



# **SNS COLLEGE OF TECHNOLOGY**



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**COIMBATORE**

## **DEPARTMENT OF CIVIL ENGINEERING**

**19CEB204 – CONSTRUCTION MATERIALS**

**II YEAR / III SEMESTER**

**Unit 5 : Modern Materials**

**Topic 9 : Fibre Textiles**



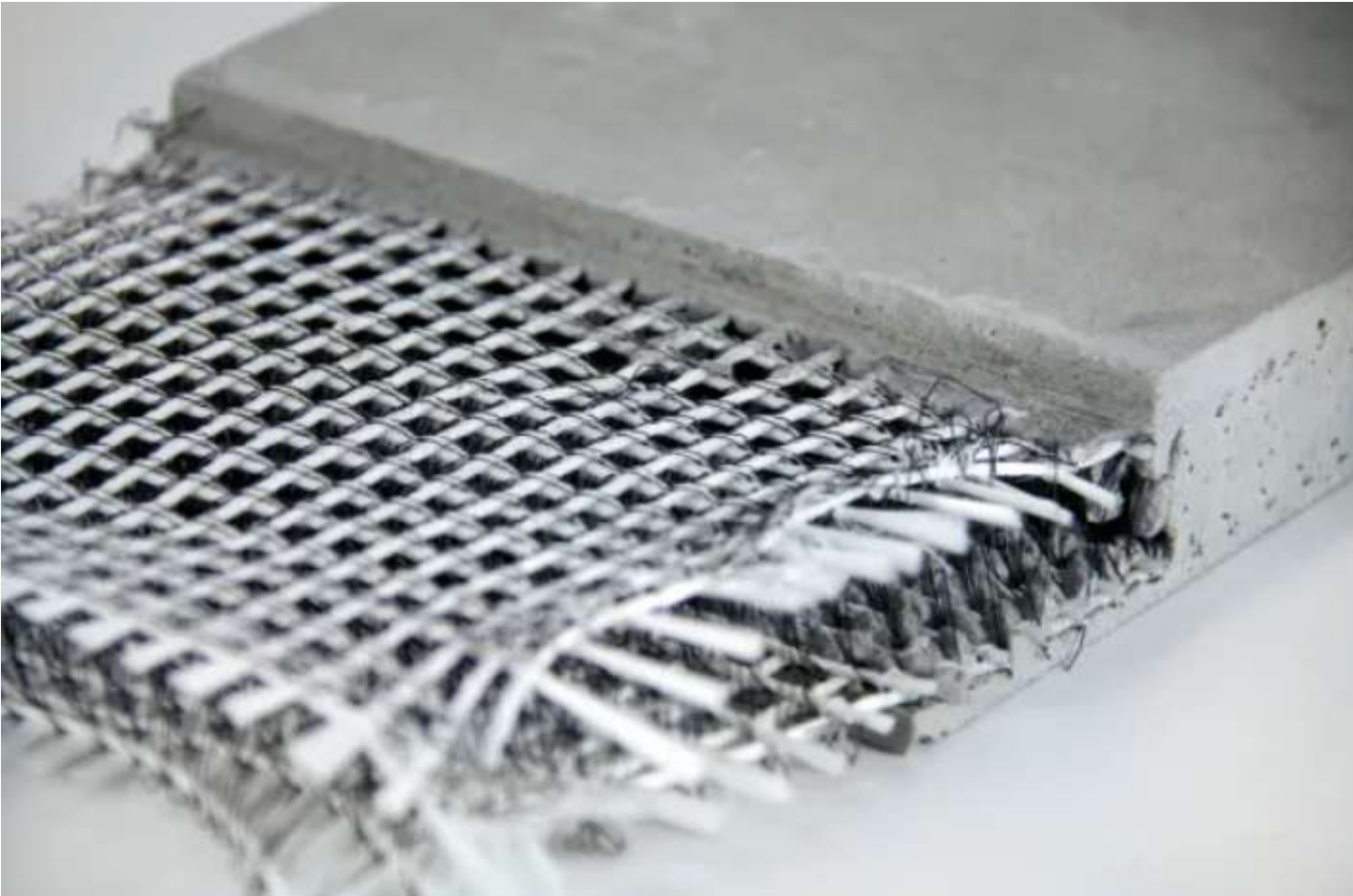
# Fiber Textiles



- Textile-reinforced concrete (TRC) or fabric-reinforced cementitious matrix (FRCM) is a composite concrete material that employs textile reinforcement instead of steel reinforcement. TRC is being widely used in construction for the past two decades and is a promising solution for retrofitting and strengthening concrete structures.
- The fabrics or textiles used for TRC are jute, glass, fiber, kevlar, polyamides, nylon etc.



# Fiber Textiles





# Features



- Tensile-reinforced concrete produces structures that are thin and malleable in nature. They have the ability to retain the high tensile strength of concrete.
- The textile mesh used for reinforcement must be open enough to allow concrete to pass through it during the concrete pouring process. The placement of the reinforcement also plays an important role in providing final strength to the concrete.
- The TRC material used must have high elongation before breaking, high tensile strength and a modulus of elasticity higher than the concrete matrix surrounding it.



# Textiles Used in TRC systems



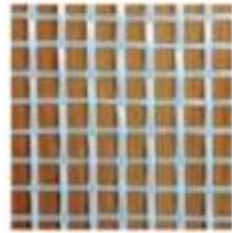
- Figure shows the textiles that are used for textile-reinforced concrete. Usually, the commercially available mesh size of most common non-metallic textiles for concrete strengthening application varies between 8 and 30 mm. They weigh between 150 to 600 g/m<sup>2</sup>. The weight of the textile mesh varies with the type of material.
- The fabric fibers unite with the mortar for achieving a good bond. The mortar or the concrete mix used for TRC must have sufficient plastic consistency, low viscosity, good workability, and sufficient shear strength to achieve this bond. So, mostly cement-based matrix is most commonly used for TRC systems.



# Textiles Used in TRC systems



(a)



(b)



(c)



(d)



(e)

Textile fiber reinforcements: (a) carbon fiber textile; (b) glass fiber textile; (c) basalt fiber textile; (d) polyphenylene bezobisoxazole (PBO) fiber textile; and (e) steel fiber textile.



# Production of TRC



The main factors that influence the production of textile-reinforced concrete are:

1. Quality of concrete mix
2. The interaction between the textile and the concrete
3. The quantity of textile fibers used
4. The arrangement of textile fibers in the concrete

The particle size of different ingredients in concrete used for TRC must be selected carefully. Coarser concrete mix does not pass through the textile reinforcement.



# Production of TRC



- It is recommended to use fresh concrete for the production of TRC. The use of chemical admixture helps the textile fibers to stick to the concrete.
- The textile reinforcement is either hand-laid or by mechanical means into the concrete.
- It is arranged in concrete in the direction of the main tensile stress. This ensures a higher degree of effectiveness to the concrete structure.
- The processes for creating TRC vary from traditional methods to pultrusion methods. The common methods to produce TRC are:





# Production of TRC



## 1. Casting

In this method,

- 1.The formwork is constructed
- 2.The textile-reinforcement is pre-installed in the formwork
- 3.The formwork is prepared for concrete pouring
- 4.The concrete is poured and left to harden
- 5.The formwork is removed to reveal the structure



# Production of TRC



## 2. Lamination

In this method,

- 1.The formwork is constructed to house concrete and textile
- 2.The concrete is spread evenly over the formwork
- 3.The textile reinforcement is placed
- 4.Concrete is poured over the textile reinforcement
- 5.The concrete is pushed into the spaces in the textile using rollers

## 3. Pultrusion

In this method, the textile is pushed into a slurry infiltration chamber. The textile covers and gets embedded with the concrete. Then the concrete is squeezed into the textiles using rollers. Rollers of various specifications are used to get the desired shape and size of the concrete.



# Advantages of TRC



- 1.The textile fiber reinforcement used in TRC is non-corrosive in nature.
- 2.TRC structures provide a higher degree of effectiveness.
- 3.Textile reinforcement in concrete enhances the mechanical behavior of concrete.
- 4.TRC structures are light in weight and can create different types of structural components.
- 5.Textile material in concrete enables the development of several cement-based composites.
- 6.Textile material allows provide freedom to engineer the of the final products for a specific objective.
- 7.TRC is sustainable in nature. It develops thin structures and hence consumes less material compared to conventional concrete structures. Retrofitting of old structures using TRC helps to increase the life of structures. TRC brings a significant decrease in terms of material consumption and cost.



# Applications of TRC



1. Construction of bridges, pillars, and road guards using kevlar or jute reinforced concrete to withstand sudden jerks and vibrations.
2. TRC can be used to reinforce and repair existing structures.
3. TRC is used as a protective layer for old structures or retrofit elements due to its corrosion resistance property.
4. TRC using carbon fiber helps to heat buildings. Carbon fiber is conductive in nature.



***Thank You!!***