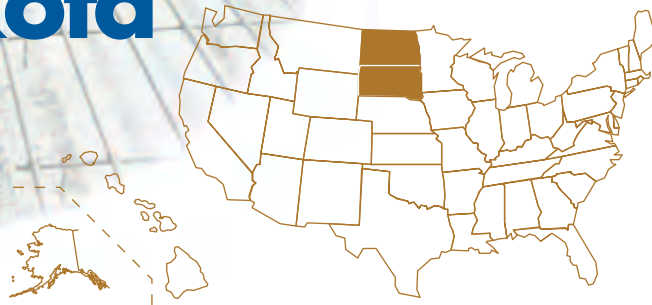


# PAVING THE PRAIRIE STATES: CRCP's Success in North & South Dakota



Why would two of the least densely populated states in the United States systematically use **continuously reinforced concrete pavement (CRCP)**—the sturdiest of pavements—to pave and repave their interstates?

Simply stated, both North and South Dakota value CRCP for its superior performance over the long term.

With approximately 166 miles of road for every 1,000 people, *North Dakota* has more miles of road per capita than any state in the nation, and a relatively smaller funding pool to maintain them. Interstate 29 (designated a NAFTA, or North American Free Trade Agreement, corridor in 1994) and Interstate 94 traverse 570 centerline miles of the state.

Approximately 250 centerline miles of North Dakota interstate were built with CRCP, some of which has now been overlaid with a thin surface coat of asphalt. There are currently 105 centerline miles of CRCP in service in addition to the overlaid CRCP, which is still serving as a super-strong base for the asphalt overlay.

*South Dakota* has 678 centerline miles of interstate, including over 260 miles combined on I-29 and I-229, and over 410 miles on I-90 and I-190.

Nearly one-third, 241 centerline miles, is paved with CRCP.

Both states are routinely upgrading their interstate pavement stock by replacing old concrete or asphalt with CRCP.

CRCP is concrete pavement that is reinforced with continuous longitudinal steel reinforcing bars. The reinforcing bars control the width of transverse cracks and holds them closed.

The transverse cracks do not impair the structural integrity of the pavement.

The steel reinforcing creates a pavement that is considerably stronger than asphalt and avoids the cracking and deterioration problems of jointed concrete pavement (JCP). Because of its greater durability, longer life expectancy, and minimal maintenance requirements, CRCP provides the best long-term value, by far, of any pavement.



*"As traffic loads increase along with the demand for longer-lasting pavement, other state DOTs should take a close look at CRCP."*

— Ron McMahon, SDDOT  
Concrete Engineer

## Superior Performance at an Equivalent Initial Cost

The North Dakota Department of Transportation (NDDOT) rarely uses full-depth asphalt pavement on its interstates, primarily because good-quality asphalt aggregate is not economically available. Therefore, over the years, most of North Dakota's interstates have been paved with either jointed plain or jointed reinforced concrete pavement (JPCP or JRCP) or CRCP, although, as Doug Fercho, NDDOT Transportation Engineer, is quick to point out, "CRCP has a much better track record than either JPCP or JRCP."

Due to differences in the pavement cross section design, NDDOT has found that CRCP is roughly equivalent in initial capital cost to JRCP, although the CRCP provides better long-term performance. "Equivalent capital costs and lower maintenance costs are why NDDOT is considering more CRCP for our interstate system," says Doug Fercho.

## Systematic Repavement with CRCP

The South Dakota Department of Transportation (SDDOT) used a combination of asphalt, JPCP, JRCP, and CRCP when first building their interstate system. As with most states, South Dakota's original interstates are now between 30 and 40 years old.

SDDOT's oldest CRCP is a one-mile-long trial segment built in 1963 near Sioux Falls. This segment, now nearly 40 years old, is performing well. This segment will be replaced in 2004, however, because the JRCP leading up to and away from the segment is in poor condition.

Since 1995, SDDOT has been systematically replacing segments of deteriorated interstate pavement with CRCP. SDDOT will continue to replace two or three 10-mile segments per year with CRCP for at least the next five years.

To date, a total of 88 centerline miles have been replaced. "Our life-cycle cost analyses clearly show that CRCP is the preferable pavement choice on our interstates," continues McMahon. "That's the main reason SDDOT chooses CRCP."

## Expansive Prairie, Expansive Soils

South Dakota, like North Dakota, has very expansive soil, especially in the western half of the state. Highly expansive subgrade is especially vulnerable to freeze/thaw heave. Full-depth asphalt pavements in South Dakota have experienced thermal cracks one inch or more in width in the winter months as a result of heave.



**The expansive soil in North and South Dakota is especially vulnerable to freeze/thaw heave....the reinforcing steel in CRCP holds the pavement together and controls cracking.**

A drier subgrade helps reduce heave, so states specify base drainage, sometimes using permeable bases with edge drains. North Dakota does not rely on base drainage for CRCP, as it does with JCP. Without the permeable base, CRCP becomes roughly equal in initial cost to JRCP.

The subgrade below CRCP built through these regions also heaves, but the reinforcing steel holds the pavement together and controls cracking. "In some areas, we've used spot asphalt overlays to smooth out the ride," says Ron McMahon, "but we haven't had to replace the pavement."



*"North Dakota has the second smallest department of transportation in the nation and our crews maintain more lane-miles of roads than any other state. Therefore, having a low maintenance pavement like CRCP is very important to us."*

— Doug Fercho, NDDOT  
Transportation Engineer

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