# RESEARCH NOTES

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## CONSTRUCTION OF RUBBER MODIFIED ASPHALT CONCRETE (METRO RUMAC) TEST SECTIONS

**N. Marine Drive in Portland, Oregon**
**S.E. Stark Street in Gresham, Oregon**

Government agencies are burdened with both pavement distress and solid waste disposal problems. In response to these problems, the METRO agency of the Portland urban area sponsored the development of specifications and mix design guidelines for a rubber modified asphalt concrete (RUMAC) hot mix pavement. This pavement, called METRO RUMAC, may reduce the amount of pavement distress by providing a pavement with superior resistance to transverse thermal cracking. In addition, it may reduce solid waste disposal costs by using portions of tires that would normally be solid waste, as about 60% of the tire, by weight, can be recycled into the crumb rubber for METRO RUMAC.

The METRO RUMAC system was developed for the dense-graded mixes commonly used by the Oregon Department of Transportation (ODOT) and other agencies in Oregon. In all of these mixes, the crumb rubber is an aggregate substitute. The rubber is added directly to the asphalt concrete plant's mixing chamber and mixed with the dry aggregate before the asphalt is added. This is often called the "dry" process.

To evaluate METRO RUMAC, the Research Unit is studying the construction and performance of test sections on three projects paved in 1991, two projects paved in 1992, and two projects paved in 1993. Two of the 1991 projects are subjects of this Research Note.

One project has METRO RUMAC of a Class "C" (½" to 0") gradation in a 2-mile long section paved by the City of Portland's Bureau of Maintenance on North Marine Drive in the Gateway Industrial Park. The METRO RUMAC is in the top lift of an overlay comprised of a 1½" thick wearing course over a variable thickness leveling course of conventional "C" mix.

The other project has METRO RUMAC of a Class "B" (¾" to 0") gradation in an overlay paved for Multnomah County on Southeast Stark Street in Gresham, Oregon between Southeast Burnside Street and Southeast 222nd Avenue. The METRO RUMAC is in a 1¾" thick single lift overlay.

Both projects have control sections of conventional mix which will be compared to the METRO RUMAC. The N. Marine Drive project uses a Class "C" control and the S.E. Stark St. project uses a Class "B" control.

METRO RUMAC mix designs were made by a modified Marshall design process. Satisfactory designs were made for both projects. However, when the design guidelines were examined, several shortcomings were noted that may cause problems on future projects. Consequently, if METRO RUMAC is to be used on future ODOT paving projects, refinement of the guidelines is recommended.

Both projects satisfactorily used different types of mix plants and rubber addition systems. One project used a drum plant and the rubber was added to the center of the drum by the equipment normally used to add recycled asphalt concrete. The other project used a batch plant, and bags of rubber were opened and dumped into the plant's pugmill.

The laydown and compaction of the METRO RUMAC and conventional mixes used the same equipment and techniques. On the N. Marine Drive project, the METRO RUMAC was tender and difficult to compact. These problems may have been due to an excessive amount of fine aggregate in the mix. On the S.E. Stark Street project, the rubberized mix was closer to the mix design gradation. This mix was not tender and was easily compacted to the desired density.

Experience on these two projects indicates that special testing procedures are needed for METRO RUMAC. Vacuum extractions using chlorinated hydrocarbon solvents may not be a good indicator of the rubber content of the mix, the asphalt content of the mix, or the gradation of the rubber in the mix. The extraction test results, however, may be valid for determining the combined gradation of the mix's aggregate and rubber. Nuclear gauges can be used to determine the density of METRO RUMAC. However, rubber particles may need to be removed from the pavement surface in order to securely seat the gauge, and the gauge must be well seated to get accurate density measurements.

Just after construction, the sections were in good condition. The surface friction values, ride smoothness values, and reductions in surface deflection values of the test sections were similar to the control sections and typical ODOT overlays.

Based on unit bid prices, the METRO RUMAC pavements cost about 50 percent more than their conventional counterparts per square yard of coverage. In addition, the mix suppliers estimated that $30,000 to $75,000 of added equipment would be needed to store the rubber and add the rubber to the plant with sufficient accuracy if this system was used routinely.

Recently, a report for this research project was published. The title of the report is "Rubber Modified Asphalt Concrete (METRO RUMAC) Evaluation: N. Marine Drive in Portland, Oregon, and S.E. Stark Street in Gresham, Oregon, Construction Report." It covers the construction and initial condition of the test and control sections. To obtain a copy of this report or additional information about this topic, please contact:

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