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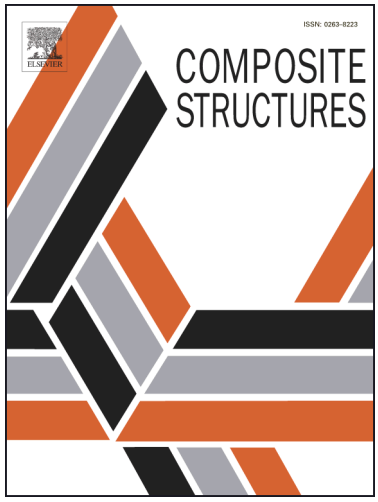

Seismic Behavior of Glass Fiber-Reinforced Polymer Wall Panels

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SEISMIC BEHAVIOR OF GLASS FIBER-REINFORCED POLYMER WALL PANELS

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ABSTRACT

Glass Fiber-Reinforced Polymer (GFRP) panels have been increasingly used for structural applications due to their light weight, corrosion resistance and construction-easiness. This study evaluates the seismic performance of GFRP wall panels based on comprehensive shaking table tests and Finite Element Analysis (FEA). A GFRP wall panel is experimentally subjected to harmonic ground motions of frequencies ranging from 10 to 15 Hz. A mass is attached to the top of the panel to simulate gravitational weight. The panel remains undamaged under a peak base acceleration of 2.1 g. Its FEA is conducted using Abaqus based on Rayleigh damping. There is a good correlation between the experimental and FEA results. Another FEA model is developed to study the seismic behavior of a Reinforced Concrete (RC) wall, which is validated by results from an existing study. The two FEA models are then used to compare the seismic performance of GFRP wall panels versus RC walls in terms of drift ratio and hysteretic behavior. It is found that while GFRP wall panels cannot replace RC walls in multi-story buildings due to their low stiffness, their performances are comparable to RC walls for low-rise buildings. Therefore, GFRP wall panels can be potentially used in low-rise buildings in seismic regions.

KEYWORDS:

Fiber-Reinforced Polymer (FRP), Wall panel, Seismic behavior, Shaking table test, Finite element modeling, Reinforced Concrete wall

1. INTRODUCTION

Fiber-reinforced polymer (FRP) materials have been widely used in civil engineering. While they are more commonly used to strengthen existing structures [1-2], FRP components have gained popularity in recent years because they are easy to retrofit and reduce the overall self-weight of the structure, yielding design flexibility.

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