

Rapid Set Low-P Cement gains traction



An October 2008 launch of CTS Cement Manufacturing Corp.'s low-permeability powder—Rapid Set Low-P Cement—targeted three markets, i.e., Missouri, Virginia, and New York/New Jersey, enabling close monitoring and collaboration with the departments of transportation, agencies, engineers, and contractors to ensure a successful introduction, the company asserts. Initial application was most widespread in Missouri, where the Department of Transportation (MoDOT) adopted the new technology for overlay work performed in downtown

St. Louis. While most state DOTs in need of low-permeability concrete and freeze/thaw durability require at least one winter exposure before approving its use, CTS's long-standing relationship with MoDOT prompted the state to come on board with Low-P's initial launch.

In 2009, MoDOT approved the use of Rapid Set Low-P Cement concrete in seven District 6 [St. Louis] bridge patching and over-

lay projects, as well as for 34 local state bridges covered by an "on-call" repairs contract. Also, last year, VA DOT used Low-P Cement concrete for bridge repairs; and, Port Authority of NY and NJ incorporated the product for partial and full-depth patching on bridge decks, joint repair, elevated sidewalk construction, and structural tunnel work.

Presently, MoDOT is moving forward with eight bridge repair and overlay projects in 2010, including three large jobs that specify Rapid Set Low-P Cement concrete to bid this spring. The product is supplied from CTS plants in Mexico, Mo., and Nazareth, Pa. In the near future, a facility in Juarez, Mexico, will serve as an additional source of the material.

Available in 2,000-lb. super sacks and bulk, Rapid Set Low-P yields about 3 to 3.5 yards of concrete per 2,000 lb. when used in a typical mix design. It is suitable for fast and ultra-durable concrete repairs and overlays, the company asserts, providing low permeability, corrosion resistance, and high early strength. The fast-setting hydraulic cement mixed with water and aggregates produces extremely workable mixes ready for traffic in one to three hours, RS Low-P developers note; and, finished concrete exhibits excellent freeze-thaw resistance, achieving a durability factor of 99 after 300 cycles [ASTM C666].

The high-slump, nonsegregating formula reportedly offers an alternative to latex-modified concrete, microsilica, low-slump, and silica-fume concrete for fast-track bridge deck overlays, elevated deck repairs, pavement repairs, and general concrete projects requiring low chloride ion permeability, high sulfate resistance, corrosion protection, and/or fast strength gain. Although volumetric mixers have been producing latex-modified (low-permeability) concrete since the early 1960s, the company notes, Rapid Set Low-P Cement concrete offers the advantages of the former in addition to corrosion resistance for the price of LMC and perhaps as inexpensively as microsilica fume concrete.

I-55 SERVES AS GATEWAY FOR LOW-PERMEABILITY MIX IN ST. LOUIS

On Interstate 55 through St. Louis, Mo., ensuring safe commutes and maintaining an economic lifeline necessitated improvement of six overpasses at five locations on a heavily travelled stretch extending 1.364 miles, as well as bridge rehabilitation spanning 0.038 miles at the Lafayette Avenue overpass. While removal and overlay were sufficient for the Lafayette overpass, extensive repairs in addition to a new wearing surface were needed for the remaining five bridge decks, which required "zone" repairs prior to the overlay due to their box girder design.

The original contract mandated use of a standard MoDOT portland-cement bridge concrete mix for the repairs and a latex-modified concrete for the overlay. In view of traffic-flow maintenance demands and a 40- to 45-day construction time frame, however, contractor Concrete Strategies submitted CTS Cement's Rapid Set Low-P Cement for use in both patching and wearing surface overlay applications. A 4,000-psi strength achieved in less than three hours would prove more than equal to the MoDOT prerequisite of 3,000 psi to

open to traffic. Moreover, the two- to three-hour wet cure would allow repairs to continue without interruption and preparations for the adjacent lane overlay to be undertaken immediately without compromising the new bond. Accordingly, local MoDOT construction engineers opted to use the product sourced from Mexico, Mo.

Started in May 2009 and completed in August 2009, the six-bridge project involved removal of existing 25-year-old overlays, partial and full-depth deck repairs, joint repairs and application of a new overlay. Once patching work was completed, deck surfaces were either sand-blasted or hydro-cleaned as preparation for the overlay, measuring 1½ to 2 inches thick, 18 to 24 feet wide, and up to 240 feet in length per placement.

Two mobile volumetric mixers supplied concrete at a rate of 10 yards per 30- to 40-min. cycle. Reloading was performed within a mile of each bridge; and, recharge averaged about 30 minutes round trip, facilitated by loading of only cement, stone, sand and water for fast turn-around times. Citric acid introduced as a retarder

permitted a controlled set for the finishers, plus reduced mobile mixer cleanup between loads. An 8- to 9-in. slump at discharge allowed easy placement and effective use of a Bidwell deck finisher. The mix did not segregate and adhered on sloped bridges without sagging.

MoDOT conducted numerous field tests including early age compressive strengths, freeze thaw (99–100), rapid chloride permeability (< 800 coulombs), and 24-hour bond pull-off tests (>200psi). In December 2009, the I-55 South rehabilitation project was recognized by the St. Louis Concrete Council with a "Quality of Concrete Award" for excellence and use of new technology.

Affirms CTS Cement Regional Sales Manager Ed McLean, "The 572-lb. mix achieved physical performance results surpassing those of competitive traditional concrete overlay materials that require 658 pounds of cement. The cost for the new cement technology is competitive when compared with latex-modified concrete, because of the lower cement content, and offers many cost-savings advantages with its three-hour speed."