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STUDY ON FLEXURAL BEHAVIOUR OF CONVENTIONAL & CORRUGATED FERROCEMENT PANELS USING DIFFERENT TYPES OF WIRE MESH

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Abstract*— An experimental investigation on ferrocement cast-in-situ panels are construct with Portland pozzolona cement(PPC) and manufactured sand of passing through 4.75mm sieve and cement and sand mix ratio as M15 grade propose respectively 1:2 and panels are in size of 900mmX300mmX50mm. In ferrocement panels have use different types of wire mesh like- Galvanize iron wire mesh, Bending wire mesh, Metallic wire mesh, Aluminium wire mesh. Panels as cast in double layer wire mesh. As the purpose of minimize the corrosion in wire mesh to increase the flexural strength of panels.

Keywords*— Panels, Corrosion, Wire mesh, Flexural strength, ferrocement

I. INTRODUCTION

Ferrocement can be consider as type of thin reinforced concrete construction In which large amounts of small-diameter wire meshes are used uniformly throughout the cross section instead of discretely placed reinforcing bars and in which Portland cement mortar is used instead of concrete. In this, meshes are generally use metallic mesh and galvanize iron mesh.

In this research change the wire mesh for proportion in properties and different types of mesh are use and that are reduce the corrosion effect. Compressive strength are generally from the layer of wire mesh and that are affected from the two layer of wire mesh and effective cover to perfect spacing in that. In formwork have the oil painted wooden sheet are use.

The whole thickness is built-up gradually in two or three consecutive dashing of mortar and then both inside and outside are rubbed smooth. Hand plastering results in slightly increased thickness of ferrocement member. For thin cylindrical units of about 1 meter diameter, 6 mm diameter mild steel rods at 15 cm spacing are used to make a cage of cylindrical shape and then chicken mesh or woven mesh is tied to the cage and plastered.

Use of chicken mesh in this type of construction may not be advisable as it is very flexible and plastering over chicken mesh (without inner mould) may not be satisfactory. Woven mesh and welded mesh are superior and more suitable than chicken mesh.

Because of lesser control, the thickness of units cast by this method becomes more. The greater thickness not only makes it uneconomical but also makes it lose some of the technical advantages. The strength obtained by this system will be lower compared to other methods as the compaction is by hand and since no inner form or mould is used, the hand pressure applied is relatively less. Less pressure is required to be applied to prevent the distortion of the shape of cage.

Ferro concrete has relatively good strength and resistance to impact. When used in house construction in developing countries, it can provide better resistance to fire, earthquake, and corrosion than traditional materials, such as wood, adobe and stone masonry. It has been popular in developed countries for yacht building because the technique can be learned relatively quickly, allowing people to cut costs by supplying their own labor. In the 1930s through 1950's, it became popular in the United States as a construction and sculpting method for novelty architecture, examples of which created "dinosaurs in the desert".

II. MATERIAL AND TEST

A. Cement

In this research work pozzolona Portland cement as 53 grade are use for casting panels, that have good soundness, warm tempt, low setting time, and very smooth for rub with finger.

B. sand

In this research work, river sand are use for casting panels and that are fine sand as like passing thru 4.75mm sieve.

C. Aggregate

In this research work fine aggregate are use that are pass thru 10mm sieve.

D. Wire mesh

1) Galvanize iron wire mesh

GI wire mesh has zinc coating to resist the corrosion effect and its yielding strength is very good for increase the flexural strength.

2) Bending wire mesh
BW mesh has good yield strength to increase flexural strength but in case of corrosion lose their yielding strength.

3) Metallic wire mesh
MW mesh has high yielding strength and no corrosion effect on it that are good compare to GI.

4) Aluminium wire mesh
AW mesh has low yielding strength but that have no chance to corrosion effect.

III. MIX DESIGN AND TEST

A. Mix proposal
In this project work, choose different types of wire mesh for increase the flexural strength and then corrugated and check for the flexural and that reason different types of wire mesh are use and get the good result of them then select one for the future work and added aggregate in this project work so we have two mix design for testing.

1) Mix proposal – 1
First we use different types of wire mesh with the cement, sand combination, that for we use pozzolona Portland cement and that have final setting time is low, that reason panels have low setting time, and that time we use sand as pass out from 4.75mm sieve. And as a mixing as M15 grade only for the cement and sand combination as the ratio for 1:2
2) Mix proposal – 2
In this mix proposal, use good flexural strength and and having high failure load wire mesh like- Galvanized iron wire mesh are use in double layer, that have use as first mix proposal as pozzolona Portland cement and sieve passing through 4.75mm sieve, and aggregate are use as passing threw 10mm sieve, and as a mixing M15 grade concrete for cement, sand, Aggregate combination ratio as 1:2:2.

B. Casting methodology
Casting methodology for panel 1 and panel 2 have same but their mix proposal are change, panels are casting as size of 900mmX300mmX50mm. In this ferrocement technique in IS cod have no form work are use in this casting method, in this research work panels are casted without formwork, in this project use different types of wire mesh like- Galvanized iron wire mesh, Bending wire mesh, Metallic wire mesh, Aluminium wire mesh, and then Which are batter that are use for next mix proposal 2, under plastic cover are use for casting panels like formwork, oiling on the plastic cover for easy removing panels from the cover, then 15mm mortar layer are spread on plastic cover as first layer, then after wire mesh are set on that first layer of mortar, then after spread second layer of mortar and then set second wire mesh and then third layer of mortar are spread and then smoothening as like plastering.

C. Quantity of matirial

1) Material – 1

- Cement use per panel – 8.5 kg
- Sand use per panel – 10 kg

2) Material – 2

- Cement use per panel – 5 kg
- Sand use per panel – 7 kg
- Aggregate use per panel – 7 kg

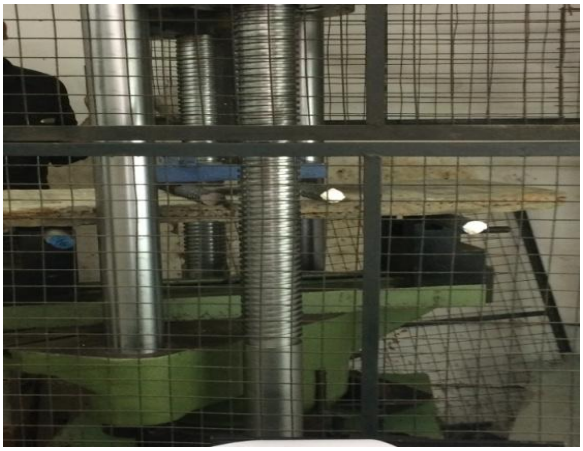
D. Testing methodology

1) Acceleration corrosion test

In this panel corrosion are apply by acceleration corrosion method for un naturally consider, Accelerated corrosion test are apply after 28 days curing, test are applying in domestic water tank. When panels are set in normal water domestic tank then after Mix H_2SO_4 as 1% of water tank for testing and accelerated the water for corrosion effect, then apply DC voltage current in tank for corrosion by accelerated method, that time apply 2V and $3A^o$ continue for 150 minute and 250 min for different type of panels 1 and 2, In the water tank one side positive (+) and other side are negative (-) are set for applying current. Then panels and inner wire mesh are varies after current form normal to corrode.

2) Flexural test

Flexural test is applied after panels are removing form the water tank in 28 days curing, panels are set for 24 hours as room tempt before testing. The flexural test are testing on UTM (Universal Testing Machine) 60 tone machine. Panel size is unique to set extra mechanisms for testing. In this UTM 2 point testing are consider for flexural test and then testing as the equal part of the panels, Gradually point load are apply on 200mm each part for 2 point loading, In this mechanisms that have centre 3 equal part as 200mm but still 150mm are cantilever at both side of panels, properly testing on 600mmX300mmX50mm, then calculate the flexural strength of feerrocement panels.

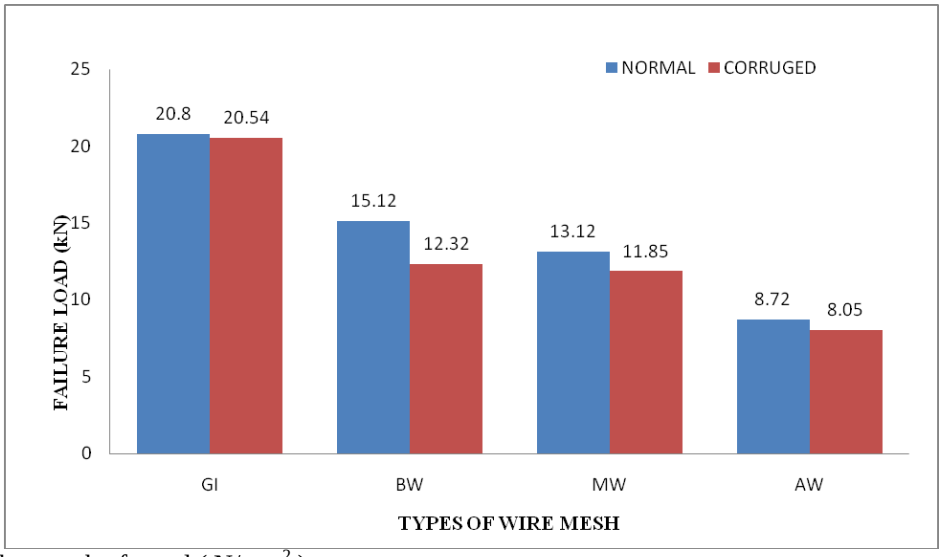


IV. TEST RESULT AND SUMMARY

MIX PROPOSAL 1

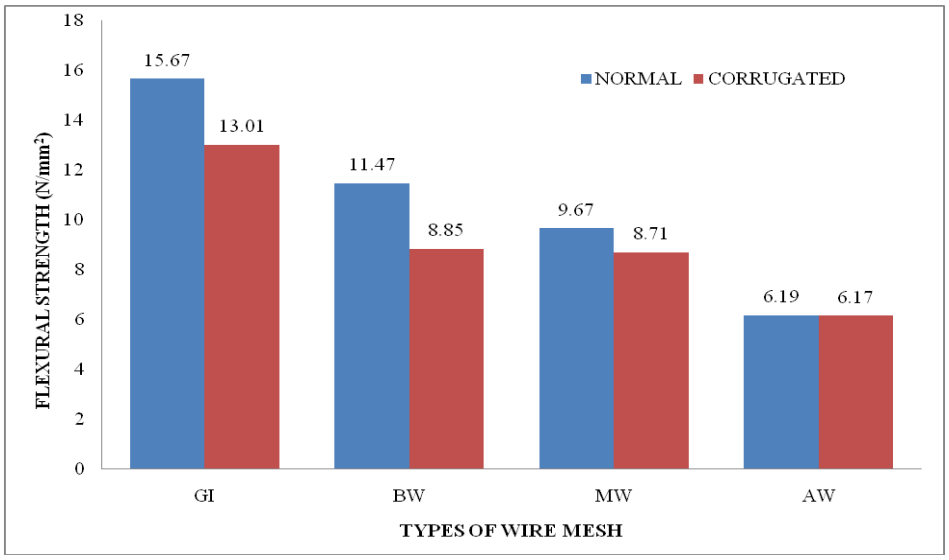
i. Failure at maximum load (kN)

NAME OF WIRE MESH	CONVENTIONAL PANEL	CORROGATED PANEL (150 min)
G.I	20.79	20.54
B.W	15.12	12.32
M.W	13.12	11.85
A.W	8.32	8.05



ii. Flexural strength of panel (N/mm^2)

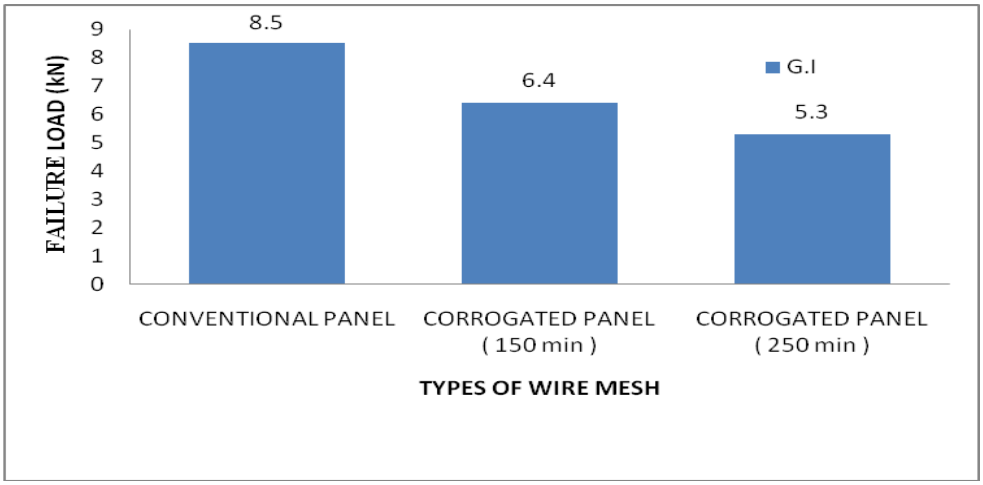
NAME OF WIRE MESH	CONVENTIONAL PANEL	CORROGATED PANEL (150 min)
G.I	1.56	1.30
B.W	1.47	0.88
M.W	0.967	0.87
A.W	0.619	0.61



MIX PROPOSAL 2

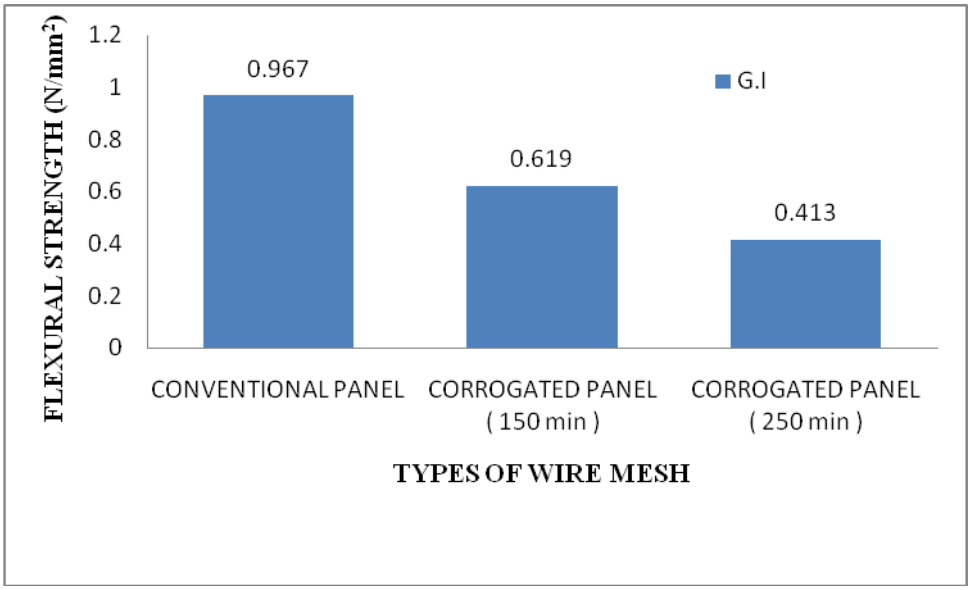
i. Failure at maximum load (kN)

NAME OF WIRE MESH	CONVENTIONAL PANEL	CORROGATED PANEL (150 min)	CORROGATED PANEL (250 min)
G.I	8.5	6.40	5.30



ii. Flexural strength of panel (N/mm2)

NAME OF WIRE MESH	CONVENTIONAL PANEL	CORROGATED PANEL (150 min)	CORROGATED PANEL (250 min)
G.I	0.967	0.619	0.413



V. CONCLUSIONS

Different wire mesh are use like- GI, BW, MW, AW as a different purpose for construction and reduce in corrosion with increase flexural strength

In all different wire mesh have different stability for flexural strength but galvanized wire mesh have higher failure capacity compare to other.

When acceleration corrosion effect is applied that time, Galvanized irons have low corrosion effect, as 20% and their strength are high. Galvanized iron wire mesh has zinc coating for resist the corrosion effect on mesh.

As the load carrying capacity are increase that time flexural strength are increase

When aggregate is use in corrugated panels, which gives reduction in flexural strength up to 40% compare to normal ferrocement panel.

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