

Partial Depth Repair Keeps Highways and Urban Roads Intact



Your Pavement Preservation Resource

Patching Quickly Restores Damaged Areas In Concrete Pavement

REPAIRS TO OUR NATION'S ROADWAYS ARE A must, yet the expense is overwhelming to many state Departments of Transportation (DOTs) and municipalities. Many states in the U.S., including Minnesota, Wisconsin, Missouri, Iowa, Michigan, Colorado and Kansas, are using an innovative partial-depth repair (PDR) method developed in Minnesota in the early 1980s. One of the unique attributes of this method is its low cost and speed of installation for both highway and municipal roadway applications.

Partial-depth repair is used to repair pavement deterioration in the top 1/3 to 1/2 of the slab. The repairs are generally located at the joints, but can be placed anywhere surface defects occur. Two concrete removal methods are commonly employed; one involves placing vertical saw cuts at the patch perimeter and chipping unsound material prior to placing the patch mix, and the other method involves milling out the deteriorated pavement sections and placing the patch mix within the removal area. In both cases, the repair sections are sandblasted clean and a cement based or hot applied polymer modified resin mastic material is placed in the repair area and the appropriate cure is applied. When using cement based repair materials, all existing joints and random cracks must



be re-established through the full depth of the repair to allow for normal contraction and expansion of the slabs. The flexible nature of the hot applied polymer modified resin mastic material does not require this step due to its flexible nature and ability to withstand normal joint movement.

The first PDR repairs in Minnesota lasted 20 years. "After 10 years, we've had a 90 percent success rate on most pavements," said Dan Frentress, consultant for International Grooving and Grinding Association (IGGA), "Some of them have gone as long as 25 years."

⚡ Complete PDR prior to diamond grinding

>>> PDR BEGINNINGS

Widespread use of the PDR method actually began in Minnesota around 1981 after the Minnesota Department of Transportation (Mn/DOT) had used the saw and chip method on two areas of Highway 61 in Duluth and Hastings. Unfortunately, both areas had a discouraging failure rate

after a year. At that point, Mn/DOT asked the contractor to mill the patch area instead of using a jackhammer on the deterioration. Minnesota found the milling so successful that in the 1990s, they had specialty milling equipment developed for the PDR process, including a V-shaped milling

head measuring 7 inches on the bottom and 10 inches on the top.

When properly used, partial-depth repairs can be more cost-effective than full-depth repairs and are accomplished with less time, labor and material.



PDR concrete placement operation

>>> SUCCESSFUL PDR IN KANSAS

Kansas Department of Transportation (KDOT) recently completed two projects in the Topeka area using PDR and has four more under contract. KDOT has employed a modified milling method for their transverse PDRs using vertical saw cuts to form the perimeter of the patch while using milling to complete the patch area removal process. One such project was on I-70 from Adams to Carnahan which was completed in 80 working days. They repaired 16,900 square yards of longitudinal joints at \$72 a square yard, and 3,800 square yards of transverse joints at \$92 a square yard.

Steve Baalman, Field Engineering Administrator, Kansas Department of Transportation (KDOT), chose PDR because he felt it wasn't reasonable to overlay concrete roads with asphalt when the roads had not reached the end of their lifespan. "KDOT has had good luck with partial depth repair," said Baalman, "This is the best way to go."

>>> WISCONSIN PDR

The Wisconsin Department of Transportation (WisDOT) roadway repair on U.S. Highway 153 included a mile and a half of repairs on a four-lane divided highway. The work on the highway consisted primarily of concrete pavement partial depth repair and some full depth repair.

Repairs began in September 2010 and concluded smoothly in mid-November 2010. The quick 2½ month rehabilitation using the PDR technique was appropriate for the type of deterioration suffered by this highway. In this situation it was a more appropriate repair than doing a full depth repair, as the remainder of the pavement was still in good functioning condition. Avoiding a full depth repair can reduce the costs involved with repairing the roadway. "Partial depth repair allows you to address more area for less money," said Tom Bonness Jr., President, CPR, Inc., the contractor for the repair work on U.S. Highway 153.

PDR has been used in Wisconsin since the mid-1990s. For Bonness, the first PDR job he was involved with was in 1997. He continues to see new projects that

call for this repair technique. "Wisconsin is looking more and more to partial depth repair and it is now a standard repair technique in their arsenal," said Bonness. "Many municipalities have also adopted the PDR technique for repair of their roads."

Step-by-Step Partial Depth Repair:

- Cut and/or mill out the deteriorated concrete from the repair area.
- Sandblast the repair area to remove debris.
- Apply a bonding slurry to promote the bond (if using a cementitious material).
- Place an approved backfill material in the repair area.
- Vibrate the concrete (if using a cementitious material).
- Finish and texture the repair area.
- Broom a bonding slurry around the edge of repair (if using a cementitious material).
- Apply curing compound to the repair area (if using a cementitious material).

ABOUT IGGA

The International Grooving and Grinding Association (IGGA) is a non-profit trade association founded in 1972 by a group of dedicated industry professionals committed to the development of the diamond grinding and grooving process for surfaces constructed with Portland cement concrete and asphalt. In 1995, the IGGA joined in affiliation with the American Concrete Pavement Association (ACPA) to represent its newly formed Concrete Pavement Restoration Division. The IGGA/ACPA CPR Division now serves as the technical resource and industry representative in the marketing of optimized pavement surfaces, concrete pavement restoration and pavement preservation around the world. The mission of the International Grooving and Grinding Association (IGGA) is to serve as the leading promotional and technical resource for acceptance and proper use of diamond grinding and grooving as well as Concrete Pavement Preservation (CPP) and restoration. For more information, visit www.igga.net.

>>> ADVANTAGES OF PDR

Several benefits are associated with using the PDR method. The biggest advantages are that it quickly restores performance, improves ride quality, and extends the service life of a pavement when dealing with shallow deterioration on concrete pavement. Another obvious benefit is the cost. Rather than replacing or overlaying a whole road, an otherwise structurally sound road can be kept intact, and the problem areas repaired.

There are some situations in which PDR should not be used. This includes spalling caused by dowel bar misalignment or lockup, longitudinal cracks caused by fatigue or foundation movement, and spalls caused by D-cracking or Alkali Silica Reactive aggregates (ASR).

When the cost of time delays to motorists and the safety hazards to both motorists and maintenance crews are considered, many projects (particularly in high traffic volume areas) require that repairs be opened to traffic within a few hours, which is a hallmark of this repair method. For more information on PDR, visit www.igga.net.

Distresses corrected by Partial Depth Repair include:

- Spalls caused by intrusion of incompressible materials into the joints.
- Spalls caused by poor consolidation, inadequate curing or poor air void systems.
- Spalls caused by the use of joint inserts.
- Spalls caused by localized areas of scaling, weak concrete, clay balls or high steel.