# Experimental Investigation on Manufactured Sand CFST Column

Dhiraj.D.Ahiwale[1*], Kamalkishor.M.Sharma[2]
[1]*Assistant Professor, Department of Civil Engineering, VPKBIET, Baramati, Pune.*
[2]*P.G.Student, Department of Civil Engineering, VPKBIET, Baramati, Pune.*
*e-mail: sharmakamal8586@gmail.com*

**Introduction:**

Steel members have the advantages of high ductility and tensile strength, while concrete members have the advantages of high compressive strength and fire resistance. Composite members made from steel and concrete, have the beneficial qualities of both materials. Concrete filled steel tube column is a recent concept. Concrete filled tube columns provide higher stiffness due to confined effect as compare to hollow steel tube column. The concrete filled aluminum CHS stub column test strength were compared with the design strengths predicted using the American specifications and Australian/New Zealand standards for aluminium and concrete structures (Feng Zhou et al. 2009). Very few research works are conducted on concrete filled steel tube short columns. It is observed that this type column has more load carrying capacity.

In this experimentation is carried out on three hollow specimens and twelve specimens are concrete filled steel tube with variable ratio of diameter to wall thickness. All the composite column specimens tests are carried out under Universal Testing Machine. The axial behavior of hollow tube and concrete filled steel tube columns have been observed in terms of load carrying capacity, strains and buckling effect, and also describes the how much contribution of concrete filled in steel tube as compare to hollow section. As the experimental work it is observed that the ultimate load carrying capacity of concrete filled steel tube columns in axial compression are more than ultimate load calculate by Eurocode 4 as well as AISC 360-10.

## Parametric study

In this experimentation two type of core concrete, including natural river sand (RS) concrete, manufactured sand (MS) concrete, were used together with steel tubes in these specimens for the sake of comparison. Secondly, the structural performances of the tested CFST specimens using these two types of core concrete were compared and analyzed based on the testing data and observation. The structural behavior of stub columns are focused in the current study. The influence of important parameters are studied, including the cross-sectional shape, the steel tubular thickness, and the material properties of steel and concrete. The comparisons of variation of load verses lateral deflection are as shown in Figure 1 respectively.

Table 1. Information of the concrete filled steel tube columns.

| Sr.No. | Section profile | Specimen labeling | Diameter (mm) | Thickness (mm) | Fcu (Mpa) | Type of fine aggregate |
|---|---|---|---|---|---|---|
| 1 | | C-3-RS-1 | 88.7 | 3.2 | 76.9 | River sand (RS) |
| 2 | | C-4-RS-1 | 88.7 | 4.0 | | |
| 3 | Circular | C-5-RS-1 | 88.7 | 4.8 | | |
| 4 | | C-3-MS-1 | 88.7 | 3.2 | 78.4 | Manufactured sand (MS) |
| 5 | | C-4-MS-1 | 88.7 | 4.0 | | |
| 6 | | C-5-MS-1 | 88.7 | 4.8 | | |

*Corresponding author E-Mail: sharmakamal8586@gmail.com

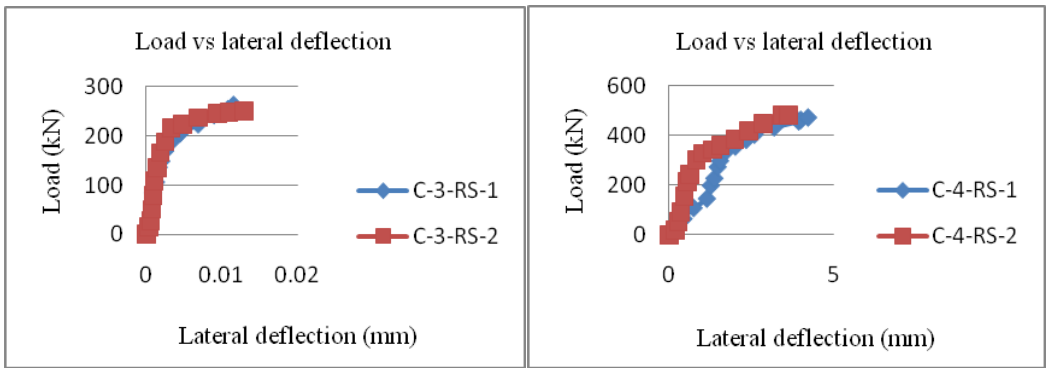


Fig.1 Load deflection curve for river sand CFST column.

**Concluding Remarks**

In the present study, a total 15 circular column specimens were experimentally investigated with their main structural parameters varied. The following conclusion can be drawn based on the test results and analysis**.**

EC4 gives 30% to 15% lower strength than experimental strengths. ACI/AISC gives 35% to 10% lower strength than experimental strengths. Generally, manufactured sand CFST specimens showed excellent ductility during the axial compression tests. The ultimate strength of manufacture sand is always more than river sand concrete. The failure mode of such type of composite columns were outward buckling at mid height.

**References**

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