International Conference on Civil Engineering, Architecture and Urban Management in Iran
Tehran University
DECEMBER-2018

Performance of SCC interior beam-column connections in lateral forces

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Abstract

The present research is aimed at the analytical and experimental study of the effect of the application of Self-Consolidating Concrete (SCC) in interior beam-column connections under different conditions. For the experimental study, three full-scale SCC interior beam-column connections with different axial loads (0, 7.5, and 15% of the column axial capacity) and a vibrated Normal Concrete (NC) specimen with an axial load equal to 15% of the column axial capacity were subjected to lateral loading. The experiments were first studied and their results were then used for the calibration of the model parameters in ABAQUS software. In the analytical study, the effect of parameters such as high axial load, amount of confinement, the ratio of the flexural strength of the beam to that of the column, and joint aspect ratio on the behavior of the connection was examined. Due to the relative weakness of self-consolidating concrete in shear, thought of as a consequential parameter in the behavior of the connection, the behavior of SCC connection is slightly different to its NC counterpart.

Keywords: Self Consolidating Concrete (SCC), Beam–column connection, Joint aspect ratio, Finite element Method

1. Introduction

Building is a series of interwoven structural components attached to each other at the connections. Should a part be designed poorly, this chain is locally weakened, and the safety and serviceability of the building is paralyzed. Since beam-column connections have important and critical role in reinforced concrete structures, such connections have always attracted the interest of researchers. Observations made after earthquakes and the multiplicity of the factors influencing the behavior of such connections have encouraged many studies and experiments on the behavior of concrete connections.

This is due to the complexity of the behavior of the connection and the variety of the failure mechanisms acting at such joints, as reflected by the wide dispersion in their strength obtained from the related equations. In addition, various parameters such as concrete strength, column axial load, the amount of confinement provided for the joint, joint aspect ratio, and the ratio of the