

RESEARCH REPORT DOCUMENT PAGE

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15. Abstract Purpose and Need Many jointed plain concrete pavements were constructed without dowels at transverse joints. Load transfer across such joints was primarily accomplished through aggregate interlock. However, as the existing pavements became older, the volume of heavy truck traffic increased. The load increase coupled with temperature variations caused the joints to open wider with time and reduce the effectiveness of aggregate interlock. Objective The objective of this study was to determine if dowel bar retrofitting would prevent faulting from recurring in jointed concrete pavement. Scope Test sections were evaluated for a period of six years on an annual basis. Items evaluated were: Monitoring of distresses around the dowel bars. Performance and comparison of the two concrete mixes used in the test sections, non-destructive deflection testing will be performed annually for load transfer across the doweled joints, and this testing was accomplished with the use of a falling weight deflect meter (FWD). The location of the test sections are on Interstate 29 in the southbound lane near reference point 188 which north of Drayton, ND and also near reference point 40 which is located south of the Christine interchange. Summary Project IM-6-029(022)186: Sections containing Patchroc 10-60 material Every joint in the 1,000' segment that was evaluated is experiencing at least one type of distress in their corresponding dowel bar slots. Distresses related to displaced core boards, durability of the mix (raveling and erosion), insufficient vibration (as determined by the cores taken by the Grand Forks District, refer to photo 1 on page 7), or excess sealant caulk is prevalent in the Patchroc 10-60 mix. FWD analysis shows approximately 42% load transfer in this segment, which is significantly lower than originally constructed. Performance of the test section containing the Patchroc 10-60 material is poor. The poor performance can be attributed to the mix material and poor construction. Sections containing 3U18 patch mix Approximately 62% of the joints in the 1,000' segment evaluated is experiencing at least one type of distress in their corresponding dowel bar slots. Some of the retrofit sections containing the Minnesota specified mix 3U18 are experiencing similar distresses as those related to the sections containing the Patchroc 10-60 mix. The retrofit sections containing the Minnesota specified mix 3U18 also experienced mix problems in the form of shrinkage cracks along the edge between the mix and the existing PCC. At this time, this section does not appear to show any signs of eroding or raveling of the mix, which may indicate greater performance from a standpoint of durability. FWD analysis shows approximately 43.4% load transfer in this segment, which is lower than originally constructed. Performance of this test section containing the Minnesota specified mix 3U18 patch mix is fair. The fair performance is attributed primarily to poor construction. Project IM-8-029(003)022: Every joint in the 1,000' segment evaluated is experiencing at least one type of distress in their corresponding dowel bar slots. Distresses related to core board failures, durability of the mix (raveling and erosion), or excess sealant caulk is prevalent in the Patchroc 10-60 mix. The average load transfer across the joints is approximately 95%. As opposed to the Grand Forks test sections the Fargo test section appears to be sustaining its ability to transfer traffic loads across the joints. Performance of this test section is good with one exception, durability. This test section appears to have had better construction as noted with the low number of construction related distresses and the load transfer is excellent. The problems associated with the raveling of the Patchroc 10-60 material appears to be in the mix itself and not related to construction. Recommendation It is recommended that dowel bar retrofit projects move forward as a way to restore load transfer in PCC pavements provided close scrutiny and adherence to the specifications are met during construction.											
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