

Recycling Roads and Roofs

Oregon currently allows up to 30 percent recycled asphalt pavement (RAP) by weight to be used in hot mixed asphalt concrete (HMAC). In the fall of 2008, ODOT was asked to consider also allowing recycled asphalt shingles (RAS) in HMAC. The two principal sources of recycled asphalt shingles are manufacturer waste and tear-off shingles.



While using recycled materials can create short term benefits such as reduced cost and environmental impact, the performance of HMAC with RAS has been unclear. RAS contains asphalt binder that is substantially stiffer than that used in HMAC in Oregon and therefore inclusion of RAS in HMAC could significantly impact the properties of the blended asphalt binder. A preliminary study was developed to determine the effects of the addition of five percent RAS in blended asphalt binder.

For the study, only tear-off shingles obtained from re-roofing projects of residential structures were included. Critical temperatures of the blended asphalt binders from mixtures with five percent RAS and 0-50 percent RAP were compared with the critical temperatures of the virgin binder. Results indicated that the mixture with five percent RAS but no RAP had a significant impact

on the performance grade of the blended binder. Initial findings from the mixtures with RAS and RAP indicated that the RAP binder appeared to temper the effects of the RAS binder, but that sufficient quantities of RAP (30% or more) in combination with five percent RAS also had a significant impact on the performance grade of the blended binder. However subsequent evaluations have shown that all RAP and RAS combinations had a significant impact on the performance grade of the blended binder.

The preliminary study provided recommendations for improvements in laboratory testing procedures as well as recommendations for changes to the mix design method. It also suggested specifications for HMAC incorporating RAS and RAP for use in special provisions for a pilot study. The pilot study will take place in the summer of 2010 as part of secondary, more extensive examination of RAP and RAS use in HMAC.



The second, larger study was developed to investigate the use of blending charts to establish the maximum RAP proportion for which the blended binder possesses the desired properties. In addition, the effects of the inclusion of up to five percent RAS will

be evaluated. This study will also research improved methods for determining asphalt binder content of HMAC for mix design verification purposes as well as for both quality control and quality assurance purposes.

One objective of the larger study is to develop recommendations for a design process for selecting the grade of virgin asphalt binder for HMAC mixtures containing RAP or RAS, or combinations of RAP and RAS, such that the blended binder meets the design grade for the mixture. Other objectives include developing procedures for effectively and efficiently recovering asphalt binder from recycled asphalt

shingles, procedures for batching virgin materials (binder and aggregate) with RAP or RAS for mix design purposes and ignition oven tests, and a procedure for determining ignition oven calibration factors for HMAC mixtures containing RAP and/or RAS. Quality Control/Quality Assurance (QC/QA) test procedures will also be reviewed for mixtures incorporating RAP or RAS, or combinations of RAP and RAS, as well as independent assurance parameters associated with determining asphalt binder content based on incineration using ignition oven tests.

The second study is scheduled to be complete in early 2011.



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The final report for this project was published in March 2010 and is available on the Research Section web page:
http://www.oregon.gov/ODOT/TD/TP_RES/docs/Reports/2010/RAP_and_RAS_in_HMAC.pdf