ECOMATERIAL TECHNOLOGIES
A CRH COMPANY

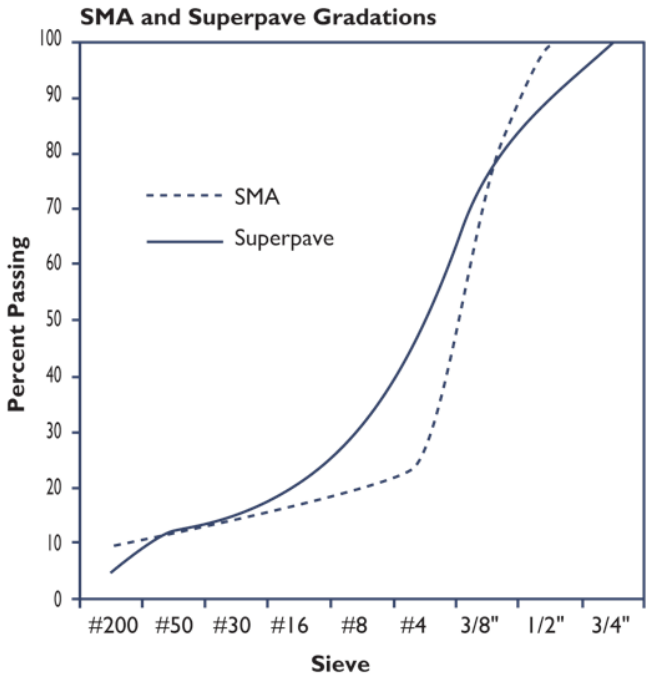
TECHNICAL BULLETIN

Fly Ash

For Stone Matrix Asphalt

Stone Matrix Asphalt (SMA) is a durable, stable, rut-resistant hot mix asphalt (HMA) consisting of two parts: a coarse aggregate skeleton and an asphalt rich binder mortar.

The coarse aggregate provides stone-on-stone contact for bearing and rut resistance. The asphalt rich binder provides sufficient mortar of the desired consistency for durability, requiring a large amount of mineral filler such as fly ash to convert the fluid asphalt into asphalt mastic.



Best known for its use as an ingredient in concrete mixes, fly ash also has physical properties that make it a valuable component in the production of stone matrix asphalt.

SMA has been used in Europe for 20 years and was originally designed to resist the abrasive nature of studded tires. The added benefit of resistance to general rutting was also observed, leading to the installation of SMA in general use highways. Because of the European success, five states constructed SMA demonstration projects in 1991. Since that time, the use of SMA within the United States has increased significantly.

In 1997, the National Center for Asphalt Technology (NCAT) completed a performance evaluation of SMA pavements that was sponsored by the Federal Highway Administration. For this evaluation, more than 100 SMA mixtures from 140 SMA projects in more than 19 states were evaluated. The report concluded, "Over 90% of the SMA projects had rutting measurements less than 4mm. Approximately 25% of the projects had no measurable rutting. The resistance to rutting appears to be excellent considering the high traffic volume on most of the SMA mixtures."[1]

The crushed aggregate gradations for SMA are more

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gap-graded than HMA or Superpave dense-graded mixtures, with approximately 75% of the aggregates retained on a No. 4 sieve for SMA versus 50% for Superpave. The gap-graduation of SMA will require a higher asphalt binder content in the range of 6.0%, versus a Superpave asphalt binder content of 4.5%. Mineral filler such as fly ash is required to stiffen the asphalt. A stabilizing additive is used to create mastic consistency, and to prevent draindown where the asphalt binder drains from the coarse aggregate during transportation and laydown. In all cases the stabilizer has taken the form of either a fiber (cellulose or mineral) or a polymer.

The mineral filler content (portion of the aggregate passing the 0.075 mm [No. 200] sieve) in SMA can range up to 10% of the total aggregate. This filler content is greater than that found in conventional HMA and is twice that of most Superpave mixes. The NCAT report concluded that of the 140 SMA projects "SMA mixtures were produced approximately…80 percent of the time with 7-11% of the material passing the 0.075 mm sieve." The high percentage of material passing the 200-mesh sieve is typically not available as a residue from aggregate crushing and must be added in some other form to the SMA mix at the batch plant. The uniform, well-graded nature of fly ash provides the high quality mineral filler required for SMA.

For more information or answers to questions about the use of fly ash in specific applications, contact your nearest Eco Material Technologies Technical Sales Representative or call 1-770-684-0102.

1 "Performance of Stone Matrix Asphalt (SMA) Mixtures in the United States", NCAT Report No. 97-1, National Center for Asphalt Technology, Auburn University, AL, 36849-5354, January 1997.

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