COMPARATIVE ANALYSIS OF LIGHTWEIGHT FERROCEMENT PANELS WITH DIFFERENT INFILLS

L. Ranjith Kumar[1], Mohamed Yusoof Rifayee M[2], Hemanth. S[3], Muhammadh Ashiq Arafath. A[4], Jeeva. N[5]
[1-5]*Department of Civil Engineering, Panimalar Engineering College, Chennai*

ABSTRACT

The main objective of this investigation is to study the structural behavior of Ferrocement panels when subjected to axial compressive and flexural load. Ferrocement wall panels with different infill materials of size .6m x .6m x 0.05m were cast and tested under axial and flexural load. Experimental studies and research must determine the results in terms of compressive strength, flexural strength, weight and strength to weight ratio. These results were compared as different infill materials such as rubber board, foam board and sand are being used. The response of the Ferrocement wall panels subjected to axial compressive and flexural loading and from above results whichever infills are satisfactory and optimum, then it can be used as a wall panel in construction sector. It is hoped the overview on this subject matter could be used as guidance for future research on developing a lightweight sandwich panel system in low to medium rise building construction.

Keywords - Ferrocement, Compressive strength, Flexural strength, Weight, Strength to weight ratio

I INTRODUCTION

Ferrocement panels are double walled ferro cement with infills in between them. The idea of industrialization of the construction technology has emerged as well accepted and preferred option in the field of building construction now days, to reduce in-situ construction up to maximum extent. This could be achieved by employing several strategies including the application of newly developed cement based composites for structural applications. Ferro cement is such a material that is slim and slender but at the same time strong and elegant which provides a potential solution to roofing problems. In countries in continuous growth and low resources economic, where the demand of house of low cost is very high, the ferrocement has been used like an effective alternative that on the other hand, it offers a constructive system with base in not described intensive manpower Prefabrication saves engineering time on the construction site in civil engineering projects. Prefabricated elements and systems offer bridge designers and contractors significant advantages in terms of construction time, safety, environmental impact, constructability, and cost. The use of prefabricated Ferro cement components for construction could possibly reduce the cost of construction and time for completion.

II MATERAILS

6 MM STEEL RODS

These 6mm steel rods provide the skeletal structure for the chicken mess. These are bent to box shaped to which the chicken mesh is tied. Infill's are kept inside this box.

CHICKEN MESH

These are web like structures made of iron. Chicken mesh is attached to the 6mm rod and provides the base for the cement mortar.

CEMENT

Ordinary Portland Cement (OPC) of grade 53 is used. Cement is the binder material for the mortar or concrete. Cement is mixed with aggregates and the mortar is applied on the mesh.

AGGREGATESRiver sand or M-sand is used as aggregates for the mortar. These are a filler material that fill the gap and also increases the strength.

RUBBER BOARD

Rubber boards are one of the infills in the ferrocement panels. They are ductile and also gives strength to the panels.

FOAM BOARD

Foam boards are kept inside the panels are an infill. These foam boards are better insulators of heat and sound.

SANDFILLS

Sand is used as one of the infills of the panels. They are excellent fillers

III SPECIMEN PREPARATION

1. 6mm rods are taken and bent to form square shape of dimension 60cmx60cmx5cm and tied with the steel wire.
2. The second box shape steel are of made as mentioned above with the same dimension.
3. Both the steel squares are joined by another steel of thickness 6mm joining the squares on either side as shown in figure below. This makes the skeleton of our specimen.
4. The chicken mesh is tied carefully to this skeletal structure. Care should be taken that the mesh doesn't get out of the steel bars for a perfect specimen shape.
5. Cement mortar of ratio 1:3 is made with 1 part of cement and 3 parts of fine aggregate.
6. Water cement ratio of 0.4 is taken and the cement is mixed thoroughly without any cluster of sand or cement to get a homogeneous mixture.
7. Care should be taken that the cement mortar should be sticky to stick on the layer of chicken mesh.
8. The cement mortar is applied at the bottom side of the mesh and left undisturbed for 12 hours.
9. The fills are kept inside and complete casting is done.
10. Then the specimen is left undisturbed for another 12 hours for setting of the cement mortar.
11. The specimen is then cured for 28 days.
12. Infills are changed and for each infill, 2 specimens are made for testing*

IV TESTING OF SPECIMENS

After 28 days curing the specimen is taken out and wiped out thoroughly to get a dried surface specimen.

WEIGHT

Weight of all the specimens are taken with the help of a weighing balance. The readings are noted and average of 2 specimens for each of the three infills is taken.

COMPRESSIVE STRENGTH:

The compressive strength is measured with the help of Universal Testing Machine.

The specimen is kept between two steel plates, top and bottom to distribute the load uniformly throughout the specimen.

The specimen with plates is installed in the Universal Testing Machine and the compression load is applied.

The reading for which the specimen fails is to be noted as the compressive strength of the ferrocement panel.

FLEXURAL STRENGTH

The flexural strength is measured with the help of a machine called flexural testing machine. No need of steel plates for this test, as point load is used for this test.

The specimen is kept in the testing machine in a flat position.

Care should be taken that the specimen should be placed at the center that the load acts at equal distance from each of the supports.

Load is applied and the reading is noted when the specimen fails, this load is known as the flexural strength of the specimen.

V TEST RESULT

Rubber board

Weight = 1.5 kg

Compressive Strength = 20.5 N/mm^2

Flexural Strength = 5.2 N/mm^2

Foam Board

Weight = 1.02 kg

Compressive Strength = 10.3 N/mm^2

Flexural Strength = 3.4 N/mm^2

Sand

Weight = 3.1 kg

Compressive Strength = 25.6 N/mm^2

Flexural Strength = 10.5 N/mm^2

VI CONCLUSION

- Ferrocement panels with *sandfills* can be used, where strength is also taken into the account, but weight can be greater (Eg: Ground Floor).
- Ferrocement with *rubber board* can be used where strength is not taken into the account, but the weight should be minimum (Eg: Partition Wall).
- Ferrocement with *foam board* can be used where the wall is made only for aesthetic purposes, as they are light in weight, they can be used in any floor of the building.
- In order to achieve the highest Strength to weight ratio, Ferrocement wall panels with rubber boards can be used.
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