MASTER® BUILDERS SOLUTIONS

Project:
Fort Drum Connector

Location:
Jefferson County, NY

Owner:
New York State Department of Transportation

Prestressed Concrete Producer:
New Enterprise Stone & Lime Co., Inc.; New Enterprise, PA

Products:
MasterGlenium® 3030
MasterAir® VR 10
MasterLife® CI 30
MasterSure® Z 60
MasterLife® SF 100
MasterSet® R 100

Market Sector:
Precast Concrete

Project Profile

Improved Surface Appearance of Concrete

Fort Drum Connector Bridge Beams

The Background

New Enterprise Stone and Lime Co., Inc. (“New Enterprise”) is a leading, well-respected producer of prestressed concrete elements. New Enterprise was awarded a contract to produce prestresssed concrete bulb tee beams 84 in. (2.1 m) high and 100 ft (30.5 m) long for the Fort Drum Connector in New York State. The concrete specified for the beams falls under the New York State Department of Transportation (NYSDOT) high-performance concrete specifications, which requires the use of 5 gal/yd^3 (25 L/m^3) of a calcium nitrite-based corrosion-inhibiting admixture. The concrete had to achieve a compressive strength of 8,500 psi (58.6 MPa) in 34 hours and 10,100 psi (69.6 MPa) at 28 days in order for New Enterprise to meet

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We create chemistry

High-Strength Prestressed Concrete Bridge Beams - Fort Drum Connector

their scheduling requirements. This early compressive strength requirement resulted in a very low w/cm of 0.30.

The Challenge

Ambient temperatures during casting ranged from 90 to 95 °F (32 to 35 °C) and concrete temperatures were approximately 85 °F (29 °C). These temperature conditions, combined with the acceleration that was expected with the addition of the Rheocrete CNI calcium nitrite-based corrosion-inhibiting admixture, a very low w/cm and, the use of silica fume created concern with respect to workability retention and the ability to achieve proper consolidation and a good surface finish. Patching bug holes and other imperfections to improve surface finish may have required the deployment of 2 men for about 8 hours per beam and resulted in significant productions costs. Therefore, it was necessary to use MasterSet R 100 admixture, a retarding admixture, to counteract the accelerating effect of the MasterLife CI 30 admixture, without changing the preset time (time delay until heat curing is applied; approximately equal to the time of initial set). Initial beam production using MasterSet R 100 admixture showed that release strengths were acceptable, but the workability retention of the concrete mixture was insufficient, resulting in surface defects. The workability retention of the concrete could be increased to alleviate the placement and consolidation difficulties by increasing the dosage of the retarding admixture. However, increasing the dosage of the retarding admixture would also increase the time of setting of the concrete, which would require a delay in the preset time and, consequently, a lower compressive strength at the desired time for release of prestress. In short, a compressive strength of less than 8,500 psi (58.6 MPa) at 34 hours, the desired time for release of prestress, would require the beam to have a longer curing regime that would delay the production schedule.

The Solution

The addition of MasterSure Z 60 workability-retaining admixture extended the working time of the concrete and allowed for significantly easier placement and consolidation. This in turn significantly reduced the number of bug holes eliminated other surface imperfections. Because MasterSure Z 60 workability-retaining admixture does not retard the hydration of portland cement, the preset time remained unchanged and New Enterprise was able to meet all the early- and later-age strength requirements. Mark Moyer, Technical Services Manager for New Enterprise commented by saying “MasterSure Z 60 admixture saved this job for us.”

Project Facts

- Total volume of concrete: 460 yd^3 (350 m^3)
- Dosage of MasterLife CI 30 admixture: 5 gal/yd^3 (25 L/m^3)
- Dosage of MasterSet R 100 admixture: 3 fl oz/cwt (195 mL/100 kg)
- Dosage of MasterSure Z 60 admixture: 5 fl oz/cwt (325 mL/100 kg)
- Specified slump: 8 in. (200 mm) maximum
- Specified air content: 7% ± 1.5%
- Required release strength: 8,500 psi (58.6 MPa)
- Required compressive strength at 28 days: 10,100 psi (69.6 MPa)
- Total cementitious content: 845 lb/yd^3 (500 kg/m^3)
- w/cm: 0.30

More Information

The Master Builders Solutions brand brings all of BASF’s expertise together to create chemical solutions for new construction, maintenance, repair and renovation of structures. Master Builders Solutions is built on the experience gained from more than a century in the construction industry.

The know-how and experience of a global community of BASF construction experts form the core of Master Builders Solutions. We combine the right elements from our portfolio to solve your specific construction challenges. We collaborate across areas of expertise and regions and draw on the experience gained from countless construction projects worldwide. We leverage global BASF technologies, as well as our in-depth knowledge of local building needs, to develop innovations that help make you more successful and drive sustainable construction.

The comprehensive portfolio under the Master Builders Solutions brand encompasses concrete admixtures, cement additives, chemical solutions for underground construction, waterproofing solutions, sealants, concrete repair & protection solutions, performance grouts, performance flooring solutions.

*Effective January 1, 2014, the names of BASF’s Master Builders Solutions brand products have changed:
Glenium 3030NS became MasterGlenium 3030
MB VR became MasterAir VR 10
Rheocrete CNI became MasterLife CI 30
RheoTEC™ Z-60 became MasterSure Z 60
Rheomac SF 100 became MasterLife SF 100
Pozzolith 100XR became MasterSet R 100

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