Concrete Research Council Announces Completion of New Research Product

The ACI Foundation is pleased to announce that the research product *Serviceability Behavior of Reinforced Concrete Discontinuity Regions* has been completed. Robin Tuchscherer, Northern Arizona University (NAU), Flagstaff, AZ, served as the Principal Investigator; Jessica Kettelkamp, Northern Arizona University, was the Research Assistant on the project. The research was sponsored by the ACI Foundation's Concrete Research Council (CRC), the Portland Cement Association (PCA), and the NAU Faculty Grants Program.

The objective of this study was to create a procedure for predicting the serviceability behavior of discontinuity regions analyzed using the strut-and-tie modeling method. This was accomplished by correlating the cracking behavior of test beams, in terms of crack width and total area of visible cracking, with the internal strain energy estimated from representative strut-and-tie models. A secondary goal of the study was to refine existing photogrammetric methods to collect crack width, crack area, and displacement data from digital images of test beams.

A total of 12 reinforced concrete beams were tested. Each beam had a 10 x 20 in. (254 x 508 mm) cross section. Experimental variables included shear span-depth ratio a/d, quantity of vertical and horizontal web reinforcement, spacing of web reinforcement, and configuration of the primary tension reinforcement. Data collected during the tests included maximum crack width, area of cracked surface, and displacement of targets placed on a 3 in. (76 mm) grid on beam surfaces.

The results of this study represent an encouraging step toward better estimation of cracking behavior of deep beams and discontinuity regions. Strong correlations were found between area of cracked surface and estimated strain energy for beams with an a/d of 1. While the correlation was not as strong for beams with a/d of 2, this can be expected because such beams are more prone to develop secondary load paths that are dependent on the placement of the web reinforcement.

"Hardy Cross's oft-quoted adage—'strength is essential but otherwise unimportant'—is as much true today as it was almost a century ago," Tuchscherer said. "Yet, we continue to design for serviceability using similarly dated and prescriptive rules-of-thumb. I'm hopeful the results of this unique study will help catalyze future work in this important area."

Information from this research product may be used by ACI committees in the creation of new codes and standards. More information about this and other ACI Foundation-sponsored research can be found at **www.acifoundation.org/research**.

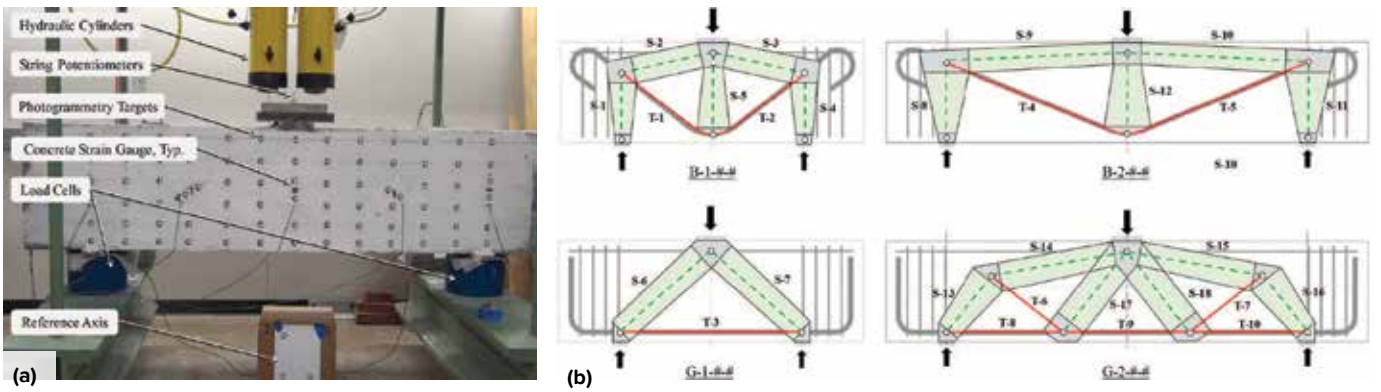
Fellowship and Scholarship Applications are Open

Applications for the ACI Foundation's 2019-2020 fellowships and scholarships are due by November 1, 2018. New for 2019-2020 is a fellowship specifically for graduate students studying in Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

Apart from the newly created fellowship, ACI Foundation fellowships are offered to both undergraduate and graduate students studying at accredited American and Canadian universities. Students must be nominated by an ACI member. Among the fellowship benefits are an educational stipend between $10,000 and $15,000 USD; airfare, hotel, travel stipend, and registration for three ACI conventions; and assignment to an industry mentor.

ACI Foundation scholarships are offered to both graduate and undergraduate students enrolled at accredited universities worldwide. An ACI Foundation scholarship includes an educational stipend of $5000 USD.

Visit **www.acifoundation.org** for additional details.



A total of 12 reinforced beams were tested and modeled: (a) typical test setup; and (b) strut-and-tie models used to analyze test specimens (from Tuchscherer, R., and Kettelkamp, J., "Estimating the Service-Level Cracking Behavior of Deep Beams," *ACI Structural Journal*, V. 115, No. 3, May 2018, pp. 875-884)