



Project Profile

Workability-Retention of Concrete

Brayton Point Cooling Towers



Dominion Resources, Inc., the owner of Brayton Point Power Station in Somerset, Massachusetts, was required by the federal Environmental Protection Agency (EPA) to construct concrete cooling towers to reduce the amount of warm water that the plant would send into Mount Hope Bay. When completed, the two structures would stand 500 feet (152 m) tall and 360 feet (110 m) in diameter with walls of reinforced concrete 20 to 21 inches (0.5 m) thick. The concrete used in the towers was designed to withstand 130 °F (54 °C) salt water and have a minimum service life of 30 years.

Project:

Brayton Point Cooling Towers

Location:

Somerset, MA

Owner/s:

Dominion Resources, Inc.

Concrete Producer:

Boston Sand & Gravel

Requirements:

100,000 yd³ (76,400 m³) of concrete

28-day compressive strength: 5,000 psi (34.5 MPa)

Slump target: 8 in. (200 mm)

Air content: 6%

Concrete needs to withstand 130 °F (54 °C) salt water

Minimum service life of 30 years

Tower Requirements:

1,100 psi (7.6 MPa) in. 12 hours

2,200 psi (15 MPa) in. 24 hours

Products Used:

MasterSure[®] Z 60

workability-retaining admixture

MasterGlenium[®] 7500

high-range water-reducing admixture

MasterSet[®] R 100

set-retarding admixture

MasterLife[®] CI 30

calcium nitrite-based

corrosion-inhibiting admixture

MasterAir[®] AE 200

air-entraining admixture

Market Sector:

Ready-mixed concrete



The Challenge

A high-performance concrete mixture was required to withstand the aggressive environment and to meet the service life requirements of the structure. Additionally, since the towers would be constructed by placing concrete in lifts, and in order to meet the construction deadline, the concrete had to achieve 2,200 psi (15 MPa) in 24 hours. To achieve all of these desired performance characteristics, the mixture developed for this project had a high cementitious materials content, low water-cementitious materials ratio (w/cm) and a corrosion-inhibiting admixture.

In some cases, mixtures with these performance requirements and proportions can be challenging to place and consolidate, particularly during warmer weather if the mixture loses workability prematurely. In order to ensure both the constructability and hardened property requirements, Boston Sand and Gravel and their admixture supplier, Master Builders Solutions, would need to ensure that the mixture achieved consistent slump and air content throughout the delivery and placement operations.

The Solution

Boston Sand and Gravel utilized Master Builders Solutions' MasterSure Z 60 workability-retaining admixture in all of the mixtures to maintain the required workability. At both the plant and the jobsite, the slump and plastic air contents were very consistent, thereby enhancing the efficiency of the placement and consolidation processes. The target slump was 8 in. (200 mm) and the target air content was 6%. As shown in the Table, for 362 measurements, the performance of the mixture as delivered was very consistent.

Table 1.
Statistical Data of Mixture Using MasterSure Z 60

	Slump	Air
No. of Measurements	362	362
Average	8.2 in. (210 mm)	6.2%
Std Dev	1.14 in. (29 mm)	0.9%

Project Facts

- 100,000 yd³ (76,400 m³) of concrete was placed
- Two 500 ft (152 m) tall towers, 360 ft (110 m) in. diameter
- Project started in November 2009 and cooling tower shells reached finished elevation in October 2010
- Approximate project cost = \$500 million

Benefits

- Consistent workability of delivered concrete
- Consistent plastic air content
- Significantly reduced need for on-site adjustment of fresh concrete properties

Master Builders Solutions

The Master Builders Solutions brand brings expertise 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 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 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, fiber reinforcement solutions, waterproofing solutions, sealants, concrete repair and protection solutions, performance grouts, and performance flooring solutions.