

NDOT Mix Design Procedures 08/11/08

The NDOT Materials Division performs Hveem dense grade mix designs for NDOT contracts. The Hveem mix design procedure gives the Department the most thorough and complete mix design procedure available with today's technology.

The Materials Division also performs open grade mix designs for NDOT contracts. The process includes mixing samples at various bitumen ratios, compacting the material and allowing the mixtures to drain down onto glass plates. Most states that use open grade mixtures use a drain-down type test.

In the Construction season of 2002, NDOT changed specifications from AC-20P to PG 64-28NV, and replaced AC-30 and AC-40 specifications with PG 76-22NV. This was an effort to keep up with national technology and the Superpave Performance Grading system. Performance grading asphalts allows for tighter control and performance based grading of paving grade asphalts. The new specifications provided asphalt that has a slightly higher polymer content and is noticeably thicker. This change resulted in higher film thicknesses in the mix and higher bitumen ratios in the dense grade mix designs. The average increase was 0.3 to 0.5 percent.

In open grade mixtures, the thickness of the asphalt was the main contributor to an increase of 0.5 to 0.75 percent in bitumen ratios. In addition to the thickness of the asphalt, the Materials Division desired to reduce raveling of open graded mixtures. This raveling problem was intensified in areas of frequent chain use, including chains on damp or wet pavement. In these areas, cold and wet temperatures also increase the frequency of raveling failures. When the mix designs showed that the higher bitumen ratios did not produce excessive drain down, higher percentages were selected. These higher bitumen ratios are still tempered by hot drops at the hot plant and direction to the Resident Engineers to reduce the amount of asphalt in the mix appears too rich.

In 2005, NDOT changed air void specifications for the dense grade mix design procedure. The specifications for Type 2C, except in Clark County, were changed to lower the desired air void range from 4 to 7 down to 3 to 6 percent. Specific targets were also implemented for Type 2 and Type 2C material. This change was made to increase the durability of the dense grade mixtures. With no appreciable rutting issues across the state, NDOT intended to reduce or delay the amount of reflective and fatigue cracking by raising the bitumen ratios of the plantmix.

There have been a few open grade mixture failures in the past three years. These failures appear to be the result of a combination of several issues. The higher bitumen ratios of the mix designs combined with various construction related issues has caused failures on three projects. Without control over the construction related issues, the Materials Division will make an effort to balance the need for a durable, long lasting open grade surface with the consideration for the reality of construction practices.