

Delaware T² Center

Technical Brief

Shingles – Use in Hot Mix Asphalt Pavement

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Date: November 14, 2008

Summary

A number of state DOTs allow the limited use of recycled shingles in hot mix asphalt (HMA) pavement, including Delaware, Florida, Georgia, Maryland, Michigan, Minnesota, Missouri, New Jersey, North Carolina, Ohio, and Indiana. Typically, use is limited to manufacturer's scrap and 5% by weight. A number of benefits have been found through the use of recycled shingles, but there are some disadvantages and concerns. A chief concern, as with many recycled components of HMA, is the quality of the recycled component; hence, the limitation by most jurisdictions to the use of only manufacturer's waste product.



Discussion

Beyond the obvious desire to reduce waste in landfills, use of shingles in HMA designs may, depending upon the regional availability of materials, provide an economic benefit and even provide improved pavement performance by way of improved rut resistance and material stability. However, the harder asphalt cement may increase low temperature fatigue and contribute to cracking.

Information Review

The published information on this topic is voluminous and the excerpts selected here should in no way be considered exhaustive or even necessarily representative of nationwide findings, policies, specifications, or conclusions.

- A typical, new residential asphalt shingle contains 16-25% (by weight) asphalt cement, 32-42% coating filler (limestone or fly ash), 28-42% granules, and smaller fractions of black dust (limestone or silica sand), fiberglass, paper, cotton rags, and adhesives. With regard to older shingles, federal law prohibits recycling of asbestos containing materials (ACM, materials with over 1% asbestos).¹
- An estimated 9-10 million tons of asphalt roofing waste is sent to U.S. landfills each year at a disposal cost of \$400 million.²
- HMA is the most common process for the use of recycled (usually manufacturing scrap) shingles. Various state DOTs' specifications provide for the use, including Maryland and New

Jersey (each allow 5%, manufacturing scrap). Waste shingles are typically ground to ½” screened size for batch plants and ¼” for continuous feed plants and added to the aggregate before the addition of virgin asphalt binder. Fiberglass-based shingles in California contain 20% asphalt, whereas HMA designs are typically 6% asphalt [or less], so a small addition of shingles can displace a large amount of virgin binder. Because the asphalt used in shingles is harder than the binder used in HMA, the resulting mix may have improved resistance to rutting and increased stability, along with other benefits.^{3,4}

- While it is believed that HMA with recycled shingles benefit from improved rut resistance, a disadvantage may be increased low temperature fatigue and cracking.⁵
- Delaware has a Beneficial Use Determination Policy that allows the use of manufacturers' recycled asphalt shingles in hot-mix asphalt (HMA); while there is no indication within DeIDOT's Specifications for Road and Bridge Construction (Section 823), the Special Provisions for Superpave do reference it (5% maximum) and the practice has been in use for about five years.⁶ There is currently one shingle recycling operator in Delaware. Maryland has a specification that allows the use of up to 5% manufacturers' shingle scrap; see Section 904 of Maryland's Standard Specifications for Construction and Materials.⁷
- “Tear-off” shingles refers to the waste material from stripping an aged roof as opposed to the waste or off-spec materials from the manufacturing process. Tear-offs can contain foreign materials (wood, nails, etc.), may contain asbestos, and may be in an irreversible, age-hardened state.⁸



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¹ “Recycling Tear-Off Asphalt Shingles: Best Practices Guide,” Construction Materials Recycling Association, October 11, 2007.

² “21st Century Recycling,” Professional Roofing, August 2001.

³ “Asphalt Roofing Shingle Recycling: Introduction,” Publication 431-97-031, California Integrated Waste Management Board, July 2006.

⁴ “Asphalt Roofing Shingle in Asphalt Pavement,” Publication 431-97-033, California Integrated Waste Management Board, July 2006.

⁵ “C&D World: Shingle Minded,” Recycling Today, January 15, 2007.

⁶ Email from Jim Pappas, Materials Engineer, DeIDOT, November 12, 2008.

⁷ http://www.shinglerecycling.org/index.php?option=com_content&task=view&id=136&Itemid=118, Construction Materials Recycling Association.

⁸ <http://www.fhwa.dot.gov/PAVEMENT/recycling/recroof.cfm>, Federal Highway Administration.