

Pumping Lightweight Concrete 54 Stories High in Chicago

In high-rise buildings, every floor has to be strong enough to support the loads imposed on each level, and also provide the fire resistance required by the building code. And in steel frame high rise buildings, lightweight concrete provides both strength and superior fire resistance, while reducing dead loads, all the way to the top.

Recently, Ozinga Chicago was called on to supply lightweight concrete for a 54-story project on Lake Street in Chicago. The project is a steel frame building with a lightweight concrete slab on metal deck floor system, with a specified concrete compressive strength of 4,000 psi at 28 days and a maximum equilibrium density of 115 pounds per cubic foot. Because of its lower heat conductance, lightweight concrete provides the required fire resistance with about 1/3 less thickness than required for normal weight concrete. Combined with a 1/5 reduction in density, the system reduced floor dead loads by about 45 percent.

The lightweight concrete for the Lake Street project was also a self-consolidating concrete (SCC) mixture using a high-range water-reducing admixture and three other chemical admixtures, and Class C fly ash. The purpose of using SCC is to provide concrete that is fluid enough at the pump discharge to spread without vibration. Steel fibers were also added to the mix at a rate of 35 pounds per cubic yard.

The lightweight aggregate used for the project was Riverlite® Coarse-Medium from Trinity Lightweight. Construction progressed at a rate of two to three floors per week, with an average of about 350 cubic yards of concrete per deck. "It was a pretty challenging pump configuration," said Scott Kelly, Ozinga's Assistant Manager of Quality Control, "but it was the best option for going up 54 floors without losing too much slump – and for getting the concrete to be both workable and placeable."

Kelly said this particular project didn't pose any other unusual challenges for Ozinga, which has worked on a large number of downtown high-rises over the years. Staging trucks in congested spaces, working with time constraints, and managing delivery and jobsite logistics are all normal processes for the company. "So far, everything has gone pretty smoothly and according to specification," Kelly says.



All of the lightweight, fiber reinforced SCC was placed by pumping using a stationary Schwing concrete pump. The operation required 5-inch steel slick line with no reducers, but there were 16 to 18 elbows between the ground level and the upper floors, adding the equivalent of 5 vertical feet per elbow. A 5-inch rubber hose was used at the pipe's discharge end to direct the concrete into place.



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