BY ADRIAN J. CRAVEN

Paving the Way at Indy

Mecca of U.S. automobile racing, the Indianapolis Motor Speedway was initially surfaced in 1909 with a mixture of crushed stone and tar. However, the track soon began to disintegrate as speeds exceeded 70 miles an hour, and up to 20 cars competed in the longer events of 300 miles. To prevent further problems, more than 3 million bricks, grouted in cement, were installed on the 2-mile circuit in late 1909. It was not until the '30s that the famed brickyard needed major resurfacing and the roughest stretches were paved with asphalt.

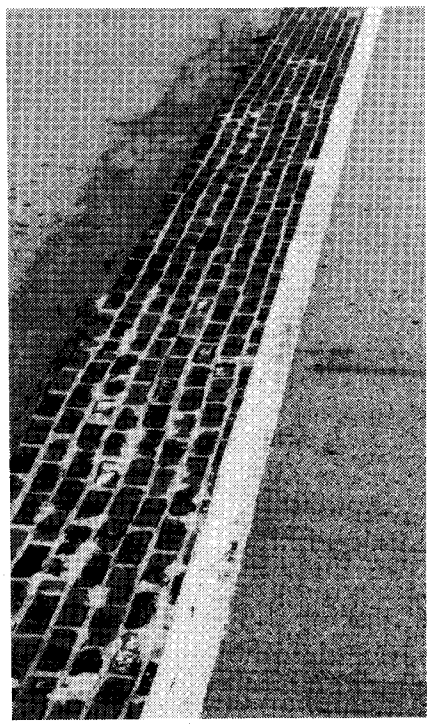
Since then, routine repairs keep the track in excellent condition. In 1988, the track again needed major resurfacing. The major recurring problem is reflective cracking. Reflective cracking was causing problems since the cars have a meager 2 inches of clearance. (Reflective cracking occurs when an existing crack in the concrete base is reflected through to a new surface.)

"Every time a car hit a reflective crack, the car bottomed out," says John Sikich of Road Fabrics Inc., La Grange, Ill., one of the installers. "Sparks would fly."

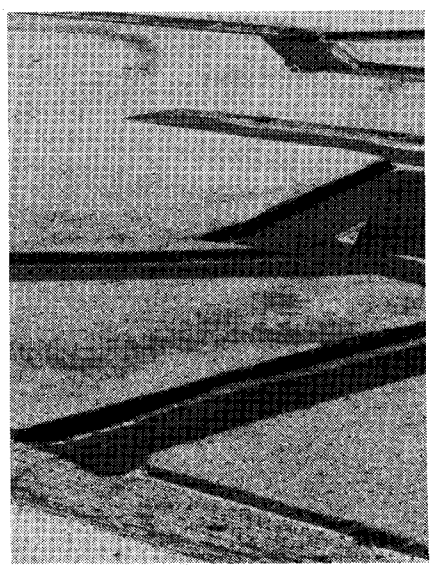
Much of the pavement stress that causes reflective cracking on the 2-mile oval track occurs on the steeply banked turns. Most cracks are on the turns that are super-elevated at 21 degrees and run across the track.

"I think there are two main reasons for the cracks," says Tom Grady of contractor Grady Bros. Inc. in Indianapolis. "The first is settlement of the track over the brick — not the most desirable subsurface. The second is the stress of high speeds and heavy tires on the track."

Grady Brothers, Inc., have done repaving work at the Speedway for over 50 years. Tom Grady's father worked on it in the 1930s. When the track was last repaired in 1976, the use of geotextiles was in its infancy. It was relatively unknown that geotextiles could be used to keep moisture out of paved surfaces, help retard reflective cracking and extend the track's service life.



This preserved section at the Indianapolis Motor Speedway shows the 3 million bricks that were originally laid underneath the track in 1909.



Before laying the asphalt overlay fabric, the reflective cracks in the curves were milled to a depth of 2 to 2½ inches.

Surprisingly, the fact that the track is raced so little - only each May - contributes to its condition.

"Being trafficked more would definitely help the surface of the track," says David Scheper of Grady Brothers, Inc. "It would help it settle. And there's a tremendous amount of oxidation that takes place on the asphalt; with the sun beating down, there's no shade at all out there."

Alternatives

To eliminate the reflective cracks would normally require placing another overlay on the track. Besides installing a thicker overlay, another alternative would have been using an unreinforced waterproof membrane on the track. This, however, could cause inadequate friction between the old and new asphalt concrete pavement layers. Without some possible pavement sharing, this friction is needed to resist the high shear forces on the track.

Instead, asphalt membrane interlayer systems were installed using two different pavement asphalt overlay fabrics to achieve high-quality rehabilitation on the high-speed curves and the pits area.

The two chosen pavement membranes were Petromat and Petrotac, both manufactured by Phillips Fibers Corp.

No formal design engineer selected these asphalt overlay fabrics because of their prior use by the Indianapolis Motor Speedway. In 1985, Speedway officials selected the fabric for the parking lot of the Speedway Shopping Center that they own. After three years of performance, they were comfortable to use the same products on the track.

Cracking in the Curves

Petrotac, a double-coated fabric manufactured by Phillips Fibers Corporation of Greenville, S.C., was specified and installed on the curves. This as-

phalt overlay fabric consists of a nonwoven polypropylene geotextile precoated with rubberized asphalt cement on the bottom side and paving grade asphalt on top.

On the curves, deep cracks had developed between the original brick and subsequent asphalt overlays. Since these cracks were on super-elevated turns, a special construction technique was employed. Cracked areas were milled to a depth of 2 to 2½ inches and the surface was then cleaned. Twelve-inch-wide strips of the fabric weighing 50 oz/yd² were installed by hand by one person.

The self-adhering pavement membrane interlayer fabric stuck readily to the track and was easily installed by rolling it over the cracks in the pavement.

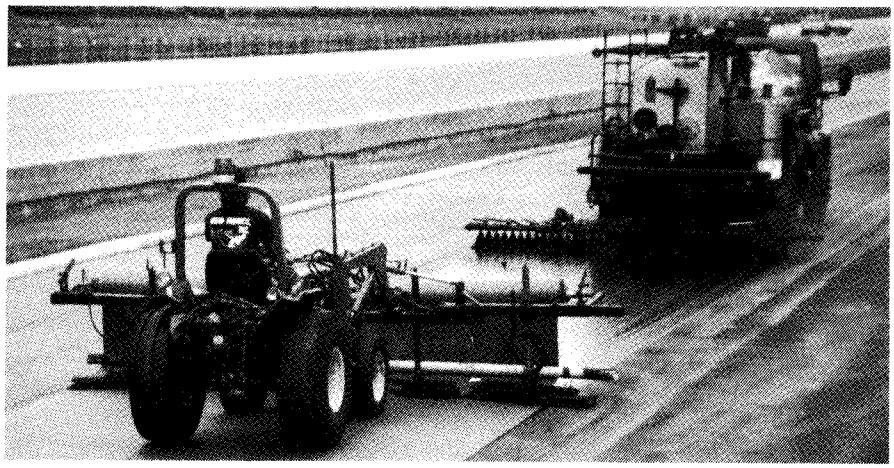
The asphalt overlay fabric will indefinitely prevent surface moisture intrusion into the pavement base and retard reflective crack development through effective stress distribution. Two inches of No. 8 binder were then placed, followed by a ½-inch leveling course (HAC #13 stone). Finally a topcoat consisting of one-inch asphalt HAC #11 slag was applied. The slag in the asphalt is a byproduct of the steel

Twelve-inch strips of Petrotac were quickly installed to dissipate the stress that causes reflective cracking and to provide waterproofing benefits.

industry and was shipped from Gary, Ind. The addition of about 50 percent slag to the mix ensures a durable, hard-wearing surface that is more skid resistant than normal asphalt.

Rehabilitating the Pits

The second type of paving membrane interlayer used at Indianapolis was Petromat, a nonwoven polypropylene paving fabric also made by Phillips.



In the pits, 12.5-foot-wide rolls of asphalt overlay fabric were used before the final asphalt overlay was placed. A tack coat of asphalt tar is sprayed onto the track to give the fabric its waterproofing and stress-relieving features, extending pavement life.

The pit area, almost half a mile long and 40 feet wide, was old PCC (portland concrete cement) pavement overlaid with asphalt. It exhibited a considerable amount of cracking. The old surface was milled, then a ½-inch leveling course of HAC #11 binder was placed. Then a tack coat of 0.25 gal./yd² of AC10 asphalt was sprayed on the pavement by a Road Fabrics truck. The paving fabric was then immediately placed by a specially-converted tractor that rolls out the fabric and brooms it into the asphalt tack coat.

One-hundred-fifty-inch-wide fabric was put down in three passes to prevent moisture intrusion, retard reflective cracking and extend service life of the pavement. Several days after the Petromat was installed, 1½-inch asphalt overlay was placed by Grady Brothers, Inc.

Cost Savings

"By using these fabrics, the Speedway is minimizing the thickness of the overlay they normally would have to place," says Mark Marienfeld, Technical Manager at Phillips. "Using an asphalt overlay fabric is less expensive than putting additional thickness on the track."

According to Marienfeld, the installed tack oil and paving fabric cost is about equal to the cost of .5 inches of asphalt concrete overlay. The California Department of Transportation (CalTrans) has reported that, for retarding reflective cracks, paving fabrics are as effective as an additional 1.2 inches of asphalt concrete overlay.

Sikich estimates that using asphalt overlay is about 1/20th of the cost of replacing the existing pit area, which would also alleviate the cracks.

"At the same time, you're also getting waterproofing and pavement fatigue resistance benefits that you can't get with straight asphalt concrete," says Marienfeld.

This waterproofing comes from the tack coat that is sprayed on the pavement to be rehabilitated before the fabric is laid down. After the pure asphalt cement is sprayed down, the fabric is rolled on top of it. Then new asphalt concrete overlay is laid over the fabric. The heat of the tack coat (about 270-300 degrees) draws it up into the fabric to create an impermeable layer and to bond it to the overlay.

The new fabric-reinforced asphalt membrane not only provides waterproofing but also creates a layer that dissipates stress.

"This layer is what will retard reflective cracks by relieving stress imposed by cracks in the old pavement before they reflect through to the new overlay," says Marienfeld. "Without this fabric layer, stresses are quickly transferred through the hard asphalt concrete to the asphalt concrete overlay, causing new cracks."

According to Marienfeld, the paving fabric also makes the pavement structure a layered system wherein each thin layer has less bending stresses than one thick asphalt concrete structure without a fabric layer to separate it.

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