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Friendly banking

Race-car drivers will get a kick out of new Kansas Speedway



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By Bill Wilson
Editorial Director

A winner's oval

Speedway will have tougher track, plenty of banking

Numbers circling above the Kansas Speedway are a little bit easier to track, but none of them have a need to pit.

For the last 12 years, the constant threat of a 44 overtaking a 29 during the course of a day was the last thing an official wanted to see. It was the freeze-thaw cycles that made damaging passes on the 1.5-mile speed oval in the outskirts of Kansas City.

"Kansas, the climate out there, it goes through some pretty severe freeze-thaw cycles, especially on the front and back end of the seasons where it cycles in and out. It could be frozen overnight and thawing during the day," Martin Flugger, director of engineering for International Speedway Corp. (ISC), told *ROADS*

& *BRIDGES*. "The track got beat up pretty good through that process."

Thermal cracking and an extensive amount of delaminated layers shortened the run of the asphalt surface, and the sometimes-abusive natural environment had racetrack officials rethinking their strategy.

"We have had tracks that have lasted 30 years before we had to repave them," said Flugger. "This one just happened to be not as fortunate, but we are taking some added measures to try and help get us to a longer life."

And if you are going to see more years, keep it exciting. The existing Kansas Speedway track carries 15° banking. The new one will have variable banking ranging between 17° and 20° in the turns. It was just another element twisting the complexity for prime contractor Lane Construction and designer HNTB.



Caterpillar D6T and D6R dozers were cutting as much as 2 ft deep into material to establish the new slopes on the turns. The original plan was to push the bulk of dirt upward before a Caterpillar motor grader smooths out the surface.

Variable success

At press time, Lane Construction was blade-deep in arguably the most difficult part of the job—establishing the right grade for the variable banking. After a pair of Wirtgen milling machines (1200 4-ft and 210 7-ft mills), grinding off 7 in. of asphalt, made the lap around the track, Caterpillar D6T and D6R dozers were cutting as much as 2 ft deep into material to establish the new slopes. The original plan was to push the bulk of dirt upward before a Caterpillar motor grader (grading subcontractor Emery Sapp used three different models—the 143H, 143M and 140H) smooths out the surface. Little grading is required at the very top of the track, where crews were simply milling off the surface and placing the 4-in. sub-base. All of the grading equipment are armed with a Trimble GPS system.

“It’s a very meticulous grading process,” Bill Braniff, senior director of construction for ISC, told *ROADS & BRIDGES* during a site visit of the Kansas Speedway on May 17. “You start out with a uniformly banked track, and as you go into the turns that is where the variable banking develops.”

Three-dimensional simulations were used to determine the exact degree of banking—one that would support two- and three-line racing. In the end

it was decided to go with a track that is 10° on the front stretch, variable from 17° to 20° in the corners and 5.5° in the backstretch.

“In the case of Kansas I have a mile and a half of track that if I put it back the way it was I was going to lose that two- and three-line racing because the fastest way around the track would be at the bottom,” said Flugger. “There will be three lanes that work themselves from 17° on up to 20° and that banking, as you start to go up the track, allows the drivers from the bottom, middle and top of the track to have that same competitive advantage going through the corner no matter what lane they pick.”

“On a uniformly banked track, depending on the horizontal geometry, there can be one fastest way around the track and the drivers will take that preferred method,” added Braniff. “You see that happening for three years with a freshly paved track, and at that point in time the surfaces become polished in that preferred groove so then it becomes advantageous for those drivers to move up in that banking, they have to travel a little further distance but they get a little more grip so they can go a little faster. We try to accelerate that process where we don’t have to wait through three years of a green-track syndrome.”

To make the track more durable,

Lane Construction will be laying down a more flexible binder—PG 82-28 as opposed to a PG 82-22, which Flugger believed was the choice of the first asphalt mix 12 years ago. The choice of aggregate also plays a critical role. Flugger said they were looking for angular pieces of rock, the kind that possess sharp edges, which are believed to be available locally. Along with the 82-28 binder, which also has been modified with SBS polymers and Sasobit, the mix also will be composed of granite and limestone aggregate with a nominal maximum aggregate of 3/8 in. A 2-in. open-graded asphalt layer will be placed on top of the sub-base to improve the resistance to the freeze-thaw cycles.

In mid-May, Superior Bowen Asphalt Co., Kansas City, was running trial batches at its KCI plant located about 25 miles from the track. The facility utilizes a CMI triple-drum plant. A split sample was delivered to Lane Construction, which conducted its own independent tests and tried it out on a test strip along pit row the week of May 14. Haul trucks dumped asphalt into a Roadtec Shuttle Buggy, which transferred the material to a Volvo ABG Titan 525 asphalt paver, which comes equipped with a high-density screed and tamping bars so the mix reaches “90% compaction right off the back of the screed,” according to Braniff. The temperature of the hot-mix asphalt was over 300°F. The rolling pattern was not determined at press time. Lane Construction could go with one steel double-drum roller handling both intermediate and finishing duties, or opt for two. When *ROADS & BRIDGES* visited the site on May 17 one Bomag double-drum roller was being used. Speed of the asphalt paver is of critical importance. Flugger said the typical speed is 13 ft a minute. “If the paver starts to get up too fast, then he starts to leave the roller and the roller can never catch up and the mat cools down past the point you want a roller to be on it,” he said. A second roller might be added during the actual racetrack paving to clean up any marks and irregularities in the surface.

To handle asphalt paving on the steep turns, Lane will use one of the Cat dozers to support the asphalt

paver and carry a conveyor that will feed material from the apron up the slope. The original apron will remain in place for a bulk of the reconstruction and will be used as a travel lane for the equipment.

After the 2-in. open-graded asphalt is down, crews will come by and apply a base course (2 in. thick), a leveling course (1.5 in. thick) and a surface course (1.5 in. thick).

All three layers and the open-graded mat call for the same mix design. Lane Construction will pave at widths of 19, 19 and 13 ft. Pit row is about 40 ft across, and Flugger would like to accomplish the required paving in only two passes. Originally it was paved in three.

According to Flugger, crews will run 10-15 cores a day, and two nuclear gauges will take four to five density readings every 25 ft.

To further assist in the drainage process, a drain tile will be laid at the bottom of the track.

When the paving process is complete, smoothness will be checked by one of three methods:

- A high-speed inertial surface analyzer (profilograph). This will check the overall quality of the pavement, and it will identify any defects that require correction;
- Straightedges will be laid across the pavement to identify defects in the transverse direction as well as to identify the severity of bumps detected by the profilograph; and
- Test laps by the design team in a standard production car.

Taking it to the road

The Kansas Speedway also will get another dimension of racing when construction is complete. Lane Construction is building a 0.95-mile road course that will run through the infield of the 1.5-mile oval. A 400-ft-wide opening will be created at the safety wall located at the bottom of Turns 1 and 2.

During NASCAR events, the entrance to the road course will be closed using temporary barriers.

Caterpillar dozers are being used to cut out the road course, which requires a little more prep work to make sure everything is good and stable before the arrival of the paving crew.

"Most of what is out in the infield is a limestone-type material," said Flugger. "From what I have been told is what we do find underneath, most of that soil should be good."

If all goes according to schedule, the track will be ready for its first action on Sept. 12.

"Things are off to a very good start, but we are still early in the process and are always subject to the weather and other things we can't control, so it is important for us to get off to a quick start and build up some float in our schedule at the beginning," said Braniff. **R&B**

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