

Rolling to Repair

Mn/DOT bridge maintenance crew finds productive solution with screed system.

Deteriorating infrastructure is a harsh reality in this country, and bridges are no exception. The 2009 infrastructure report card from the American Society of Civil Engineers graded the nation's bridges a C—one of the higher grades received, but still leaving plenty of room for improvement. Nothing in recent years illustrates this problem better than the devastating collapse of the I-35W bridge in Minneapolis.

When the bridge fell in late summer 2007, an even bigger spotlight was put on the structural integrity of bridges across the nation. A positive outcome from the tragedy was the passing of bridge maintenance and repair bills across the country, one being Minnesota's Chapter 152 Bridge Program bill. Passed by the Minnesota legislature in 2008, the bill allocates funding specifically for bridge maintenance and designates it as a high priority. Beyond funding more repair and improvement projects, the money also allows for the purchase of new equipment to help maintain and repair that infrastructure. The Minnesota Department of Transportation (Mn/DOT) southeastern bridge maintenance department saw this as an opportunity to obtain a piece of equipment it had been looking at for several years.

The Lightning Strike Concrete Screed system (Lura Enterprises, www.luraconcretescreed.com) differs in many ways from concrete screeds the DOT had used for years, mainly that it's a lightweight roller screed. The southeast branch's supervisor had heard a lot of positive comments about the Lightning Strike over the years and spent time on his own researching it. He was pleased with what he found, but hadn't yet been in a position where he could purchase the screed. When Chapter 152 passed, he realized it was a

possibility and set up a meeting to see the product in person.

"When we were contacted by Mn/DOT, I went to Rochester to demonstrate the product and teach the bridge maintenance crew how to operate it," said Dennis Lura, president of Lura Enterprises. "They were intrigued with all the ways the screed could save them time and labor while increasing productivity and safety."

Through the state purchasing process, the Lightning Strike was selected, not as a replacement, but as an alternative to the screeds the DOT currently had. Furthermore, it's designed to be user-friendly and cuts down on labor, requiring only two people to operate. It weighs just 4.5 lb/lineal foot, and is easy to transport on the ladder rack of a pick-up truck, which also frees up space in the truck's bed to haul other equipment.

All of these features were factors in the decision to purchase the Lightning Strike. The bridge maintenance department put the new tool to work on the Bridge 5848 deck overlay project in the summer 2009.

On Deck: Bridge 5848

Spanning 124 ft, Bridge 5848 crosses over Crystal Creek along Highway 16 in southeastern Minnesota. It's the main artery to neighboring Lacrosse, WI, and sees an ADT of about 1,700, mostly commuters from Hokah and Houston. Built in 1939, the three-span, steel-beam bridge still has the original substructure and superstructure. During a routine inspection in 2008, it was considered to be in good structural shape by Mn/DOT's standards. However, it was due for an in-depth maintenance and repair project.

Mn/DOT specifications state that on bridges with an overlay replacing the overlay is typical every 25 years. The previous overlay on Bridge 5848 was

done in 1984, so 2009 marked the end of the overlay's expected life. The department assessed and determined the degree of maintenance required to update the condition of the bridge. There was also the chance it would need to be replaced.

Another factor that put this project on the list for 2009 was that a nearby section of Highway 16 is scheduled for a major renovation in 2010. It is common—and more efficient—to do bridge repair projects before a major road renovation. The bridge maintenance department scheduled work to begin in late June 2009.

Scope of Work

Before work could begin, Mn/DOT's southeastern bridge maintenance supervisor, structural engineer, and representatives from the central office evaluated the bridge to determine exactly what the project should encompass. Beyond assessing work on the driving surface, the project included upgraded railing design, repairing deck joints, and assessing the substructure.

First, core samples were taken to determine the depth of the overlay, the shape of the structural concrete, and to calculate the dead load. It was discovered that, at 3 1/2 in., the overlay from 1984 was too thick, making the dead load too high. Next, the existing black-top was removed and the deck was chain-dragged, which determined that about 40 percent of the existing concrete was delaminated. Those two factors led to the decision that the crew would remove the entire overlay from 1984 and the replacement would not exceed two in.

Because of the project's complexity, and citing experience on similar past deck overlay projects, two crews from Mn/DOT's bridge maintenance depart-



At left, the bridge maintenance crew waits for the mixing truck to arrive after using the Lightning Strike screed to prepare the bridge deck. At right, bridge maintenance crews use the screed while the cement is placed on the bridge deck.

ment worked together on the job. The group from Winona was the lead crew throughout the project, while the crew from Rochester assisted with pouring concrete for the overlay.

A major challenge was working in live traffic. Anytime traffic is a factor, safety is a key concern. The bridge would have to be reduced to single-lane throughout the duration of the project, with traffic stopping and taking turns to cross. This caused frustration and confusion for drivers, making it essential to have the entire project completed on schedule, by the end of July. After witnessing the Lightning Strike's capabilities during the demonstration, the project's supervisor felt the tool could help keep the project on schedule.

The first step of the project was to mill off the existing deck. A large milling machine was brought in and 3 1/2 in. of concrete were removed—the entire overlay from 1984. Before the new overlay could be placed, curb repair work was completed and a new railing was formed and poured. The crew was now ready to pour concrete for the lanes.

Mn/DOT specified the concrete design mix and water reducer admixture. When it was time to pour the concrete, both lanes of the bridge were shut down temporarily to allow the mixing trucks access to the site. During this time, traffic was held up completely, so the crew needed to work quickly. The

water reducer admixture was added onsite and the trucks were ready to supply the fresh mix. A cement slurry paste was applied just before the pour to act as a bonding agent. An estimated 18 cu yd of concrete were used per lane. After the pour, the Lightning Strike screed was brought in to smooth the concrete to its proper level.

By using the screed, operators eliminated vibrating the aggregate to the bottom of the concrete. The motion of vibrating screeds often forces heavier aggregate to settle at the bottom of the concrete slab, while air pockets and excess water rise to the surface. The result of the uneven mixture reduces the concrete's strength and can cause a bubbled finish effect called honeycombing on the slab's surface. By using the Lightning Strike, the aggregate stayed suspended throughout the concrete, keeping the mix consistent and not compromising strength.

Curb Attachment

The Lightning Strike also offers a curb attachment, a time- and labor-saving tool for the job. The curb attachment connects to the end of the screed and can be adjusted in 1/2-in. increments to match a curb's height. It rides on the curb, allowing the screed to run next to the curb. By using the attachment, the crew was able to pour and screed right against the curb without needing a screed pipe, something not

offered with other screeds.

"No other company offers anything like our curb attachment," Lura said. "In fact, we developed it as a response to several customer requests. Contractors were looking for a solution to the back-breaking, time-intensive finish work, especially the hand-screeding portion."

Because the curb attachment eliminates the need to set forms, it greatly reduced the finish work portion of this job and further saved time and labor. In fact, several hours of preparation and finish work were saved by using the attachment.

Thanks to accurate planning, proper execution, and productive equipment, Bridge 5848 was completed on schedule and provides a safe route from southeastern Minnesota to Wisconsin.

"After the project, I received a call from the bridge maintenance supervisor and they were really pleased with how the Lightning Strike screed worked," Lura said. "In fact, we've actually been invited to demonstrate it for another group of DOT workers."

Mn/DOT is planning to host a meeting for its construction foremen in Brainerd this spring. Lura and his representatives will be there to demonstrate the Lightning Strike, giving attendees a chance to learn how the screed works, and see how it can be an asset to them on future projects. Thanks to funding from Chapter 152, they should have plenty of opportunities to do so. **GE**