*Excellent long-term (>10 years) dowel-bar load transfer effectiveness was common. Pavement distress index curves showed little or no distress development with no upward trend. This is directly attributed to a stable and uniform base support. Excellent long-term joint load transfer effectiveness (>85%) was found as well for the two JPCP SHRP test sections.

Evaluation of Recycled Concrete Aggregate used as Stabilized Open-Graded Base Course

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INTRODUCTION

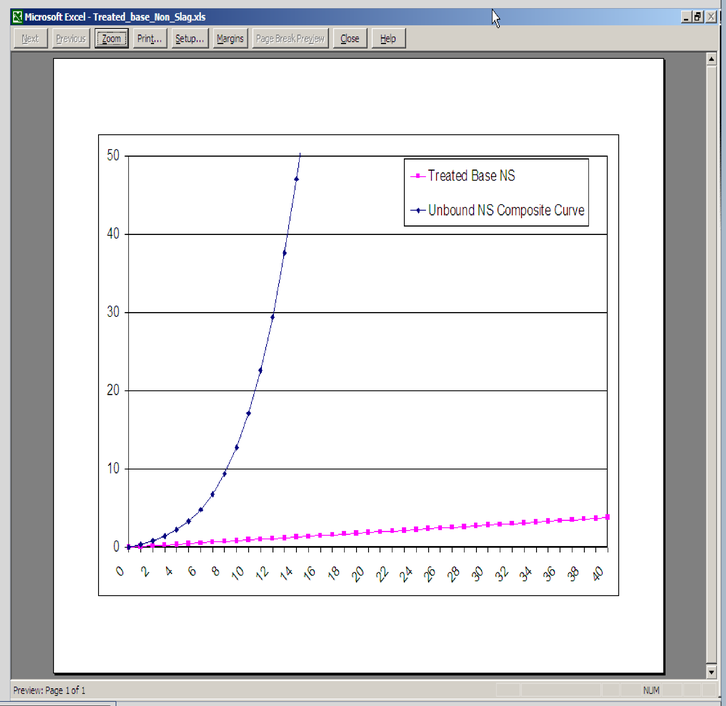
From 1990 to 1995 MDOT used recycled concrete pavement as stabilized open-graded drainable base for thirteen concrete reconstruction projects. Two projects were stabilized with cement and eleven projects with asphalt.

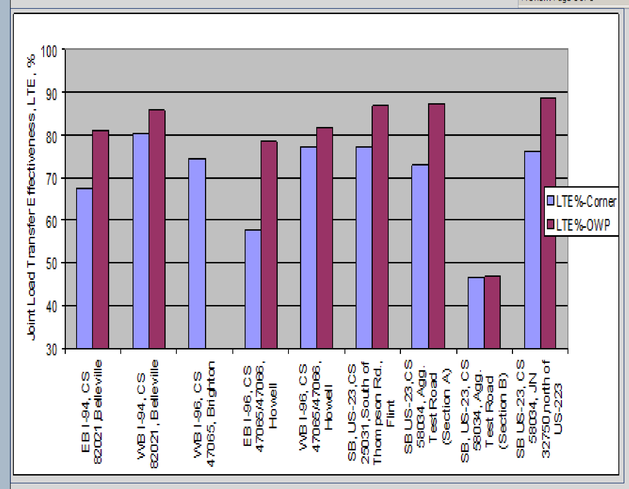
The primary purpose of the treatment was to coat the aggregate particles, since crushed concrete from the old pavement was used by specification to promote recycling. The coating prevented the formation of a leaching concrete residue that could clog the drainage layer or the internal drainage system.

A secondary benefit was to provide stability to the aggregate matrix, which was a gap-graded gradation (5G) that was selected to enhance drainage.

FIELD EVALUATION OF CONCRETE PAVEMENTS WITH STABILIZED RECYCLED OPEN-GRADED BASE COURSE

Distress index, DI, is MDOT's visual measure of a pavement's surface distress condition. DI values start at 0 (a distress free pavement) and increase numerically as distress levels increase. A DI of 50 is the threshold value where reconstruction or major rehabilitation should be seriously considered. The latest year (2007) average project DI values for stabilized base projects in each traffic direction fall in the range of 0 to 10. This range corresponds to low severity cracking or joint deterioration. Pavement distress index curves showed little or no distress development in the recycled stabilized base projects as compared to project constructed with unbound base . This is directly attributed to stable and uniform base support.





Joint Load Transfer Effectiveness

For most recycled stabilized base projects the FWD test section joint load transfer effectiveness, LTE, was found to be excellent for the outer wheel- path (OWP) as concluded from results shown. These values ranged between the mid seventies to the upper eighties.

LTE was calculated using the PCA (Portland Cement Association) equation:
LTE (%) = 2D1/(D0+D1)*100

Ride Quality

As a group the projects constructed on recycled stabilized (5G) base had lower IRI with less grinding than projects constructed on virgin unbound (3G,3G mod) base

Projects constructed on stabilized base have maintained lower IRI over the 15 year period studied.

2007 average IRI was less than 85 for the stabilized projects

COST COMPARISON OF OPEN GRADED DRAINAGE COARSE

I-94WB Wayne Co., 4" cement coated recycled 5G,
393,000 SYD's @ $2.35/SYD, constructed 1992
I-96 Howell, 4" asphalt emulsion coated recycled 5G,
360,000 SYD's @ $1.35/SYD, constructed in 1991-1992
I-75 Wayne Co., 4" asphalt emulsion coated recycled 5G,
464,000 SYD's @ $1.90/SYD, constructed in 1991

I-69 Eaton Co., 5" 3GM1 (not recycled concrete),
457,000 STD's @ $3.20/SYD (project 21823A)
346,000 SYD's @ $2.70/SYD (project 21824A)
307,000 SYD's @ $2.69/SYD (project 21825A)
166,000 SYD's @ $2.69/SYD (project 21826A)
Projects constructed between 1991 and 1993

CONCLUSION and RECOMMENDATIONS

Excellent long-term (>10 years) dowel-bar load transfer effectiveness was common. Pavement distress index curves showed little or no distress development with no upward trend. This is directly attributed to a stable and uniform base support.

A key factor in achieving excellent long-term performance is controlling base erosion and joint settlement by providing an adequate drainage system. In some cases, extensive base erosion and joint settlement of 0.10-0.2 inches from inadequate subsurface drainage lead to ineffective dowel-bar load transfer effectiveness and mid-slab, top-down cracking.

In view of the varied performance that MDOT has experienced with JRCP/JPCP on untreated OGDC it is therefore recommended that MDOT use stabilized OGDC as the standard base. The incorporation of crushed concrete pavement into the base further improves long-term sustainability. However, the full, long-term benefits of using a stabilized OGDC are contingent on a maintaining a well-draining pavement system.

REFERENCES

Research Report RC-1523 , Performance Evaluation of JRCP with Stabilized Open-Graded Drainage Course
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