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CIVE 6111 Graduate Seminar

What Yields the Best Performance? The Design and Repair of Lap Splices with a View on Deformability

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2:45pm-3:45pm
Classroom Business Building (CBB) - Room 104
Zoom: https://uh-edu-cougarnet.zoom.us/j/94589160391

Abstract

It is evident that splices which fail prior to, or soon after yielding are not reliable. Demands from earthquake, blast, wind or settlement can result in bar strains that exceed the yield strain by large margin. The reliability of the splice should not be based on stress values alone, but rather strains. Achieving large strains, or adequate deformability without splice failure should be the emphasis for design. The real question is how much deformability a lap splice should have. For seismic applications, for instance, all the evidence considered suggests that it would be prudent to expect strain demand to exceed drift ratio. Given a) current design target drift ratios as high as 2.5%, b) uncertainties involved in estimating drift demands for phenomena that require the most ductility (earthquake and blast) and c) the potentially fatal consequences of splice failure, it is hard to envision situations in which drift or rotation targets would not exceed 2 or 3%. The verdict is simple: unconfined lap splices in critical regions of critical structural elements pose high risk and need strengthening and/or retrofit.

In the investigation presented, a series of beam and coupon specimens containing a pair of spliced Gr. 60 #11 reinforcing bars were tested. A splice length of 56-bar diameters and the same cross-section were used in twenty-four specimens. In twelve specimens the spliced bars were unconfined while the remaining twelve specimens were confined by post-installed epoxied anchors. Conclusions regarding the behavior of the spliced bars and the effects of the epoxied anchors are discussed from the perspective of both strength and deformability.

Bio

Kinsey C. Skillen is an Assistant Professor of Civil & Environmental Engineering within the Construction, Geotechnical, and Structures Division at Texas A&M University. He also holds a joint appointment as an Assistant Research Scientist of Major Highway Structures for the Texas A&M Transportation Institute (TTI). He obtained his BSCE from Montana State University in 2015, MSCE from Purdue University in 2017, and PhD in Civil Engineering from Purdue University in 2020. He conducts research on topics related to bond and anchorage of steel reinforcement, the development of early-high-strength & eco-efficient cementitious mortars, and hyper-velocity impact behavior of concrete materials. He is a voting member of ACI committee 408 – Bond and Development of Steel Reinforcement and associate member of ACI committees 351 – Joints and Connections and 441 – Columns.