17th Symposium on Earthquake Engineering
November 14-17, 2022
IIT Roorkee, India
Paper No. 436

A Promising Alternative for Low Rise Buildings in Seismic Regions: EPS Core Sandwich Panel Structural System

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Abstract

In the present study, use of Expanded Polystyrene (EPS) Core Sandwich Panel Structural System in seismic regions has been explored through experimental and analytical studies both. The mechanical properties of the chosen Reinforced Concrete Sandwich Panels (RCSP) system are determined experimentally, and detailed seismic safety evaluation of a proposed low rise 4-storey RCSP, Expanded Polystyrene (EPS) core sandwich panel building is been performed using finite element method (FEM). The specimens are tested in displacement control mode, and displacements (strains) measurement are done with Digital Image Correlation (DIC). The mode of failure, propagation of cracks, ultimate axial load carrying capacity, in-plane shear strength, and out-of-plane flexural capacity are studied. The experimental results are also compared with analytical values. The analytically calculated capacities are matching with experimental results.

A FE (finite element) model of a 4-storey RCSP building using layered shell elements has been developed in SAP2000. The axial force, bending moment, and shear force acting on the critical sections in the ground storey piers under all the considered load combinations are compared with the capacity of piers. The results of the analysis conclude that the design of the building is adequate to withstand the gravity and seismic forces of Zone V and EPS Core sandwich panel structural system is a promising alternative for low rise buildings in seismic regions.

Keywords: Composite structures, Expanded polystyrene (EPS) core, Reinforced concrete sandwich panels (RCSP), Seismic safety