Knowledge to Practice:

aci Foundation

Annual Research Request for Proposals Now Open

The Concrete Research Council of the ACI Foundation is seeking proposals for research that will further the knowledge and sustainability of concrete materials, construction, and structures. Key points of the request for proposals include:

- Topics are encouraged from all areas of concrete research;
- Up to $50,000 may be approved per project for direct costs;
- The ACI Foundation limits the indirect costs of the research institution to 15%; and
- An ACI technical committee must support the research concept.

The latter point is essential for approval. Principal investigators should reach out to technical committee chairs as soon as possible to ensure that proposed research will have the support and engagement of a committee.

Proposal submissions are due December 1, 2019, by 11:59 p.m. Eastern time.

Please visit **www.acifoundation.org/research.aspx** for more information on requirements, details, and tips to help prepare materials for submission.

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, industry critical research results, and 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.

The forum will include several technology showcases that highlight new and innovative equipment, materials, and applications that have the potential to advance the industry, including:

- Fiber-Reinforced Polymer Composite Macrofibers Used in Precast Concrete;
- Strengthening Bridges and Existing Concrete Structures Using Titanium;
- Integrated Design of Chemical Admixture Systems via Machine Learning;

The next SDC Technology Forum will be held August 27-29, 2019, in Pittsburgh, PA

- Opportunity for Improved Productivity and Quality with Robotics;
- Machine Learning—Prediction of Concrete Performance from Mixture Proportions; and
- Integrating Traditional Civil Engineering with Artificial Intelligence.

A panel presentation moderated by ACI President Randall W. Poston on the "Use of Non-Metallic Reinforcement" will show the technology from the viewpoints of private owner, public owner, designer, contractor, manufacturer, and researcher. Speakers will discuss the state of research and development; activities by ACI, ASTM, and AASHTO; and constructability, productivity, and risk.

Other presentations will include:

- Engineering Analysis for Fiber-Reinforced Polymer Composite Solutions Using ACI 440.1R and ACI 544.4R Design Guides; and
- Value Proposition of Glass Fiber-Reinforced Polymer Reinforcing Bar in Bridge Decks.

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

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 final projects. To learn more about all the research projects funded by the ACI Foundation, please visit us at **www.acifoundation. org/research.aspx**.

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Deconstruction Monitoring of a Cast-in-Place Segmental Concrete Box Girder Bridge
Principal Investigator Matthew Yarnold, Texas A&M University
Co-Principal Investigator John Mander, Texas A&M University

The goal of this study is to further the state-of-knowledge about the long-term behavior of segmental concrete box girder bridges. Due to increased traffic volume and ship clearance demands, the Sam Houston Ship Channel Bridge is being replaced after 36 years of service. This presents a unique opportunity to conduct a detailed field study to identify the locked-in prestressing forces in addition to the in-service behavior under thermal variations and live load demands. The locked-in prestressing forces will be measured using deconstruction monitoring—the measurement of deformation in structural members as the structural system is being disassembled. These measurements will be valuable for evaluating prestressing forces over the life of a segmental concrete bridge. Long-term effects such as concrete creep and shrinkage, along with steel strand relaxation, can significantly alter these forces over time. The measured results will be compared to a variety of current models and the original design.

"As a former DOT researcher, I fully recognize that the ability to monitor during deconstruction can provide information that cannot be obtained by any method from a structure that remains in service," said Michael C. Brown, Chair of ACI Committee 343, Concrete Bridge Design, and Senior Supervising Engineer, US Bridge Asset Management Leader, WSP USA. "Such information can inform designers about the accuracy of long-term assumptions of prestress losses and load distribution and will provide valuable insight to ACI Committees 342, Concrete Bridge Evaluation, and 343, Concrete Bridge Design, as well as to the greater transportation industry, including AASHTO, TRB, PCI, PTI, and ASBI, and their constituent stakeholders," Brown continued.

Optimization of Fiber-Reinforced Concrete Using Data Mining
Principal Investigator Emilio Garcia-Taengua, University of Leeds

Fibers improve the mechanical properties of concrete, and fiber-reinforced concrete (FRC) has gained increasing presence in routine production and field applications. However, the residual flexural strength parameters, which are the basis of FRC characterization and specification, present high levels of variability. The proportioning of FRC mixtures must include consideration of fresh and hardened state properties as well as their variability, and a comprehensive study is urgently needed.

This project will be useful for designers, practitioners, and the concrete industry in general, as it will advance industrial practice by simplifying the proportioning of trial mixtures, reducing production costs, and yielding better FRC. The goal is to compile an exhaustive database with information on different FRC mixtures and their properties, and to use data analytics to develop mathematical models for mixture optimization. Using papers published since 1999 as the main source of information, probabilistic analyses will be used to define quality control charts for use in the monitoring of continuous production of FRC mixtures. The models will be implemented in a software package called "OptiFRC," which will allow users to access the database developed in this program, to visualize models developed for the optimization of FRC mixture proportioning, and to calibrate and apply quality control charts. The software will be user-friendly, and the information will be accessible to concrete practitioners without requiring specialist statistical knowledge. This application-oriented project is endorsed by ACI Committee 544, Fiber-Reinforced Concrete.

Students can now apply for 2020-2021 ACI Foundation Scholarships and Fellowships

Applications for Scholarship and Fellowships Now Open

The 2020-2021 application cycle for fellowships and scholarships opened July 1. Based on essays, submitted data, and endorsements, the Scholarship Council will select award recipients who appear to have the strongest combination of interest and potential for professional success in the concrete industry.

If you or someone you know plans to apply, visit **www.acifoundation.org/scholarships.aspx** for more information on requirements, details, and tips to help prepare materials for submission.