Australian Government
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Sustainable Built Environment National Research Centre AUSTRALIA

Project # IE250100031- ARC Early Career Industry Fellowship

Novel Lightweight Modular Panel System for Multi-Hazard Resistant Construction

Project Duration: 3 years (2026-2028)

Australia faces increasing risks from natural hazards such as cyclones, earthquakes and wind-borne debris. Current prefabricated construction systems struggle to deliver affordable, rapidly deployable, and multi-hazard-resilient solutions—particularly in remote and high-risk regions. This project will develop and validate a next-generation lightweight modular wall and floor panel system that integrates advanced composite materials with innovative connection design. The system enables fast construction, high energy efficiency, and robust performance across multiple hazards, supporting safer and more resilient buildings.

Objectives

To design, test and deliver a lightweight modular panel system capable of resisting wind, earthquake, and impact loads, while maintaining high thermal performance and suitability for rapid, panelised construction.

1. Hybrid composite panels combining fibreglass-reinforced polymer (FRP) frames, insulated foam cores, and durable skins
2. Multi-hazard resistance designed into walls, floors, and inter-panel connections
3. Industry-ready design manuals and simplified engineering models.

Industry Outcomes

This project aims to deliver the following key industry outcome:

- Validated modular wall and floor panel systems for multi-hazard regions
- Design procedures and simplified models for engineers and manufacturers
- Pilot-ready panel solutions suitable for immediate industry uptake
- Strengthened Australia's capability in resilient and sustainable construction.

Methodology

The project adopts a design-test-refine research approach that integrates industry-led prototype development with experimental testing and engineering analysis. Modular wall and floor panels are manufactured using real-world construction methods and then subjected to full-scale laboratory testing to assess their performance under wind, earthquake-type loading and impact. Results from these tests are used to develop and validate engineering models that capture the structural behaviour of panels and connections. The outcomes are translated into simplified design procedures and practical guidance to support uptake by engineers, manufacturers and industry partners.





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