Coming Untied

Tieless modular track systems built with precast concrete are gaining recognition for their durability, low maintenance and ease of construction.

By Shari Held

The clanging of the bell. The whistle announcing the approach. The rumbling of the train as it barrels down the tracks. Who hasn't fallen under the spell of the railroad? Railroads have been a part of human history since the 18th century. And like other institutions that have survived over the years, they are changing.

Traditional railroads use a tie-ballast system to support the track. But over time, ties give way, ballasts deteriorate and rails shift off-gauge. The result: everything from bumpy rides to accidents.

These systems need continual maintenance to stay running. But shutting down a railroad crossing or track creates logistic nightmares and generates long-term maintenance costs.

Photo courtesy of Oldcastle Precast

Photo courtesy of Oldcastle Precast

Replacing more than 250 track feet of railroad ties with a new precast concrete system in Urbana, Ill., took less than 10 days.

PERFORMANCE PLUS

As a result, rail companies and municipalities are adopting tieless precast concrete railroad systems. Compared to traditional tie-ballast systems, precast systems offer a speedy, less labor-intensive installation and require little to no maintenance. Precast units are also highly adaptable and factory-produced to ensure quality control.

"Precast tieless railroad systems are starting to take hold more every day," said Wayne Weszka, vice president of rail products for Calabash, N.C.-based Premier Modular Railroad Crossings, Inc. "The ride quality for vehicular traffic is the best around. If it's blacktopped properly, vehicles don't even know they're going across a railroad crossing."

Oldcastle Precast's StarTrack system has been on the market for more than 20 years. It has successfully passed performance tests at the Transportation Technology Center in Pueblo, Colo.

"Modules can be customized to radius configurations so they work for any track layout," said Jim Baker, vice president and national products manager for Atlanta, Ga.-based Oldcastle Precast. "We've installed over 200,000 feet of track and never had a structural failure."

IVES (Intelligent, Versatile, Efficient, Solid), a new precast slab track system developed by Rhomberg Sersa Rail Group, has been

on the market for about two years. IVES test tracks have been laid in the U.K. and a Switzerland test is upcoming. The German Federal Rail Authority recently approved IVES.

"IVES has raised a lot of interest because of its installation method and the fact that the precast elements can be produced locally," said Tariq Al-Thuwainy, project manager for Rhomberg Rail Consult, a department of track system technology for Rhomberg Sersa.

Installation of IVES systems is fast and economical because the rail isn't fixed until the last step, allowing installers to "work rough" until that point.

Here's a look at the aforementioned products on the job site.

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N. LINCOLN AVENUE AND U.S. 150 – URBANA, ILL.

This Norfolk Southern railroad crossing, located a few blocks south of the University of Illinois campus, is situated at a high-density traffic intersection. In the past, it required high maintenance and was continually shut down for repairs, presenting a difficult situation for the city.

"Over the years, they'd experimented with different materials," Baker said. "Finally they got tired of dealing with it and turned to us."

That was late summer 2012. The project called for removing 262 1/2 track feet of rubber inlay-topped railroad ties and replacing them with Oldcastle's tieless StarTrack II system.

Fifteen precast panels – each 14 inches thick, 8 feet wide and 17 1/2 feet long – were cast in custom steel molds at Oldcastle's Topeka, Kan., plant. The 6,000-psi, steel rebar-reinforced precast panels weighed 22,500 pounds each.

Once the contractor removed the old crossing, installation was quick and easy.

"It was pretty straightforward," Baker said. "Norfolk Southern was there to assist and we had site representation there as well."

The contractor prepared the subgrade, achieving the correct grade. After setting the panels in place, the contractor installed the rail, attached it to the precast elements and repaved the asphalt approaches. The entire process took less than 10 days.

The crossing no longer "makes your fillings almost fall out." On rainy days, the diamond-plate, anti-skid surface makes the crossing safer for vehicles, bikes and pedestrians. The city will realize future savings since the crossing will remain maintenance free for years to come.

"It was a quick turnaround on the installation, and a high-quality, long-term solution for a crossing that had continual maintenance issues," Baker said.

Workers installed approximately 800 feet of IVES precast slab track at Asfordby Tunnel in the U.K.

ASFORDBY TUNNEL – U.K.

At Asfordby Tunnel in the U.K., Rhomberg Sersa laid 803 feet of IVES precast slab track and 410 feet of cast-in-place slab track in a trial project for Network Rail, the British rail authority.

"Railway construction is a lot about logistics, especially in tunnels," Al-Thuwainy said. "In general, our experience is the less cast in-situ concrete you have, the better."

Each IVES precast element measured 8 feet long, 2 feet wide and approximately 1 foot high, weighing about 1 ton.

"The elements are very simple compared to conventional, traditional ties," Al-Thuwainy said. "Other than the concrete quality, the only thing that needs accuracy is the recesses for grouting in the rail fixation units."

The first step of the installation – laying the base layer of asphalt – challenged the Rhomberg Sersa team. Network Rail had moved the installation site farther from the job site a few days prior to the project start. With the longer route to the job site, the asphalt cooled substantially, making it difficult to spread.

Once the base was ready, the team used a two-way excavator to place the precast elements. They then fitted the rail fasteners into the recesses of the elements, positioned the track panel and filled the voids between the rail fastenings and the precast elements with high-strength mortar. The grout used for the project required a curing time of approximately 24 hours before the team could remove the formwork and finish the job.

The Asfordby trial project, which took about two weeks, was completed in March 2014. The experience confirmed that precast solutions for rail applications are more practical than their cast-in-place counterparts. Not only did the cast-in-place concrete require a lengthier cure time, but the logistics of bringing in additional machinery to manufacture the components on site were also difficult to manage given the space constraints.

MAIN STREET – BUFFALO, N.Y.

In Buffalo, N.Y., Premier's modular railroad crossing system won the bid over cast-in-place for Phase I and II of a downtown project. It encompassed two tracks – for a total of 4,000 track feet – and took nearly two years to complete both phases.

"This track was going straight down Main Street with traffic running up and down it," Weszka said. "It took a lot of coordination with the Niagara Frontier Transportation Authority and the city of Buffalo."

NFTA purchased the product from Premier and hired a contractor to install it. Weszka spent a week showing the

Photo courtesy of Premier Modular Railroad Crossings, Inc.

A modular precast track system provided the perfect solution for residents of Buffalo, N.Y.

contractor, who had no experience with the product, the tricks of the trade. According to Weszka, he did a great job and had no issues.

The project used both standard three-piece (base and two centers), 8-feet-wide, 8-feet-high, 13-inches-thick precast modules and custom modules that measured a foot wider. The custom pieces specified box holes to accommodate the looped cables and wiring and tucked down sides that would match up with the sidewalk. Tolerances were tight at +/- 3/8 inch.

Forterra Pipe & Precast, which produces the modules for Premier, manufactured the precast elements in its North Carolina plant. The company used steel forms and a 7,000-psi concrete mix, which was necessary to meet the required tolerances.

The two main challenges were the tight tolerances and getting the modules to the job site on time. Each standard-sized module weighed 10,000 pounds. The custom modules weighed even more. And very few of the pieces could be stored on site because the second track was operational.

To install the Premier system, the contractor established the centerline, positioned the rail, dropped in the two center panels and installed the anchor bolts. Because the crossing was located in the theatre section, modules were placed on "big hockey pucks" to keep the noise and vibrations to a minimum.

"Once they got the old track out and set the grade, they were rolling," Weszka said. "They laid close to 240 feet per day or better. That's how quick it can be. The trains are running, the traffic's running and everybody's happy."

GOOD FOR THE LONG HAUL

Tieless precast systems are ideal for nearly every application thanks to their ease of installation, low maintenance and longevity.

"We installed some in Portland, Ore., 40 years ago," Weszka said. "They're still in service and doing what they're supposed to do." **PS**

Shari Held is an Indianapolis, Ind.-based freelance writer who has covered the construction industry for more than 10 years.