to be monitored continuously for grade changes, a somewhat unique solution for thickness monitoring. Cores were also taken to verify thicknesses.

The contractor used control charts to monitor several aspects of the quality control and quality assurance (QC/QA) process, including charts for air content, slump, unit weight, temperature, gradation, thickness, strength, and other factors. Maturity testing was used to determine strength gain, saw cut timing, and when the pavement could be opened to traffic.

Placing 3½-inch concrete overlay *(ACPA)*

I-70 open to traffic *(ACPA)*

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