

Research Examines Column-to-Footing Connections

The ACI Foundation approved the funding of four research projects for 2017. This edition of *Knowledge to Practice* features “Benchmark Tests on Anchoring Columns to Foundations.”

This project will explore the applicability of various ACI 318-14 provisions to the design of column-to-footing connections. The primary objective of this project is to clarify which ACI 318-14 provisions should apply to the design of column-foundation connections, or whether alternative provisions should be developed for these connections. This project will also identify the applicability/limitations of ACI 318-14, Chapter 17, concrete anchoring provisions to the design of connections between structural members. Size effects for punching shear and breakout will also be investigated.

Physical tests will be performed on representative geometries to explore the design requirements for tension, compression, and moment loading cases. The designs will be based on representative design approaches, and the results will provide direct evidence on the efficacy of those design procedures. This project will also provide guidance on the use of existing ACI 318 anchoring-to-concrete provisions in a range of applications.

Jack Moehle of the University of California, Berkeley, CA, will serve as the project’s principal investigator. Cofunders of this research include Hilti Corporation and Ron Klemencic of Magnusson Klemencic Associates, Inc. ACI Subcommittee 318-B, Anchorage and Reinforcement, supports this research project.

New Research Product on Chloride Limits

“Evaluation of Chloride Limits Phase A” was funded by the ACI Foundation and RMC Research & Education Foundation. This research sought to establish a relationship between total chlorides calculated from the concrete materials and water-soluble chlorides measured on concrete specimens at a test age between 28 and 42 days. Neal Berke of Tourney Consulting Group, Kalamazoo, MI, served as the project’s principal investigator. Research testing was performed at National Ready Mixed Concrete Association (NRMCA) and Tourney labs.

Specimens with Type II and Type V portland cement, slag cement, Class C and Class F fly ash, and silica fume were evaluated. Mixtures with varying water-cementitious materials ratios were also evaluated. Following current ACI 318-14 guidelines, water-soluble chlorides were measured

at an age between 28 and 42 days in accordance with ASTM C1218/C1218M, “Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.”

Results suggest that current ACI 318 chloride limits are conservative and may need to be reevaluated. Chloride limits for portland cements should be further examined, especially in cements containing supplementary cementitious materials such as slag and fly ash. “Evaluation of Chloride Limits Phase B” is ongoing.

SDC Technology Forums Bring Innovation to Concrete Industry

The Strategic Development Council (SDC) will host several Technology Showcases at its 42nd Technology Forum on September 6-7, 2017, in Reston, VA. These showcases highlight new and innovative equipment, materials, and applications that have the potential to advance the industry. Technology Forum 42 Technology Showcases will include:

- Oceans Technology Group will present Zero Thermal®, a patented algae-based supplementary binder and additive for concrete. Zero Thermal works through exothermic reaction and formation of covalent bonds. It can provide advanced thermal properties, increased *R*-values, and anti-corrosive attributes; and it offers mold and mildew control;
- Blue Planet Ltd. will present “Utilization of Carbon Dioxide for Limestone Aggregate.” Forty gigaton of anthropogenic carbon dioxide (CO₂) is emitted annually and over half is released from large industrial plants, including coal- and gas-fired power plants, steel mills, and cement plants. This CO₂ can be converted into limestone aggregate with similar properties to natural limestone aggregate; and
- Dan Zollinger, Texas A&M Transportation Institute, will discuss the use of ground-penetrating radar (GPR) to detect moisture under concrete pavement slabs near joints. Recent research indicates that it may be feasible to use GPR to determine when a sealed joint is no longer effective. Such assessment can help to determine crack potential and support the use of performance monitoring rather than repair to maintain a sustainable concrete pavement system.

Twice per year, SDC hosts technology forums, which are 1.5-day technical conferences to highlight innovative technologies and research the SDC perceives as having positive productivity or economic impacts on the industry. More information and past technology forum presentations are available at www.concretesdc.org.