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Cellular mix protects Con Edison dock

Consolidated Edison, an electric, gas and steam utility serving New York City and neighboring Westchester County, used cellular concrete made with Engelhard Corp.'s Geofoam concentrate and MetaMax EF high-reactivity metakaolin to protect a 50-year-old dock on the East River from water rot and marine borers. The only other viable alternative-rebuilding the dock and replacing its timber elements-would have cost two to three times as much, project officials note.

The cellular concrete was used to encase pile tops and caps down to the mud line in the near-shore half of the 600-ft.-long, 50-ft.-wide structure. The lightweight concrete used on the other half extended three feet below the deck to the high-water line. Piers were wrapped in plastic below this point. MetaMax EF metakaolin was added to trucks containing a cement-sand-water mixture at a rate of 5 percent by mass of cement.

The preformed foam used for the cellular concrete was generated on-site by Accurate Engineered Concrete, Haverhill, Mass., and injected into the trucks. Foam additives were about 50 percent by volume.The cellular concrete, which was pumped below the dock through a flexible hose and placed in timber and sheeting forms by divers, filled the space beneath the dock and around the piers. The project required 2,000 yd. of cellular concrete, which had a density of 70 lb./cu. ft. and a strength of 300 psi at 28 days."This was my first experience with cellular concrete," says ConEd's Ed Northup, project engineer. "The effort went smoothly and was cost effective. I estimate the upgraded dock, which is used primarily for fuel unloading, should last another 30 or 40 years or more."

Cellular concrete using Geofoam foaming agent is an engineered material having uniformly distributed fine air bubbles. Englehard reports that the concrete is highly fluid and self-leveling; has good workability; can be prepared with density of 20 to 120 lb./cu. ft. and compressive strength from 30 to 3,000 psi. The MetaMax EF metakaolin works as an anti-washout aid by forming a gel-like matrix in cellular concrete that limits cement wash-out as the concrete comes in contact with water. In addition to improving the underwater integrity and cohesiveness of cellular concrete, it reduces rebound and permeability in high-performance shotcrete and acts as a pozzolan by reacting with the lime that forms as a byproduct of cement hydration.