

Strength-on-Demand Concrete

Poplar Street Bridge Deck Replacement



The Poplar Street Bridge Complex was constructed in the late 1960's. It is the main bridge connecting downtown St. Louis, MO, with Illinois via I-70. Over the years, the bridge deck surface began to deteriorate due to chloride-induced corrosion and distress caused by freezing and thawing cycles. In the summer of 2003, the Missouri DOT determined that 10,000 ft² of the deck needed replacement. The challenge for this project was that the concrete repair needed to be completed within a 10 hour overnight shift so that traffic could use the bridge during rush hour the following morning. The requirement for the project was concrete that achieved 3,200 psi (22.1 MPa) within 4 hours.

Project:

Bridge Deck Replacement tying I-55, I-64, and I-70 together

Location:

St. Louis, MO

Owner/s:

Missouri Department of Transportation

Concrete Producer:

Breckenridge Material Co.

Concrete Contractor:

St. Louis Bridge Construction

Requirements:

High-early strength concrete

Compressive Strength: 3,200 psi (22.1 MPa) @ 4 hours

Target air content: 6.0%

Products Used:

MasterGlenium[®] 3030
high-range water-reducing admixture

MasterPolyheed[®] 997
mid-range water-reducing admixture

MasterSet[®] AC 534
accelerating admixture

MasterAir[®] AE 90
air-entraining admixture

Market Sector:

Paving

Project Profile

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The Solution

To meet this challenge, the patented 4x4 Concrete system from Master Builders Solutions was utilized to facilitate a rapid repair of the bridge deck. The repair work was performed at night to minimize the inconvenience to motorists. For this project, Breckenridge Material batched the water, coarse and fine aggregate into a ready mix truck at 6:00 p.m. At midnight the driver brought the truck to the project site where a Type III cement and the admixtures were added and the concrete mixed. To facilitate rapid placement, the 4x4 Concrete mix was designed to be self-consolidating, eliminating the need for vibration for consolidation. After placement, the pavement received a tined finish to meet the requirements of the Missouri DOT.

High-Early Strength Concrete Mixture Proportions

Cement	799 lb/yd ³ (474 kg/m ³)
w/cm	0.23
s/a	0.39

Plastic Properties

Slump	10 in. (255 mm) on slightly sloped areas
Slump Flow	24 in. (610 mm) on level areas
Air Content	6.0%

Project Facts and Benefits

- 300 yd³ (229 m³) of 4x4 self-consolidating concrete placed
- Compressive strength: 3,200 psi (22.1 MPa) @ 4 hours 4,000 psi (27.6 MPa) @ 5 hours
- The contractor did not need to make small batches of repair material
- Using a ready mix truck provided the right mobility to reach repair areas
- The contractor was able to optimize use of personnel and equipment during staging and placing the concrete at the job site
- The 4x4 Concrete system was more economical for the contractor than conventional repair materials
- Missouri DOT was very pleased with the results of the repair made with the 4x4 Concrete system
- This project was profitable for both the producer and the contractor
- The Poplar Street bridge repair was highlighted in a feature article in Concrete Construction, December, 2003

About Master Builders Solutions

Master Builders Solutions is a leading global manufacturer of concrete admixtures, as well as other sustainable solutions for the construction industry, focussed on delivering its vision: **Inspiring people to build better**. Master Builders Solutions provides value-added technology and market-leading R&D capabilities to improve the performance of

construction materials and to enable the reduction of CO₂ emissions in the production of concrete. Founded in 1909, Master Builders Solutions has ca. 1600 employees operating 35 production sites globally, supporting their customers in mastering their building challenges of today – for a decarbonised future.

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