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Placing shoulders with warm mix and 50 percent RAP

By Daniel C. Brown

The Illinois DOT elected to replace the shoulders on Route 53 before doing something about the mainline.

It would be hard to imagine a greener, more sustainable asphalt paving project than this one. Last summer, Gallagher Asphalt Corp. of Thornton, Illinois, placed 54 miles of shoulder pavement using a warm-mix asphalt design comprised of 50 percent RAP (recycled asphalt product) for the 6-inch base course.

The \$4.5 million Illinois Department of Transportation (DOT) project created new shoulders for Illinois Route 53 in southwest suburban Chicago.

The condition of the existing shoulders along the 14.6 centerline miles was very uneven, says Dan Darden, Gallagher's vice president of construction. In some areas the shoulders were built with 8.5 inches of asphalt, and in other areas there was no asphalt, only stone.

Route 53 is a four-lane urban arterial with a median in some stretches, which means Gallagher paved four shoulders in those areas. The highway carries heavy traffic with a high percentage of trucks. The contractor handled traffic control by sealing off one lane to use for construction while pushing traffic to the opposite side. Three to four crews worked simultaneously, doing milling, laying down a stone base, and paving the shoulders.

Warm-mix benefits

Two of Gallagher's three asphalt plants are equipped with foam attachments for producing warm mix. Darden says his company has performed six warm-mix projects, including two for the Illinois DOT in Homewood, Illinois.

Foam attachments inject a tiny amount of water into the liquid asphalt stream as it passes into the drum, foaming the asphalt which helps it to coat the aggregate thoroughly at lower temperatures. During the mixing and compaction process the steam is released from the mix.

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"I think warm mix is going to be a very, very important part of the industry in the near future," says Darden. "Gallagher is all about being environmentally friendly and working within the constraints of being green."

The Route 53 project called for 6 inches of base asphalt, 1 inch of polymer leveling course, and a 1.5-inch surface course. Gallagher paved the base course in two lifts.

"We're ahead of schedule," Darden told *HMAT* in August. Construction began in June and was scheduled for completion by October, but Darden planned to finish around the first of September.

The base course mix design calls for an N-Design of 30 and 50 percent RAP, says Alan Okkonen, regional manager at Chicago Testing Laboratory Inc., which is handling the mix designs and quality control for the project. The grade of virgin asphalt is PG 58-28, which is a softer asphalt than normal to compensate for the high RAP percentage. The binder in RAP is harder, so the softer virgin AC brings the composite blend back to approximately a PG 64-22.

In the base course, Gallagher is adding 2.4 percent of virgin asphalt and the top-size aggregate is $\frac{3}{4}$ -inch (0.75 inch). The warm mix is being produced at approximately 250 to 270 degrees F. Typically, hot mix is produced at 280 to 320 degrees F.

Warm mix lowers the carbon footprint of the asphalt, says Jim Trost, Gallagher's superintendent of plant operations. The contractor has found that warm mix requires 7 to 11 percent less burner fuel than hot mix. Because warm mix is produced at lower temperatures, blue smoke and fumes are reduced to nothing. And because of the reduced oxidation of the new asphalt, warm mix allows for an increased percentage of RAP, which contains harder, oxidized asphalt, Trost says.



Gallagher Asphalt's road widener paves the first lift of a 6-inch base course of warm mix on Route 53's shoulders



Gallagher mills out the old shoulders, which were up to 8 inches deep.

Photos courtesy of Gallagher Asphalt.

The second mix design – for the polymer leveling course – calls for an N-design of 50 and a top-size aggregate of 4.75 millimeters. It is a polymer sand mix with 4 percent air voids and 15 percent RAP. Liquid PG 76-22 asphalt is added at 6.9 percent. At the 15 percent RAP level, the binder grade need not be bumped, says Okkonen.

Darden said Gallagher is trying out two different brands of road wideners to place the base stone and shoulder asphalt. “The plant can typically run this warm mix at around 300 to 500 tons per hour, but in the field, we are laying that base at anywhere from 240 to 250 tons per hour,” says Darden.

For several years now, Gallagher has fractionated RAP into two sizes, coarse and fine, divided at 3/8-inch. Fractionating the RAP provides improved control over the aggregate gradation and AC content of the mixture, says Trost. Fine RAP contains more liquid

asphalt than coarse RAP does, so separating the two helps produce a well-blended mix.

Trost says the Illinois DOT is running rut tests on warm mix for the surface course. The surface mix design has an N-design of 70 gyrations, 4 percent air voids, and 20 percent RAP. The grade of liquid asphalt is PG 64-22, which is being injected into the mix at the rate of 4.9 percent. The top size aggregate is 3/8-inch.

The project requires 45,200 tons of asphalt for pavement, and 25,450 tons of stone for base.

“I’d say the challenge of this project is just the length of it, and getting it done in a timely manner,” says Darden. “We have to deal with a lot of heavy traffic. We take a lane daily and then break it down by the end of the day. We have multiple operations going at the same time. We are out ahead grinding the old asphalt; we are putting down

stone; we are paving with asphalt. So we have three or four different crews going in different modes and in different areas of the project at all times.”

It’s a green and sustainable project. And if IDOT agrees, Gallagher will be able to use warm mix on the surface course, which will make it greener yet. “The guys who ran the mix said it looked pretty good,” says Darden. “We love our warm mix.”

Finally, Chicago Testing Laboratory is using this project to run tests on warm-mix asphalt made with a liquid additive from Akzo Nobel. Production temperatures are running about 250 degrees F. The Illinois DOT will take numerous samples of the warm mix to determine if the additive can be approved for state use. **HMAT**

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