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The Performance of Self-Compacted High Strength Concrete Columns with Laced Steel Section

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Abstract

In view of the great orientation to the steel buildings and the large role played by the columns in carrying and transferring the loads it is necessary to go to strengthen the steel rolled columns to meet the requirements of the architecture that witch is looking for large spacing. In present paper this research the objectives of this research can be summarized as following: prevent local buckling occurs in columns, strengthen the steel columns from the weak axis in a new methodology, to compare buckling loads of single lacing reinforcement versus double lacing reinforcement and obtain a high bearing column steel section with small surface area increase in column strength capacity. Different parameters are taking into account to investigate the behavior and strength of steel and composite columns such as slenderness ratio, and double lacings and presence of longitudinal reinforcement that parallel to the column height. The type of concrete that adopt is self-compact concrete with high compressive strength. The new and alternative method is were used to strengthen the steel rolled columns at low cost by strengthening the weak axis to preventing or minimize buckling of the columns by using high strength concrete self-compacted without main reinforcements with steel section columns reinforced by lacing as single and double so that it work as full composite structural element and there are connections between concrete block and steel column. There are five specimens with the same height of 1450 mm that was classified as the control specimen and the others with different parameters such as lacing configurations, presence of longitudinal dowels and presence of concrete subject to concentric load. All specimens except the control filled with self-compacted high strength concrete. The result showed that as increase in strength in presence of concrete as compared with the control specimen. Control specimen gave strength capacity compared with the others composite specimens; the increased are 50% composite column, 62.50% composite column with single lacing and 75.00% composite column with double lacing respectively. Specimen (CL1CDL2R) increased in strength capacity as compared with the control specimen 87.50% and 7.14% compared with specimen (CL1CDL) because of presence dowels along the specimen height that increase the stiffness of the composite column. Presence of single and double lacing reduced the buckling value because of reduced the effective columns height. Specimen (CC1L1) gave maximum buckling 32.00 mm compared with the others specimens such as CL1C), (CL1CSL), (CL1CDL) and (CL1CDL2R) respectively, there is significant difference in buckling that reduced by 17.19%, 28.13%, 45.31% and 55.63% respectively.

Keywords: Column Strengthens; Lacing; Self Compacted Concrete; High Strength Concrete; Composite Columns.

1. Introduction

Columns are structural members subjected to combinations of axial compression and bending moment, rather than pure axial loading so that this structural element is they are of critical of importance for the performance and safety of structures. In spite of the importance of columns in the buildings, they don't constitute more than 2% of the total weight of the building, so strengthening columns are more important and essential to ensure the safety of building and make

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