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Experimental Study of Concrete Canvas

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Abstract

The present generation has a huge demand for construction materials to follow different conventional methods. Due to a rapid increase in the materials widely used in construction, it also needs an enormous number of economical investments in materials. There is no provision for very rapid and emergency workable concrete installation methods. Worldwide, there is an increasing demand for construction and construction materials. Because of that, concrete is the most extensively used material in construction. These days, concrete is being used for so many purposes in different adverse conditions. Concrete has many advantages, but there is one drawback which is that it is not flexible when it is hardened. That's why a UK-based company introduced a solution called "Concrete Canvas" to overcome this drawback. It is hardened by hydration to form a thin, durable, waterproof, and low-carbon concrete layer. CC effectively worked to save time and money. CC is the most up- to-date fiber material in construction worldwide. CC is a flexible material. Due to this advantage, the use of CC is rapidly extended. The life span of the CC is 15 to 20 years. Countries like India import CC, which is costly because of differences in materials, the process of manufacturing, and taxes. So, we genuinely tried to prepare the CC using locally available materials, namely fibrous air mesh, artificial sand, and pozzolana portland cement (PPC). The materials used for the CC were dry mix as well as the 3-D matrix in the middle and an impermeable membrane at the bottom. Various tests such as permeability test, compressive strength test, and flexural strength tests were conducted on specimens. Although the required compressive strength is less than the actual compressive strength that has to be obtained after 28 days of curing, it is near the required value. But due to the difference in the cement content, the actual value of the compressive strength of the refereed specimen's mix is way more than the compressive strength of the preferred mix. But at last, the maximum flexural strength of the prepared CC is more in comparison with the referred specimen. Along with that, the success of the cost reduction has been seen in the end. This report expresses the theoretical, experimental, and analytical results of CC along with the comparative study of product performance based on the results and study of cost.

Keyword- ASTM, ACI, CAC, CC

I. INTRODUCTION:

We are in an age where is an increasing need for understanding and researching how things can be made more durable with ease and with speed. The textile industry is one of the fastest-growing industries in the world. The textile industry is one of the focused areas for research and development.

Since from a very long time the construction field is playing a very important role in the development of any country and it is a well-known fact that the concrete is the most commonly used construction material in a scenario in which we are working for a long time. But as the concrete is not flexible so it creates many difficulties in certain essential works in construction.

1. CONCRETE: AN INTEGRAL MATERIAL

Concrete is regarded as one of the most widely used materials in construction which in terms has increased the demand in the construction field. In this continuously expanding world, the demand for new construction techniques has been increased to complete the construction in less time with less cost and more effectively. The conventional method of concrete has raised some queries regarding the cost, flexibility of concrete, and whether it can be used in very rapid and emergency work. So, to overcome these problems of traditional concrete leads to the evolution of concrete canvas.

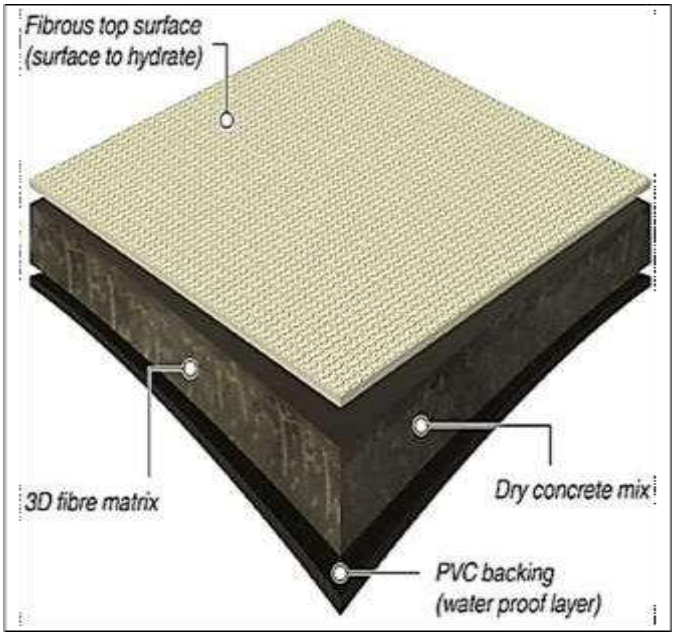
The main issue is that concrete loses its flexibility while it hardened. It loses its tensile strength. Now a day, composite material is being increasingly used because of their specific strength, flexibility, and stiffness and this can be altered easily by changing fiber orientation and some other property. Thus, the behavioral study of the composite flexible concrete sheet is important. The concrete sheet is an upcoming revolution in the field of civil engineering.

2. CONCRETE CANVAS:

In 2005, Peter Brewin and William Crawford from the United Kingdom developed a replacement material consisting of a special sort of material that makes it flexible and named it 'Engineered Cementitious Composite' (Concrete Canvas). This material possesses flexibility as compared the traditional concrete. Within the flexible concrete, the coarse aggregates are eliminated.

Concrete canvas includes a 3-D spacer fiber matrix containing a specifically formulated dry concrete mix. A polyvinyl chloride (PVC) backing on one floor of the cloth guarantees the cloth is absolutely water-evidence, at the identical time as hydrophilic fibers (polyethylene and polypropylene yarns) on the opposite surface resource hydration with the useful resource of drawing water into the aggregate. The material can be hydrated either by way of using spraying or by being immersed in water. It may be effortlessly nailed, stapled through, or covered with an adhesive for smooth attachment to

different surfaces. Once set, the fibers fortify the concrete, stopping crack propagation and imparting a secure plastic failure mode. Concrete canvas is to be had in three thicknesses; CC5, CC8, and CC13, which can be 5, 8, and 13 mm thick respectively



II. OBJECTIVE:

1. To prepare the prototype of concrete canvas.
2. To perform the tests on prototype of concrete canvas.
3. To compare the results and cost with conventional concrete canvas.

Conclusion :

- The maximum compressive strength of concrete canvas is obtained from the cement and sand mix of about 21 N/mm2 which is less in comparison with actually referred specimen.
- The maximum flexural strength of concrete canvas is obtained from the cement and sand mix of about 12.05 N/mm2 which is more in comparison with actually referred specimen.
- The PVC backing shows great stability against water penetration, so it serves concrete canvas as a layer that gives an extra advantage when used at sites.
- The approximate cost required to prepare 1 sq. m. concrete canvas of 8 mm thickness in India with locally available material is 1304/- only, meanwhile the actual price of referred specimen varies from Rs.3600/- to Rs 6890/-.

III. LITERATURE REVIEW:

Article No. 1 "Influences of geometric patterns of 3-D spacer fabric on tensile behavior of concrete canvas".

Published by and year:- Fangyu Han, Huisu Chen, etc. all; (2014). The designed formulation of dry cement powder for concrete canvas, which was expected to have both high mechanical strengths and short setting times, was obtained by partially replacing calcium sulfoaluminate cement (CSA). The influence of anhydrite fineness

on the mechanical properties of concrete canvas and its mechanical anisotropy were both investigated. Results revealed that increasing anhydrite content or fineness improves the mechanical strengths of concrete canvas and shortened its setting times.

2.2. Article No. 2 "Concrete Cloth".

Published by and year:- Narayanan V. Vedha; (2015). The author briefly narrated the history of the concrete canvas. He also gave the market availability of canvas with the help of data available on the internet.
According to data available he described the strength of concrete canvas in means of compression test (ASTM C473-07), 10-day compressive failure stress is 40 MPa; bending test (BS EN 12467:2004), 10-day bending failure stress 3.4 MPa, abrasion resistance (ASTM C1353-8) and tensile strength (DIN 52108).
Also given the method of hydration.

IV. METHODOLOGY

Step-1: Making of product with mix design by trial & error method.

Step-2: Conduction of laboratory testing on the product.

Step-3: Repetition of step 1 with different mix design.

Step-4: Actual placement of product on required site.

Step-5: Study of cost benefit ratio.

V. RESULTS

- As concrete is strong in compression, it is seen that the results of the proportions which taken are comparatively good against the proportion of conventional mix.After 28 days of curing, the compressive strength is 21 N/mm2
- From the flexural test results, it has been found that the material is not flexural rigid material and hence it has been concluded that it is an elastic material.
- After 28 days of curing, the flexural strength is 12.05 N/mm2 with 7.5 mm maximum displacement.
- The permeability test is conducted by simple observation by pouring water into the previously

mould PVC layer with a measuring jar underneath the mould. It is observed that no leakage of water takes place through the PVC backing layer.