

# Study paves way for widespread architectural use of end-of-life tires

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"Earthship" built from recycled tires at Ironbank, SA.

A new study by the University of South Australia has tested and verified the structural integrity of walls constructed from tires packed with earth, with the results potentially providing new opportunities for the reuse of end-of-life tires in the construction industry.

Tire waste represents a major sustainability challenge globally, with Australia alone generating an average of 55 million (450,000 tons) end-of-life tires each year.

While earth-packed tire walls have been used in niche construction scenarios for decades, there has previously been no strong empirical data available to support their use, a fact that has limited their wider uptake by architects and engineers.

Supported by Tire Stewardship Australia, a UniSA team consisting of Yachong Xu, Martin Freney, Reza Hassanli, Yan Zhuge, Mizanur Rahman and Rajibul Karim, has rigorously assessed the [structural integrity](#) of a test tire wall to examine how the structure performed under various stressors.

According to Dr. Martin Freney, the wall proved to be as structurally sound as conventional walls used in residential applications.

"The wall we tested was the first of its kind to be scientifically tested in this fashion, and all the data indicates tire walls can be extremely strong and safe structures," Dr. Freney says.

"While that structural integrity has been observed for many years in applications such as the retaining walls in earth-sheltered, Earthship homes, the lack of supporting data has prevented wider uptake of tire walls by engineers and architects, and we're hoping this study will change that and expand the range of projects in which these walls are used."

In considering expanded uses for tire walls, Dr. Freney suggests several unique characteristics of the structures may offer benefits over some traditional building approaches, particularly for retaining walls.

"Not only are the tire walls as structurally sound as concrete or wood sleeper retaining walls, they are also extremely resilient.

"Unlike a concrete wall, we found these walls have the ability to 'bounce back into shape' following impact, such as from an earthquake."

"And if a drainage material such as recycled concrete rubble or crushed bricks is used to fill the [tires](#), they also offer excellent drainage, which can be a major consideration in many retaining wall scenarios. Furthermore, the use of recycled fill materials reduces the environmental impact of the wall."

While the study only tested one real world wall as part of the project, UniSA Ph.D. candidate Yachong Xu developed software models that allow the data obtained to be extrapolated to other designs, making the results applicable to a wide range of scenarios and stakeholders.

"We really believe this research provides a strong evidence base for the expanded use of tire walls in housing and other applications, and the next step will be to engage with an industry partner to develop a range of real-world applications for tire walls," Dr. Freney says.

The study is published in *Engineering Structures*.

**More information:** Yachong Xu et al, Experimental study on the structural performance of full-scale tyre wall for residential housing applications, *Engineering Structures* (2022). [DOI: 10.1016/j.engstruct.2022.114181](https://doi.org/10.1016/j.engstruct.2022.114181)

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