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An investigation on the ductility and energy dissipation capacity of the Eccentrically Braced Frames with vertical link beams

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Abstract

An Eccentrically Braced Frame system with Vertical link beam (V-EBF) which hasboth of the enough lateral stiffness, in order to control the drift of structures, and the ability of being ductile and energy dissipating to reduce lateral forces and absorb the importing energy of the earthquake, can be considered as an adequate seismic force resisting system.In this paper, the effects of the length and cross-section shape of the link beam, as well as the number of the stiffeners used in the link beam, on the capacity of ductility and energy dissipation of this system are studied. For this purpose, a number of single-story, single-bay frames are analyzed under the cyclic loading, utilizing the ABAQUS software. The results obtained from these analyses show that this system has a high ductility level and can significantly absorb the entering energy of the earthquake.

Keywords: vertical link beam, ductility, energy dissipation, earthquake, cyclic loading.

1. INTRODUCTION

Eccentrically Braced Frame with vertical link beam (fig. 1) uses the vertical link as a fuse which has the role of producing ductility and energy dissipation for the whole system, by large plastic deformation during earthquakes that let the other parts of the system remain in elastic domain.

This system can be easily renewed after earthquakes, by replacing the damaged joint with a new one. One of the most important matters in using this system is the lack of knowledge about it, which requires more experimental and numerical studies to better understanding of its behavior.Vafa and Pourzeynali in 2011 [1] and 2012 [2] conducted some researches on the behavior of V-EBF systems constructed of IPE shear links.

2. TEST MODELS PROPERTIES

For the purpose of investigating the effects of the length, cross-section shape of the link beam, and the number of stiffeners used in this system, twelve models with different parameters mentioned above (see fig. 1) are modeled in ABAQUS[3] software, for whichthe details are presented in Table 1.