

Comparative Study on Structural Behaviour of Circular Hollow Steel Tubular, Concrete Filled Steel Tubular, and Reinforced Cement Concrete Stub Columns under Pure Axial Compression

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Abstract : This paper is aimed at studying the structural response of circular hollow steel tubular (HST), concrete filled steel tubular (CFST), and reinforced cement concrete (RCC) stub columns when subjected to only axial compressive forces and also examining their comparative nature using finite element (FE) models. These results are further compared with the respective experimental results. FE software package ABAQUS 6.14 has been used for further parametric studies where a total of 108 FE models were modelled. The diameters of the HST, CFST, and RCC stub columns are kept as 100, 140, 180, and 220, with length to diameter ratio fixed at 3 to avoid end effects and flexural failure. To keep the same percentage of steel (by volume), the thicknesses of steel tubes in HST and CFST columns were varied in response to the change in diameter of the main reinforcement bar in RCC columns. M25 grade of concrete was used throughout. The objective is to compare the structural behaviour of HST, CFST, and RCC stub columns on the basis of their axial compressive load carrying capacity and failure modes. The studies show that filling the circular HST columns with concrete increases the P_u of the CCFST columns by 2.97 times. It was also observed that the P_u (HST) is about 0.72 times P_u (RCC) on average, and the P_u (CFST) is about 2.08 times P_u (RCC) on average. After the analysis and comparison, it has been proved that CFST has much more load carrying capacity than HST and RCC and also provides the same strength at a very less sectional size.

Keywords : HST columns, stub columns, CFST columns, RCC columns, finite element modeling, ABAQUS

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