

Project:

I-93 Rapid Bridge Replacement
(93Fast14)

Location:

Medford, MA

Owner/s:

Massachusetts Department of
Transportation (MassDOT)

Concrete Producer:

Boston Sand & Gravel

Construction Contractor:

JF White

Requirements:

Compressive strength of 2,000 psi
(14 MPa) in 4 hours after final set

Target air content: 7%

Target slump 10 in. (250 mm)

Products Used*:

MasterAir® AE 200 air-entraining
admixture

MasterGlenium® 7500 high-range
water-reducing admixture

MasterSure® Z 60 workability-retaining
admixture

MasterSet® DELVO ESC extended set
control admixture

MasterSet AC 534 accelerating
admixture

MasterLife® SRA 20 shrinkage-reducing
admixture

Market Sector:

Paving

Project Profile

Strength-on-Demand Concrete

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The Background

A total of 14 bridges on Interstate 93, where the traffic volume is 200,000 cars per day, needed replacement due to deterioration of the concrete. Using normal construction procedures, this project would have taken at least five years to complete.

In order to accelerate the project and minimize the impact on commuters, the MassDOT chose to use the Patrick-Murray Administrations' Accelerated Bridge Program, which includes the use of accelerated project development and construction techniques.

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The Challenge

Under this program, it was determined that the project could be completed over 10 weekends in the summer of 2011 using precast bridge units fabricated off-site and hauled into place.

After placement, these 252 precast modular units, which form the superstructure of the bridge, were to be connected using a special rapid-setting concrete that would achieve a compressive strength of 2,000 psi (14 MPa) in 4 hours after final set. The total quantity of concrete required was approximately 1,600 yd³ (1,230 m³).

The Solution

The MassDOT approved the use of BASF's 4x4 Concrete System, a unique method of achieving 400 psi (2.75 MPa) flexural strength in 4 hours, or as needed. Concrete producer Boston Sand & Gravel and their admixture partner, BASF, developed a modified 4x4 Concrete mixture utilizing Type III cement, Class F fly ash and BASF admixtures that was able to achieve the compressive strength of 2,000 psi (14 MPa) in 4 hours after final set. The BASF products included MasterSure Z 60 workability-retaining admixture and MasterLife SRA 20 shrinkage-reducing admixture. The concrete met all the requirements of the MassDOT, including low shrinkage, allowing the bridge to be reopened to traffic on schedule.

Rapid-Setting Concrete Mixture Proportions

Type III Cement	720 lb/yd ³ (428 kg/m ³)
Class F Fly ash	180 lb/yd ³ (107 kg/m ³)
Water	277 lb/yd ³ (165 kg/m ³)
w/cm	0.31

Facts and Benefits

- A total of 252 precast modular units were connected with 4x4 Concrete
- The entire bridge replacement project was completed on time over a period of 10 weekends
- The bridge was closed each Friday after rush hour and reopened to traffic at 5:00 AM each Monday.
- 1,600 yd³ (1,230 m³) of 4x4 Concrete were used
- Additional information can be obtained from a dedicated web page developed for the project: www.mass.gov/massdot/93fast14

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:
Micro Air became MasterAir AE 200
Glenium 7500 became MasterGlenium 7500
RheoTEC Z-60 became MasterSure Z 60
DELVO ESC became MasterSet DELVO ESC
Pozzolith NC 534 became MasterSet AC 534

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