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Wire Mesh Jacketing Roll On Enrichment Of Concrete Potency

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ABSTRACT

Construction in developing countries required to improve the performance of conventional concrete against fire, earth quake and corrosion. In this research paper an attempt made to analyze the enhancement of compressive strength of concrete specimens wonted with steel mesh wire. Both the cylindrical and cubical specimens were made and cured for 7 days initially then they are wounded with wire mesh of 0.5 mm and covered with C.M 1: 3 plastering and then they was further cured for another 21 days. After curing they were tested for compressive strength enhancement compared with conventional concrete and it is found that there was about 21% and 23% strength increase in the specimens of cubical and cylindrical respectively.

1. INTRODUCTION

Construction in developing countries required to improve the performance of concrete against fire, earthquake, and corrosion than the conventional material of construction such as such as wood, adobe and stone masonry and ordinary concrete. 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.

2. CONSTRUCTION

The desired shape may be built and around whish if it is a load carrying beam or column and at bottom if it is a slab a multi-layered construction of mesh, supported by an armature or grid, built and tied with wire has provided. For optimum performance, steel should be rust-treated, (galvanized) or stainless steel. Thin cement mortar coating has been given for enhance the bonding as well as to improve the aesthetic. sand and water and/or admixtures is applied to penetrate the mesh. During hardening, the assembly may be kept moist, to ensure that the concrete is able to set and harden slowly and to avoid developing cracks that can weaken the system. The construction process can be divided into 4 distinct phases:

2.1. Designing the structure:

The basic structure has to be properly designed and casted

2.2. Wire Mesh wounding:

Steel structure has to be properly fixed and then wrapped with adequate layers of chicken wire.

2.3. Mortar application:

Cement mortar of ratio 1:3 has to be applied on both sides of the structure. This is a very meticulous job. The application has to be good enough so that the finishing is smooth.

2.4. Curing:

Recommended Curing is for 7 days before wire mesh winding and 21 days after.

3. Material used Description

Grade of concrete utilized for casting of conventional sections in this study cylinders and cube M30. OPC 53 grade cement and fine and coarse aggregate Conforming to grading Zone III of Table 4 of IS: 383-1970 were used with water cement ratio of 0.4. Indian Standard method, based on IS 10262-1982 and SP23 is adopted for deriving the mix proportion of concrete and the following were the mass of materials adopted to prepare one cubic meter of concrete.

Table 1 Composition of Material of Conventional Concrete

Kind of Material	Quantity in kg / m^3
Coarse aggregate	1115
Fine aggregate	683
Water content	192
Final mix proportion	1 : 1.42: 2.32

4. EXPERIMENTAL METHODOLOGY

4.1. Conventional specimens

The cubes of size 150 x 150 x 150 mm and cylinders of size 100 mm diameter and 200 mm height were casted and tested for its compressive strength capacity after 28 days of curing in a water tank.

4.2. Mesh Wire Winding

After initial curing for 7 days wire mesh (Chicken mesh) of 0.5mm diameter wounded on the casted concrete specimens and cement mortar coating of ratio 1:3 were also given on the exposed surfaces as bonding coat and exposed to sunlight for 24 hours then fed in to the curing tank for further 21 days and then the compressive strength test were carried out.

Figure1. (a). Typical Spread View of Wire

Figure.1. (b). Typical Rolled View of Wire Mesh

Figure.2.View of Cubes and Cylinders Wound with Wire Mesh

Figure.3.View of Cube with mortar cover

5. Testing of specimens

Cube and cylinder of each 5 sample were prepared as per the Indian standard method and placed one after the other properly in the compression testing machine in such a way that load will be applied uniformly over the cubes and cylinders. Loading was given at the rate of 2.5kN/sec and 2kN/sec respectively and the dial gauge readings at the failures were taken. The failure pattern is shown below and the obtained data is tabulated.

Figure.4.View of Cubical Specimen at Failure under Ultimate Loading

Figure.5.View of Cylindrical Specimen at Failure under Ultimate Loading

6. Results and Discussion

Wire mesh jacket mortar imparts tensile strength and ductility to the material. In terms of structural behavior it exhibits very high tensile strength-to-weight ratio and superior crack resistant performance. The distribution of small diameter wires over the entire surfaces enveloped with chicken mesh provides very high resistance against cracking. Moreover many other engineering properties, such as toughness, fatigue resistance, impermeability are considerably improved.

Table.2. Compressive strength variations of Cubes and Cylinders

Type of Sample	The Average Compressive Strength in N/mm^2
Conventional Cube	30
Wire mesh wounded Cube	36.2
Conventional Cylinder	26.3
Wire mesh wounded Cylinder	32.4

7. Conclusion

Based on the research made with the usage of mesh wire (chicken mesh) in the concrete, the following conclusions are drawn:

- The compressive strength of concrete increases by $6.2N/mm^2$ in the case of cubical specimen wounded with mesh wire when compared to conventional concrete specimen of about 21%.
- The compressive strength of cylindrical specimen increases by $6.1N/mm^2$ in the case of specimen wounded with mesh wire when compared to conventional concrete specimen of about 23%.
- Thus the usage of mesh wire mesh jacketing with mortar covering provides an increase in compressive strength of the concrete.
- This method can be adopted for columns in the earthquake prone areas.
- This will be a better alternative material to strengthen the concrete with inadequate shear resistance.

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