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FERROCEMENT

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ABSTRACT

Ferrocement is thin-shell concrete reinforced with wire mesh, its high quality construction material whose ingredients is widely available in developing countries. It can be used to build the wide range of structures, can be worked mainly by unskilled, though supervised, labor. Throughout the world, highly satisfactory fishing boats, pleasure craft, storage tanks, housing components & sorted agricultural , commercial facilities have been constructed of ferrocement. Its use is increasing rapidly.

***Keywords**: ferrocement water tank.*

I.INTRODUCTION

Ferrocement , ferro-cement (also called thin-shell concrete or ferro-cement) is a system of reinforced mortar[1] or plaster (lime or cement, sand and water) applied over layer of metal mesh, woven expanded-metal or metal-fibers and closely spaced thin steel rods such as rebar, metal commonly used is iron or some type of steel. This is used to construct relatively thin, hard, strong surfaces and structures in many shapes such as hulls for boats, shell roofs, and water tanks. Ferrocement originated in the 1840s in France and is the origin of the reinforced concrete. It had a wide range of other uses including sculpture and prefabricated building components. The term "ferrocement" has been applied by extension to other composite materials, including some containing no cement, no ferrous material The
Ferrocement behaves like reinforced concrete in its load bearing characteristics, with the essential difference being that crack development is retarded by the dispersion of the reinforcement in fine form through the mortar. It makes the material of interest in boat construction and it has been established that when cracking takes place it results in a wide distribution of fine cracks which, in combination with the high alkalinity of the cement rich mortar, inhibits corrosion in the reinforcing steel.
The main advantages of ferrocement is low cost, the low level of skills required for hull construction, and reduced maintenance with increased resistance to rot and corrosion when compared to wood and steel.
Claims of low cost could only be substantiated where the second advantage of low level of skills required can be exploited, for example, in developing countries with a large unskilled, underemployed and low paid labour force. In industrial nations, where there is little difference between the cost of skilled and unskilled labour, these advantages are less apparent and even disappear, explaining the relatively slow growth in the use of ferrocement. its advantages in developing countries are more obvious, and this explains FAO's interest in the material.
The main disadvantages of ferrocement is its weight and poor impact resistance. However, these disadvantages only restrict the application, of the material, but need not detract from its potential. the case of heavy displacement workboats over 11 m LOA, the increased weight is of reduced importance; for such craft over 15 ms, the weight will be no more than that of a similar size steel vessel. Poor impact resistance can be largely overcome at the design stage by provision of appropriate hull protection members.
It may well therefore be asked why ferrocement has not been used more widely? This is due mainly to three factors: bad publicity due to poor amateur and professional construction; publication in the early years of outlandish claims for strength , low cost of construction, which in some cases could not be substantiated; the heavy rise in labour costs in industrialized countries which affected what is generally speaking a labour oriented material. Although today with the range of building techniques for ferrocement expanding, the labour cost factor need not play such an important part.

II.METHODOLOGY

1. Selecting materials
2. Testing on materials
3. Fixing the reinforcing wire and mesh

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4. Mix design
5. Plastering
6. Curing

Cement mortar

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

1.Sand:

Clean, dry sand should be used. It should be well-graded, comprising particles of different sizes.

2. Cement:

Cement should have been recently manufactured and have been protected from water vapor during storage& transport.

3.Water:

The water used in the mix needs to be clean, preferably of drinking-water quality.

The cement: sand ratio

The usual ratio of cement to dry sand is 1:3 by volume. To achieve a desired ratio, The bucket can be used to accurately measure out proportions of sand and cement.

The water: cement ratio

The ratio of water cement has an important effect on the final strength of mortar. A ratio of about 0.4:1 to 0.5:1(ratio of water: cement by weight) is ideal, which is equivalent to between 20 to 25 lit. of water to each 50kg bag of cement.

III. METHODS OF CONSTRUCTION

There are basically three types of methods of ferrocement. They are following

1. *Armature system:* this method the skeleton steel is welded to the desired shape on either of sides of which are tied several layers of stretched meshes. This is strong enough, so that mortar can be filled in by pressing for one side and temporarily supporting from the other side. Filling in of mortar can also be administered by pressing in the mortar from both the sides. In this method the skeletal steel (bars) are at centre of the section and as such they add to the dead weight of without any contribution to strength.
2. *Closed template systems:* Several layers of meshes it tied together against the surface of the mould which holds them in position while mortar is being filled in. The template may be removed after curing or may remain in position as a permanent part of a finished structure. If the template is to be removed for reuse, releasing agent must be used.
3. *Integrated template system:* Using minimum reinforcement any integral template is first to be considered to act as framework. On this template layers of meshes are fixed on either side and plastering is done onto them from both sides the name suggests, the template remains permanently an integral part of the finished structure. (eg. double T-sections for flooring& roofing etc.) Precaution should be taken to have firm connection between the template and the layers filled in later, so that finished product is whole integral structural unit.

IV. ECONOMICS

The economic advantage of ferro cement structures is they are stronger, more durable than some traditional building methods. Depending on the quality of construction and the climate of its location, houses may pay for themselves with almost zero maintenance &lower insurance requirements. Water tanks could pay for themselves by not needing periodic replacement, if properly constructed of reinforced concrete. Ferrocement structures can be built quickly, which can have economic advantages. In inclement weather conditions, the ability to quickly erect and enclose the building allows workers to shelter within and continue interior finishing. In India, ferrocement is used often because the constructions made from its more resistant to earthquakes. Earthquake resistance is dependent on good construction technique , additional reinforcement of the concrete.

V. ADVANTAGES

The advantages of a well build ferrocement construction are the low weight, maintenance costs& long lifetime in comparison with purely steel constructions.[8] However, meticulous building precision is considered crucial here.

Especially with respect to the cementitious composition, the way in which it is applied in the framework, and how or if the framework has been treated to resist corrosion.
When a ferro cement sheet is mechanically overloaded, They will tend to fold instead of break or crumble like stone Or pottery. A`s a container, it may fail &leak but possibly hold together. Much depends on techniques used in Construction.

VI. DISADVANTAGES

The disadvantage of ferrocement construction is the labor-intensive natures, which makes its expensive for industrial application in the western world. In addition, threats to degradation (rust) of the steel components is a possibility if air voids is left in the original construction, due to too dry the mixture of the concrete being applied, or not forcing the air out of structure while its wet stage of construction, through vibration, pressurized spraying techniques, or other means. These air voids can turn to pools of water as the cured material absorbs moisture. If the voids occur where there is untreated steel, the steel will rust and expand, causing the system to fail. In modern practice, a advent of liquid acrylic additives other advances to the grout mixture, create slower moisture absorption over the older formulas, also increase bonding strength to mitigate its failures. Restoration steps should include treatment to the steel to arrest rust, using practices for the treating old steel common in auto body repair.

VII. USES

Fittings are usually built into the ferrocement during construction. These include:

- one or more taps for the water collection;
- The drainage tap (or wash-out) at the bottom of the tank, to be used when cleaning;
- inlet pipe; and overflow pipe. This must be screened to prevent insect entry.

The tank may be sited above ground or below ground and it may be partially sunk (provided its base is situated well above ground water level).

VIII. CONCLUSION

Ferro cement construction is the low weight construction and low maintenance cost construction, long lifetime construction in comparison with purely steel constructions.[8] However, aluminous building precision is considered crucial here.
Especially with respect to a cementitious composition, the way in which it applied in& on the framework, how or if the framework has been treated to avoid corrosion. When a ferrocement sheet is mechanically overloaded, They will tend to fold instead of break or crumble like stone Or pottery. As a container, it may fail and leak but possibly hold together. Much depends on techniques used in the construction.

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