

A STUDY ON TRANSPARENT CONCRETE

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Abstract – "TRANSPARENT CONCRETE" can also be called as TRANSLUCENT CONCRETE. Basically it is a type of concrete which transmit the light from one end to another end. For transmitting light we can use optical fiber. We need to place optical fiber properly so it can come out through the both ends of concrete block or panel. First of all we studied about "Optical Fiber" that how does it actually work. Optical fiber transmits light from one end to another end without loss of amount of light inserted into fiber. We also found that Optical Fiber is not Brittle Material so it will not reduce the strength of the concrete. After trying some different placing method we did not got satisfactory results. So, we made special hollow mould in which we can place optical fiber easily and in much more amount. Now, we found one difficulty that we cannot use coarse aggregate in this type of mould due to its size. So, we neglected coarse aggregate from our mix design and we used only mortar mixture with the ratio of (1:1.55)(Cement : Sand). We also designed our cubes as per the mix design of M20 and we got the strength of the cubes about M23-M25. We made cubes of (100mm x 100mm x 100mm) size as a assumption of a partition wall of 4-inch. We compared graphs of every cube after compressive strength and we got consistency in the strength of our cubes. Then we decided to make our cubes more Lightweight so we tried material called "PERLITE" in our mortar mixture. WE reduced 1kg. of weight with the use of perlite in the cube of size (100mm x 100mm x 100mm). Also we got reduction in the strength of our cubes but we achieved strength of 12-15 Mpa which is acceptable. We analyzed cost of all cubes of all different mix design.

Key Words: Transparent, Translucent, Optical Fiber, Transparency.



(TRANSPARENT CONCRETE PANEL OF SIZE

500mm X 200mm X 100mm)

INTRODUCTION

Concrete has been used since Roman times for the development of infrastructure and housing, but its basic

components have remained the same. Three ingredients make up the dry.

Mix: coarse aggregate, consisting of larger pieces of material like stones or gravel; fine Aggregate, made up of smaller particles such as sand; and cement, a very fine powder. Material that binds the mix together when water is added.

Just a few decades ago concrete was often misunderstood, disliked and captured by its image fixed due to the rapid urbanization of the 1960s. But since that time, concrete has made Considerable progress, not only in technical terms, but also in aesthetic terms.

It is no longer the heavy, cold and grey material of the past; it has become beautiful and lively. By research and innovation, newly developed concrete has been created which is more resistant, lighter, white or colored, etc. Concrete has learned to adapt to almost all new challenges that appeared. In 2001, the concept of transparent concrete was first put forward by Hungarian architect Aron Losonzi at the Technical University of Budapest, and the first transparent concrete block was successfully produced by mixing large amount of glass fiber into concrete in 2003, named as LiTraCon.

The transparent concrete mainly focuses on transparency and its objective of application pertains to green technology and artistic finish. It is the "combination of optical fibers and fine concrete". At present, green structures focus greatly on saving energy with in door thermal systems. Therefore it is imperative to develop a new functional material to satisfy the structure in terms of safety monitoring (such as damage detection, fire warning), environmental protection and energy saving and artistic modeling.

Due to globalization and construction of high-rise building, the space between buildings is reduced; this causes to increasing the use of non-renewable energy sources, so therefore there is a need of smart construction technique like green building and indoor thermal system. Translucent concrete (Transparent concrete) is new technique different from normal concrete. Translucent concrete allow more light and less weight compared to normal concrete. The use of sunlight source of light instead of using electrical energy is main purpose of translucent concrete, so as to reduce the load on non-renewable sources and result it into the energy saving. Optical fibers is a sensing or transmission element, so decrease the use of artificial light, the normal concrete is replaced by translucent concrete, which has natural lighting and art design.



Figure 1: Piece of Transparent Concrete used in Fencing Wall.

ABOUT OPTICAL FIBER:-

An Optical fiber is a flexible, transparent fiber made by drawing glass (silica) or plastic to a diameter slightly thicker than that of a human hair. Optical fibers are used most often as a means to transmit light between the two ends of the fiber and find wide usage in fiber-optic communications, where they permit transmission over longer distances and at higher bandwidths (data rates) than wire cables. Fibers are used instead of metal wires because signals travel along them with less loss; in addition, fibers are immune to electromagnetic interference, a problem from which metal wires suffer excessively.

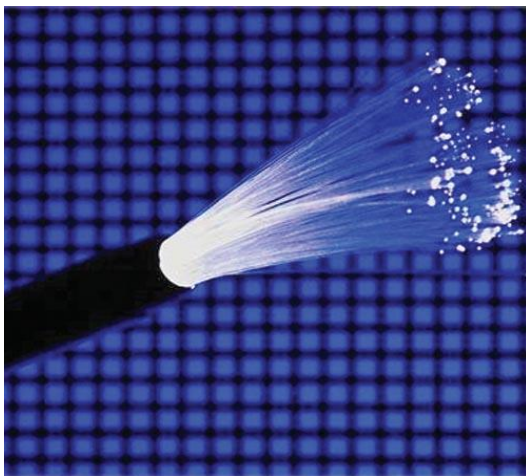


Figure 2: Picture of optical fiber.

MIX DESIGN:

(FOR CUBE OF SIZE 10cm X 10cm X 10cm).

WATER	CEMENT	SAND	OPTICAL FIBER
0.78 lit.	1.48 kg.	2.29 kg.	0.296 kg.
0.43	1.0	1.55	0.2

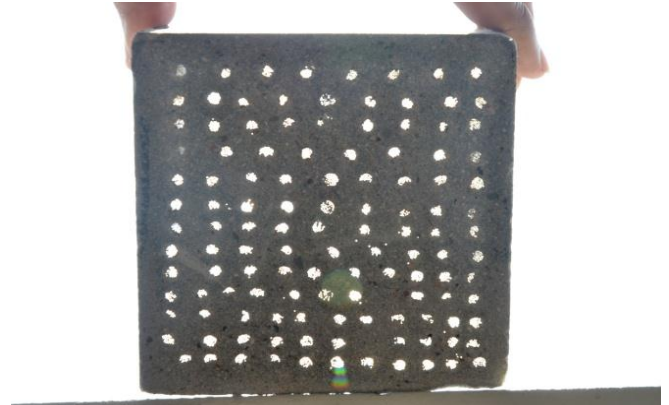


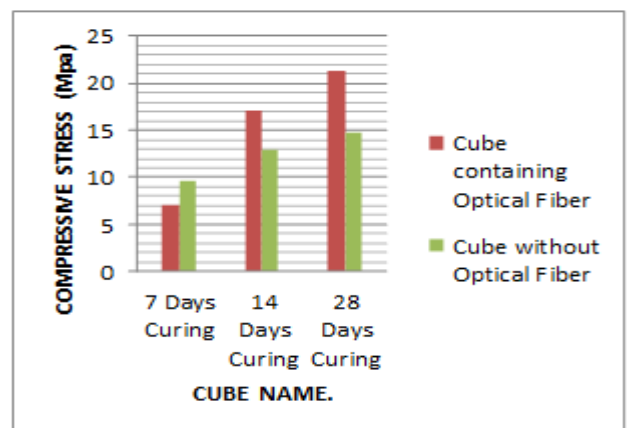
Figure 3: Actual Photograph of Transparent Concrete I made and transparency I got.



Figure 4: A special Hollow mould I made by my self so I can place good amount of Optical fibers uniformly.

Title	Weight	Compressive Strength of cube
7 days curing	2.10kg	71.4kN (7.1Mpa)
14 days curing	2.25kg	172.9kN (17.2Mpa)
28 days curing	2.12kg	214.5kN (21.4Mpa)

(Strength Analysis of Cubes of Transparent Concrete)



(Comparison CHART of strength between cubes containing optical fiber and without optical fiber).

APPLICATIONS OF TRANSPARENT CONCRETE CUBES:-

1. An Optical fibre is a flexible, transparent fibre made by drawing glass (silica) or plastic to a diameter slightly thicker than that of a human hair. Optical fibres are used most often as a means to transmit light between the two ends of the fibre and find wide usage in fibre-optic communications, where they permit transmission over longer distances and at higher bandwidths (data rates) than wire cables.
2. As this types of cubes can transmit the light they can be also useful in fencing walls in farm houses or club houses for attractive look.
3. This type of concrete block is only useful for a single wall or partition wall to as a part of interior design.
4. Even this type of concrete blocks can also be useful for making IGLOO because in the igloo we need some arrangement for light inside but using this product during the day time we can get easy access of the light inside the IGLOO.
5. For the BARN (GODOWN) we can also use this types of blocks so we don't need to provide extra space to enter sunlight and we can protect all the grocery stored in the BARN (GODOWN).
6. Transparent Concrete is a pure architectural product because of its high cost it is not useful as normal concrete block.
7. It can be also use as a decorative piece in the wall or at any corner as a night lamp.

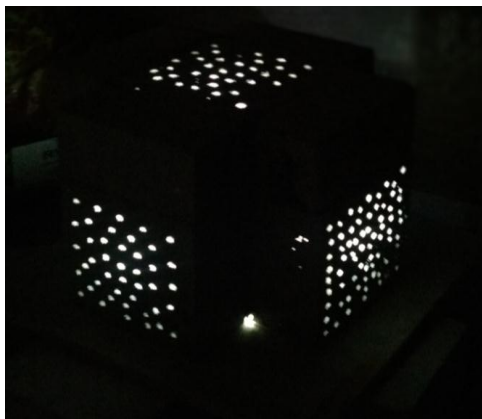


Figure 5: Night Lamp made by me using Transparent Concrete Blocks

CONCLUSIONS

1. This is a multipurpose product you can use it as a block of the wall also you can use it as a DECORATIVE PIECE for the small portion of the wall it saves energy

as well it also gives good aesthetic look. as well as is a strengthen product so this is a more durable product.

2. Our project is of a high cost but it can be economical after the use of long time because as its cost is high but it also save electricity in the area where we need to use electric light in the day time. Also it is the good product for providing aesthetic look of room or house.
3. We gets about 70% of light transmission (LUX) (Light Intensity) using optical fiber.
4. In the transparent concrete cube in which we placed optical fiber we get 40% more strength compare to the cube which does not contain optical fiber.
5. This product is also be use as a GREEN BUILDING MATERIAL because, it saves energy in the day time if you do not want to provide window you can use this type of blocks for the wall and also optical fibre do not pass the heat so we can reduce the temperature of the room. This product can be also useful in the Store rooms where you do not want to affect atmosphere to your stored products.

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