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Compressive Strength Properties of Cylindrical Stocky Hollow Column

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Abstract—*Hollow Circular segment (CHS) segments have been progressively utilized as a part of construction, due to its stylish appearance, long life expectancy and great flexibility. This paper displays an exact examination on flexural carry on of empty round about solid pipes under load. A sum of 12 examples considering the accompanying essential framework parameters were tested in two height to diameter proportions (3, and 4), two diameters of PVC pipes (110mm and 40 mm) and three W/C proportions (0.45, 0.50, 0.55). We utilized PVC (polyvinyl chloride) pipes as the limit of round about segment and take the quality of segment.*

Keywords*: Stocky Hollow section, PVC pipes, Compression test.*

1. INTRODUCTION

Their incredible auxiliary execution makes them especially reasonable for applications in elevated structures. Broad research has been directed on the conduct of cement filled hollow segments at surrounding temperature. Hollow section on the other path brought about the critical increment of the self-weight, which may enormously increase the seismic activity on the composite structures. Hollow areas are regularly utilized for tall scaffold sections to lessen their mass, minimize seismic inertia force, and decrease establishment force. Not with standing, the seismic execution of hollow segments is as yet not completely comprehended despite the fact that a couple of trial works were led already. There are a few intriguing zones which must be examined for the hollow segments, i.e., ductility limit, shear quality.

The hollow sections likewise empower to minimize establishment measurements and along these lines spare the development cost freely. Consequently, these preferences have advanced the utilization of empty segments rather than comparative strong individuals. Then again, the seismic conduct of the hollow segments has been unsure because of an absence of comprehension. The impact of the empty segment ought to be sufficiently surveyed in the seismic outline, on the grounds that the auxiliary reaction of the empty segment under seismic stacking might be essentially not the same as that of strong segment because of presence of a void area. In any case, there are a few obscure zones which must be comprehended, that is, evaluation of ductility limits and shear quality.

2. LITERATURE REVIEW

Hollow segments have more second moment of Area because of more remote circulation of material from axis of cross area. Besides, hollow areas have lesser zone as well. These two elements result in higher radius of gyration [1].

$$K = (I / A) \wedge (1/2)$$

This Paper introduces a survey of studies performed on concrete filled to PVC pipes individually. The paper is mainly focus on flexural members at static loading condition, cyclic loading condition and analytical consideration. Accentuation is given on extreme quality, flexibility, ductility limit, solidness corruption and harms records of the composite individuals.

A study on directed a test on fifty-two cement filled steel tubes to watch the stiffness and ductility limits. Twenty-six sections nos. 7 were produced using square tubes and other twenty six were circular about containers of various measurements fluctuating from 4.50 in. to 6 inches For the sections in flighty load tests, the total of hub powers was kept up practically consistent while the minutes were expanded until failure [2].

A trial experimental led on concrete-filled circular-sections. In this study total number of six examples of cement filled composite segments were tried under cyclic compressive loads and four examples of steel segments were tried to failure with the end goal of comparison in the results [3].

A study [4] investigated on hollow steel Segment loaded with formed and lightweight total cement. This investigation covers eight quantities of square and round segments and eight quantities of square just bolstered pillars.

3. MATERIALS AND PROPERTIES

3.1 Polyvinyl Chloride (PVC)

PVC is solid and lightweight plastic which is mostly used as constituent for development. It is more adaptable by the expansion of plasticizers. If no plasticizers are used it is commonly known as UPVC (plasticizers polyvinyl chloride) or inflexible PVC. [5]

TABLE 1 Properties of PVC

Name of Property	Value
Relative Density	1.46
Water Absorption	0.0015
Hardness	85-90
Ultimate Tensile Strength	50 MPa
Poisson's Ratio	0.3

3.2 Aggregate

TABLE 2 Properties of Course Aggregate

Parameters	Properties	
	Sieve Size	% Passing
Partial Size Distribution	10 mm	50%
	20 mm	50%
Bulk Density	10 mm	1600 kg/m^3
	20 mm	1560 kg/m^3
Specific Gravity	2.35	
Water Absorption	3-4%	

4. EXPERIMENTAL DETAILS

The column was tested for compression load the following arrangement using Compressive testing machine (CTM). Different water content ratios used i.e. 0.45, 0.50, 0.55 with the grade of M20 concrete. The columns were fixed at CTM machine and applied the axial load at cross section area.

A pre-load of about 5 KN was applied to hold the specimen.

Table 3 Specimen Details

Length	Water/Cement Ratio	No. of Specimen	Total Specimen
300 mm	0.45	3×2	6
	0.50	3×2	6
	0.55	3×2	6
400 mm	0.45	3×2	6
	0.50	3×2	6
	0.55	3×2	6
Total			36

Preparation of specimen for the calculation of compression strength-

A mix of concrete M20 was tested in compression for this test. For first sample take cement is 2.82 Kg, Sand is 5.75 Kg and aggregate is 11.22 Kg for first hollow circular column sample. Different water cement ratios used i.e. 0.45, 0.50 and 0.55 with the grade of M20 concrete. The aggregate size varies 10mm to 20mm passed was taken in specimen. Concrete strength is depending on the water content ratio, quality of material etc. [6]

For sample making cube size 15cm x 15cm x 15cm and it depends on the aggregate size. The samples are placed on mould with proper tempered and also put on vibrator machine for removing the voids. After the moulding removed the mould and put the specimen for curing for 7days and 24 days testing. Two edge testing were performed 7 and 24. Load should be applied gradually till the specimen fails. For calculating the compressive strength load is divided to the area of cross segment.

5. RESULTS AND ANALYSIS

Table 4 shows the difference of compressive strength with different water/ cement ratio in cubes after 7 days proper curing.

Table 4 Result of Compressive Strength of Cubes for 7 Days Curing

Water/Cement Ratio	Compressive Strength (N/mm^2)
0.45	10
0.50	8.888
0.55	6.666

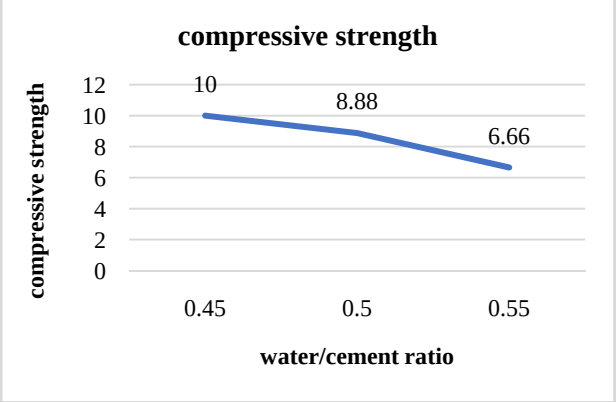

Fig. 1: Result for cubes

Figure 1 shows the difference of compressive strength with different water/cement ratio in cubes after 24 days curing.

Table 5 Compressive Strength of Cubes after 24 Days Curing

Water/Cement Ratio	Compressive Strength (N/mm^2)
0.45	19.56
0.50	17.66
0.55	15.88

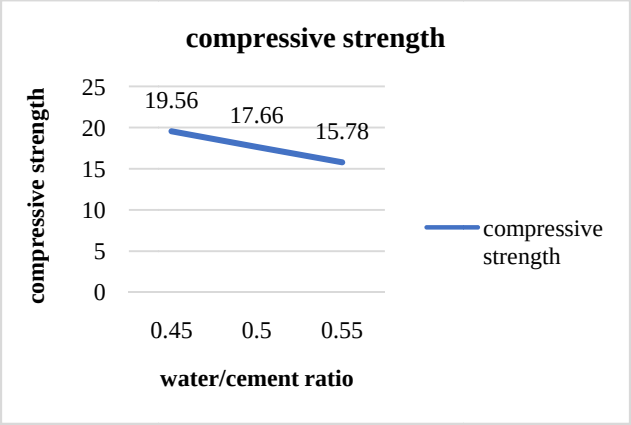

Fig. 2 Compressive Strength at 24 days

Figure 2 shows the difference of compressive strength with different-different water/ cement ratio in hollow circular column sample after 7 days curing.

Table 6 Compressive Strength of Pipes after 7 Days Curing

Water/Cement Ratio	Length of specimen	Compressive Strength (N/mm^2)
0.45	300mm	5.15
	400mm	4.54
0.50	300mm	4.24
	400mm	4.129
0.55	300mm	3.897
	400mm	3.78

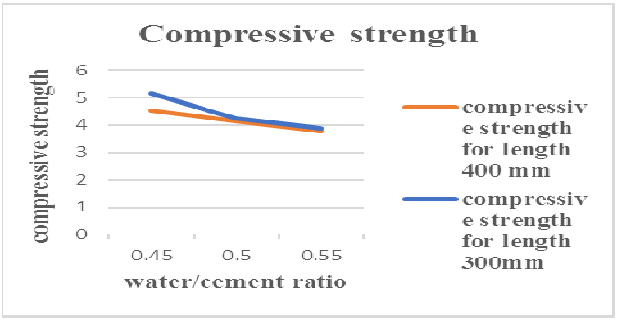

Fig. 3: Compressive Strength of Column 7 days

Figure 3 shows the difference of compressive strength with different-different water/cement ratio in hollow circular column sample after 24 days curing.

Table 7: Compressive Strength of Column after 24 Days Curing

Water/Cement Ratio	Length of specimen	Compressive Strength (N/mm^2)
0.45	300mm	18.6
	400mm	15.45
0.50	300mm	16.24
	400mm	14.56
0.55	300mm	12.97
	400mm	11.21

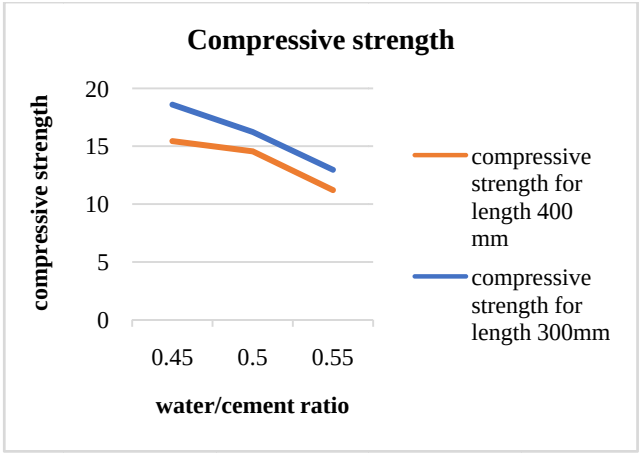

Fig. 4 Compressive Strength of Column at 24 days

6. CONCLUSION

32 hollow circular columns subjected to compression testing machine were tested, which were divided into two groups: Type 'A' specimens (16 specimens) where the length of specimen is 300 mm; and Type B specimens (16 specimens) where the length of specimen is 400mm.

The results obtained by hollow circular column used in bridges for high loading resist compare to solid column significant cost for making hollow circular column.

It helps to control the ductility of hollow segment.

The Compressive strength and ductility strength were found high in hollow circular concrete column.

The tested hollow circular columns find that is good ductile behaviour during the compression loading.

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