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Improve Design for Steel Reinforcement of the Traditional Design Used by Decreasing the Number of Steel Ties

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ABSTRACT

Mains bars or vertical steel rods are always provided in order to assist in carrying the direct loads. And there is set limit to provide that longitudinal steel in different shapes of column, whether it is taken into consideration of the type of load acting or not. And this is done to avoid tensile stresses formed due to some eccentricity of the loads acting longitudinal direction. Different sets of benchmarks that are listed in codes to provide the amount of maximum reinforcement, because reinforcement more than the upper limit may generate difficulties in pouring of concrete and compaction of the concrete. Vertical reinforcing bars are tied horizontally by ties or stirrups or welded joints at certain intervals so that the bars do not shatter or cause bulging.

KEYWORDS: *steel rods, eccentricity, tensile stresses, reinforcement, longitudinal*

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INTRODUCTION

Columns with longitudinal reinforcement and lateral ties: - when no lateral ties are used with main bars and when load is applied on such a column, the concrete bulges out laterally. The bars themselves act as along slender columns and therefore tend to buckle away from the column's axis. Due to this, tension is caused in the outside shell of the concrete which opens out. The failure usually takes place suddenly. In order to check this tendency, the longitudinal rebars are tied transversely, at a suitable interval, with the help of ties. These ties check the bars from buckling and also restrain the concrete from bulging action.

Columns with longitudinal steel and spirals: - each of the tie has to be spliced by lapping or By bending its ends around the main bar, which is quite troublesome. In order to overcome thisdifficulty, the longitudinal bars are tied continuously together with the help of spirals. The spiralsso provided serve an additional purpose of laterally supporting the concrete inside and thus hasconfining effect on it.

Composite columns: - Reinforced with a centrally placed joist and four or more longitudinal bars. Other steel sections may also be used. However, composite columns are used only forheavy loads.

Braced and unbraced Columns: - In the greater part of the cases the segments are exposed to level burdens like breeze, seismic tremor and so forth. In the event that sidelong backings are given toward the finish of the segments, the parallel burdens are borne totally by the horizontal backings. Such sections are known as supported segments, different segments, where the sidelong loads mustbe opposed by them, notwithstanding hub loads and end minutes are named as unbraced segments.

OBJECTIVES

1. To find the strength of a circular column using traditional design for steel reinforcement.
2. To improve design for steel reinforcement of the traditional design used by: -
   A. Decreasing the number of steel ties.

LITERATURE SURVEY

Francesco Micelli(2018) The use of external constrainment of strong fragments by using Fiber Reinforced Polymers (FRPs) composites has been extensively pondered and seen as a convincing advancement. The most bit of the preliminary examines that were coordinated are related to portions that were kept without a pre-stacking condition, which is the most notable situation that is met in the field. In order to extend the data, this assessment speaks to and discusses the preliminary outcomes that were gotten by testing strong chambers that were limited with Carbon FRP (CFRP) unidirectional sheets at five unmistakable pre-stacking levels. The strong chambers were prepared and poured all the while to restrict differentiate to start with properties of the strong focus. Five models were set up for each pre-load level. Thusly, 25 strong models having a separation across of 100 mm broadness and height of 200 mm have been attempted. In detail, 5 coupons were unconfined ("U"); 5 were CFRPconfined with invalid pre-load level ("P0"); and three courses of action of 5 models, named "P20", "P50" and "P80", were FRP-continued during the utilization of a pre-load level comparable to 20%, half and 80% of a conclusive unconfined cement compressive quality, independently. The test outcomes revealed the differing mechanical response depending of the pre-hurt state of the chambers identifying with different pre-load levels. Until a pre-load level of 20% the effects can be thought of for all intents and purposes insignificant, while for higher pre-load levels (half and 80%) it is critical to consider the loss of mechanical properties respect to an ideal un-stacked plan. The paper will discuss all the perspectives identified with the test outcomes, moreover showing a demonstrative technique to consider the effects of the pre-stacking conditions.

Qusay Al-Kaseasbeh , Iraj H. P. Mamaghani. (2018) Due to their excellent Steel tubular columns with conventional uniform circular sections and newly proposed graded-thickness circular sections then, the GC column with a size and volume of material equivalent to the C column is introduced, Thin-walled steel tubular columns with circular cross sections are widely used as cantilever piers in bridges. these have proved to have significant improvements in overallperformance of column as compared with its counterpart C column.

METHODOLOGY

MATERIAL & SPECIFICATIONS

Material used for experiments are listed below with brief specifications: -

Mould: - for the experiment we used a circular mould that was having a height of 900mm and diameter 150 mm. Pictorial representations and front view of Auto-cad are shown below in figure 3.1 and 3.2 respectively.

Figure 3.2 Mould

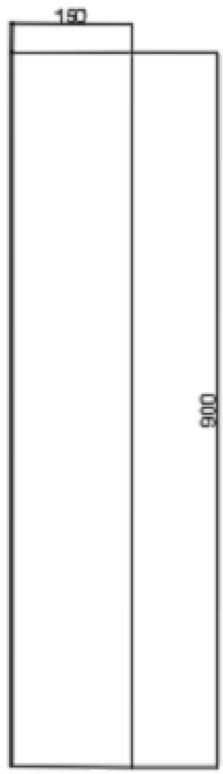

Figure 1. Font view of mould using AutoCAD

Cement: - For experimental work we used OPC 43 Grade. Before using it for experimental work we did some basic tests as mentioned below : -

IST & FST: - consistency test in a cement paste is defined as the minimum amount of water that is required to form the cement paste. And practically if we talk about this test then if it vicat's apparatus needle reaches a depth of 33-35mm from the upper end, then it defines the consistency of the cement at that amount of water. This is also known as Ordinary consistency. Apparatus is shown bellow in Figure 3.4. Through all this experiment we found out the IST and FST of cement. The IST is the time elapsed between adding water to the cement to the time cement paste starts loosing plasticity. It came out be 40 min as per the experiment conducted in lab (As per IS-4031 it shouldnot. And the FST of the cement. Final setting period is the period from adding water to the cement to the time when cement paste completely loses its plasticity. It came out to be 310min (As per Indian standards it should not exceed 600min.

Figure 2. Apparatus for IST and FST

Soundness Test: - According to IS-4031, soundness value should not exceed 10mm else the cement is termed as unsound. Sound cement is one retains its volume expansion up to some extent. For this experiment we used Le-Chateiler apparatus. The new Expansion value was 5mm.

Specific Gravity: - For specific gravity of cement we used Le-Chateiler's flask (As shown in Figure 3.4). By using the formula given below we found the specific gravity with respect to known kerosene oil.

Specific gravity of cement=

$$\frac{W^{2}-W^{1}}{(W2-W1)-(W3-W2)*0.79}$$

Where, W1= weight of empty bottle
W2= weight of bottle +cement
W3= weight of bottle + cement + kerosene
0.79 is the S.G. of kerosene oil

Figure 3. Density bottle.

Fineness Test: - Fineness test of cement was carried out by sieving in through 90 micron sieve. Lumps due to moisture were crushed using trowel (As shown in Figure 3.5). Percentage retained on the sieve was approximately 4%.

Figure 3. fineness test of cement

CONCLUSION

1. The load carrying capacity or we can say compressive strength of the sample that was wrapped with the welded wire mesh on the outer periphery of the major reinforcement of the column has 7% more compressive strength than that of the other two samples named as 4RS and 5RS.
2. The ductility of the column confined with welded wire mesh is more than conventionally or traditionally reinforced samples.
3. The axial load carrying capacity load carrying capacity was not having much difference.

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