



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 ASPHALT IN ANDERSON COUNTY, SOUTH CAROLINA Michelin Boulevard (Phases IA, IIA, IIB, & IIC)

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 Anderson County for placing rubber modified HMA on several large county roads.

This project involved placing approximately 10,000 tons of rubber modified HMA surface course on several newly constructed roads in Anderson County. A 9.5mm Superpave mix ($N_{des} = 100$ 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 the 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.

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 6.10%. 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.

Placement of the rubber modified HMA mix with standard paving equipment was similar to that of standard Superpave mixes. Like many Superpave mixes, a "tender zone" was encountered during the rolling process when the asphalt mat reached temperatures between approximately 250° F and 200° F. This problem was resolved by altering the rolling pattern to avoid this temperature zone. Compaction was attained through both vibratory and static steel wheel rollers. Pneumatic tire rollers were not utilized due to the tendency of the asphalt to adhere to the tires. In general, the compaction requirements of 92% of maximum specific gravity were met for this HMA mix.

It was also noted during placement that this mix appeared to cool at a much slower rate than conventional mixes. This could be attributed to the insulating effects of the ground tire rubber.

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.
- Minimal plant modifications may be necessary to incorporate portable asphalt rubber blending equipment into the asphalt plant.
- Calibration of the asphalt pump for the asphalt rubber is recommended prior to starting production of the rubber modified mix.
- For the materials used, mixes containing 10% ground tire rubber by weight of binder can be placed on the roadway using conventional paving and compaction methods. Like many Superpave mixes, a "tender zone" may be experienced that may be resolved by altering rolling patterns.
- Due to its insulating effect, mixes containing tire rubber may cool at slower rates than normal mixes. Because the mix does not cool as quickly, the time before introduction of traffic to the pavement may be extended.
- Rubber modified asphalt pavements constructed in the manner performed in this project may be produced at costs approximately 18% more than conventional asphalt mixes. These costs are highly dependent on several factors including materials, project location, and project size. Although more expensive than conventional mixes using unmodified asphalt binders, the cost of this rubber modified asphalt mix is very similar to those using common polymer modified binders such as PG 76-22.