Minneapolis Bridge Replacement —Smarter Bridges

Innovation: Embedded Sensors & LED Lighting

Owner: Minnesota Department of Transportation (Mn/DOT)

Partners: FIGG Engineering, Flatiron Constructors and Manson Construction

Location: Minneapolis, Minnesota

Cost: $234 million

Completion Date: December 2008

The 2009 opening of the 10-lane, 504-foot St. Anthony Falls Bridge to replace the I-35W Bridge, which tragically collapsed August 2007, is considered one of the most impressive infrastructure projects of the decade—not just because it was completed in just over a year, and three months ahead of schedule—but because it's probably one of the smartest bridges in the world. Designed and built by FIGG Engineering, Flatiron Constructors and Manson Construction, dozens of innovations were literally built into the bridge itself, among them embedded sensors, LED lighting, light-activated, pollution-devouring concrete, and self-consolidating concrete. Equipped with 323 sensors embedded in different sections, information about not only the bridge's temperature (for release of anti-icing chemicals) but also its design and construction will allow researchers at the University of Minnesota to collect and analyze data for use by future generations of designers and engineers. The bridge is lit entirely with light-emitting diodes (LED), literally marking it as the first application of LED solid-state lighting on a major highway. Including the bridge's 504-ft span as well as the adjacent roadways on either side, it's durable, energy-efficient LED unit stretches 1,300 feet and covers 10 lanes of traffic. The LEDs use a fraction of the energy of standard highway lighting, and require significantly less maintenance. The pavement itself is mixed with an Italian compound called TX Active, which creates photo catalytic process activated by ultraviolet light on the surface of the concrete, turning pollutants such as sulfur dioxides and carbon monoxide into salt.

Re-HEAT Hot-in-Place Recycling— Double Duty Paving Equipment

Innovation: Cost-effective, carbon-reducing paving equipment

Company: Gallagher Asphalt Corporation

Location: Chicago, Illinois

After a pilot project on the badly eroded Carondolet Avenue last fall, the city of Chicago appears to be poised to incorporate the Re-HEAT Hot-in-Place (HIR) process into its resurfacing program for 2012. HIR paving equipment makes road repairs using 100 percent existing pavement and without having to add an overlay afterwards. Gallagher Asphalt Corporation estimates public agencies can make repairs for about 30 percent less than the cost of the conventional mill and overlay approach and reduce their carbon footprint by 63 percent compared to more traditional methods. Re-HEAT begins with the pre-heater unit gradually heating the existing two to three inches of asphalt pavement to approximately 200 degrees Fahrenheit. The second unit, the heater/recycler, then continues to gradually bring the temperature of the pavement up to approximately 350 degrees Fahrenheit when paddles underneath the unit begin to collect the heated and softened material into a windrow where it is fed into on on-board asphalt drum mixer. Within the horizontal drum mixer, the rejuvenating oil is uniformly applied and thoroughly mixed while the heating process is maintained within the drum. Less than a minute later, the recycled hot mix is distributed out of the drum onto the pavement where it is augured and put through a traditional asphalt paving screed. The paving screed ensures proper slope and grade is delivered to this final surface course. Immediately following the second unit is a traditional steel drum vibratory roller to achieve specified density. Minutes later, the road will be open to traffic.