PERFORMANCE OF CONCRETE-FILLED DOUBLE-SKIN CIRCULAR STEEL TUBES IN COMPRESSION AND ITS APPLICATION IN BUILDINGS IN SRI LANKA

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In this research, an attempt has been made to check the feasibility of using concrete-filled circular double skin steel tubes in buildings in Sri Lanka in terms of performance. Concrete-filled steel tubes (CFST) are becoming a new trend in the construction industry. CFST is a component with good performance resulting from the confinement effect of steel with concrete and design versatility. Concrete filled double steel tube is a composite construction component that consists of two steel layers embedding a concrete layer in between and the inner hollow steel section acts as formwork and reinforcement for the concrete. CFDST has many advantages such as high strength, high bending stiffness, good seismic and fire performance. Columns are designed to resist the majority of axial force by concrete alone can be further economized by the use of thin-walled steel tubes. The study about the behaviour and construction of CFDST columns is a prime need. Moreover, this type of structural member has not been used much in Sri Lankan conditions and hence it is vital to investigate further these sorts of structural elements. This research presents a detailed investigation on how CFDST columns behave under axial compression by experimenting on three concentrically loaded columns with three varying diameters. In terms of the failure, global buckling can be seen when the slenderness ratio is higher and the column with the least slenderness ratio demonstrated global buckling along with local buckling which was localized to the top end of the specimen. The test results were verified by analysing the structural element using ABAQUS finite element software and further validated by using a design standard. Finally, this research discusses the feasibility of using CFDST columns in buildings in terms of seismic performance.

Keywords: concrete-filled double-skin circular steel tubes; axial compression; finite element analysis; seismic performance

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