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**OneCem**<sup>®</sup>

# Smooth Sailing for the Long Haul with OneCem Portland Limestone Cement



The Federal-Aid Highway Act of 1956 created an Interstate Highway System for eliminating unsafe roads, inefficient routes, traffic jams, and other problems restricting speedy, safe transcontinental travel. Now accounting for about one-quarter of all vehicle miles driven nationwide, this elaborate 41,000-mile network of expressways is essential to connecting our communities, driving our economy, and improving our quality of life.

The first completed section of our Interstate Highway System was an eight-mile segment on Interstate 70 (I-70) just west of Topeka, Kansas. The event marked the beginning of the largest public works project in US history. When the entire 424-mile stretch of I-70 in Kansas was finished, it was the longest continuous segment of interstate highway to be completed by any state. Today, it is nicknamed the “main street of Kansas” as it crosses the state in its entirety and passes through most of its major cities.

## The Challenge

Kansas is the heart of farm country and the economic survival of its rural communities depends on reliable infrastructure. To ensure roadways are kept in top-notch condition, the Kansas Department of Transportation (KDOT) prioritizes preservation projects as part of the Transportation Works for Kansas (T-WORKS) Highway Program. These projects help create a safe and smooth ride for the traveling public by maintaining high-quality structural and surface pavement conditions.

As part of the T-WORKS Highway Program, KDOT determined that a nine-mile stretch of I-70 in northwest Kansas was at the end of its useful service life and long overdue for a major overhaul. The full-depth 20-inch asphalt pavement was placed during the highway's construction in the early 1960's and required expensive and disruptive rehabilitation over the years to address persistent problems.

To improve the roadway's performance, KDOT decided to rebuild all four lanes on this portion of I-70 with a more durable, safer, and cost-effective pavement that would stand the test of time and require far less maintenance. Rather than bringing in new subgrade and base materials, the project would rely on a full-depth reclamation of the existing flexible pavement. The recycled asphalt base—stabilized with cement—would then be topped with 12-inch concrete having a designed service life of 30 years.

Throughout the large-scale reconstruction, planning, coordination, production, and performance requirements created challenges that would require innovative solutions and tremendous collaboration among KDOT, Koss Construction Company, and various project partners to ensure success.

## The Solution

In the Kansas I-70 rehabilitation work, OneCem Portland Limestone Cement (PLC) was utilized for stabilizing the recycled asphalt road base and for producing the paving mix of the concrete overlay. This marked the first time PLC, known as Type II, was used by Koss Construction in a KDOT project.

Harnessed by neighboring Colorado in paving more than a thousand lane miles of concrete roadways over the last decade, OneCem is used seamlessly as a direct substitution for ordinary portland cement and provides equivalent performance. Because it uses less clinker, carbon dioxide emissions are reduced by up to 10 percent per ton of cement. With 50,000 tons of OneCem used in the Kansas I-70 reconstruction work, the sustainability benefits of reducing the project's carbon dioxide footprint by 5,000 tons were significant.

*“There was minimal work required after the mix came out of the back end of the paver as it filled in the top surface of the slab very nicely with no bug holes”*

Chris Berroth,  
Project Manager,  
Koss Construction

## The Results

Subgrade preparation got underway with workers milling 12 to 16 inches off the top of the existing asphalt pavement to create a new profile alignment. OneCem was then incorporated into the remaining asphalt and some soil to create a stable base for placing 12-inch concrete overlays 30-foot wide, which included two 12-foot driving lanes and a six-foot inside shoulder in each direction. To ensure the concrete slabs met state and national performance standards, the team conducted on-going quality-control tests for strength, thickness, permeability, air voids, and pavement smoothness. Compressive strength of the pavement was specified at 3,900 psi.

Due to the scarcity of construction materials in the area, exceptional logistics planning and flawless execution were key to overcoming material accessibility challenges. For example, the large volume of OneCem needed for the work was produced by the Holcim plant nearly 300 miles away from the job site. Sourcing Class C fly ash due to supply shortages was another issue that was addressed by switching to a 100 percent OneCem concrete mix for mainline paving operations in 2020.

To meet the demanding supply needs of the project, Holcim produced and shipped 25 to 28 truckloads (600 to 650 tons) of OneCem per day. This allowed the on-site ready-mix batch plant operators to achieve the desired daily production rate of 3,300 cubic yards of concrete to ensure an uninterrupted paving operation.

The project team was very pleased with the enhanced performance they experienced with the concrete paving mix that relied on the Type II cement. According to Chris Berroth, project manager at Koss Construction, the OneCem worked well in stabilizing the recycled asphalt road base, and the 100-percent PLC concrete mix provided excellent workability and finishing characteristics in the placement of a high-quality pavement. “There was minimal work required after the mix came out of the back end of the paver as it filled in the top surface of the slab very nicely with no bug holes,” said Berroth.

The single-digit mainline smoothness numbers measured by a profilograph were remarkable—averaging a 5.9 ride on the 12-inch pavement and earning Koss Construction a smoothness incentive from the state. The pavement’s compressive strength also consistently hit 5,500 to 5,600 psi at 28-days, easily surpassing KDOT’s specification requirements.

Placement of the mainline concrete pavement on this nine-mile stretch of I-70 is now complete and Koss Construction will finish up the project with roadway striping, signage, and shoulder work by mid-November 2020. For the traveling public in northwest Kansas, the new durable high-quality concrete pavement will deliver a smoother, safer, and uninterrupted ride experience for many years to come.