

Portable Modular Conveyor Plays Key Role In Chicago Transit Authority Track Rehabilitation Project

When a major contractor needed to rehabilitate several miles of the Chicago Transit Authority's (CTA's) rapid transit tracks, a Portable Modular Conveyor helped meet the important requirements of placing ballast along the track bed.

The project was part of Chicago Mayor Rahm Emanuel's "Building a New Chicago" initiative. The CTA's Red Line South Reconstruction Project involved rebuilding the 10.2-mile stretch from just north of Cermak-Chinatown to 95th Street. The 44-year-old line had exceeded its expected life and was plagued by slow zones and delays, according to the CTA. Five months later, the \$425 million project—funded by the "Illinois Jobs Now!" program—delivered a brand new railroad to an estimated 80,000 daily riders.

The scope of work included improvements to eight stations, as well as elevators to make the entire south Red Line more accessible to customers with disabilities. As noted, the project also included the placement of a new track bed, including new rail ties, tracks, and ballast (the stone material along the tracks).

A key to replacing the 1 in. to 3 in. ballast was a Portable Modular Conveyor from E2 Systems, LLC. The versatile equipment helped the contractor meet some unique project needs.



One of the challenges is that the tracks are located between the eastbound and westbound lanes of Chicago's busy Dan Ryan Expressway (Interstate 90/94). The project also involved placing more than 200,000 tons of AREMA¹ No. 3 ballast, as well as 90,000 tons of Illinois

¹ American Railway Engineering and Maintenance of Way Association.

DOT CA6 (course aggregate), most of which had to be placed at night, when lane closures would be least disruptive to Chicago commuters.

The project called for a minimum of 8 in. of sub-ballast, over which 12 in. of ballast was placed under the railroad ties, and 7 in. of ballast was placed between the ties.

Walls and Fences No Barrier to Success

Although the track work was completed under the auspices of the CTA, the contractor also worked with the Illinois Department of Transportation (Illinois DOT), whose specifications and standards applied to the adjacent highway.

The DOT provided guidance on lane closures, as well as the use of the highway lanes and shoulders for equipment access. The work on the tracks and the adjacent area needed to be completed without disturbing the walls and fences, which meant the ballast had to be “pitched” over the safety/security

structures, required by the Illinois Department of Transportation.



The concrete walls and fences are a necessary safety feature, but they also made placing the 1 in. to 3 in. stone during the track reconstruction project more challenging. The contractor was only allowed to close a

single lane and the shoulder from 6:00 PM until 6:00 AM, which only provided a 17' working path.

“The Illinois DOT’s wall is 42 in. high, and the fence added another two feet of height, so we had to make adjustments to the equipment to clear the 6’ barrier, which operated 6 to 8 ft. away on the inside shoulders. A standard conveyor would not shoot the ballast that far,” according to the project manager.

The contractor used two different approaches to placing the ballast. The first was a series of metal bins, into which dump trucks dropped the ballast. The boxes were then tipped over the walls/fences, after which, the ballast was spread into place.

The other option used E2 System’s Portable Modular Conveyor, which was moved along the shoulder on a front-end loader. Moving the 8.5 ft.-wide conveyor into place, as well as assembling it to its base was made easy because of its compatibility with most manufactures’ wheel loaders and other modular equipment.

The conveyor also can be rotated 180 degrees to accommodate desired travel direction, another feature that proved helpful in both set-up and operation.

After the short set-up, individual dump trucks backed into place, deposit their loads of ballast into the conveyor’s 2 CY hopper, and then the conveyor moved the ballast into place. Although the



hopper was plenty large enough to handle large loads, the extra capacity was not needed for this project, because the conveyor moved the ballast into place within seconds.

As the first group of dump trucks headed back to staging areas (a nearby quarry and the contractor’s yard), crews easily and quickly moved the conveyor, which weighs only about 9,800 pounds. This

process of “walking” the conveyor along the shoulder was smooth and seamless, and without any apparent effort or time.

“The E2 equipment provided a very productive machine that does not require double-handling,” according to the project manager. “The productivity was about the same [as the boxes], but we wanted to have a couple of different ways to get stone over the walls.”

“The biggest advantage is the very simple, open design,” the contractor’s project manager said.

“There are not a lot of moving parts, which made me comfortable,

especially with the large, abrasive materials we were handling. We looked at other equipment with augurs, multiple conveyors, and more. With other systems, we were concerned about the large ballast ripping the belt apart.”



The belt speed of approximately 550 ft/min meant that trucks were emptied in a matter of seconds. The three-ply, 60-in. wide belting also stood up to the large, irregularly shaped ballast with no problems. Also, the conveyor’s 21 ft. length allowed the ballast to be placed over the top of the wall/fence structures.

Control of the conveyor is in the hands of the loader operator, who maintains control from the loader cab. (Crewmembers stationed at key points provide signals to the loader operator as well as the dump trucks.) During operation, the belt speed is controlled by the RPM of the loader engine. As an added measure of performance and safety, a flow control valve will limit flow and speed, if required.



“The speed was variable by the use of hydraulics and the size gears in the motor. It was a matter of finding a happy medium between torque and speed,” the project manager said.

As designed, the system features a low torque, high-speed hydraulic motor. The

loader’s pump capacity must match conveyor motor and minimum requirements, 40 g/m @ 3000 psi. Oil supply to the conveyor motor is from loader, and a third valve function control is required.

“We got a lot of help from Mike Evangelista and his staff at E2 Systems. We were looking for answers, and they always seemed to have the right answers.”

At the end of the shift, the conveyor was disassembled, loaded onto a lowboy trailer, and returned to the yard. The conveyor folded at mid-point to travel in a 10-foot path while attached to the loader. Folding and travel features controlled from the conveyor’s base also helped make short work of loading and unloading the equipment, as well as assembly/disassembly from the base.

About E2 Systems

The company name, E2 Systems comes from the brothers Evangelista, Mike and Carl, who bring to the business extensive experience as paving contractors.

“When we were in the paving business, we thought about buying conventional material placers, but they were always very expensive,” says Mike Evangelista. “We could not justify the purchase because we did not use them often enough.”



“The machines were expensive to buy and operate,” he says, adding, “set-up could take a couple of days.”

In 2007, while setting up a paving project, Evangelista joked with a company employee, observing that “we stick different attachments to paving equipment, so why not a conveyor?”

The concept took a serious turn when Evangelista decided to design and build a prototype of a portable conveyor. “We unloaded concrete from Agitor trucks at about 200 SY/hour,” he said, and by 2008, a second prototype was built that would accommodate trucks backing into the unit.

“We used it on the Interstate-75 reconstruction project,” Evangelista explained, “On the first day, we poured 4,500 SY of concrete.” In 2010, the company began its sales and marketing efforts in earnest, and today, contractors throughout the United States use the patented system.

The simplicity of the design, the portability and modularity of the equipment, also make it an attractive investment for contractors, as the costs is considerably lower than more complex equipment traditionally sold in the marketplace.

As for the City of Chicago, the CTA’s Red Line passengers now have a reliable rapid transit system that links riders between the south side and downtown in about 20 minutes. Riders and casual observers may not be aware of how all that stone under and around the tracks got there, but for the contractor and agencies involved, it was no secret that an affordable, portable and modular conveyor was a key component in this successful construction project!

For additional information, contact E2 Systems, LLC. Phone: 248-795-3000. Email: info@materialplacer.com. Visit the company website at <http://www.materialplacer.com/>.