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Seismic Behavior of Self-Balancing Post-Tensioned Reinforced Concrete Spatial Structure

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Abstract : The construction industry is currently trying to develop sustainable reinforced concrete structures. In trying to aid in the effort, the research presented in this paper aims to prove the efficiency of modified special hybrid moment frames composed of discretely jointed precast and post-tensioned concrete members. This aim is due to the fact that current design standards do not cover the spatial design of moment frame structures assembled by post-tensioning with special hybrid joints. This lack of standardization is coupled with the fact that previous experimental programs, available in scientific literature, deal mainly with plane structures and offer little information regarding spatial behavior. A spatial model of a modified hybrid moment frame is experimentally analyzed. The experimental results of a natural scale model test of a corner column-beams sub-structure, cut from an actual multilevel building tested to seismic type loading are presented in order to highlight the behavior of this type of structure. The test is performed under alternative cycles of imposed lateral displacements, up to a storey drift ratio of 0.035. Seismic response of the spatial model is discussed considering the acceptance criteria for reinforced concrete frame structures designed based on experimental tests, as well as some of its major sustainability features. The results obtained show an overall excellent behavior of the system. The joint detailing allows for quick and cheap repairs after an accidental event and a self-balancing behavior of the system that ensures it can be used almost immediately after an accidental event it.

Keywords : modified hybrid joint, seismic type loading response, self-balancing structure, acceptance criteria
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