

# RMRC



## Recycled Materials Resource Center



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## Research Project 54

# Synthesis of Use of Crumb Rubber in Hot Mix Asphalt

### Project Objectives

- Identify an optimum method for incorporating Ground Tire Rubber in asphalt
- Development of optimum methods of processing and blending GTR
- Accumulate knowledge regarding the merits of the solubility requirement in various binder specifications used currently

### Project Summary

Ground tire rubber (GTR) is a unique recycled material. Additional research to assist in developing optimum methods of processing and blending GTR with asphalts is required to yield the full potential of this material and may influence the more widespread use of GTR. If it can be shown that GTR-modified asphalt concrete has the potential to improve road performance, highway agencies may be less skeptical about incorporating the material into projects of various sizes, possibly even offering increased incentives for use of this waste product in an effective recycling process.

This study started with a significant literature review and analysis of trends reported in the literature regarding GTR reaction time and attempts to dissolve it in asphalt. Also, the current practice of PG testing and grading developed by some agencies. The results of the literature review were summarized in a white paper format, and presented to the Binder Expert Task Group in Fall of 2010 to solicit feedback on the subject. The white paper is included in Appendix A of this report. In addition to the literature review, an extensive experimental plan was conducted to compare

different GTR modified binders (MB) were produced using recycled tire rubber by altering the percent modifier used, the reaction time allowed during the blending process, and the temperatures at which this blending was performed. This study investigates the variability in properties as the time exposed to elevated temperatures progresses as the potential for material degradation during this period may increase. Multiple percentages of GTR were used to modify the same base binder and each of these percentages was prepared at a range of reaction times.

In addition to testing binders modified with GTR, binders and mixtures produced with other types of polymer modifiers were produced and tested. All modifications were done to modify the base binder, which is a PG 64-22, to an equivalent PG grade of PG76-22. Repeated creep testing was performed on the mixes to determine if the elastic or plastic effects of corresponding binders was observed, and GTR mix response was compared to the response of mixes containing the polymer modified asphalts to determine the elastic versus plastic effects of the GTR.

### Project Partners

University of Wisconsin-Madison Asphalt Research Group

### End Products

The data presented in this report clearly indicates that GTR-modification of asphalt binder has the potential to improve the rutting resistance performance of the binder as well as mixtures incorporating the GTR-modified asphalt binder. However, it is clear that the GTR modification used in this study could not produce superior or even equivalent performance to that of the virgin polymer modifiers in terms of rutting resistance.

### Further Information

The Recycled Materials Resource Center (RMRC) is a national center that promotes the appropriate use of recycled materials in the highway environment. It focuses on the long-term performance and environmental implications of using recycled materials