

# 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 yd<sup>3</sup> (76,400 m<sup>3</sup>) 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<sup>®</sup> Z 60

workability-retaining admixture

MasterGlenium<sup>®</sup> 7500

high-range water-reducing admixture

MasterSet<sup>®</sup> R 100

set-retarding admixture

MasterLife<sup>®</sup> CI 30

calcium nitrite-based

corrosion-inhibiting admixture

MasterAir<sup>®</sup> AE 200

air-entraining admixture

**Market Sector:**

Ready-mixed concrete

## Project Profile

Brayton Point Cooling Towers



### 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.

### Project Facts

- 100,000 yd<sup>3</sup> (76,400 m<sup>3</sup>) 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

**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%

### 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 CO<sub>2</sub> 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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