

Overview of “Adapting Cementitious Structural Insulated Panels for Multistory Use” Project

While advances in SIP technology have increased the extent of their application within the construction industry, current construction systems limit their use to residential and light commercial applications. Due to the large size of the commercial construction market and their impact potential as an energy efficient structural building system, FAS is interested in extending the application of SIP technology beyond its current state.

With a grant from [the Charles Pankow Foundation](#), FAS will determine if CSIPs can improve the safety and other performance characteristics of multi-story structures while simultaneously reducing constructing times, construction costs, and operating costs. Using completed and on-going research projects, FAS will evaluate the current state of SIP technology, and analyze a variety of design options for multi-story buildings for their structural strength, energy efficiency, earthquake and hurricane resistance, and costs. FAS will select and deliver a complete design, ready to be employed on actual CSIP construction projects and for the rapid adoption by the building construction industry.

The initial phase of the project is a comprehensive review of current CSIP technologies and building performance. Additional testing of the thermal performance of CSIP panels is planned at the [Oak Ridge National Laboratory's Advanced Wall Systems Laboratory](#), and a comprehensive pseudo-dynamic seismic performance test will be conducted at the [Pacific Earthquake Engineering Research \(PEER\)](#) center at the University of California, Berkeley.

Following this research and several in-depth case studies, FAS will review potential design strategies for multi-story buildings to understand which each constituent part of the assembly does for the overall composite structure of the building. Comparing this with the strengths of CSIPs, FAS will select an optimal structural design strategy to be tested. With the help of PEER, designs will be tested using the Open System for Earthquake Engineering Simulation (OpenSEES) program. OpenSEES is an advanced performance simulation software framework that integrates structural behavior, soil and foundation behavior, and damage measures. It also facilitates the combining of computational simulation with physical testing of building elements on shake tables and other laboratory test equipment. The final product of this research will be the production of a comprehensive guide for the adoption of CSIP technology to multi-story building. The guide will serve as a decision resource for any future work on the use of CSIPs in multi-story buildings.