Asphalt Rubber Technology Service

SUMMARY REPORT

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Asphalt Rubber Technology Service
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SUMMARY

FIELD EVALUATION OF THE USE OF RUBBER MODIFIED HOT MIX ASHPHALT IN THE PICKENS COUNTY SCHOOL DISTRICT SOUTH CAROLINA

In the year 2000, the United States generated 273 million waste tires weighing approximately 3.6 million tons. In addition to this, there are approximately 300 million more waste tires in stockpiles throughout the U.S. The state of South Carolina generates approximately 4 million waste tires each year, which equates to roughly one tire per person per year in the state. It is clear that in terms of quantity, the disposal of waste tires poses a serious problem.

One method of recycling waste tires that has proven to be quite beneficial is that of rubber modified hot mix asphalt (HMA). Several agencies, such as the Arizona Department of Transportation have been using rubber modified HMA for years. Reported benefits include reduced pavement rutting and cracking as well as the recycling of tires. In order to better promote the use of rubber modified HMA in South Carolina, the Asphalt Rubber Technology Service (ARTS) was formed by Clemson University, the City of Clemson, and the South Carolina Department of Health and Environmental Control.

ARTS promotes rubber modified asphalt in various ways, one of which includes giving grant money to South Carolina public agencies who use rubber modified HMA. One such grant was awarded to the Pickens County School District for placing approximately 2,600 tons of rubber modified HMA on several driveways, parking areas, and play areas at various Pickens County schools.

A 9.5mm Superpave mix (N_{des} = 75 gyrations) using PG 64-22 binder modified with 10% ground tire rubber (#40 mesh) was designed by ARTS for use on this project. In general, plant production of this mix proceeded as with conventional asphalt mixes. Blending of the asphalt rubber was performed at plant site using equipment specifically designed for asphalt rubber blending. Minimal plant modifications were necessary for the use of this equipment.

The HMA was mixed at approximately 330° F to 340° F (166° C to 171° C), stored in the silos, and loaded into dump trucks for delivery to the project. Normal production rates allowed the plant to produce as much as 600 to 1,500 tons per day. The total amount of rubber modified HMA produced for the project was approximately 2,600 tons and took 7 days.

During production a few problems were encountered with the HMA mix in terms of meeting the job mix requirements. Although the asphalt plant was set to introduce 6.10% binder, initial tests indicated that the actual binder content was somewhat lower. In general, test results showed that the actual binder content was approximately 0.50 to 0.70 points lower than the desired 6.30%. This was attributed to the fact that the asphalt rubber had a significantly higher viscosity than the unmodified binder normally used in the plant. The binder pump had not been calibrated for the asphalt rubber and therefore could not perform accurately. Through trial and error and several tests, this problem was rectified by setting the plant's control computer approximately 1.5 points higher than the desired asphalt binder content. Once this problem with binder content was corrected, all job mix requirements were generally met.

The HMA mix was hauled to the project site in dump trucks. Because various schools were paved, the haul length to the project site varied. The average haul length was approximately 30 miles and took 45 minutes to one hour depending on traffic. Once at the site, the mix was placed in a two inch lift using conventional paving methods and equipment. Compaction was generally attained through the use of two steel wheel rollers, depending on the job site. Due to the poor condition of the existing pavement in most locations, target densities were based on optimum compaction obtained in the field instead of lab densities.

The paving process using the rubber modified HMA needed no modifications. Significant amounts of "handwork" were required in several of the parking lots, but no special problems were noted with this process either. In general, paving proceeded as with a normal hot mix asphalt.

Results from this project indicate the following:

- For the materials used, the Superpave mix design process can be used to develop an HMA job mix formula utilizing asphalt binder containing 10% ground tire rubber by weight of binder.
- Ground tire rubber can effectively be blended using the "wet method" at a rate of 10% by weight of binder on site at an asphalt plant.
- Minimal plant modifications may be necessary to incorporate portable asphalt rubber blending equipment into the asphalt plant. This may include an additional valve to the asphalt pump and an electrical breaker.
- Calibration of the asphalt pump for the asphalt rubber is recommended prior to starting production of the rubber modified mix.

This project was performed by the Asphalt Rubber Technology Service with cooperation from the South Carolina Department of Health and Environmental Control, the City of Clemson, Clemson University, and the Pickens County School District. This report reflects the views of the authors, Serji N. Amirkhanian and Kevin M. Vaughan. For more information, contact ARTS.

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