SUMMARY REPORT

Investigation of SCDOT Asphalt Mixtures Using the Pavement Analyzer – Phase 1

SUMMARY OF PROBLEM STATEMENT

In South Carolina, rutting has been one of the major distresses that decrease the life expectancy of asphalt pavements. This problem is attributed to increased traffic counts, higher vehicle loads and higher tire pressures. Since 1995, the South Carolina Department of Transportation (SCDOT) has been placing Superpave mixtures on all major interstate routes to help alleviate the problem with asphalt rutting.

While some Superpave mixtures have been successful in alleviating the rutting problems, others still exhibited a tendency to rut. To help better define the causes of the difference between mixtures, the SCDOT Research and Materials Laboratory established a test plan to utilize the Asphalt Pavement Analyzer (APA) and the current proposed ASTM testing procedure to examine variations within mix designs and establish a specification limit for different types of Superpave and high strength Marshall mixtures.

SUMMARY OF CONCLUSIONS

To determine the rutting tendencies of high volume mixtures being used in South Carolina, this research looked at the variations with mixture types, dust to asphalt ratio, percent compaction, and asphalt binder grades.

This project began by examining Marshall verses Superpave mix designs. Three quarries were used for this portion and the research showed that there is a direct
relationship between the mixture’s aggregate gradation and rut resistance.

Next, the dust to asphalt ratio was altered to produce three ratios: 0.60, 1.20 and 1.60. The noticeable trends showed that the higher dust to asphalt ratio exhibited a greater degree of rutting. This phase of the research was extremely important to help indicate a consequence that may occur with inadequate quality control at the asphalt plant.

The level of compaction at 91% and 93% of theoretical maximum specific gravity of the mixture (G:mm) was examined next. As expected, the higher initial compaction mixtures exhibited the most rut resistance.

The final variable that was researched as part of Phase 1 of this study was the utilization of polymer-modified binders to the surface mixtures. On average, the measured rutting was reduced by approximately 54% with the use of polymer modification.

In conclusion, three major factors were shown to have a direct affect on the rutting susceptibility of asphalt mixtures; dust to asphalt ratio, compaction level obtained, and polymer-modification.

Based on the findings of this study, we recommend continuing using the current proposed ASTM APA procedure that includes a test temperature equal to the high end PG grading, 100 pounds of wheel pressure and a hose pressure of 100 psi, and implementing the following specifications:

- Increase the compaction level to 93% instead of the current 91% of Maximum Specific Gravity for high strength HMA mixes,
- Maintain the dust to asphalt ratio between 0.60 to 1.20,
- Use PG 76-22 in high volume riding courses and in problem areas,
- Utilize the APA to eliminate high volume asphalt mixtures that could potentially rut by implementing the following specification:
  - Intermediate Courses with PG 64-22,
    - Maximum rut depth of 7 mm at 8000 cycles,
  - Surface Courses with PG 64-22,
    - Maximum rut depth of 5 mm at 8000 cycles,
  - Intermediate and Surface Courses with PG 76-22,
    - Maximum rut depth of 3 mm at 8000 cycles,

While some of the mentioned rutting-susceptibility factors can only be addressed in the mix design process, others have to be addressed during construction. The APA, along with strict but fair specifications can help identify and reduce potential problems before they are produced. This reduction in potentially problematic asphalt mixtures should have a direct affect of increasing the life expectancy of South Carolina asphalt pavements.

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