Taconite Aggregate in 4.75 mm Asphalt Mixture:
Research In Progress

Introduction

Fine mixtures are attractive for their potential for surface course and thin lift applications.

In October 2008 Mn/DOT Road Research constructed a test section to evaluate the performance of thin-layered-asphalt containing fine aggregates. The asphalt was also part of a performance evaluation of a composite pavement system. The pavement system consisted of a 2-in. asphalt surface above 5 in. of jointed concrete pavement and a 12-in. granular base. The test section is located in the westbound lanes of I-94 on the MnROAD test facility near Albertville, MN. The jointed concrete portion of the test section has 15 x 12 ft slabs and includes a region without dowels and a region with 1-in. dowels.

The asphalt surface mixture was a 4.75 mm Superpave mixture comprised of two sources of fine taconite tailings and a granite manufactured sand. A PG 64-34 asphalt binder was used, and the mixture contained no recycled material. The National Center for Asphalt Technology in Auburn, Alabama designed the mixture for a laboratory study, and this was a chance to validate that design with a field test section.

Field construction densities averaged 90% to 91%, typical as observed around the country. The mixture proved tough and durable, resisting damage by turning truck movements later the same day. A number of mixture samples were collected for several research groups to conduct laboratory performance testing.

Performance

The 4.75 mm surface will be evaluated over time for surface characteristics (noise, ride, texture, and friction) as well as durability and resistance to reflective cracking.

Results from a preliminary rutting analysis from an Asphalt Pavement Analyzer indicated good performance. September 2009 field measurement at MnROAD showed that 95% of the test cell has developed less than 0.09 inches of rutting.

Tire-pavement noise measurements were collected using the On Board Sound Intensity method. In November 2009 seven of MnROAD's dense-graded asphalt sections were measured, results showing the taconite was 99.9 dBA, approximately 1.4 dBA lower than the rest.

Cracking surveys show that by November 2009 transverse reflective cracks had developed at the rate of 61% for doweled and 86% for undoweled joints.

Friction performance of the 4.75 mm surface was compared to a set of 25 dense-graded test sections in place at MnROAD. MnROAD data from June and November 2009 showed all cells exhibited excellent friction, and that each mixture has retained its relative performance over time.

Ride (IRI) measurements have been lower than expected, likely because of the amount of cracking that has developed.

RailMate trailers hauling taconite aggregates to MnROAD.

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