

# EVERYTHING ASPHALT

## Hot Mix Asphalt (HMA) with RAP



*"Indiana DOT's savings in materials were nearly \$330,000 per year when adding only 5 percent RAP to more than 5 million tons of base and intermediate mixes—although RAP contents of 15 percent to 20 percent are more typical."*  
TR News, 2005



### Saving Taxpayer Dollars and The Environment

When an asphalt pavement or asphalt surface has reached the end of its life, it is usually milled off of the pavement before reconstruction. While the asphalt binder in these millings is normally age-hardened, the reclaimed asphalt pavement (RAP) can contain valuable road paving material. Although RAP had been blended into HMA for many years, the process was largely discontinued because RAP was not included in Superpave design. RAP was stockpiled and even considered as a hazardous waste by some jurisdictions. To allow the substitution of recycled material for increasingly expensive aggregates, guidelines for Superpave RAP use were developed under National Cooperative Highway Research Program (NCHRP) Project 9-12.

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### Designed for Quality

The NCHRP research demonstrated that acceptable Superpave mixtures can be designed with RAP, but aggregate quality and gradation in the RAP material may limit the amount of RAP that can be incorporated. Adding 20 to 25% RAP raised the high temperature grade of the plant-produced mixture by one increment. Dropping the virgin binder grade by one increment will counteract the stiffening effect of the RAP binder. Low amounts of RAP (up to about 15%) could be used with no change in the virgin binder grade. The North Central Superpave Center concluded that the use of RAP can offset the perceived higher costs of Superpave mixtures while still providing good performance for low volume roads. They further state that all mixtures need to be designed for appropriate traffic levels, and agencies should evaluate their own materials to assess typical RAP binder grades and aggregate quality and gradations. The following guidelines were developed for the use of RAP in HMA:

Tier 1 - The amount of RAP in the HMA mix is equal to or less than 15%. The selected PG grade of the virgin binder should be the same as the Superpave specified PG grade.

Tier 2 - The amount of RAP in the HMA mix is more than 15% but equal to or less than 25%. The selected PG grade of the virgin asphalt binder should be one grade below, both high and low temperature, the Superpave specified PG grade.

Tier 3 - The amount of RAP in the HMA mix is more than 25%. A viscosity blending chart should be used to select the high temperature grade of the virgin asphalt binder. The low temperature grade should be at least one grade lower than the binder grade specified by Superpave.

For a quality mix, it is important to know what stone and asphalt properties exist in the reclaimed pavement. RAP stockpiles should be separated and identified by source, and contamination with other materials avoided. Consistent RAP products can be produced using a crushing and screening operation and reprocessing stockpiles.

### Manufacture and Construction

To incorporate the RAP into the mix, it is delivered from a separate cold-feed bin to the plant. The RAP can be added to the new aggregate in one of three locations: the bottom of the hot elevator; the hot bins; or, most commonly, the weigh hopper. Heat transfer between the superheated new aggregate and the reclaimed material begins as soon as the two materials come in contact and continues during the mixing process in the pugmill.

Conventional HMA techniques and equipment can be used for laydown and compaction when using recycled mixes. However, recycled mixes are frequently placed at slightly cooler temperatures than virgin mixes to reduce the effects of super-heated temperatures at the mix plant. The recycled mixes may be stiffer, so compaction should commence quickly. Densities are typically achieved faster than with mixes made from all virgin materials.

### Martin Asphalt Products for Hot Mix Asphalt with RAP

**PG Graded Asphalts** | Hot mix asphalt is made with Superpave performance graded asphalt binders. When using RAP, see the above guidelines for adjusting the binder grade to account for the aged binder in the recycled material.

### Martin Asphalt Makes It Easy

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