

Experimental Investigation on the Seismic Performance of LWS Drywall Architectural Non- Structural Elements

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Abstract. The paper presents the research activity carried out for evaluating the seismic performance of Lightweight Steel (LWS) drywall architectural non-structural elements made of Cold-Formed Steel (CFS) profiles sheathed with gypsum-based or cement-based boards, i.e. indoor partition walls, outdoor façade walls and suspended continuous ceilings. The experimental investigation was organized in three phases: ancillary tests, element-level tests and assembly-level tests. Ancillary tests were carried out for assessing the local behaviour of partitions, façades and ceilings through tests on steel material, screws, sheathing boards and board-to-frame fixings. Element-level tests on partitions, specifically 22 out-of-plane quasi-static monotonic tests, 11 out-of-plane dynamic identification tests and 12 in-plane quasi-static reversed cyclic tests, were performed. Finally, the dynamic behaviour was investigated through 5 shake table tests on different assemblages of partitions, façades and ceilings. The influence on the seismic response of stud spacing and basic and enhanced anti-seismic solutions, corresponding to the use of fixed or sliding connections at the wall and ceiling perimeter, was investigated. Test results were analysed in terms of strength, stiffness, damage phenomena, dynamic properties, dynamic amplification and seismic fragilities. The study categorized the element behaviour in three classes, i.e. elements with low, intermediate and high fragilities, by demonstrating that the tested architectural non-structural elements are able to exhibit a good seismic behaviour with respect to the damage limit states according to the inter-storey drift (IDR) limits given by Eurocode 8 Part 1.

Keywords: Indoor partition walls, In-plane and out-of-plane behaviour, Lightweight steel, Outdoor façade walls, Suspended ceilings.

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