EXPERIMENTAL STUDY ON FERROCEMENT DOME BY USING CHAIN MESH

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ABSTRACT

Domes are space structures which cover large area with minimum surface. It is a doubly curved shell structure. This paper deals with experimental study of constructing Ferrocement dome by using chain mesh. Dome is stronger, stable and durable than any other structures. Ferrocement may be cast in various shapes and forms even without the use of form work and are aesthetically very appealing. Chain mesh is normally erected along a fence line of tubular steel post. Chain mesh is a type of woven fence galvanized or LLDPE-coated steel wire. Chicken mesh or poultry netting is a mesh of wire commonly used to fence in fowl. It is form of thin, workable, galvanized steel wire with hexagonal gaps. Chicken mesh strengthens the plaster against forces within the plaster itself and the backing upon which it is layer.

Keywords: Ferrocement, chain mesh, chicken mesh, doubly curved shell, high quality construction, and low cost technology.

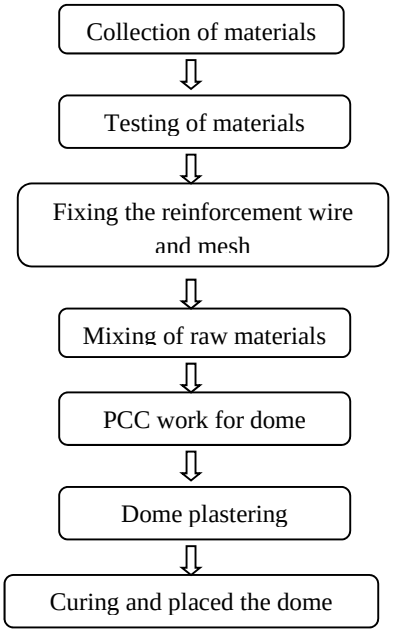
I. Introduction

Dome has high structural strength and it is more efficient. It is doubly curved structure shell structure which is more stable. “Dome” is originated from the Greek and the Latin word “domus” which was used up through renaissance to label the reversed house due to the shape of its roof. Ferrocement is a composite material calm of a mortar reinforced with light steel fabric/mesh, used to form thin sections. The construction action consists of forming the shape of the required structure. The main advantages of Ferrocement is low cost, the low level of skills required for frame work construction, and minimize maintenance with an enlarge resistance to rot and corrosion when compared to wood and steel with a chain and chicken mesh.

The word "Ferrocement" has been put in application by addition to other blend materials, involving some involving no cement, no ferrous material. Ferrocement arise in the 1840s in France In industrial nations, where there is little difference between the cost of experienced and un experienced labor, these advantages are less apparent and even vanish, explaining the relatively slow growth in the use of Ferrocement and it is the origin of the reinforced concrete. The engineering properties of Ferrocement structure are equivalent to normal concrete, and in some applications it performs better.

There are new form built of ferrocement-building units, exterior roofs, water tanks and swimming pools, gaseous fuel digesters, silos, food storage units, and for other talent utilization such as buoyant marine structures for which reinforced concrete is too massive, ferrocement is a preferred choice higher than reinforced.

II. Methodology



III. Specification of materials

A. Cement Mortar

Cement mortar is a mixture of sand, cement, water. The strength of the mortar depends on these raw materials, the mix ratio, and the workmanship of those who mix and use the mortar.

B. Cement: Sand Ratio

The normal ratio of cement to dry sand is 1:3 by volume. To attain a preferred ratio, the bucket can be used to exactly measure out the quantity sand and cement.

C. Water: Cement Ratio

Water: cement ratio are normally used as 0.4:1 to 0.5:1.which is equal to 20 to 25 lit of water for 50kg bag of cement.

D. Chicken Mesh

Chicken net or equipment cloth is used as a metal lath to hold cement or plaster, a process known as stuccoing. Concrete reinforced with chicken wire or equipment cloth yields ferrocement a flexible construction material.

E. Purpose of Chicken Mesh

Chicken mesh has a same function as reinforcement does in concrete it strengthen the plaster against forces within plaster itself and the backing upon which it is layer.

IV Materials Used

A. Cement: Cement is a binding material. A good quality of fineness cement is used. Ordinary Portland cement is used the cement should be placed under a dry place.

B. Sand**:** sand should be a great strength and it is well graded particle and grained for a different size of aggregate. Sand should be clean and dry.

C. Water: water is needed to mix the cement and sand and it should be in correct ratio. It should be free from organic matter, oil, chlorides, acids and other impurities. Seawater should not be used.

D. Wire mesh**:** wire mesh is relatively used for more beneficial it is a highly durable. The mesh has the same function as reinforcement does in concrete.

E. Weld mesh: The performance of ferrocement dome with weld mesh is also to be for comparison. Hence ferrocement dome with 8mm diameter bars are used.

F. Chain mesh**:** steel chainmesh are considered the primary mesh reinforcement. it gives more strength to a structure in chain mesh has widely used for commercial buildings.

G. Application of Ferrocement

- Applied in manufacturing boats.
- Applied as beams for racks in housing projects exchange costly wooden beams.
- Applied in building of boxes for water and electrical meters.

- Applied in building of sewage manhole covers.
- Ferrocement elements are used in pastoral areas for low cost housing.
- Applied in making of agricultural structures.
- Applied in making of industrial structures

H. Advantages of Ferrocement

- Raw materials needed for ferrocement making are effortlessly accessible.
- The fabrication of the net can be ready in many shapes that outfit the needs.
- Ferrocement are more long-lasting and are inexpensive than steel and wood.
- Application of ferrocement doesn't need any heavy hardware.
- Repairs are normally accessible and cheaper.
- It has considerable tensile strength.
- It gives superior opposition to fire, earthquake and corrosion.
- Low manufacture material cost.

I. Disadvantages of Ferrocement

- Excessive shrinkage due to higher cement content. Needs constant curing for a period of 7 days to keep away from any shrinkage cracks.
- Vulnerable to corrosion of Mild Steel rods and Galvanized Iron mesh due to incomplete treatment of materials by mortar.
- Ferrocement is labor concentrate. So it might not be inexpensive to use ferrocement in planes where the labor costs are high.
- As ferrocement elements are normally thin structure, buckling is another factor that needs to be taken into consideration.
- Its poor impact resistance.
- It is not workable to nail, screw, or weld to ferrocement.
- More number of labors required.

V. Construction of Ferrocement Dome

Fig 1. Skelton setup for dome.

Fig 2. PCC work for dome

Fig 3. Finishing the dome

Fig 4. Curing the dome

VI. Economics

The economic advantages of ferrocement structure is they are Stronger and more durable and it gives high tensile strength for ferrocement, under favorable conditions almost equal to compression strength Ferrocement structure can be built easily and quickly. Ferrocement can be constructed without formwork for almost any shape so the cost of form work is economical. Earthquake resistance is dependent on good construction. Ferrocement structures are good earthquake resisting structures. It gives some construction techniques and additional reinforcement of concrete.

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VIII. Conclusion

- Ferrocement is being a labor in depth and a material saving ability, has never been to compare with reinforced cement concrete.
- In dome structure has made it possible to construct a light but strong, durable weather resistant shell with a weight reduction to almost $1/10^{th}$ of the convectional material.
- This method has provided a solution where by air supported forms may be used for such large concrete domes.
- The overall cost of dome project using air supported forms is very efficient. Structures are highly waterproof and higher strength to weight ratio than R.C.C.

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