



BY BILL WILSON
EDITORIAL DIRECTOR

FULL-DEPTH RECLAMATION

It is tough to evict pavement. At least the kind that can still pay the bills. Like many road agencies, the Illinois Tollway could have tossed a stretch of I-90/I-39 in Rockford, Ill., out on another street somewhere, one that would have led to the back of an unfamiliar asphalt plant or a landfill.

The private agency, however, saw aggregate with potential, and gave the 16 miles a new line of work—as an assistant to one of the finest examples of recycling in the state of Illinois. Every last bit of the aging section of roadway, which consisted of a 12-in. base, a 10-in. layer of portland cement concrete and a 3-in. asphalt overlay, was reused for the eastbound Jane Addams Memorial Tollway Widening and Reconstruction project that ultimately saved the Illinois Tollway \$6 million and secured the concept of high-percentage recycling in the region.

“The biggest challenge was tailoring the projects to match the availability of materials and contractors in the region to put together a cost-effective project to get the most for the Tollway’s money,” Paul Kovacs, chief engineer for the Illinois Tollway, told *ROADS & BRIDGES*. “By developing the specific

A GOOD RAP

Illinois Tollway uses a high percentage of reusable material on I-90/I-39 job





Along with using high doses of RAP, the Illinois Tollway introduced the use of fractionated RAP and ground-tire rubber modifiers.

pavement types and contract packaging strategies, our staff met this challenge.” Adding weight to the challenge was the fact that the corridor under question handled a heavy load of truck traffic (30% of its average daily traffic).

Rockford is located about 90 miles northwest of Chicago, but for this job the two cities seemed worlds apart. After all, materials and big-time contractors are draped all over the Second City, but the numbers turned small the farther out you drifted.

Innovation refused to get caught in the tide of challenges for this job, which also involved the addition of a third lane for a total cost of \$70 million. Along with using high doses of reclaimed asphalt pavement (RAP), the Illinois Tollway, along with contractors Rockford Blacktop and Rock Road Cos. and designer URS Corp./STS Aecom, introduced the use of fractionated reclaimed asphalt pavement (FRAP) and ground-tire rubber modifiers. The experiment quickly took on the form of an expert and was an obvious top choice in the full-depth reclamation category of the 2008 ROADS & BRIDGES/ARRA Recycling Awards.

Old pavement, new trick

Rockford was hard when it came to changing operations. In order to sell the idea of increased recycling, the Illinois Tollway needed to charm

and convince its way into planning rooms of road contractors. An industry representative from Astec Industries also helped soften the rigidity, and after an afternoon session the idea of reusing more material started turning up in conversation.

“You would not believe the people who turned out for that,” Steve Gillen, materials engineer for the Illinois Tollway, told ROADS & BRIDGES. “It was every HMA [hot-mix asphalt] contractor in the northern half of Illinois along with the Illinois DOT people. That meeting flipped the switch to it all.”

The existing pavement was cooperating, too. Because the Illinois Tollway demanded the use of prime material during initial construction years ago, plenty of life remained in the stone. According to Gillen, the agency used “A-quality stone” throughout its system back then, whereas the Illinois DOT only required B-quality stone, which was softer and more susceptible to breakdown. The “A” material also contained manufactured sand instead of the natural variety, which helped its overall performance.

The higher grade allowed the use of a higher percentage of RAP, as much as 50% in some mixes. The confident Tollway, however, was cautious when it came to the approach.

To solidify the choice of mixes, the Illinois HMA industry, local agencies and the Tollway executed a string

of test strips through an advanced work contract in 2007 to support temporary traffic on the I-90 reconstruction project. In selected spots, three different varieties of stone-matrix asphalt (SMA) and six dense-graded HMA mixes were tested. All three SMA variations contained the ground-tire rubber modifier and 15% fine-portion FRAP. The difference between the trio was the type of rock used. One came with dia-base stone coarse aggregate, one had steel slag coarse aggregate and another came with crushed gravel. In other test sections, the HMA binder course for the mainline intermediate lifts of mainline pavement was an N70 with a PG 58-22 binder made up of 4% air voids and 40% FRAP. Three mixes were tried for the shoulders (one for the surface course and two serving as binder courses). The binder courses were N50 mixes with 3% air voids and 40% FRAP. One carried a PG 58-28 binder while the other had a 58-22 binder to determine if a softer and more costly PG 58-28 grade asphalt liquid would be needed with the higher FRAP mixes. The surface course mix was an N70 with a PG 64-22 binder and contained 4% air voids and 25% FRAP. There were two HMA binder course mixes for the mainline base. Both were N50s with 2% air voids and 40% FRAP. One carried a PG 58-28 binder while the other had a PG 58-22 binder to

confirm if the costlier liquid would be needed. The production samples were bagged and shipped to the University of Illinois Advanced Transportation Research and Engineering Laboratory facility for structural analysis. The contractors opted to go with the SMA mixes with the diabase stone and crushed gravel, even though the test results for all three were positive. The diabase stone came from Wisconsin, which was closer than the steel slag that had to be hauled up from northwest Indiana. For the dense-graded mixes, the contractors basically used the same mixes produced and analyzed. The University of Illinois research data indicated little or no increased risk of reduced durability using the stiffer and less costly liquids with the increased FRAP quantities.

Where test sections were not placed, the contractor put in a bandage overlay that was an N90 mix

with 3/8-in. nominal aggregate held together by a PG 64-22 binder.

With the new mix now official, starting in 2008 crews tore through the existing pavement. Wirtgen milling machines came in and milled the 3 inches of asphalt overlay. The old PCC pavement was either chipped with an Antigo Multi-Head breaker for rubblization or simply removed and reprocessed through an Astec ProSizer Mobile Crusher and Screening Plant or one of two Cedarapids crusher/screening plants. The milled HMA overlay material was returned to numerous plants and fractionated or sized through the Astec ProSizer Mobile Crusher and other screening devices.

“We did rubblization in some confined areas, but in most cases the existing concrete was fed into stationary processors located just off the jobsite. Then after the processing and screening it was hauled back

to the site for placement as sub-base material,” said Gillen.

With the site cleared, open-graded gravel (1/2-in. to 3-in. particles) containing the reprocessed concrete or virgin dolomites brought in from local quarries was dropped in as porous granular embankment. The 9-in. porous granular embankment was covered with a dense-graded aggregate consisting of CA-6 aggregate.

“When there was not enough concrete to reprocess because we widened that roadway, we had to incorporate some quantity of new stone,” said Gillen.

The site was now ready for the fresh asphalt, which was placed in numerous lifts to construct full-depth HMA mainline pavements of 12 and 15 inches. The 12-in. portion contained the following lifts:

Continued on p 64

INCREDIBLE ATTACHMENTS
FOR EXCAVATORS, WHEEL LOADERS, AND BACKHOE MACHINES

PIPE HOOK
shown: PH3500
self-leveling model
Move any shape of pipe

PIPE LIFT
shown: PL2700
Move any type of pipe

Bridge deck removal
SLAB CRAB®
shown: SC300

BARRIER LIFT
Move Jersey wall
shown: KL9000NG
w/ alignment guides

KENCO
"America's Largest Attachment Provider"

See our entire line of attachments at www.kenco.com
Call Today 1-800-653-6069

Circle 761

ARRA AWARDS

Continued from p 33

- A 3½-in. N50, IL-19 base course containing 40% FRAP with a PG 58-28 binder;
- A 3½-in. N90, IL-19 binder course containing 40% FRAP with a PG 58-22 binder;
- A 3-in. N80 SMA/ground-tire rubber binder course containing 15% fine-aggregate FRAP with a PG 76-22 binder; and
- A 2-in. N80 SMA/ground-tire rubber binder surface course containing 15% fine-aggregate FRAP with a PG 76-22 binder.

The 15-in. full-depth sections were made up of:

- A 3-in. N50, IL-19 base course containing 40-50% FRAP with a PG 58-28 binder;
- A 3½-in. N70, IL-19 binder course containing 40% FRAP with a PG 58-22 binder;
- A 3½-in. N90, IL-19 binder course containing 25% FRAP with a PG 58-22 binder;
- A 3-in. N80 SMA/ground-tire rubber binder course containing 15% fine-aggregate FRAP with a PG 76-22 binder; and
- A 2-in. N80 SMA/ground-tire rubber surface course containing 15% fine-aggregate FRAP with a PG 76-22 binder.

The temperature of the HMA was 300-310° when it left the asphalt plant, and for the densified mixes the laydown temp was 260-270°. However, the SMA version had to be as hot as 300° when it left the paver, which meant the contractors had to work the mix in during warm-temperature days.

A number of different pavers were used by Rock Road and Rockford Blacktop, including a Cedarapids 562, a Terex 552, an Ingersoll Rand

PF-2181 MTD, MC-330 and a PF-4410 MTD, a Caterpillar AP-1000 and a Roadtec SB-2500.

The SMA also required special treatment during compaction. Double-drum steel rollers were used, while vibratory rollers worked the other mats. Compaction machines included two HYPAC C 784s, two C 350Ds and a C754, an Ingersoll Rand DD-118, DD-90 HF, ST80 and DD-32, a Sakai R2H-1, a Hamm HD 120 and a Hyster C 350C.

Roadtec material transfer devices also were used during the paving operation.

The contractors were required to handle all of the quality-control testing. Both were achieving the specified minimum densities of 92-93% and the air voids were within the design tolerances of 4% (3.5% for the SMA mix).

“We did not have any significant problems with these materials because of the extensive prework that was done,” said Gillen. “The work

Iroquois shows strength of recycling

If you are going to share an award, it is a little easier when you are located in the same state. The Iroquois (Ill.) Highway Department also claimed a ROADS & BRIDGES/ARRA Recycling Award in the full-depth reclamation category.


The reconstruction of a 3.6-mile stretch of 1700E involved stabilizing the existing aggregate base course, existing chip seal and 4 inches of compacted stone. The upper 12 inches of material was stabilized using Class C fly ash, and a new 20-in.-wide A-2 bituminous surface was put in place. After the additional stone was added, the existing pavement was pulverized.

The experimental feature of this reconstruction involved the utilization of the self-centering Class C fly ash and its effects on the eventual outcome of the structural strength of the roadway. Following the pulverization of the existing pavement, the surface required the addition of the Class C fly ash, moisture conditioning and the mixing and compacting of the stabilized material to the specified required density. After compaction was complete, the new pavement was sealed with the A-2 bituminous surface treatment.

The total cost of the project was just over \$530,000. If the Iroquois Highway Department went with a 9-in. HMA lift over a 6-in. aggregate base it would have cost over \$1.74 million.

confirmed that the high FRAP material mixes could be easily compacted and produced consistently. The fact that we used variably sized processed RAP made the control and consistency of those materials much better than standard mixes using lower quantities of unprocessed RAP.”

The Illinois Tollway is starting to show consistency with its RAP approach. Currently the agency is overseeing a job on the Veterans Memorial Tollway (I-355 between 75th Street and Ogden Avenue) that has similarities to the Jane Addams project. High volumes of RAP are being used, albeit not quite at the level of the job in Rockford.

“There are many system-wide overlays coming up in the near future and I am sure we will incorporate similar specifications for material,” said Gillen. 



LearnMore!
For more information related to this article, go to: www.roadbridges.com/lm.cfm/rb020910