



INTERNALLY CURED CONCRETE (ICC) REDUCES SHRINKAGE CRACKING, ENHANCES DURABILITY

QUICK FACTS:

Project:

Lone Tree Tank No. 2

Location:

Lone Tree, CO

Notes:

As quoted by Erik Holck, PE Engineering – Denver Water Materials Lab Manager, “Denver Water is constantly looking to improve the longevity of our facilities, and ICC is a great way to improve the quality, performance and longevity of our treated water tanks. The qualities of ICC that accomplish this are reduced shrinkage cracking, greater cement hydration, more constant heat of hydration and decreased permeability”.



Constructing large capacity water storage tank slabs without construction joints is a complex proposition in Colorado’s low humidity and often windy climate. One solution that has been successful is to specify low-shrinkage concrete mixtures and monolithic placement of the slab within a prescribed time period to reduce the probability of shrinkage cracking.

Previously, the focus has been to commence placement of the concrete at a given day’s peak temperature in the summer months or at 32°F [0°C] and rising in the winter months with daytime temperatures forecasted to be well above freezing. This allowed for optimum concrete/ambient temperature conditions to reduce the potential of early age cracking. However, even under the best of circumstances and planning, shrinkage cracking still occurred. It was felt that more could be done to

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improve concrete curing, further reducing shrinkage cracking and enhancing durability.

Robert Bates of Bates Engineering and Erik Holck of Denver Water elected to utilize an Internally Cured Concrete (ICC) mixture as a means to further reduce shrinkage cracking and enhance the durability of the base and roof slabs of the Lone Tree Tank No. 2 water storage facility in Lone Tree, CO. To accomplish the desired result of an internally cured concrete, prewetted expanded shale lightweight aggregate fines were chosen. The prewetted expanded shale fines were used to replace a portion of the normal weight concrete sand. In conjunction with Trinity experts, Aggregate Industries developed the initial ICC mixture under laboratory conditions with further field tests conducted to demonstrate the desired placing and finishing characteristics of the mixture.

The post-tensioned floor slab placement was conducted in early October 2011 and consisted of approximately 1,300 CY of the developed ICC mixture. This particular tank project was primarily schedule driven, and the general contractor decided that significant time could be saved if the ICC mixture was used for the walls and columns as well. The request was made and approved by the design team. By capitalizing on the additional performance characteristics of the ICC mixture, the contractor was able to strip and set their forms quicker, which compressed and accelerated the schedule for placing the walls and columns. The project "topped out" on March 4, 2012, when approximately 1,800 CY of the ICC mixture was placed for the post-tensioned roof slab.

Internally Cured Concrete has been viewed by the entire design team as an extremely effective means to address early age cracking, enhance durability and improve construction schedules.



Trinity Lightweight is the largest producer of rotary kiln expanded shale and clay lightweight aggregate in North America and is a leading supporter of research, independent testing and field studies to improve the manufacturing process and expand the beneficial uses of the product.

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