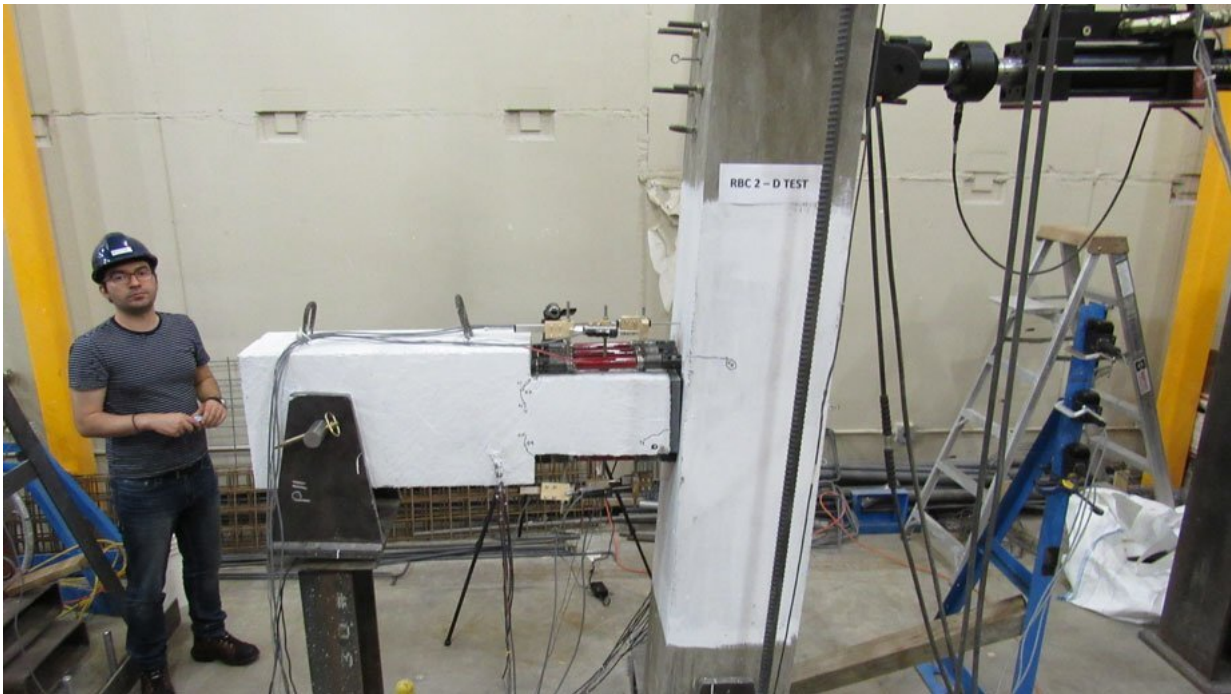


New method of connecting precast concrete beams and columns

October 5 2020, by Christie Delfanian



Assistant professor Mostafa Tazarv of the Department of Civil and Environmental Engineering oversees testing of a new method of connecting precast concrete beams and columns that makes it possible to repair buildings after an earthquake, hurricane or tornado and makes the components better able to absorb energy without sustaining damage. The time-lapse video, below, shows the half-scale model being subjected to cyclic loading. Credit: South Dakota State University

A new method of connecting precast beams and columns will make it possible to quickly repair concrete buildings damaged by extreme events such as earthquakes and hurricanes.

The [patented technology](#), developed at South Dakota State University, can also reduce the amount of damage a [building](#) sustains, according to inventor Mostafa Tazarv, an assistant professor in the Department of Civil and Environmental Engineering.

Typically, the reinforcing steel bars that link precast beams and columns together are embedded in the concrete components. Therefore, when damage is so extensive that the connecting bars buckle or rupture, the building will usually have to be demolished, Tazarv explained. "Our idea is to make buildings more like cars, so we can change damaged components whenever needed."

In the patented design, the precast [beam](#) slides into the column and the buckling-restrained reinforcement connects the beam reinforcement to the column reinforcement. "The reinforcing bars are exposed and connect to the beam and column bars using a coupler," Tazarv said. "Since the bars are exposed at the connection, they can be easily replaced if damaged."

Testing on half-scale beam-column specimens showed the patented design can withstand extreme demands that are even "greater than any earthquake that has hit the United States thus far ... with only minor cracks here and there. No typical reinforced concrete structure can do this," Tazarv said. Furthermore, the beam-column connection has at least twice greater deformability than conventional structures, meaning the components are better able to absorb energy without sustaining damage.

In addition to minimizing damage, the new technology also reduces repair time. "Putting the bars outside of the concrete in buildings' critical

regions means that after an event, you can take a pipe wrench, unscrew the nuts and replace the damaged bars and your building is as good as new," Tazarv said.

Though an [economic analysis](#) has not yet been done, Tazarv estimates implementing the new connection design will have a minimal impact on building costs. "That's the beauty of it. You pay a few percentages upfront, but you can save your entire building," he said.

One doctoral student and one master's student also worked on the project, which was made possible through department funding as well as in-kind material donations from Headed Reinforcement Corporation and SAES Smart Materials.

The next step will be to do large-scale component and system level testing, according to Tazarv. For that, university officials want to partner with companies interested in further developing and commercializing the technology, according to TreMonti Consulting's Rick Swatloski, who assists with technology transfer and commercialization for SDSU.

"A simple conversation with the faculty member could develop into sponsored research, which can be just as valuable as a licensing deal," Swatloski said. "The most important thing for us is to encourage and grow relationships with outside stakeholders and potential funders."

In addition, Tazarv said, "We are now testing the new connection method for bridges." He anticipates this technology could also result in significant savings for transportation agencies.

Provided by South Dakota State University

Citation: New method of connecting precast concrete beams and columns (2020, October 5)

retrieved 31 January 2023 from <https://phys.org/news/2020-10-method-precast-concrete-columns.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.