I-35W Bridge over the Mississippi River
Minneapolis, MN

Team

Owner:
Minnesota Department of Transportation

Designer:
FIGG, Tallahassee, FL

General Contractor:
Flatiron Construction Corp., Longmont, CO
Manson Construction Co., Seattle, WA (A Joint Venture)

Reinforcing Bar Fabricator:
Gerdau Ameristeel, West Allis, WI

Epoxy Coating Fabricator:
Simcote, St. Paul, MN

Total Project Cost:
$234 million

Total Project Size:
220,000 sq ft (1,223 ft overall span; 505 ft main span; 315 ft / 248 ft back spans; 147 ft approach span)

Award:
2010 CRSI Design Award Winner – Bridges Category

Photography:
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STRUCTURAL FRAMING SYSTEM

Designed and built in only 11 months, the new I-35W bridge in Minneapolis, Minnesota, features a progressive design utilizing a variety of new technologies. These innovations were critical to the bridge’s success, which included not only restoring service after the bridge collapsed on August 1, 2007, but restoring users’ confidence.

The 504-foot precast concrete segmental main span across the Mississippi River was constructed in just 47 days. Its gateway elements feature the first major use of a pollution-eating cement, and its design incorporates state-of-the-art “smart” bridge technology that monitors structural behavior in real time while also providing feedback to aid in future designs. The elegant arching shapes, curved piers and white color harmonize with the bridge’s surroundings—while achieving Minnesota Department of Transportation officials’ vision for quality, safety and innovation. The project made use of the design-build format to emphasize speed throughout design and construction.

The bridge features 80 reinforced concrete piles, approximately 100’ deep and 8’ in diameter, that were drilled into rock. These were fitted with steel-reinforced cylindrical cages and then filled with concrete to produce a permanent foundation. The concrete pier caps at the top of the drilled shafts utilized epoxy-coated reinforcing steel (rebar) for added corrosion resistance. The foundation piers support 70-foot-tall concrete bridge piers, also using epoxy-coated reinforcing steel (rebar), had their “hourglass” shape created using curved forms. Truck-mounted boom pumps delivered concrete to the tops of the pier forms for placing. The 120 precast concrete box girder segments were cast in short lengths using long-line casting beds set up on the existing roadway and then delivered to a staging area for erection. Adjacent side spans constructed over land feature cast-in-place concrete elements, using the same box girder shape.

High-strength, high-performance concrete was placed over mats of epoxy-coated reinforcing steel (rebar), with high-strength steel post-tensioning strands located along the length and width of the bridge. Transverse post-tensioning tendons compress the top slab, providing additional strength and extending the life of the driving surface by keeping crack widths tight. Multi-strand tendons, consisting of 19 to 27 strands, run longitudinally along the bridge’s length creating levels of design redundancy.

The use of precast, segmental box girders provided for long, open spans that eliminated the need for piers to be placed in the river, minimizing the environmental impact. Utilities, data monitors, lighting conduits, and drainage pipes are hidden in the box girders—providing safe and easy maintenance access while offering pleasing aesthetics. The three cast-in-place bridge spans located over land were constructed simultaneously with the precast segments spanning the river. This saved considerable time in the schedule and ensured the project met its aggressive opening date.

Economy and efficiency were maintained, even on a tight schedule, through the use of various reinforcing bar diameter, steel strength, and concrete strength combinations. The innovative geometry of this project was easily constructed through the use of reinforced concrete. Approximately 10.9 million pounds of steel reinforcing steel (rebar) were used in the project.