EXPERIMENTAL TESTING OF 3D STEEL FRAME WITH COMPOSITE BEAMS UNDER COLUMN LOSS

Florea Dinu[a,b], Ioan Marginean[a], Dan Dubina[a,b] , Ioan Petran[c], Mircea Pastrav[d], Andreea Sigauan[a], Adrian Ciutina[a]

a Department of Steel Structures and Structural Mechanics, Politehnica University Timisoara, Romania
b Laboratory of Steel Structures, Romanian Academy, Timisoara Branch, Romania
c Department of Structures, Technical University of Cluj-Napoca, Romania
d National Institute for Research and Development in Construction, Urban Planning and Sustainable Spatial Development "URBAN-INCERC", Cluj-Napoca Branch, Romania

Abstract: The different nature and intensity of accidental loads make difficult the development of design requirements for such situations. Therefore, a better strategy is to limit the extent of damage so that the progressive collapse is not initiated. Features like ductility and continuity provide more deformation capacity and redistribution of loads, so that the structure can bridge over damaged/lost elements. Interaction between the steel beams and the concrete slab is also expected to enhance the resistance after the loss of a column. This paper presents the results of an experimental study that aimed at investigating the contribution of the floor system and beam-floor interaction to the load redistribution capacity in case of a column loss. For this purpose, a 3D steel frame structure, with composite beams and extended end-plate bolted beam-to-column connections, was considered. The specimen was tested under monotonic loading applied to the top of the central column until complete failure. The results showed the system was capable of developing larger capacity to resist the loss of a column but lower deformation capacity when compared to a bare steel frame tested under similar conditions.

Acknowledgments

Partial funding for this research was provided by the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), Romania, under grant PCCA 55/2012 “Structural conception and collapse control performance based design of multistory structures under accidental actions” (2012-2016).