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ANALYSIS AND DESIGN FOR CONFINED FERROCRETE CROSS BEAM AND ITS BENDING BEHAVIOUR

Mustafa Bohra, Prof. Priyanka Petkar

Department of Civil Engineering, TGPCET College of Engineering Nagpur, Maharashtra, India
Address

1Mrmustafabohra55@gmail.com, 2Priyanka.civil@tgpcet.com

***Abstract*—— Ferro cement cross beam obtain its flexural strength through interaction of the wire mesh, acting in tension and concrete in compression with a moment capacity depending on depth of flange cross section and it also obtain its flexural rigidity through structural cross section. The flexural rigidity can be increased by chooing proper cross section because cross section of ferro cement beam is very small. Very limited researches are available of the structural cross section like I, C, T and L. Hence ferro cement cross beams of size 150mm width, 150mm breadth and 1000mm long are used to study ferro cement cross beam behavior by an experimental and analytical method for diferrent diameter of steel bars at constant loading which is further validated by FEM analysis on Ansys software.**

***Keywords*—— flexural strength, flexural rigidity, compound structural section, experimental and analytical analysis, FEM analysis, ANSYS.**

I. INTRODUCTION

Ferro cement is made up of Ferro (Iron) and cement. Ferro cement is thin wall reinforce concrete construction in which wire meshes of small diameters are used uniformly throughout the cross section. In ferro cement construction portland cement mortar is used instead of concrete. Ferro cement structures are thin-walled, light in weight, durable and have more degree of impermeability. It combines the properties of thin sections and the high strength of steel. Ferro cement has wide range of applications almost all fields of civil engineering like water based structure, residential building, domes and dams.

Ferro cement has good strength and good resistance to impact. It provides better resistance to fire, earthquake and corrosion.

II. LITERATURE REVIEW

1. P. Raghunathapandian, B. Palani, D. Elango (2020) Flexural Strengthening of RC Tee Beams using Ferrocement: Twenty three samples of reinforced concrete T- Beams were tested for flexural strength. 3 sets of beams were impaired up to 60%, 70%, and 80% of the maximum load i.e ultimate load level of control beams respectively. Beams impaired up to 60% are labelled as B1 and S1. Beams impaired up 70% as B2 and S2 and beams impaired up 80% as B3 and S3. B1, B2 and B3 (three beams in each set) of beams were strengthened along with soffit only using ferro cement. S1, S2 and S3 (three beams in each set) of beams were enhanced along with the side faces of the web. After proper and required curing, all the beams were tested for flexural strength. The obtained results were compared with corresponding control beams. Based on result it is concluded that the flexural strength capacities of reinforced concrete T-Beams enhanced with ferro cement are remarkably increased.

2. N.Gokulnath , S.Rajesh Kumar (2019) Strengthening Of Reinforced Concrete Beams Using Basalt Reinforcing Mesh for Flexure: In this paper it is revealed that ferro cement plates are used to enhance pre damaged reinforced concrete beams. Eight beams of 100mm x 150mm x 1600mm were casted and tested for flexural strength. Two beams were considered as conventional beam and left over six beams were weighted up to 75% of ultimate load. After restored was made to beams, flexural test was carried out.

3. Mohamed. O. Elsibaey, Zakaria. H. Awadallah, Omar. A. Farghal, Mohamed.Zakaria (2021) The study of ferro cement square columns enhanced by using ferro cement jacket: This study shows an experimental analysis to justify the behavior of Ferro cement square columns enhanced by using Ferro cement jacket. Ten samples with cross-section of 200mm x 200mm x were casted and tested for axial loading until its collapse. The obtained results were showed that the column capacity is increased by using ferro cement jacket and vertical & lateral displacement is reduced.

4. Ashish Sudhakar Burakale , Prof.P.M.Attarde(2020) Ferro cement panels shielded with different number of layers of wire mesh: This study shows that by using number of wire mesh layer, the ferro cement panels is shielded. The fundamental goal of this study is to compare ferro cement construction with conventional technique for affordable costing of house.The fundamental aim is to identify the cost saving in construction by using ferro cement construction technology.

5. Adheena Thomas, Afia S Hameed(2020) The study of Flexure and Torsion on Reinforced Concrete Beams Fabricated with jacketing of Ferro cement - Experimental Study: Six beams of 2 m length and 0.23×0.30 m cross-section is taken for the study. The specimens were first loaded for the initial failure and are retrofitted. Ferro cement, a cost - effective material over FRP, is used for studying the effectiveness of jacketing. Two types of Ferro cement wire meshes are taken for the study - chicken mesh and welded mesh. Configurations like U wrapping, wrapping along with compression side only and double side wrapping with both meshes are done. Load-deflection characteristics, torque-twist response and load-strain characteristics have been compared with those specimens retrofitted with Ferro cement jacketing. It is revealed that unwrapped welded mesh shows superior properties in every respect compared to other types of retrofitting configuration and types.

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I. METHODOLOGY

EXPERIMENTAL ANALYSIS:

Material	Description	Specific Gravity	Water Absorbtion
Cement [Kg]	**OPC 53 Grade IS-269**	**3.15**	**--**
FineAggregate [Kg]	**Crushed Sand**	**2.74**	**3.09**
CoarseAggregate [Kg]	**20 mmAngular**	**2.92**	**1.08**

WELDED MESH: Dia =1 mm, Opening = 30 mm x 30 mm, Fy =250 Mpa.
BAR: Dia =8 mm, 10mm, 12mm, Fy = 500 Mpa

Material	Description	Per m^3	Per 50 Kg Cement bag
Cement [Kg]	**OPC 53 Grade IS-269**	**370**	**50**
Fine Aggregate [Kg]	**Crushed Sand**	**834**	**113**
Coarse Aggregate [Kg]	**20 mm Angular**	**1132**	**153**
Water [Lit]	**Potable Water**	**185**	**25**

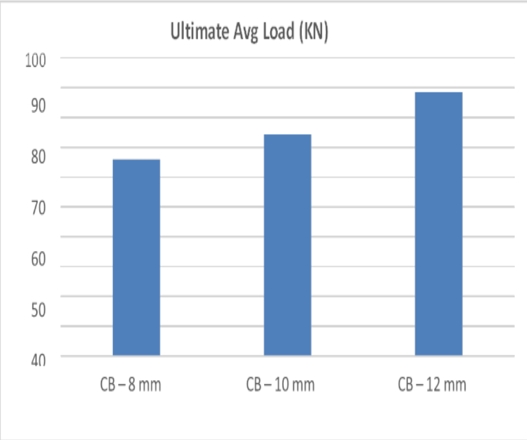
TEST PROCEDURE:
1. THE STEEL & STEEL CUTTING:
2. PREPARATION OF FORMWORK:
3. MIXING OF CONCRETE & MORTAR:
4. POURING OF CONCRETE:
5. SETTING AND CURING OF SPECIMENS:

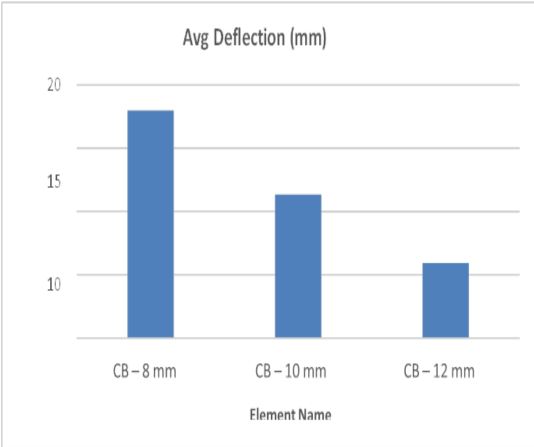
TEST SETUP:

Sr. No.	Sample Type	Element Name	Ultimate Load (KN)	Deflection (mm)	Average Ultimate Load (KN)	Average Deflection (mm)
1.	Set I	CB1 – 8 mm	63.43	22.3	65.92	17.98
2.		CB2 – 8 mm	65.01	12.9		
3.		CB3 – 8 mm	69.32	18.76		
4.	Set II	CB1 – 10 mm	75.3	15.99	74.33	11.32
5.		CB2 – 10 mm	68.73	10.42		
6.		CB3 – 10 mm	78.96	7.56		
7.	Set III	CB1 – 12 mm	87.87	5.19	88.44	5.93
8.		CB2 – 12 mm	90.45	6.54		
9.		CB3 – 12 mm	87	6.06		

EXPERIMENTAL RESULTS:

EXPERIMENTAL AVERAGE RESULTS GRAPH:

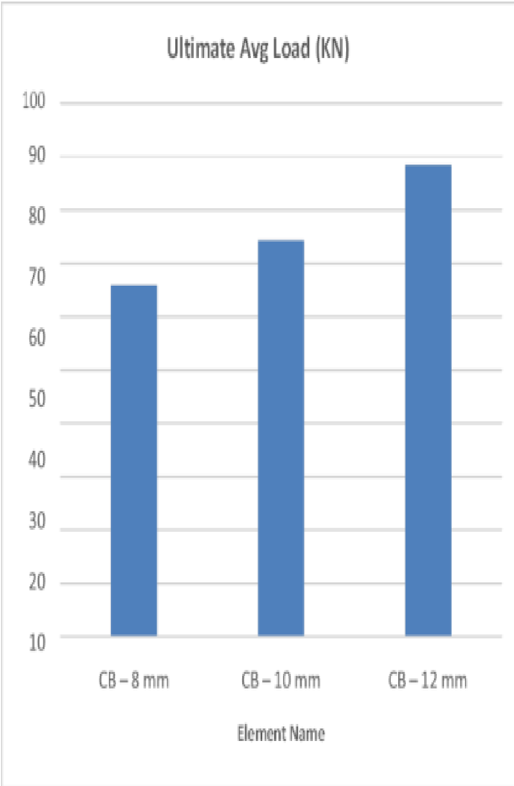


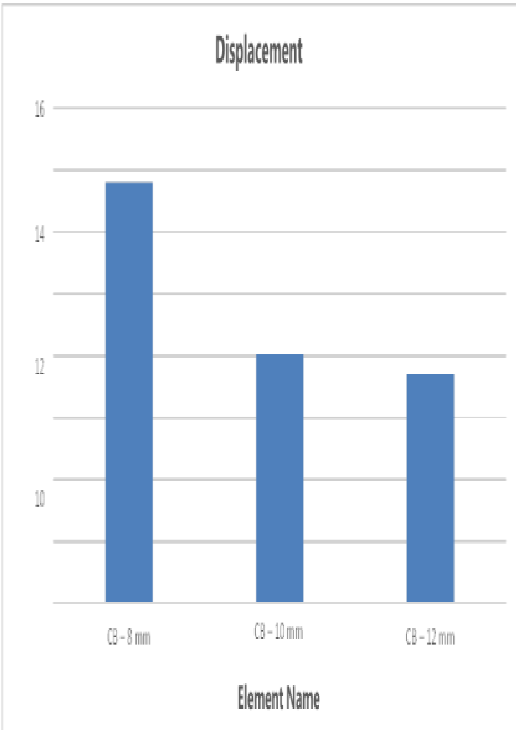


ANALYTICAL RESULTS:

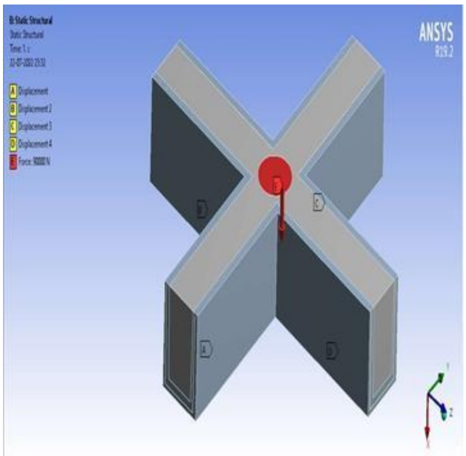
Sr. No.	Sample Type	Element Name	Ultimate Load (KN)	Deflection (mm)
1.	Set I	CB – 8 mm	70	13.608
2.	Set II	CB – 10 mm	78	8.06
3.	Set III	CB – 12 mm	90	7.4

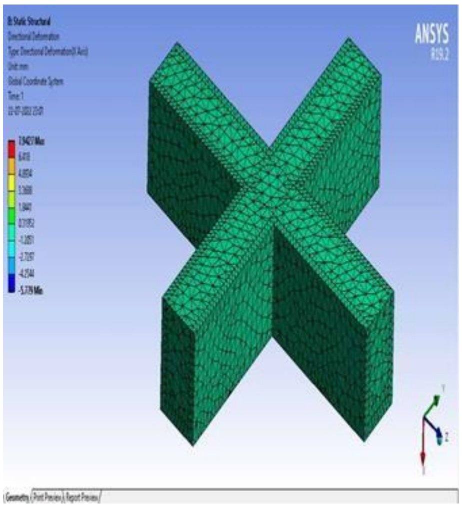
EXPERIMENTAL AVERAGE RESULTS GRAPH:



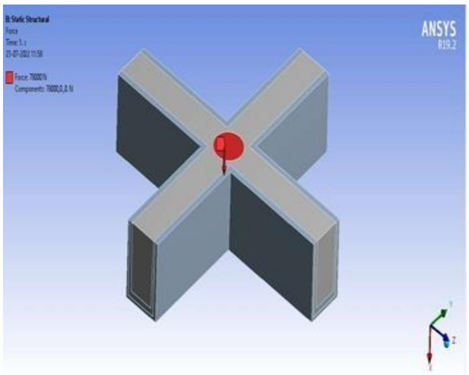


12 MM SAMPLE MODEL ANALYTICAL RESULT FIGURE





10 MM SAMPLE MODEL ANALYTICAL RESULT FIGURE



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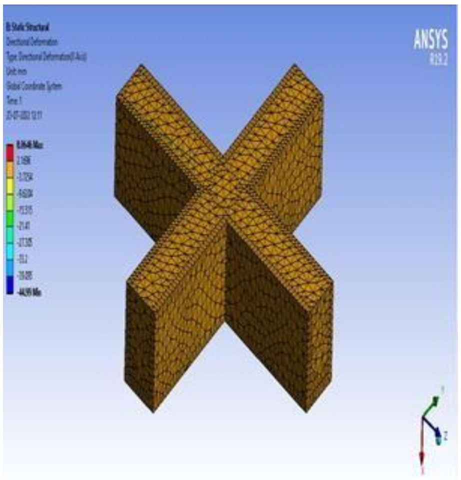
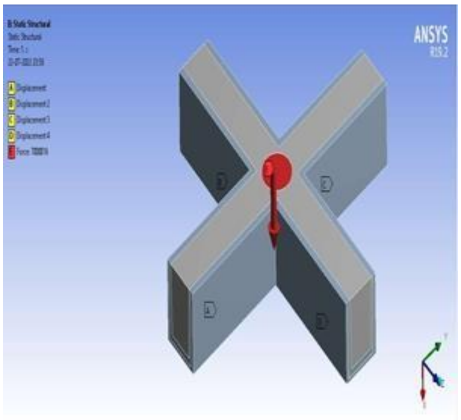
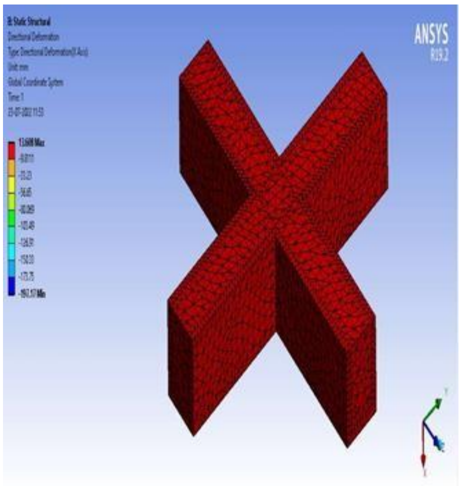
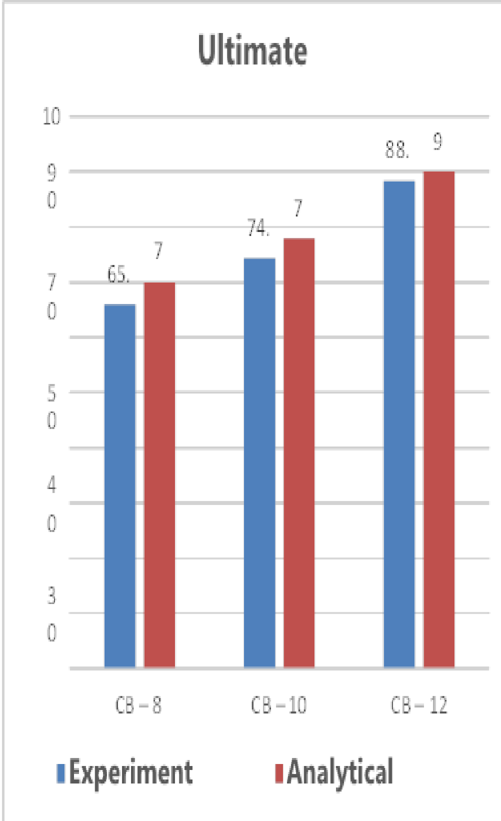


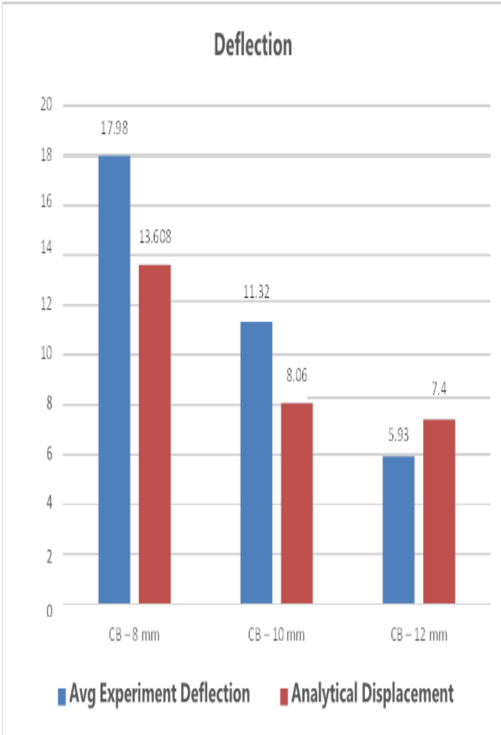
8 MM SAMPLE MODEL ANALYTICAL RESULT FIGURE





COMPARATIVE ANALYSIS OF EXPERIMENTAL AND ANALYTICAL RESULTS:





II. CONCLUSIONS

1. The diameter of the bar increases the ultimate load carrying capacity of beam.
2. The diameter of the bar decreases the deflection of beam.

III.REFERENCES

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