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Comparison of RC interior wide beam-column joints' behavior with various beams width (a finite element study)

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Abstract

A finite element study was performed to compare two wide beam-column joints with different width of beams. After accurately analyzing these models under lateral loading, the force–displacement curves were determined for both of reinforced concrete (RC) wide beam-column joints. The behavior of connections in terms of ductility, strength and energy dissipation was quantitatively evaluated. The results indicated that the amount of reinforcement bar play important role on behavior of wide beam-column joints. Moreover, for width varying from 600 to 1000 mm, an increase in width can result in 19% decrease in ductility and 33% ultimate strength enhancement.

Key words: Reinforced concrete, wide beam, beam-column connection, finite element model.

1. Introduction

The most critical area in RC moment frames subjected to lateral loading is beam-column connections. This is because of tolerating maximum loads and moments in connection areas. Wide beam-column joints are one of the connections in which width of beam is larger than width of column. Using this kind of connection has some advantages such as decrease the time and cost of construction processes [1]. Whereas, low capacity of energy absorption enable some limitation to use such a connection in seismic region [2, 3]. Lack of information about behavior of wide beam-column connection caused to researchers be interest for studying about them. LaFave and Wight conducted an experimental study on three exterior RC wide beam-column connections, based on ACI provisions. The results demonstrated that the strength of wide beam-column joints against torsional moment was similar to conventional beam-column connections [4, 5]. Elsouri et al. performed an experimental test on two gravity-load designed specimens and two more joints "earthquake resistant" with wide beams, under quasi static cyclic loading. They found out reinforcement detailing can improve dramatically seismic resistant of specimens [6].