

WP 12: Transnational Access to structure lab reaction wall at University of Patras

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Keywords

Earthquake engineering, Hybrid simulation, reaction wall

Figures



Figure 1. Project ARISTA



Figure 2. Project ARCO



Figure 3. Project HitFrames

Main Results

The scope of the ARISTA project (project team: Cyprus University of Technology, Ecole Centrale de Nantes, DENCO Structural Engineering) was to experimentally study the seismic behaviour of a 1:1.5 scaled three-storey two-bay RC frame with smooth bar reinforcement. The frame was designed using gravity loads only and lacked any seismic design or detailing. The experiment in one of the few worldwide, in which a specimen with smooth bar reinforcement and size (i.e., number of storeys and full scale) was tested. It provided invaluable information for design guidelines and code rules.

The ARCO project (project team: University of Liege, Liege, University of Lisbon, Aarhus University) focused on the effect of axial restraint on the seismic behaviour of short coupling beams. This effect is



generated by the interaction between the coupling beam and the adjacent shear walls. As the beam cracks under loading, it tends to extend in the longitudinal direction and pushes upon the walls. Because of the large stiffness of the walls, compression force develops in the beam, which limits the opening of the cracks. As a consequence of this effect, beams are characterised by a shear-dominated response, being susceptible to brittle shear failures. The only test variable was the level of axial restraint. A fourth beam was tested under a large inelastic pulse in one direction followed by a push to failure in the opposite direction. This unconventional cyclic loading scenario can be associated with a near-fault pulse-type ground motion.

The project HitFrames (project team: University Liverpool, University of Naples Federico II, University of Ljubljana, University College London, University of Toronto and FIP Industriale) investigated effective methods for the seismic assessment and retrofitting of existing non-compliant steel frames. Recent earthquakes in the Mediterranean region demonstrated that present steel, multi-storey, residential, framed buildings are designed primarily for gravity loads, exhibiting low energy absorption and inadequate dissipation capacity under seismic loadings. The low lateral stiffness and strength of the steel framed structures and the slender masonry infills induce significant lateral drifts, buckling and/or fractures to structural steel members. Additionally, the current provisions for the seismic performance assessment of existing steel structures are scarce and they do not account for the presence of the infills.

List of Publications

Palios, X., Strepelias, E., Stathas, N., Fardis, M.N., Bousias, S., Chrysostomou, C.Z., Kyriakides, N. "Experimental study of a three-storey concrete frame structure with smooth bars under cyclic lateral loading", Bulletin of Earthquake Engineering, BEEE (under review).

Di Sarno, L., Gutiérrez-Urzúa, F., Freddi, F., D'Aniello, M., Landolfo, R., Kwon, O-S., Bousias, S., Dolšek, M., Wu, R-W., Castellano, M.G. "Pseudo-Dynamic testing of existing steel frames with masonry infills: assessment and retrofitting with BRBs", XVIII ANIDIS Conference 2019.

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