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# Concrete Canvas: Solution of Pavement

Rajan Pandey[1], Dr. D. Jegatheeswaran[2]
[1](P.G Structural Student/ Department of Civil Engineering / Sona College Of Technology / India)
[2](Professor / Department of Civil Engineering / Sona College Of Technology / India)
*Corresponding Author: Rajan Pandey*

***Abstract:*** *The paper deals with the reliability of concrete canvas. Different materials were accumulated and tested in order to make concrete canvas more cost effective. The materials used for the concrete canvas was as water permeable material at top, micro-concrete as well as 3D matrix in middle and an impermeable membrane at the bottom. Various test such as impact test, Tensile strength test and flexural strength tests were conducted on specimens.*

***Keywords:*** *Concrete canvas, Concrete cloth, 3D Fiber*

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## I. Introduction

Concrete is regarded as one of the most widely used materials in the construction which in terms has increase the demand in construction field. In this continuously evolving world, the demand for new construction technique has been urged which can overcome the old ones. The conventional method of concrete has raised some of 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.

Concrete canvas is revolutionizing the construction world, as it is economical and has vast scale of application in construction field. The reason behind it is, its own physical properties mainly flexibility and easy application. Concrete canvas is cement infused canvas that solidifies when hydrated to form a thin, durable, water and fireproof concrete layer. This evolution gives a new dimension to the construction field because it doesn't require any mixing machineries. Hence, construction has become easier as it requires only placing of concrete canvas and spraying water over it.

Concrete canvas is waterproof as well as fireproof. It has vast range of applications in construction field as well as other sectors. The application of concrete canvas includes roofing, flood defenses, military purpose, tunnel lining, retaining walls, erosion control etc.

## II. Materials

The concrete canvas is made of 3D fiber with cement materials trapped inside it and the membranes (Permeable and Impermeable) placed at the top and bottom. The fibers that are generally used in concrete canvas are Polypropylene and Polyethylene fiber. The 3D fiber is essential to confine the cement and also acts as reinforcing components. Thus it enhances tensile strength of the concrete cloth. The 3D fiber provides flexibility and prevents crack growth. Normally, the thickness of 3D spacer fabric is about8-20 mm, and the maximum thickness dependent on the type of the woving machines can reach 60 mm [1] (Hui et al., 2016).

The dry mix concrete should have both mechanical as well as short setting time. The Micro-concrete was introduced in between the 3D spacer fiber as the dry Concrete mix. The micro concrete was selected after couple of test.

The permeable membrane at top and impermeable membrane at the bottom was provided for CC. The top permeable polypropylene membrane was provided for hydration as well as for injection of water into dry mix concrete. The bottom PVC membrane acts as water proof materials providing resistance against surrounding moisture as well as ensures that the water doesn't escape from bottom during the injection of water in CC from top.

## III. Experimental Programme

Generally concrete canvas is used as pavement, lining and repair works. So, the concrete canvas meets the pavement properties and withstands the forces over the pavements. The following tests were conducted on concrete canvas.

**1. Impact Test (Drop Ball Test)**

The cast specimens were subjected to impact load with simply supported and sand bed condition as per ACI 544.2R, 1989. A specially designed frame consisting of manually operated lever with a ball of weight 9.81N was freely dropped from a height of 30cm over the centre of the Concrete cloth specimen. The drop hammer slides down along a vertical guide. This guide was aligned so that the impact occurred at the center of the specimen. A lever releases a lock and allows the drop hammer to fall. The cylindrical drop hammer was fitted with a hemispherical head. This process was repeated a number of times, until failure of the specimen. During testing, observations were made on a number of blows required for failure of the specimen.

Energy absorption at complete failure = w×h×n

Where,

w = weight of drop ball (9.81N)

h = height at which the drop ball is dropped (30cm)

n = number of blows required for complete failure of the specimen.

**2. Tensile Strength**

The test was conducted to determine the axial tensile strength of the canvas in accordance to ASTM D-5035. The test was conducted on six specimens of similar dimensions of 25mmX50 mm.

**3. Flexural Strength:**

This test was conducted to determine the moment the canvas can withstand before failure when flexure loading is applied. It was done in accordance to ASTM C-1185. Six identical samples with dimensions of 150X300 mm were tested. The concrete canvas was placed in the testing machine with the solid fabric facing upward and the PVC layer facing the rollers.

## IV. Results and Discussions

During the drop ball test, it was found that the energy absorption of the specimen was 8.829J which is more than two times of the conventional pavement slabs.

Tensile strength in length direction is 10.5MPa and width direction is 6.5MPa.

The dry state concrete cloth is more flexible in length direction compare than width direction. 15-day bending failure stress is 38MPa and 15-day young's modulus is 1500MPa. It absorbs more stress compare than conventional pavement slabs.

Concrete canvas cannot be over hydrated and an excess of water is always recommended. Do not jet high pressure water directly onto the Concrete canvas as this may wash a channel in the material. Concrete canvas has a working time of 1-2 hours after hydration. So do not move Concrete canvas once it has begun to set. Working time will be reduced in hot climates. If Concrete cloth is not fully saturated, the set may be delayed and strength reduced.

## V. Figures

**Fig.1** Drop ball Test setup

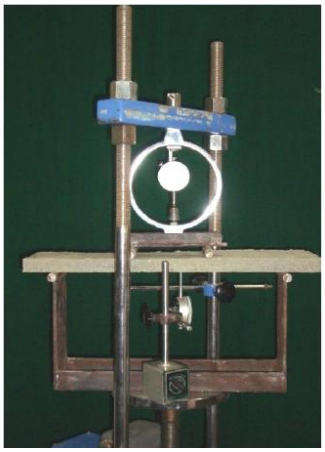

**Fig.2** Flexural Test setup

## VI. Conclusion

The study shows that the concrete canvas is one of the most important inventions in civil engineering field. It is flexible, economical, time consuming and can be used for emergency situations either temporarily or permanently. The study also shows that the concrete canvas has good resistance against impact as well as

withstands heavy loads with minimum deflection. It is easy to handle and install and can be used alternative of conventional concrete in tunneling, drainage lining etc.

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