

Join Us at SDC's Technology Forum 46

The ACI Foundation's Strategic Development Council (SDC) will host Technology Forum 46 in Pittsburgh, PA, on August 27-29, 2019. Please join us as we discuss numerous material options in reinforcement and prestressing, code changes, and industry-critical research results, along with the potential roles of computer vision, artificial intelligence, and robotics in the concrete industry.

The program begins on Tuesday, August 27, 2019, with an opportunity to take a tour of the Frick Environmental Center. This outstanding Pittsburgh Chapter – ACI project won second place in the Low-Rise Buildings category in the 2017 ACI Excellence in Concrete Construction Awards competition. The tour will take place from 1:00 to 2:00 p.m. and is available for a maximum of 20 people. Following the tour, a fun evening of mingling is planned as we host a welcome reception at the Kimpton Hotel Monaco, located in downtown Pittsburgh, from 5:00 to 7:00 p.m.

During the Forum, presentations will include:

- Reinforcement—a 2-hour panel discussion on the use of nonmetallic reinforcement. Speakers will present the viewpoints of owners, manufacturers, contractors, and academia; discuss the state of research and development activities by ACI, ASTM International, and AASHTO; and address constructability, productivity, and risk;
- Technology Showcases—using titanium to strengthen bridges and existing concrete structures; fiber-reinforced polymer macrofibers for precast concrete; and TyBot, an autonomous robot for tying reinforcing bars;
- Codes and Design—engineering analysis of fiber-reinforced polymer (FRP) composites and fiber-reinforced concrete using ACI 440.1R and ACI 544.4R, respectively; integration of the work products of ACI Committee 375,



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Performance-Based Design of Concrete Buildings for Wind Loads, and ACI Committee 440, Fiber-Reinforced Polymer Reinforcement, with those of ACI Committee 318, Structural Concrete Building Code; and building code changes related to the use of high-strength steel reinforcement; and

- Future Trends and Inventions—potential applications of computer vision, artificial intelligence, robotics, and augmented reality.

The City of Pittsburgh is currently undergoing a postindustrial reinvention. Advances in robotics and other cutting-edge technologies are the result of research by Carnegie Mellon University's Manufacturing Futures Initiative and the Advanced Robotic Manufacturing Institute. Join the discussion on how these technologies might affect the future of concrete and the built environment. Then use the remainder of the day on Thursday, August 29, 2019, to network or connect with several start-up companies focused on bringing new technologies to the market.

For more details, visit www.acifoundation.org/sdc.aspx.

Applications for Scholarships and Fellowships Now Open

On July 1, 2019, the 2020-2021 application cycle for ACI fellowship and scholarship awards will open. Based on essays, submitted data, and endorsements, the ACI Foundation's Scholarship Council will grant awards to those candidates judged to have the strongest combination of interest and potential for professional success in the concrete industry.

During the last award cycle, the council awarded the first-ever Middle East (MENA) Fellowship, which is available to students studying in Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates. The ACI Foundation is pleased to offer this award again for the next cycle.

ACI Foundation fellowships and scholarships are made possible through generous contributions by our donors in the concrete community. Together, we are strengthening the concrete industry by encouraging students toward a professional career in the field.



Demonstrating virtual reality



Students at The ACI Concrete Convention and Exposition

If you know of a student who would benefit from receiving tuition and networking assistance and who would serve our industry well, please encourage them to apply. This is a life-changing opportunity for students in their career and we value their experience in this program. Students who apply are required to have an endorsement from an ACI nonstudent member, so you may also consider offering an endorsement to that student.

The ACI Foundation's Fellowship and Scholarship program has been extremely successful in getting high-potential students to become more engaged in the field of concrete via education and more involved in the ACI community. We are proud to share that 85% of the students who have received an award from the ACI Foundation have remained in the concrete industry.

If you or someone you know plans to apply, please visit www.acifoundation.org/scholarships.aspx for application requirements and tips for preparing materials for submission.

ACI Foundation's Concrete Research

We are excited to share that the ACI Foundation funded six research projects this year. This month, we focus on two projects and will highlight more in upcoming issues. To learn more about all the research projects funded by the ACI Foundation, please visit www.acifoundation.org/research.aspx.

Effective Characterizations of Recycled Concrete Aggregate (RCA) for Concrete Applications

Principal Investigator Jiong Hu, University of Nebraska–Lincoln

Co-Principal Investigator Tara Cavalline, University of North Carolina at Charlotte

As sources of quality natural aggregates become challenging or economically prohibitive to obtain in some markets, and the economic and sustainability benefits of concrete recycling become increasingly enticing to stakeholders, use of recycled concrete aggregate (RCA) in new concrete is receiving renewed interest. Major obstacles that hinder the use of RCA in concrete construction cited by practitioners are the lack of specifications/procedures for

qualifying an RCA source and the unclear impact of RCA on concrete performance. Resolution will require an accurate characterization of RCA, including its geometrical properties, physical and mechanical characteristics, and chemical characteristics/compositions. While the composite nature of RCA makes it more complicated than natural aggregate, its characterization is similar—primarily focused on gradation, specific gravity, and absorption.

While more robust characterization is required, it is not practical or economical to include an excessive amount of testing or expensive types of characterization methods. The purpose of this research is to identify the most effective and practical RCA characterization methods and procedures through experimental study. The study intends to establish an RCA characterization protocol, provide recommendations for RCA concrete mixture designs, and identify best practices for RCA to be used in concrete construction. The project was endorsed by ACI Committee 555, Concrete with Recycled Materials, which believes the success of the study will greatly encourage the use of RCA in daily concrete production.

Structural Response and Buckling Behavior of Slender Ultra-High-Performance Columns

Principal Investigator Mohamed Moustafa, University of Nevada–Reno

The use of ultra-high-performance concrete (UHPC) is currently expanding worldwide from bridge deck joints and connections to full components and larger applications. One potential application is the use of UHPC columns in buildings and bridges to reduce the members' cross sections and footprint. Due to the enhanced mechanical characteristics of UHPC and its high compressive strength, more slender sections are expected for the same applications relative to conventional reinforced concrete. Thus, it is important to investigate the elastic and inelastic buckling behavior of UHPC columns and determine whether current ACI 318 procedures for slender columns are valid for UHPC columns.

The objective of this study is to test several large-scale UHPC columns with different slenderness ratios, confinement levels, and cross sections under concentric axial loading to determine the axial load capacity and ductility as it relates to crushing versus buckling. This experimental data can be immediately used to validate ACI 318 design procedures for columns and future validation/calibration of computational and constitutive models for capturing the UHPC columns' structural response through failure. The project was endorsed by ACI Committee 239, Ultra-High Performance Concrete, which is developing a report on design processes for structures constructed with UHPC, with the long-term intent to develop structural design guidance.