

Design and Analysis of Energy-Absorbent Precast Concrete Infill Panels for Seismic Retrofits using Nonlinear Finite Element Analysis

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Abstract

A seismic retrofit strategy for critical-use, steel moment-frame buildings using infill panels made of a ductile high-performance fiber-reinforced cementitious composite (HPFRCC) material is currently under investigation. The infill panel material is a self-compacting mix that uses high strength steel fibers. In the retrofit, the panels are bolted to each other and into existing steel moment-frame buildings with pretensioned, slip-critical connections to add stiffness, strength, and energy dissipation. Seven half-scale, component-level single panel tests have been conducted and four half-scale double panel tests are underway. Specimen designs are based on non-linear finite element analysis and comparisons between predictions and post-experiment analysis are made. Simulations are 2D plane stress analyses with strain-hardening cementitious material modeled as well as embedded (bonded) and unbonded steel reinforcement. Hysteretic response and failure modes are compared between the analyses and experiments.