

Good techniques for concrete repair

New methods have improved concrete pavement repair techniques. The Wisconsin Concrete Pavement Association has recommendations for partial depth repairs, crack filling, and dowel bar joint repairs.

In the mid-1980s the Wisconsin DOT discouraged partial depth concrete repairs because of poor performance; they failed within a year or two. Since then the Minnesota DOT has perfected partial depth repair methods. In 1997 WCPA sponsored demonstration projects in Superior and Horicon, Wisconsin.



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"They've performed wonderfully," says WCPA Executive Director Kevin McMullen. "There's been no documented failure yet." Since then WCPA has done 110,000 lineal feet of partial depth repair on several jobs with WisDOT, as well as other jobs with the Cities of Superior and Brookfield. The major change is to mill off the surface material rather than cut holes. Patches use normal PCC materials.

It's very important to match the repair to the severity and size of distress, McMullen says. Partial depth repairs are appropriate for small areas where distress is confined to the surface or top 2-3 inches. "It's much more economical to repair a little bit of area with a small patch than pulling out a 6 by 12 foot square to do a full depth repair," says McMullen.

Joint sealing

"We encourage people to seal concrete joints on low volume streets using low-cost hot pour fill material," says

McMullen. "You can spend a lot of money on sealants —\$1.50 to \$2 a foot—that doesn't perform any better than hot pour asphalt at 30 to 50 cents a foot."

There is some confusion about sealing concrete joints since WisDOT stopped doing it in 1989 after research showed it was ineffective. McMullen was on the WisDOT research staff at the time. "I still believe that policy is strong and applies to rural, high speed highways where the research was done," he says. The blast of air that follows trucks will push dust and stones off pavement and onto the shoulder on high speed roads. On low speed roads, it will find its way to the joint and end up causing spalling and joint distress.

It is important to watch the pavement performance where joints were sealed before the WisDOT policy. Some sealants have failed in places and that is where joint distress occurs. Normal expansion and contraction stresses are concentrated in the small, unsealed joint segment that is clogged with sand and rocks.

One repair option is to completely remove the old seal and leave it out if the road carries fast-moving traffic. The other option is to remove as much sealant as possible and blow stones and sand out of the joint, then refill the joint with hot pour asphalt.

"That stuff will stick to anything," says McMullen. "You can even seal over the old sealant." Over the years it tends to drain down into the pavement. In that case, just add a little more, making sure not to overfill it and allow traffic to track it over the pavement.

Retrofitting with dowel bar

For about 15 years, from 1972 to 1987, both WisDOT and municipalities built concrete pavements without dowels at the



Slots cut for dowel bar joint repairs

joints. While these pavements have performed well in general, they tend to develop faults at the joints due to the action of heavy truck tires.

Where these pavements are still in good condition and the faulting is no more than 1/2–3/4 inch, they can be retrofitted with dowel bar across the joint. This involves cutting a series of slots across the joint and inserting short lengths of dowel bar. Concrete is poured into the slots, then crews return later to grind the pavement smooth.

"It's been very well tested nationally and has a great track record," says McMullen. In Wisconsin, retrofits were done in 1999 and 2000 on US Highway 151 at Dodgeville and US Highway 61 north of Dubuque.

Initial cost of the retrofit is probably more than asphalt, says McMullen, but over the road's life cycle it is more cost effective. "There's reason to believe that this treatment will last 25-30 years. In that time you may have one or two additional asphalt overlays."

Voids under pavement slabs

Sometimes a hollow area will develop under pavement slabs. WCPA recommends using flowable fill to fill the void—usually a high fly ash mix with very little stone in it. It flows and densifies well and can be pumped in while removing a minimal amount of pavement. Flowable fills are generally proprietary materials and expensive.

Slab jacking is an alternative method for filling voids. One technique involves pumping grout into the void until it pushes the pavement up into place. It works well in limited applications, but can be very costly if a lot of grout is needed, says McMullen. Another technique involves physically jacking the slab up and pumping grout underneath, then releasing the jack. "That has been problematic," says McMullen. "If you don't watch it, you end up breaking the slab in half, creating more problems." Slab jacking works well and is usually done on small slab areas.

The Wisconsin Concrete Pavement Association has print materials giving more detail about partial depth concrete repair and dowel retrofits. For copies and more information contact WCPA at 608/240-1020, 2423 American Lane, Madison, WI 53704.