

## New Shoring System Helps Twins Stadium Foundation

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One challenge stands out beyond the everyday challenges faced by crews building the new, \$412 million, 40,000 capacity stadium for the Minnesota Twins. Located just a few blocks west of downtown Minneapolis, the construction site is hemmed in on all sides by bridges, roads and buildings; making for tight working conditions and a logistical challenge for moving hundreds of workers and trucks in and out of it daily.

It was conditions below ground, however, that first challenged Minneapolis-based Mortenson Construction crews before any piece of steel or concrete rose above the ground. Formerly a flat parking lot, the site of the new stadium is an urban fill and part of an old riverbed, Basset Creek.

When Mortenson crews began excavating to build the underground supports, they quickly realized that the ground conditions were too soft and unstable to safely dig and build the concrete support beams without digging a mammoth pit.

Mortenson turned to Gary Carlson Equipment, Blaine, Minn., knowing that the company has a unique slide rail shoring system that might help with the construction of the underground support system. Manufactured by Pro-Tec Inc., headquartered in Charlotte, Mich.; the slide rail shoring system is a modular, flexible design composed of a series of corner posts, panels, spreader posts, spreader beams and roller



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beams in a variety of sizes.

### How It Works

Unlike the one box shoring typically used for shoring support, the slide rail system is built panel by panel at the construction site, giving the contractor the versatility to create a shoring system where the length, width or depth can be changed, depending on the soil conditions and the structure being installed.

According to Pro-Tec, once the initial excavation is

done, the first panel and corner post are placed and squared. The second, third and fourth panels and posts are then pushed into place by an excavator, which begins a dig and push process to slide the panels and posts into the ground.

The panels are installed from the top down and removed from the bottom up. During the removal process, the panels are lifted out of the system incrementally while compaction and backfilling proceed.

"We got a call from Mortenson wondering if [our] shoring systems [would] work for [them]," Mike Doyle, project manager of Gary Carlson Equipment, recalled. "We went down and took a look at the site and the work involved. The grade beams they were building [to support the bleachers above the pipe] ranged 40 to 50 feet in length. Because of its flexibility, it allowed our crews to change the length by the panels we used. We have 6-, 12- and 24-foot panels in 2-foot increments. If they wanted to build a smaller beam, then we could put in a 12-foot panel versus a 24-foot panel."

"That's what was appealing to the Mortenson crews. The versatility of the system and the fact that they were able to minimize excavation and removal and get the big cranes right next to the bays and drive the piles after they did the excavating. Basically the crews had an assembly line going. They were excavating and installing in one area while in another area, they had the system up and pounding piles. It was quite the operation. We are factory trained installation technicians so we'll go out to the site with the contractor and show the crews how to do a proper installation. After a customer does a couple of installations, he can usually do it on his own. It has a fairly short learning curve." Doyle said.

### Successful Solution

Tom Nonweiler, a concrete superintendent of Mortenson, could not have been happier with the slide rail system.



At the Twins site, as many as eight slide rail systems were in place at one time, allowing workers to complete several tasks at the same time.

Photo courtesy Gary Carlson Equipment



## Shoring System Bridges Stadium's Underground Creek

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"With the saturated clay we were working in, we just didn't have the opportunity to open cut it. The hole would have been so excessive to safely work in it," Nonweiler remarked. "We minimized the cut and the cost on that end plus the expense of hauling the excess material off the site. Not every girder we poured was the same length so it was adaptable and we could reconfigure to work with the different size pile cap transfer beams that were required," Nonweiler said.

The Twins stadium site, one of several where his crews have used the slide rail system over the past year, "was one of the more challenging jobs I've seen in awhile!" Carlson said. "Much of the creek was put underground in a cut and cover tunnel years ago and the new stadium sits right above it. And much of the surrounding ground was muck."

"You've got railroad tracks, clay, sand, brick, all urban fill. Pretty bad stuff with quite a bit of contaminated soil. You name it; it's in there. No one has built on this site in years. It was a parking lot because of that," Doyle added.

The unstable fill along with the underground pipe forced engineers to design a below surface support system to bear the load of a good portion of the left field side of the stadium.

"The poor fill, made up of clay, soft, spongy ground and muck along with the underground creek bed made for a perfect combination of conditions to use the slide rail system," Carlson said.

### Supporting a Stadium

The underground support system is composed of thousands of feet of steel piling up to 120 ft. (37 m) deep and capped by heavily reinforced concrete footings or grade beams. More than 36 grade beams span the creek area under the future bleachers.

At the Twins site, as many as eight slide rail systems were in place at one time and installed perpendicular to the underground pipe allowing workers to complete several tasks at the same time.

"We had seven or eight of these systems in a row in different stages of completion," Carlson explained. "So they would excavate and get the system in, drive the pilings, build the rebar cage and pour the concrete in a continuous rotation. Once compaction and backfill were completed, work crews removed that system and moved it down to the next beam location."

Among other advantages of the slide rail system, it is cost effective, installed and removed easily by a small crew and allows low vibrations installations, according to Pro-Tec.

### Innovative Thinking

Carlson himself came up with an additional tool to make the slide rail installation process easier. Before the Twins stadium job, Carlson's crews had met some tight working conditions at a sewage treatment plant project in southern Minnesota that made the panel installation extremely difficult.



Photo courtesy Gary Carlson Equipment

Mortenson turned to Gary Carlson Equipment's slide rail shoring system to help with the construction of the underground support system.



Photo courtesy Gary Carlson Equipment

The poor fill, made up of clay, soft, spongy ground and muck was a perfect place to use the slide rail system.

"We were very near to a tank and the excavator with its hoe was at an angle and trying to push down on the narrow tops of the shoring wall. It was extremely difficult because of the restricted space," Carlson said.

Carlson sat down that week and spent some time studying the pictures of the equipment and site.

"At 3 a.m. one morning, the lights went on and I came in to the office the following Saturday and built the first panel pusher," Carlson recalled.

"Now, rather than having an excavator push down on the relatively narrow edge of a panel, the operator can place this beam on the panel and push the bucket down on the pad," Carlson explained.

"This has revolutionized the installation of the rail

systems," Carlson added. "We patented it and sold the rights to Pro-Tec and it has made a dramatic difference in selling the slide rails."

Similar to the advantages of the slide rail system, the panel pusher or P.I.T. Boss, as coined by Pro-Tec, increases the speed of installation, reduces wear and tear on the excavator and panels and allows access in tight conditions, according to Pro-Tec.

### Finding Stable Footing

Mortenson crews faced another challenge at the Twins site as the summer climate changed to a wetter pattern in mid-August, just as they began digging. The wet pattern, running into October, combined with the existing soft ground conditions created a quagmire and bogged down man and machine alike.

"Mortenson ushered in another innovative solution to the quagmire by trucking in thousands of square feet of Dura-Base matting just to give the heavy equipment some solid footing on the ground," Doyle said.

"The Mortenson guys looked at the huge pieces of plastic mats and thought, 'Wait a minute, we're not going to be able to put our cranes on that stuff,'" Carlson added. "But it

didn't take too long and we had cranes going all over that mat."

"The Dura-Base mats also gave work crews some solid footing and moved them out of the muck to build staging areas and piece together the rebar cages on stable ground," Doyle said.

Sidewalk superintendents can now see the stadium structure come to life as Mortenson crews have moved into the overhead stage of construction after recently completing the underground support work.

Twins fans will see the first ball game in the new stadium when the American League kicks off its season in 2010. CEG