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TITLE: LIGHT TRANSMITTING CONCRETE

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Abstract

Engineers have now developed concrete mixture that are capable of transmitting light, this is done by switching the ingredients of traditional grey concrete with transparent one. By embedding fibre optics now transparent concrete has become a reality. It is one of the new types of concrete introduced today, which is also known as translucent concrete or light transmitting concrete, which carries special property of light transmitting due to Optical fibres. Optical fibres are one which helps for transmission of light through fibre, to sense the stress of structures and to give aesthetic appearance. Translucent concrete is a concrete based material with light-transmissive properties, light is conducted through the fibre from one end to the other which results into a certain light pattern on the other surface, depending on the fibre structure. Optical fibres transmitting light concrete is so effective that there is virtually no loss of light conducted through the fibres. The Paper confines with the need of transparent concrete in today's world to utilize the sunlight and for architecture technologies, the usage of translucent concrete and also the advantages it brings in the field of smart construction and how optical fibre made transparent concrete a reality. The new technology concrete can satisfy the green energy saving with its own Natural properties.

Index Terms: composite material, Transmitting concrete, optical fibre, Aesthetic view, Architectural material

1. INTRODUCTION

Just a year decades ago concrete was often misunderstood, disliked and captured by its image fixed because of the rapid urbanization of the 1960s. But since that time, concrete has made considerable development, not only in technical terms, but also in aesthetic terms. In recently the heavy, cold and Grey material of the past; it has become beautiful and lively. By research and development, newly developed concrete has been created which is more, lighter, transparent or coloured, etc. Concrete has developed to adapt to almost all new challenges that appeared. In 2001, the concept of transparent concrete was first proposed by Hungarian architect Aron Losonzi, the first transparent concrete block was effectively developed by mixing a large quantity of glass fibre into concrete in 2003, called as LiTraCon. Joel S. and Sergio O.G. established a transparent concrete material which can passed 80% light through and only 30% of the weight of common concrete. The term "translucent concrete" has the ability to be somewhat misleading. The concrete itself is not only, but also different to

conventional concrete. Translucent concrete has been first reported in a 1935 Canadian patent. But from the development of optical glass fibres and polymer-based optical fibres the rate of inventions and developments in this field has increased rapidly. There have also been developments that apply this concept to more technical applications like fissure detection. In the early time forms like translucent concrete products popular today with fine & layered patterns were developed. Concrete is one of the components of a revolutionary new material marketed as "translucent concrete". Engineering has developed a long way in the field of construction. When many buildings are constructed close to each other and there is not much natural sunlight passing through and the importance of natural sunlight is well-known. Actually, 50 % day lighting is a compulsory requirement in a green building according to (IGBC) Indian Green Building Council accounting for 3 credits. A concrete block is going to be built with optical fibres in it and going to be tested for other properties. But the important reason of the blocks is saving energy using natural light and therefore reducing the amount of heat produced from artificial light. In Light-transmitting concrete which is also

known as translucent concrete, optical fibre's strands are cast into the concrete to transmit light either by naturally else by artificially means through translucent panels. It can be used in a wide range of architectural and interior design. This material can be used for architectural and interior design purpose. Building energy saving and building safety are main advantages of it. While the translucent concrete focused on transparency and its objective of application pertains to green technology and artistic finish. Transparent or translucent concrete can be seen as a recent solution to the architects call for more Transparent Architecture. Recently some new building materials are developed and used in structures, including self-diagnosis smart concrete, self-tuning smart concrete, self-repairing smart concrete, soundproof concrete, thermal insulation concrete etc. All these functional materials only focus on intelligence characteristics.

2. OBJECTIVE

- The aim of this paper is to analyze and describe one of the particular types of architectural concrete – translucent concrete.
- To know the study of how transparent concrete does works on light transmission.
- To cast a optical fiber concrete with light transmitting properties.
- To make concrete partially transparent by using optical fibres in it to impart good aesthetic view.
- To study Energy saving for illumination by using transparent block for making smart building.

3. MANUFACTURING PROCESS

The process for the manufacturing of transparent concrete is almost same as of the traditional concrete. The only difference is that it includes the optical fibre in the aggregate and cement mix. Fibres are placed in layered form in the mould. Small layers of concrete are transferred over one another and the fibres are imparted with the concrete. Large amount of optical fibre is used in the manufacture of transparent concrete, to have maximum exposure to the light, and to maintain its strength. A common transparent concrete is manufactured by adding 4% to 5% of optical fibre to the total volume of concrete mixture. The coarse aggregate is not used in the production of transparent concrete as they have tendency to damage the optical fibre. At the time of filling of concrete, concrete is transferred slowly so that the position of optical fibre is not displaced from its preferred place, to avoid the presence of void at the time of casting, the vibrating tables are used. While manufacturing transparent concrete, one must follow Indian standard method (IS 10262-2009) for concrete mix ratio and proportion of mixture. With proper curing of 2 times a day for next 7 days and after 24 hours of casting, the frame work can be removed, for having the desired strength of concrete. After that, for good shine and shape, the polishing and cutting work is done according to the need.

4. TEST

1] Workability test.

2] Compressive test.

3] Flexural test.

1] WORKABILITY:

The slump cone test is conducted to determine the workability of the concrete.

2] COMPRESSIVE TEST:

The compressive test is conducted to determine the compressive strength of the concrete. The compressive strength of the concrete is obtained by cast the cubes of size 150mmx150mmx150mm.

Compressive strength = load/area

3] FLEXURAL TEST:

The test on prism by two point loading is conducted to determine the flexural strength of the concrete.

Flexural strength = Pl/bd^2

Where, P – Load, l – Length of the specimen, b - width of the prism, d – depth of the prism.

4. APPLICATION

- Making it appear attractive and specious.



- The transparent concrete as front exterior wall of home or offices, make its look more attractive and it allows the people inside to see when there is a person standing outside.

statues etc. Above figure shows wash basin made up of transparent concrete.



- 3. Transparent concrete is also used as flooring on surface, illuminated from below. During the day time this type of flooring looks like typical concrete pavement but at sunset the paving block begin to shine in different colours.



6. ADVANTAGES

- It has very good architectural properties for giving good appearance to the building.
- It is used where light is not able to come properly.
- By utilization of transparent concrete in building energy can be saved.
- It is totally environment friendly and it reduces energy consumption.
- It is economic.
- Can be used in cold countries, to transmit heat with sunlight to the inner end.

- It can be used in stairs. Above figure shows the transparent concrete stairs.

7. DISADVANTAGES

- Costing of this material is difficult as the techniques are just start to develop.
- It is precision material and it needs correct procedure to be followed.
- Its main disadvantage is its high cost because of the optical fibres.
- Its manufacturing process requires both skilled labour and skilled supervision to perform the casting.
- Due to the light transmitting property of transparent concrete it has potential to change that cliché image of concrete and can transform the interior of building.



- Transparent concrete block can be made in desired shape and used as decorative material like table,

8. COMPARISON BETWEEN CONVENTIONAL AND TRANSPARENT CONCRETE

1. Transparent concrete is expensive as compare to conventional concrete.
2. It gives good appearance than conventional concrete.
3. The strength of transparent concrete is similar to conventional concrete.

9. FUTURE SCOPE

- Most of the engineer teams are working together to creates more affordable translucent concrete products through future licensing deals and large-scale production.
- This was best idea and now a days it is become very popular for decorative purpose and elevation view also
- It can become highly demanding for automobile showrooms for automobiles which run on solar power.
- If more and more began using this technology, more natural light can be used to light offices and structures.

3. CONCLUSION

Transparent concrete is a combination of optical fibre and traditional concrete which is made by fine aggregate, cement, water and optical fibre bonded together which is harden by time. The highlight of transparent concrete is it uses natural solar energy and reduces pollution. It also gives aesthetic view to the structure with the same strength. This concrete is very useful in cold region where main purpose is to utilize natural resources that is solar energy. All architectural and constructer need to focus mainly on creating alternative to a fibre optical with a lower price or to try a fine a solution for cheaper fibre optical production. The high strength of transparent concrete can be achieved by adding 4% of optical fibre to cement paste. It is durable, useable, systematic and modified green building.

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