SPONSE
International Association for the Seismic Performance of Non-Structural Elements

4th International Workshop on the Seismic Performance of Non-Structural Elements (SPONSE)

May 22-23, 2019 – Pavia, Italy

Structural Behavior of Screw Connections between Cold-Formed Steel Studs and Gypsum Boards

Kyung-Suk Choi[1], Hyung-Joon Kim[1]

[1] Department of Achitectural Engineering, University of Seoul
Arch. & Civil Eng'g Bldg, 163, Seoulsiripdae-ro, Dongdaemun-gu, Seoul 02504, Korea
e-mail: hyungjoonkim@uos.ac.kr

Abstract. Typical partition walls used for configuring the architectural layout of a builing are classified as nonstructural elements that are not usually considered as components influencing its structural seismic performance. Under strong ground motion, inertial forces and/or interstory drifts imposed by a structural system cause the seismic damage of partition walls that can further create falling hazards, block corridors, and consequently, endanger occupants attempting to exit from a damaged building. Therfore, nonstuructural partition walls should be seismically designed to prevent from such life-threatening damage. A typical partition wall consists of cold-formed steel (CFS) framing members, such as C-shaped studs and tracks, and gypsum boards used as a sheathing material. A gypsum board is connected to CFS framing members by self-drilling screws with a regular interval. It has been long recognized that the seismic performance of a CFS gypsum partition wall is mainly dependent on the structural behavior of the self-drilling screw connections because of their low strength and deformation capacities. Many previous tests of partition walls have demonstrated that the structural damage of the connections was initiated by tilting and bearing of screws transferring shear between the gypsum board and CFS studs, and the separation of the gypsum board from CFS studs due to screw pull-through or breaking of the gypsum board edge then leads to the failure. Also, they confirmed that the seismic capacity of the CFS stud-to-gypsum connections is governed by the constructuction detail including board thicknesses, spacings and edge distances of screws, etc. At each country, different connection details have been used for the construction of partition walls and the structural response should be experimentally verified. In this study, cyclic tests are carried out to evaluate the structural behavior of CFS stud-to-gypsum connections which are chosen as a representative of Korean commercial details. The screw spacing, edge distance, and number of board layers are selected as the experimental parameters and their effects to the initial stiffness, peak load, ductility and failure mode are estimated. The test results show that the seismic capacity of screw connections can be significantly improved by the increase in edge distances.

Keywords: Partition walls, Cold-formed steel studs, Gypsum boards, Self-drilling screws, Edge distances

DOI 10.7414/4sponse.ID.22