



# Binder Performance

*Georgia test section uses Elvaloy modified asphalt binder*

**By Patrick Lavin, P.E.**

*The use of polymer modified asphalt (PMA) in the United States has increased substantially since the implementation of the Strategic Highway Research Program (SHRP). Asphalt cement (AC), in combination with certain modifiers, is required to meet performance grade (PG) specs created by SHRP. These asphalt binders are typically modified with a polymer, such as styrene butadiene styrene (SBS), to meet these requirements.*

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Recently, the Georgia Department of Transportation (GDOT) specified the use of one such modifier, Elvaloy RET, in a 12.5-millimeter Level C Superpave mixture. Elvaloy RET, manufactured by Dupont Packaging and Industrial Polymers, Wilmington, Del., is a reactive elastomeric terpolymer that can



The 12.5-millimeter Superpave mixture was produced by Southern Asphalt, Columbus, Ga., and was placed as a wearing course at a thickness of 1.5 inches.



Gulf Coast Asphalt, Mobile, Ala., manufactured the PG76-22 by dispersing 1.5 percent Elvaloy RET pellets into a PG64-22 base asphalt binder in a blend tank.

be added to an asphalt binder. It is designed to stiffen the asphalt binder and improve its elastomeric properties. A terpolymer is a polymer that is made from three monomers. Elvaloy RET is an elastomer that is added to the asphalt binder at a typical dosage of 1 to 2 percent. Elvaloy RET reacts with certain portions of the asphalt binder to provide both high temperature and elastomeric properties. Elvaloy RET is designed to:

- React with the asphaltene fraction of the asphalt binder through the use of epoxy functional groups. These

**Elvaloy RET is an elastomer that is added to the asphalt binder at a typical dosage of 1 to 2 percent.**

groups provide an increase in the binder stiffness at high pavement service temperatures with a corresponding reduction in permanent strain. Because Elvaloy RET is reacted with the asphalt binder, it will not separate during storage.

- Provide elastomeric properties to the asphalt binder. The GDOT Superpave mixture

was placed on a section of the Veterans Parkway (U.S. Route 27) in Columbus, Ga., in May 2003. The



## POLYMERS

According to Hawley's Condensed Chemical Dictionary, a polymer is either organic or synthetic and is a macromolecule formed by the chemical union of five or more identical combining units called monomers<sup>1</sup>. A polymer is added to the asphalt binder to increase the resistance of the entire asphalt mixture to permanent deformation, especially at high service temperatures. This is accomplished without significantly affecting the physical properties of the asphalt binder at lower temperatures. The asphalt binder is stiffened so that its total viscoelastic response is reduced with a corresponding reduction in permanent strain.

Certain polymers, usually called elastomers, provide the elastic component of the asphalt binder and provide an increase in the binder's stiffness at high temperature and loading. SBS is an elastomer that is typically added to the asphalt binder at a dosage of 2 to 4 percent. Polymers that are called plastomers will provide an increase in the binder's stiffness at high temperature and loading, but without an increase in the elastic component of the binder. ■

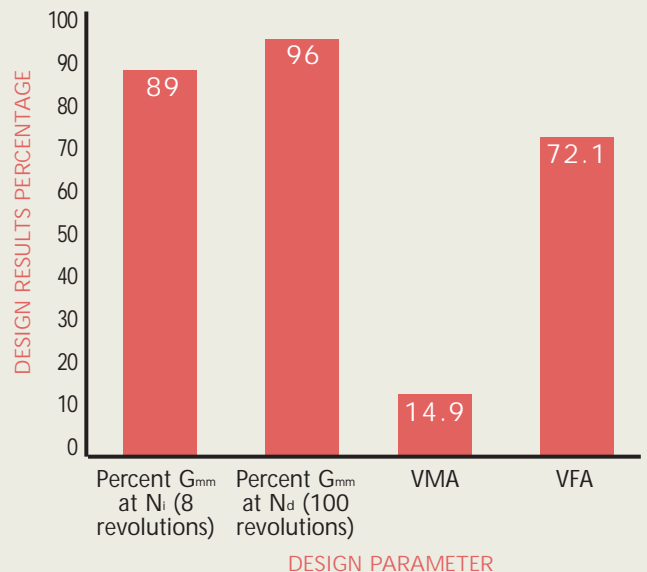
TABLE 1

## 12.5-millimeter Superpave mixture gradation

SIEVE SIZE, MILLIMETER	TOTAL PASSING, PERCENTAGE
19.0	100
12.5	99
9.5	85
4.75	52
2.36	37
1.18	29
600 micrometer	23
300 micrometer	15
150 micrometer	9
75 micrometer	4.9

TABLE 2

## Volumetric Properties



average daily traffic for the parkway is approximately 31,600 and was last measured in 2000. The 12.5-millimeter Superpave mixture required a binder PG76-22. GDOT also requires the phase angle of the asphalt binder be less than or equal to 75 degrees. Typically, asphalt binders meeting the PG76-22 grade requirements will be modified with an SBS polymer or an Elvaloy terpolymer.

Gulf Coast Asphalt, Mobile, Ala., manufactured the PG76-22 by modifying a PG64-22 base asphalt binder with 1.5 percent Elvaloy RET. The

Elvaloy RET pellets were dispersed into the asphalt binder in a blend tank. The 12.5-millimeter Superpave mixture was produced by Southern Asphalt, Columbus, Ga., and was placed as a wearing course at a thickness of 1.5 inches. The mixture contained 10 percent recycled asphalt pavement (RAP) and required an asphalt binder content of 4.7 percent. The gradation of the job mix formula is provided in Table 1 (above).

The design volumetric properties are provided in Table 2, (above). GDOT used the effective bulk specific

gravity of the combined aggregate to determine VMA.

Compaction was achieved through the use of a vibratory breakdown roller followed by a pneumatic roller.

The asphalt pavement was immediately put into service and GDOT will monitor its performance. ■

<sup>1</sup>Lewis, Richard, Sr. (1993). *Hawley's Condensed Chemical Dictionary, 12th ed.* New York City, NY: Von Nostrand Reinhold.

For Process Chemicals,  
InfoDirect 3826 at [www.asphalt.com](http://www.asphalt.com)

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Elvaloy® RET is manufactured by Dupont Packaging and Industrial Polymers. In 2002, Dupont appointed Process Chemicals, ARR-MAZ Products Division, the exclusive distributor for Elvaloy RET in asphalt paving markets in North America.

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