

# A Study of Flexible Concrete Sheet in Civil Engineering Works

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**Abstract**-Concrete is most extensively used material in today's rapidly growing world. The concrete is used extensively in large variety of works such as construction of buildings, embankment construction, canal lining, slope covering and many such works. The laying of concrete on some places like the slopes and lining of canal is bit tedious and difficult if we use a conventional concrete. Hence, a new material was needed to be developed to overcome such difficulties. In addition, such material must be able to construct a structure in an emergency. Hence, a new material called flexible concrete sheet has developed. Flexible concrete sheet is the composite member having three layers in which bottom layer is impermeable layer, intermediate layer is a 3-D fiber matrix and top layer is permeable cotton layer. The middle layer has filled with a settable material, which can be cured. The settable material used here is cement mortar. The geometry of material consists of the three-dimensional matrix sandwiched in between the impervious PVC coating and top permeable layer. In addition, a separate settle able material is filled in the 3-dimensional matrix material. This leads to more typical form of material, which cannot made readily. This paper emphasizes on the benefits of using flexible Concrete sheet or Concrete cloth for rapid and fast construction of structures like canals and many other purposes. This material has a wide range of applications throughout the building and civil engineering industry.

**Index Terms**- Concrete Sheet, Concrete, Cement, 3-D fiber matrix

## I. INTRODUCTION

The cement concrete is the most commonly used material in the world in the field of construction industry. Concrete is composed of cement, sand, aggregate, water and admixtures. Now-a-days, concrete is widely used various fields in different conditions. Concrete can be molded in to any shape until it is wet. The concrete has many advantages like those that it is economical, can be easily made on site, and many more. Despite of these benefits the

concrete has a great drawback that it is not flexible. This drawback leads us to the development of new material called as flexible concrete sheet.

In construction field there is often need of flexible material that can be easily casted on site as well as in factory. Now a days, the composite material are being increasingly used because of their specific strength, flexibility, stiffness and this can be altered easily by changing fiber orientation and some or other property. Concrete sheet is upcoming revolution in the field of civil engineering. The material is then tested in practical situations of Ditch lining, slope protection, dust suspension in Helipad, Capping, pipeline protection and several other uses. The various advantages observed include ease of installation, high resistance to chemical attack, abrasion and high speed of work.

## II. REVIEW OF LITERATURE

The flexible concrete sheet is new innovative material and therefore not much work has done on it. The present material gets stiffness and hardness within 24 hours. The present literature review has classified into two parts

- Behavioral study
- Study of applications

The behavioral study of concrete sheet is essential because of its wide range of applications. Since the material is new and still in innovation stage no research work is available for the research work. The present work is carried out taking the reference of work of the Milliken Infrastructural Solutions. Milliken Infrastructural Solutions manufactured a material called Geo-synthetic Cementitious Composite Mat (GCCM).GCCM Concrete Cloth is three-dimensional flexible cement impregnated fabric that hardens after hydration. GCCM Concrete Cloth is an easy to use material with high degree of

flexibility. It can be rapidly unrolled to form a ditch or channel lining.

V. Vedha Narayanan published a paper, which aimed at study of different properties and application of concrete cloth in different fields. Vaseem Akhtar and AmitTyagi issued a paper on “Studying the Utility of Concrete Canvas”. The material with three different thicknesses is use for the research work. Prof. K. Srinivas and Prof. Ravindra studied the material closely to study the various specifications of the material manufactured by the British Company.

A review of the literature shows that a lot of work has done on the usefulness of flexible concrete material. The present study mainly aims at filling some of the voids that exist in the proper understanding of the behavior of the Concrete Sheet.

### III.APPLICATIONS

The flexible concrete cloth is applied in the wide range of fields from canal lining to pipe protection and from helipad construction to force protection. The uses of flexible concrete sheet are classified into two major categories: -

- **Civil uses or public uses** i.e. the sheet can be utilized for the common civilian uses such as trench lining, slope protection, weed control, etc.
- **Military uses** i.e. it can be employed for the various military applications such as construction of bunkers, tank lining, surface restructuring, etc.

### IV.CIVIL USES

#### A. Trench lining:-

The trench can be lined by two methods i.e. one layer method in which single section is used for installation and three-layer method in which three sections are used.

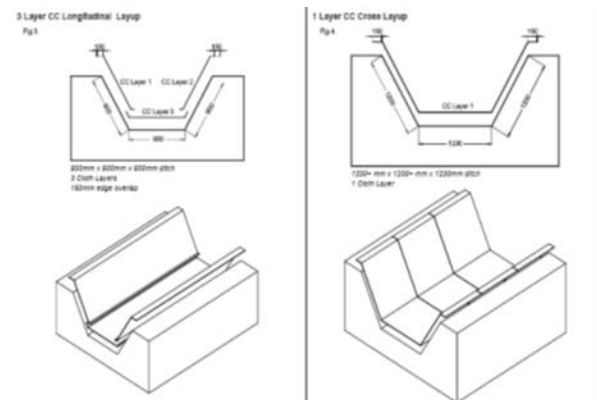


Fig. 1: - Trench Lining Methods

#### B. Man-made slope protection:-

Man-made slope can be protected with the help of flexible concrete sheet. It can be employed wherever there is minimal possibility of constructing retaining wall.



Fig. 2: - Slope Protection Method

#### C. Culvert and Pipe protection:-

The sheet can be used to protect the conduit or channel. The connection can be obtained by using arious stiffeners with the conduit. The material can be used to protect the pipe from inner and outer sides and hence helps in reducing corrosion.



Fig. 3: - Culvert Protection



Fig. 4: - Pipe Protection

### V.MILITARY USES

The material is very useful in improving the working and providing protection to the military forces.

#### A. Helipads:-

Many times in military work, it becomes necessary to construct temporary helipads instantaneously. Conventional concrete require long duration for construction however, the helipad construction with flexible concrete sheet requires only 24 hours and proper fastenings.



Fig. 5: - Helipad construction

#### B .Force protection and Bunkers Construction:-

The material is helpful in protection of military forces, which will significantly reduce the loss of human life. The following are specific benefits:

- It can available in any size as per the requirement and can molded in any shape at the time of casting.
- The concrete will provide a firm and rigid support and frontline protection to the military men



Fig. 6: - Sandbag Protection

**C. Device Resurfacing: -**

Many times the military men have to work in the area where there is no proper condition available for working. In such cases, it becomes difficult to conduct the military operations. In such extreme condition scan be employed



Fig. 7: - Road Repair

**D. Tank Lining: -**

The tank or ditches of army are to be lined for better results. However, in practice it is not possible to do so because conventional concrete requires large number of labors, time and material for lining



Fig. 8: - Tank Lining

**VI.BENEFITS**

The following are the key benefits of the flexible concrete sheet:

- The flexible concrete sheet can be shaped to follow a natural watercourse; woven surface can green over time

- Environmentally friendly: Minimal washout, low alkaline reserves
- Easy Installation
- Easily laid on steep slopes, in the rain
- Ideal for limited access sites
- Can be installed in the rain & sets underwater
- The concrete canvas or flexible concrete sheet is cost effective material, which can be used with minimum labor requirement on site.
- It can be manufacture at mass level in the factories and hence can help in saving the time on site.

**VII.CONCLUSION**

The various effects of the practical condition and other practical applicability are noted from the study of applications of the homogeneous composite flexible concrete sheet panels have been studied. The observations are summarized as follows:

- a. The homogeneous composite flexible concrete sheet panels can be used for both the civilian and military uses.
- b. The flexible concrete sheet material is found to be useful for large number of public utility works. The study has revealed that the sheet is suitable as well as economical instead of conventional concrete material.
- c. From the above study, it was observed that material performs satisfactorily in all even and odd conditions.

**REFERENCES**

- [1] "VASEEMAKHTAR, AMITYYAGI International Research Journal Of Engineering And Technology Volume: 02 Issue: 09 | Dec 2015 www.irjet.Net
- [2] "V. VEDHA NARAYANAN" International Journal on Applications in Civil and Environmental Engineering Volume 1: Issue 3: March 2015 ISSN (Online): 2395 - 3837, PP 6-12. www.aetsjournal.com
- [3] The Journal For Science, Engineering And Technology In Wales, issue 62, winter 2009
- [4] Spec.No.: Bd.F.8/Page No.302/I.S. 456 (2000)