RESEARCH
PROJECT CAPSULE [12-5C]
September 2012
TECHNOLOGY TRANSFER PROGRAM

Comparison of Conventional and Self-Consolidating Concrete for Drilled Shaft Construction

JUST THE FACTS:

Start Date:
May 1, 2012

Duration:
18 months

End Date:
October 30, 2013

Funding:
SPR: TT-Fed/TT-Reg

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Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used Implementation Potential

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PROBLEM

Significant anomalies have been observed in many of the recently drilled shaft constructions throughout Louisiana. The anomalies typically occur in the form of honeycombing within the zones of heavy reinforcement or sometimes at the shaft bottom. Self-consolidating concrete (SCC) has shown great potential to overcome the difficulties noted in some pilot studies. As an example, SCC was used in the drilled shafts for the Huey P. Long Bridge in New Orleans, La, and performed satisfactorily. However, when conventional concrete was used for the Audubon Bridge in Louisiana, problems were noted in the construction as well as the shaft resistance. Both projects consist of large size shafts constructed in the Mississippi River under similar conditions. One possible explanation for the differences in shaft performance is the concrete mixture design.

OBJECTIVE

The objective of this research project is to study the suitability of SCC in the drilled shaft construction. The research will observe the influence of water on the effectiveness of SCC. The research will introduce the use of an "L-box," which tests the turbidity of the concrete during placement under water or through drilling slurries. Field produced SCC will be tested according to the outlined test procedures to determine suitability for underwater concrete applications. It is anticipated that at least three field sites that were constructed with drilled shafts will be included in the study. One is in District 04, Shreveport, La, and another potential site is located on the ALF site in Baton Rouge, La. An effort will be made to include industry partners in as many field produced concrete applications as possible.

METHODOLOGY

Two control mixtures will be tested for this study. Concrete conforming to Class S and Class MASS structural mixtures will be fabricated as control mixtures. SCC will then be produced and compared to the Class S and Class MASS concrete. Different admixtures will then be used to make the concrete more resistant to washout in the underwater L-box test. Concrete will be produced with air content in the range of 2-7 percent, and slump in the range of 2-8 in. The concrete will use a B or D aggregate blend.

A comprehensive literature review will be conducted, comparative testing will be conducted on fresh and hardened concrete, a statistical analysis will be used to compare conventional concrete and self-consolidating concrete in laboratory conditions, an implementation plan will be developed with positive results, and a final report will be prepared and will include the results and findings of this study.

IMPLEMENTATION POTENTIAL

The results of this study will assist the Louisiana Department of Transportation and Development (LADOTD) in determining whether to fully implement SCC mixtures in drilled shaft construction, and will also give much needed direction to the LADOTD on how to more effectively test the SCC for segregation resistance, deformability, and blocking behavior. The underwater L-box test is anticipated to provide much needed insight as to the washout characteristics of SCC placed in underwater conditions.