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ANALYSIS OF AXIAL LOAD BEHAVIOUR OF NONPRISMATIC CIRCULAR AND RECTANGULAR CFST COLUMNS

Aleena Binth K H[1], Amritha E K[2]

[1]*M.Tech Student, Structural Engineering, Universal Engineering College, Thrissur, Kerala*
[2]*Associate Professor, Civil Department, Universal Engineering College, Thrissur, Kerala*

Abstract – *Concrete filled steel tube (CFST) columns was popular these days. This study was mainly used to examine presentation of non-prismatic CFST by dissimilar columns arrangement by T and L shaped columns by steel plate joining and also to examine the presentation of non-prismatic TCFST and LCFST with FRP coating. To examine performance of non-prismatic CFST column by different shapes. Result obtained that load -carrying capacity was improved a lot by introduction of steel plate stiffeners. Also the addition of FRP helps to increase the stiffness. The performance of non-prismatic CFST with non-prismatic end column elements here LCFST have ultimate load. By comparing different shapes CFST columns, here circular column have high deformation.*

Keywords: Special-shaped column, CFST column, bearing capacity, Stability Stiffener.

1. INTRODUCTION

1.1 General Background

The traditional rectangular column has column corners which protrude toward the inside of the rooms. The special shaped column denotes a structural column with L shaped, T shaped or cross shaped segments. Columns-limbs was as thick as wall. Special shaped column -structures have CFST gets advantage that has great bearing capacity and ductility of CFST structures. Compared to traditional CFST columns and special shaped column has smaller column limb dimension and has smooth connection with together infilled walls. Utilizes the indoor space more efficiently. Good architectural performance.

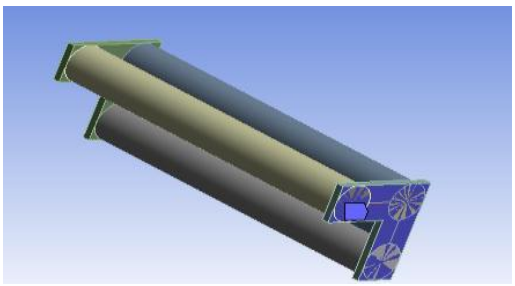

Fig -1: Model of circular CFST

2. OBJECTIVES

The main objectives are,

1. To study, performance of non-prismatic LCFST and TCFST with FRP.

2. To examine the performance of non-prismatic CFST column with different shapes of column elements

2.1 To examine the performance of non-prismatic TCFST and LCFST with FRP

Here the FRP are provided in the L and T shaped non-prismatic columns. Geometry of specimen was L- shaped and T- shaped non-prismatic columns was considers for the analysis. The columns steel tube thickness was took as demonstrated in the figures shown below.

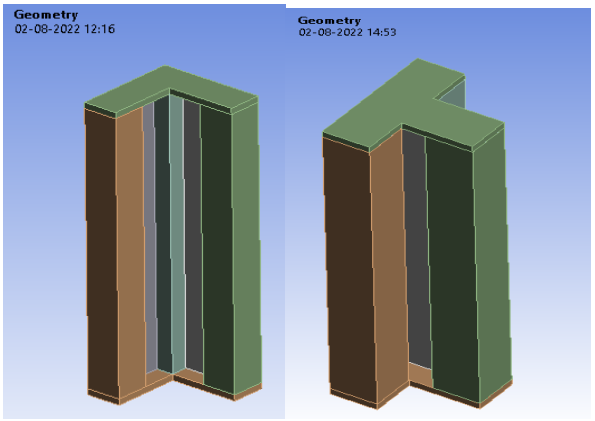

Fig -2: Model of CFST FRP and TCFST FRP

The geometry of the specimen is such that L shaped and T shaped non-prismatic columns were considered for the analysis. The columns steel tube thickness is took as demonstrated in the figures shown below. The thickness of steel tube is equal to 3mm with yield strength 306 MPa and stiffeners having thickness 3mm with yield strength 306 MPa and specimen length is taken as 900 mm. Here the end plate connections are provided in the L and T shaped non-prismatic columns.

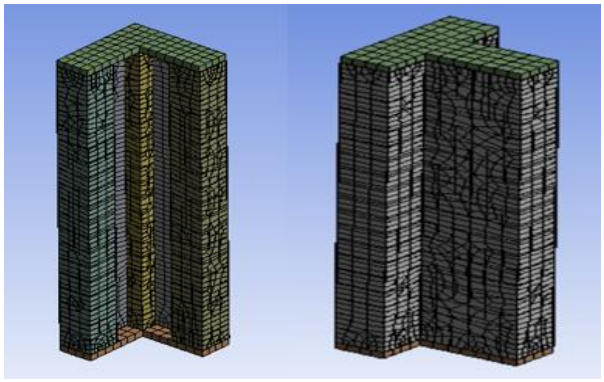

Fig -3 : Mesh developed in CFST FRP and TCFST FRP

To simulate real conditions column were modelled with one end fixed and another end free. Load was applied only in one direction. Behavior of specimen under axial load under axial load was studied using ANSYS.

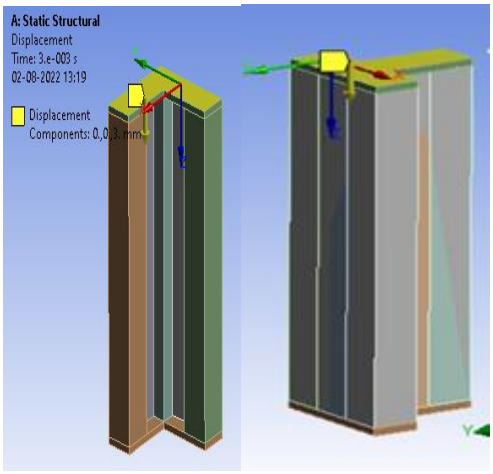

Fig -4 : Appilcation of boundary conditions

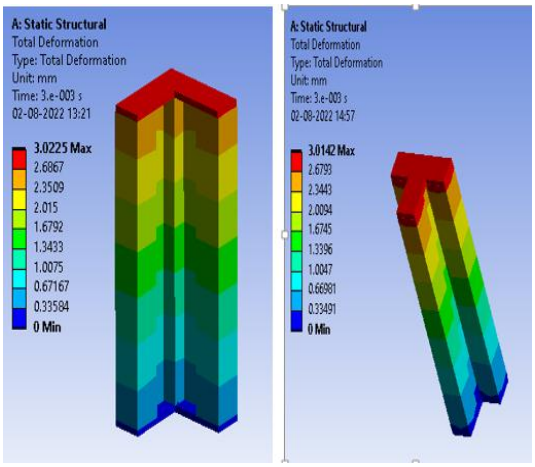

Fig -5 : Total deformation in LCFST and TCFST with FRP

Table-1: Result obtained from analysis of non-prismatic end column elements.

Column type	Deformation (mm)	Ultimate load(kN)	Eq. stress (MPa)
TCFST with FRP	3.0142	5222.3	3161.8
LCFST with FRP	3.0025	7314.1	3121.3

2.2 To examine the performance of non-prismatic CFST column with different shapes of column elements

This study using the software ANSYS helps us to find out which shape of the CFST column gives better performance as related with other sections. Here end plate connections are provided in the L shaped non-prismatic columns. The diameter of circular column was about 112.86mm. Also length and width of rectangular section is 120 and 83.35mm.

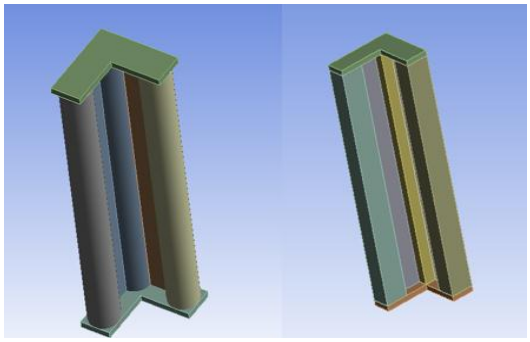

Fig -6 : CFST analysis using different shapes

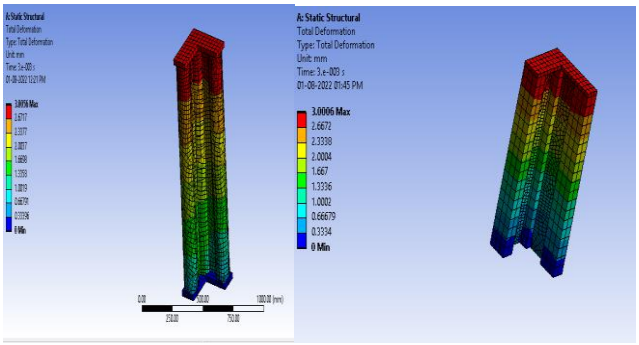

Fig-7: Total deformation in circular and rectangular element

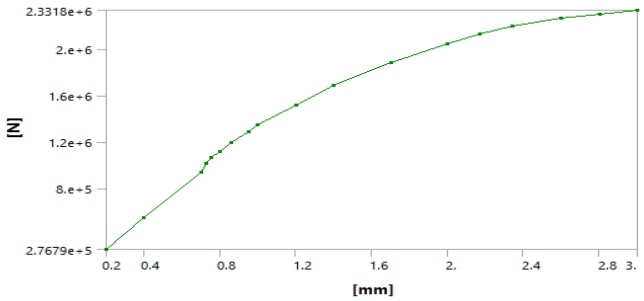

Chart-1 : Load vs displacement diagram of circular section

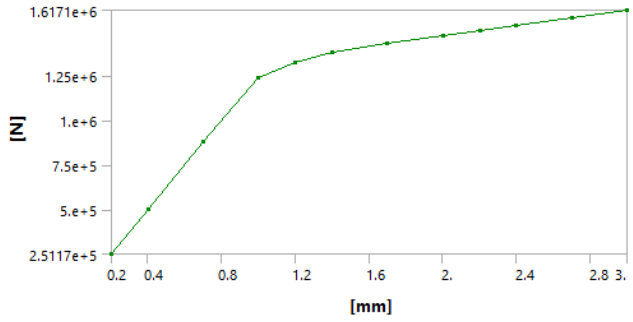

Chart-2 : Load vs displacement diagram of rectangular section

3. CONCLUSIONS

Load carrying capacity was improved a lot by introduction of steel plate stiffeners. Ductility and stiffness of the material was also improved, so that material gain it's ability to absorbs more energy before its fracture. The presentation of non-prismatic CFST with non-prismatic end column elements here LCFST with FRP have critical load. Through comparing different shapes in CFST columns, here the circular column have high distortion.

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