Building taller, sturdier wood buildings

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Dr. Thang Dao, left, and Dr. Sriram Aaleti, both assistant professors in civil, construction and environmental engineering, are developing a new method of constructing woodframed buildings.

University of Alabama researchers are leading an effort that could lead to the construction of taller and sturdier wood-framed buildings in earthquake-prone areas.

Dr. Thang Dao, UA assistant professor of civil, construction and environmental engineering, hopes to combine two methods of constructing tall-wood buildings to yield a new system that could lead to wood-framed buildings reaching eight to 12 stories that withstand earthquakes better than current methods that top out at seven stories.

Earthquake damage, with the potential for substantial economic losses, highlights a need to focus on developing earthquake resilient and sustainable buildings, Dao said.

"As the result of rapid population growth and urban densification, there is a need for taller buildings that are also sustainable and can perform better than simply 'adequate' in moderate to large earthquakes by sustaining only minimal damage," he said. "Further, it is critical that such buildings have minimal interruption to allow people to remain in their residences and community following an earthquake event."

The research project sponsored by the National Science Foundation will use equipment in the Large Scale Structures Lab on the UA campus to mimic earthquakes on partially built structures connected to computer simulations that give feedback on how the entire building would perform.

Working with Dao are Dr. Sriram Aaleti, UA assistant professor of civil, construction and environmental engineering, and Dr. John van de Lindt, professor of civil and environmental engineering at Colorado State University.

The research team will study how to combine, for the first time, the traditional Light Wood Frame System, LiFS, of construction with the emerging method of Cross-Laminated Timber, or CLT, an engineered wood panel usually consisting of layers of wood glued at intersecting angles. CLT is strong, and its make-up can resist lateral forces created during an earthquake.

In the proposed system, the CLT panel anchored with unbonded post-tensioning will be combined with the LiFS, using the beneficial features of each. While the unbonded post-tensioning in the CLT will self-center the system, the connections in the light-frame wood should provide a way to dissipate the energy created during an earthquake. The system should ensure main structural parts of the building remain elastic during an earthquake with no damage, making the system resilient.

"The endeavor of this research project is to understand the mechanistic and statistical properties of all sub-components of the CLT-LiFS system and form a fundamental understanding of how to combine these two types of systems into an optimal hybrid system," Dao said.

If successful, the hybrid woodframe system would mean more buildings in earthquake zones could be made from wood, a renewable material, Dao said.

Provided by University of Alabama in Tuscaloosa