

# dowel bar retrofit

*Effective for Concrete Pavement Preservation*

Washington State  
Study Finds DBR  
Superior Performing,  
Cost-Effective  
Rehab Method



**STATE DEPARTMENTS OF TRANSPORTATION** across the country face a common challenge: how to repair concrete roadways that may be up to 50 years old in some locations. While replacing or overlaying deteriorated pavement can be time- and cost-prohibitive, Concrete Pavement Preservation (CPP) often provides the better solution. Recent studies demonstrate the long-term effectiveness of one CPP method known as Dowel Bar Retrofit (DBR).

DBR is a CPP procedure that involves cutting slots in the pavement across the joint or crack, cleaning the slots, placing the dowel bars and then backfilling the slots with new concrete. The method links slabs together at transverse cracks and joints to evenly distribute the load across the crack or joint. Such load transfer across transverse joints of jointed plain concrete pavements is essential for long-term performance, especially when the roadway carries heavy truck loads.

In Washington State, plain jointed concrete pavements constructed prior to the 1990s did not contain dowel bars across the transverse joints. As such, a significant number of the pavements aged 30 or more years had developed transverse joint faulting. With sufficient funding unavailable to reconstruct the faulted and rough concrete pavements, WSDOT decided in 1993 to begin its first full-scale DBR project for a severely faulted concrete pavement. Since that time, WSDOT has used DBR to repair more than 300 lane miles of faulted concrete pavements. WSDOT's DBR repair has also included diamond grinding of the entire project length, full-depth replacement of concrete panels with two or more cracks, partial-depth spall repair, crack sealing, and resealing transverse and longitudinal joints.





## » STUDYING DBR'S EFFECTIVENESS IN WASHINGTON

Based on research by Dr. Linda M. Pierce, as well as Stephen T. Muench, Assistant Professor, and Joe P. Mahoney, Professor, both of the University of Washington, DBR is a highly effective, cost-efficient method for repairing aging concrete roadways.

In the study, road roughness and wear were examined on Washington State pavements repaired with the DBR method between 1993 and 2007. The average age of the existing pavements prior to DBR was 32 years (with a range of 17 to 46 years), and the average in-service age of the DBR was 9 years (with a range of 1 to 14 years).

Based on the review of approximately 380,000 DBR slots, Pierce noted the presence of cracking, spalling and debonding of the patching material as nearly non-existent, indicating superior construction and inspection practices leading to long-term performance.

“From the review of data collected, it was determined that Washington State has experienced very little DBR slot-related distress, with less than 3 percent of all DBR slot distress combined on any given project and typically less than 1 percent on all projects,” said Pierce.

Further, after reviewing DBR performance, it was found that 5 of the 21 projects examined showed superior longer-term performance as compared to all other DBR projects.

“The best results were found when DBR was performed prior to the development of significant faulting in the concrete,” said Pierce. “Therefore, it can be concluded that applying DBR prior to significant fault development can result in improved, longer-term DBR performance.”

Based on the findings in Washington, DBR is a highly effective solution for long-term pavement repair. Critical to the success of DBR projects are appropriate specifications and construction inspection processes, as well as contractors firmly establishing themselves in DBR construction techniques. As all states seek ways to repair aging concrete pavements, DBR can be the ideal solution when long-lasting, cost-effective repairs are desired.

### GENERAL STEPS FOR DOWEL BAR RETROFIT

- Cut Dowel Bar Retrofit (DBR) slots.
- Remove existing concrete from slots.
- Clean slots of all debris.
- Place caulking compound at all joints/cracks.
- Place the dowel bar assemblies in slots.
- Place the patching material.
- Consolidate the patching material.
- Finish and properly cure the patching material.
- Diamond grind the pavement surface.
- Seal cracks and reseal transverse joints.



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