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International Doctoral Program in Civil and Environmental Engineering

SEMINAR

Location:
Campus of Engineering of UNIPG
Room 15
Teams platform
(Room 1 - PL_Dott_Civil_Environmental_Engineering)
Timetable:
January 25th 2022 - 11:30 a.m. (CET)

Earthquake-resistant thin-walled cold-formed steel structures (the structural response of steel connections and concentric bracing systems)

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Federico Gusella obtained the degree in Civil Engineering (Master Level) from the University of Florence in 2013 and the PhD degree in Structural Engineering in 2018. Since 2019, he is a researcher at the Department of Civil and Environmental Engineering of Florence. He collaborated to the research project SmartISS (Smart Industrial Steel Structures) in 2019 and the StruMetaL project (Light Metallic Structures) in 2015. The main topics investigated during his research activity are the structural response of Reinforced Concrete (RC) structures as influenced by the beam-to-column joint behavior and the ductility of members, and the earthquake response of cold-formed and hot-rolled steel structures.

Thin-walled cold-formed steel pallet racks are industrial systems commonly used worldwide to store goods on pallets. In down-aisle direction, bracings are usually not installed to make palletised goods, stored on horizontal beams, always accessible. Along this direction, racks behave like moment resisting frames whose stability and seismic resistance depend on the performance of the beam-to-column connections. In cross-aisle direction, racks are typically braced, with uprights connected by diagonal braces, to improve the stability and seismic response.

The seminar is motivated by the need to increase the knowledge of the mechanical behavior of rack joints and to highlight its effect on the global seismic response of industrial storage systems. The proposed goal is achieved showing results of experimental tests on full-scale boltless rack joints and equipped with additional bolts, a theoretical model based on the application of the Component Method is proposed for a reliable analytical estimation of the joint moment-rotation response, and finally results of non-linear dynamic analyses of racks are explained with the aim to estimate the effect of the pinching, which characterizes the hysteresis loops of connections.

Along the cross-aisle direction, the influence of perforated diagonal braces on the ductility of concentric X bracings, designed according to the capacity design approach, is investigated. The structural response of diagonals as impacted by the size and number of holes is explored. To promote utilization of perforated braces in seismically-active areas, the work concludes with recommendations for designers.

For more info:
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