



Ferro - Cement

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Abstract— When layers of reinforcing concrete with layers of wire mesh and added polypropylene fibers according to the dosage required is used the concrete gives very good results as compared to normal structures which are to be constructed nowadays.

It is a very advanced type of construction brought in use now-a-days which maximizes the advantages and minimizes the cost.

Ferro - cement is a high-quality material whose simple constituents and formations make it usable for many construction purposes in even the most underdeveloped societies. Ferro - cement is more versatile than RCC and can be formed into simple or compound curves. In contrast, RCC construction is cast in section and needs extensive and very solid formwork to support the weight of concrete.

Index terms— ferro cement, polypropylene fibers, reinforcing mesh.

I. INTRODUCTION

Ferro - cement is a thin construction element with thickness in the order of 10-25 and uses rich cement mortar; no coarse aggregate is used; and the reinforcement consists of one or more layers of continuous/ small diameter steel wire/ weld mesh netting. It requires no skilled labour for casting, and employs only little or no formwork . In Ferro - cement, cement matrix does not crack since cracking forces are taken over by wire mesh reinforcement immediately below the surface.

Ferro - cement is a term commonly used to describe a steel-and-mortar composite material. Pier Luigi Nervi introduces Ferro - cement concept in 1942 when he observed that reinforcing concrete with layers of wire mesh produced a material possessing the mechanical characteristic of an approximately homogenous material.

Essentially a form of reinforced concrete, it exhibits behaviour so different from conventional reinforced concrete in performance, strength, and potential application that it must be classed as a separate material. Ferro - cement is a construction material that proved to have superior qualities of crack control, impact

resistance, and toughness, largely due to the close spacing and uniform dispersion of reinforcement within the material. One of the main advantages of Ferro - cement is that it can be construct with a wide spectrum of qualities, properties, and cost, according to customer's demand and budget.

II. CASE STUDY

A. Case Study Of Water Tank

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SITE ADDRESS : J. A . Desai , RC Charai Marg ,
Chembur Naka , chembur , Mumbai:- 400071.

TYPE OF CONSTRUCTION : Water tank using Ferro-
cement concept.

CAPACITY OF TANK : 13000 TO 13500 litres.
DIMENSIONS OF WATER TANK : 3.3 * 2.7 * 1.5
Metres. Precast material prepared of water tank to be
transported on another site: (somewhere in lonavala).

III. CONSTITUENTS OF FERRO – CEMENT

Cement:-

The cement should be fresh, of uniform consistency and free from lumps and foreign matter. It should be stored under dry conditions and for as short duration as possible.

53 Grade cement is preferred to be used.

Sand:-

Normally wet sand is the most commonly used in Ferro - cement. It should be free from silt and clay. It should be inert with respect to other materials used and of suitable type with respect to strength, density, shrinkage and durability of the mortar made with it.

Water:-

Water to be used in mixing and curing should be potable i.e. fresh and free from any organic and harmful solution which will lead to deterioration in the properties of the mortar. Saline water is not acceptable but chlorinated water can be used.

Reinforcing mesh:-

One of the essential components of Ferro - cement is wire mesh. Different types of wire meshes are available. These generally consist of thin wires, either woven or welded into a mesh, but the main requirement is that it must be easily handled and, if necessary, flexible enough to be bent around sharp corners. The function of the wire mesh and reinforcing rod in the first instance is to act as a lath providing the form and to support the mortar. In the hardened state its function is to absorb the tensile stresses on the structure which the mortar, on its own would not be able to withstand.

Polypropylene Fibers:-

These prove to be essential component of ferro cement. They are added during the batching process.

Thousands of individual fibres are then evenly dispersed throughout the concrete during the mixing process creating a matrix-like structure.

Feature:-

1. Increased cohesion of the mix.
2. No requirement for crack control steel mesh.
3. Concrete placement and crack control in ONE operation.
4. Reduced bleeding.
5. Less expensive (per m²) than conventional steel mesh reinforcement.

Rapid Hardening Admixture:-

Hardening accelerator for concrete which increases the early strength of concrete without reducing the ultimate strength.

Increases high early stage strength development at 6–24 hours.

Sika 3 admixture was used at the site.

Water Repellent:-

Increase water repellency and reduce water penetration and absorption in all types of cement-based construction

materials. This easily used admixture makes such materials more hydrophobic and resistant to the structural damage or appearance problems caused by excess moisture and sunlight (UV) degradation.

Impermo, PWR, etc can be used.

IV. PROCEDURE OF CASTING

Initially they bind the chicken mesh on either side of steel grill of appropriate size using binding wire. Mortar is been prepared of required quantity. The wire mesh which has been prepared earlier is been kept on the vibrator machine and the mortar is been poured or filled in the wire mesh of steel grill and is been stalled by using hand trowel.

After completing the process of filling and stabilizing the mortar, the vibration is done. This allows the escape of entrapped air and reduces the voids which remained unfilled by hand trowel. In a similar manner numbers of structural members are casted. These casted members are then allowed to set and harden for 24 hours. Spraying curing is done to gain the required strength.

1. Fine sand (2.5 ghamelah)
2. Cement (1 ghamelah)
3. Admixture (corniche chemical powder 500 grams)
4. Fiber (1 gram per sq.m).

V. OBJECTIVES

1. To evaluate tension stiffening effect of Ferro - cement with polypropylene fibers.
2. To evaluate tension stiffening effect of Ferro - cement with polypropylene having double layers of hexagonal mesh at top and bottom with polypropylene fiber having varying percentage of fiber (0.00%, 0.10%, 0.15%, and 0.20%).
3. To evaluate tension stiffening effect of Ferro - cement with polypropylene 28days curing.
4. To establish correlation between different fiber percentage in Ferro - cement and ultimate failure of specimens.
5. To reduce the weight of the structure.
6. To reduce the structural size.
7. Less use of concrete.
8. To make it more economical.

9. To increase the life span of the building.

VI. ADVANTAGES & DISADVANTAGES

Advantages:-

1. Light weight.
2. Waterproof
3. Temperature resistant
4. Durable (negligible life)
5. Fire resistance
6. Easily mouldable
7. Less maintenance
8. Resistance to earthquakes
9. Sound and vibration proof
10. Economical
11. Resistance to environmental deterioration.
12. Reduced size of structural member.

Disadvantages:-

Waterproofing to R.C.C. structure is carried out with modern material known as Ferro - cement. It is carried out generally in two layers of about 8 mm thickness each layer. It consists of wire mesh reinforced cement matrix layers which are vibrated in situ. The top surface also vibrated finished smooth with non-metallic fibres impregnation. The cement matrix and wire mesh layers are laid alternately. Each cement matrix layer is laid on a bond coat for assured integrity. Each wire mesh layer is fixed with u-clips to the base.

The performance of the treatment is most excellent. Because in situ low water cement ratio cement matrix is vibrated and become dense with nil/negligible pores. The wire mesh layers generally two nos. prevent crack

formation, if at all due to shrinkage, temperature or structural relative movements. Therefore the treatment is durable and permanent. It takes care and care efficiently due to certain admixtures. The wire mesh layers add strength to the main structure in addition to crack formation prevention. It is laid on insulated foundation layer of about average thickness of 40 mm. There will be dead load reduction to conventional brickbat coba treatment. It adds strength to base structure.

VII. CONCLUSION

Thereby it is concluded that using ferro-cement over conventional cement gives various benefits:-

1. Enhanced durability.
2. Harder, more durable surface with better abrasion resistance.
3. Improved flexural properties. Increased resistance to spalling at higher temperatures and so.... better fire resistance.
4. Reduced absorption of water, chemicals and dirt.
5. Cost savings in secondary reinforcement steel mesh for ground supported slabs.
6. Faster construction (removes the need to lay mesh and spacers etc.)

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