OPTIC FIBER EMBEDDED LIGHT TRANSMITTING CONCRETE BLOCK

H. R. Pawar
Assistant professor Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Dr. M. G. Deshmukh
Associate professor Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Kapil Patil
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Umesh Dhavare
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Nikhil Kadam
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Pratik Doke
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Ashutosh Kotalkar
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Prajoat Gatkal
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

ABSTRACT
Imagine a room without windows; it is day time but there is no light streaming through the door and no light are on inside. There is light however, because the walls are made up of translucent concrete, so far no-one has actually built room like this, but it is technically possible. LiTraCon a new concept in concreting field is gaining fast acceptance from civil and architectural firm from aesthetic avenues. LiTraCon is smart combination of optical fibers and fine concrete. Because of little size of filaments, they mix in to concrete turning into a part of material like little bits of total. Strands of optical filaments in cement to send light either normal or fake. The LiTraCon can be used in the variety of architectural and interior design applications such as cladding, side way, logos, litracube lamps, arches, speed

bumps and also for heat insulation. Light conducting glass fibers have been used for a long time in technical fields such as communications, medicine and automotive sector.

I. Introduction

Optic fibers embedded light Transmitting concrete (LiTraCon)

One of the recent inventions in 2004 is litracon, translucent concrete block. Invented by young Hungarian architect AronLusonzi. The recipe for concrete includes tens of thousands of optical fibres that run side by side and transmit light between the block's two major surfaces. Internal reflection directs the light waves toward the centre of the object. The following blends are in the fibre up to 20 metres from the exit. Light rays' hues are unchanged.

Litracon light- Transmitting concrete Litracon presents the peculiarity of lighttransmitting concrete as a generally pertinent new structure materialLitracon is a blend of optical filaments and fine concrete. It very well may be delivered as pre-assembled fabricating blocks and panels.

Advantages of Litracon concrete blocks:

1) Light transmitting concrete improves aesthetic view of building.
2) It saves electricity.
3) It used as structural member in load bearing building
4) It also insulates the heat.
5) Concrete would soon change from being a material that was massive and unnatural to one that was lovely and airy.
6) It reduces thickness of concrete panel.

Disadvantages of Litracon:

1) Cost of raw materials and fabrication is high.
2) It requires skilled labour.
3) It requires waterproof sealing.

II. Objectives

1. To study different optic fiber embedded light transmitting concrete blocks and their applications.

2. Comparative study of strength of optic fiber embedded light transmitting concrete blocks with conventional concrete blocks.

3. Evaluation of light transmission capacity of optics fiber embedded light transmitting concrete blocks.

III. Methodology

1. **To cast a special type of concrete that transmit light.**

   Translucent concrete is to be utilized in fine design as a veneer material and for cladding of inside walls. Light- transmitting concrete has likewise been applied to different plan items.

2. **To investigate their traits and create a material that works and not only saves energy but also has a beautiful finish.**

   Practically every new challenge that surfaced has been overcome by Concrete. Aron Losonzi, a Hungarian modeller, first proposed the concept of simple cement in 2001, and the first simple substantial block was successfully made by incorporating a great deal of glass fibre into concrete.

3. **To study cost effectiveness of the product**.

   The cost is to be more but energy save. Effective for transferring energy.

4. **To give architectural and aesthetic view to the structure**.

   Give architectural and aesthetic view to the structure. Light is transferred

IV. Therotical analysis

This section consist the light properties of matter, Ingredients of litracon, manufacturing process of optic fibers, Manufacturing process of light transmitting concrete block, Properties of LiTraCon concrete blocks, Illumination of LiTraCon concrete blocks, Advantages of Litracon concrete blocks, Applications of Litracon concrete blocks, Ingredients of litracon, Manufacturing process of optic fibers, Materials, Manufacturing process of light transmitting concrete block, Properties of LiTraCon concrete blocks, Illumination of LiTraCon concrete blocks, Advantages of Litracon concrete blocks etc..

Light Properties of Matter:

Following are the light properties of matter

1) Transparent: It is the properties of matter which allows light to pass through it so that body can be distinctly seen, i.e. easily seen through.

2) Translucent: It is the properties of matter which allows light to pass through it diffusely. e.g. – Coloured Glass.

Ingredients of litracon:

Already we seen the optic fibers embedded light transmitting concrete made up of thousands of optic fibers and fine concrete the recipe of litracon contains following ingredients-

Cement + water + Crushed sand + Optic fibres = LiTraCon

Cement:

Quick set, ordinary Portland cement having 53 grades. which satisfy all the IS requirement is used to make cement concrete blocks

Crushed sand:

As in fine concrete crushed sand is deployed rather than ordinary aggregates. Because of optics fibers acts as aggregates. LiTraCon is combination of fine concrete and optic fibers we already seen. In fine concrete there is no use of course aggregate in concrete. Instead of that crushed sand (very fine) is deployed to make LiTraCon blocks.

Optic fibers:

Present age is age of optical materials. This is because optical materials and equipment play a significant part in a number of crucial aspects of human activity, such as fibers for optical communications. Optical coating and energy-saving tools, lenses, filters, and optically active materials for observing, detecting, displaying, and recording images in microscopy, photography, media, and information applications, as well as in the construction industry as building materials and structural health monitoring.

V. Manufacturing process of light transmitting concrete block

Initially, each fibre filament was individually inserted into the concrete, which added time and expense to the production process. Instead of using single fibres, most modern, self-loader production procedures use woven fibre texture. In melds, concrete and fabric are alternately injected at intervals of around 2 to 5 mm. An increased amount of light can pass through the substantial via layers that are more thin or modest. After projecting, the material is cut into predetermined-thickness boards or blocks, and the surface is then typically cleaned, resulting in the transition from semi-sparkle to reflexive.

The building block also into a cast material embedded photoconductive fibers, like for the example optical fibers or such a thing, whereby the fibers make a light transmission possible of a side face of the building block to an opposite side face of the same, can become by a method manufactured, which exhibits the subsequent steps Admit a cast material into an elongated shape in an initial step, positioning of a layer of fibers in the mould in a second step, whereby the layer becomes from a plurality of parallel disposed fibers formed, exercising mechanical pressure and/or vibration on the mould in a third step, so that the fiber layer can sink into the cast material up to a desired depth, to repeating step one to three, the alternative steps two to three, until the mould with the cast material and a plurality of fiber layers is filled, whereby allowed becomes that the cast material solidifies itself and forms an homogeneous body, and division of the solidified moulded body by cuts into building blocks, so that the respective ends of the fiber layers at a respective side face of the building block end.

VI. Properties of LiTraCon concrete blocks

Name of the product: LiTraCon: Light Transmitting concrete block.

Table No: - 1

Sr.No.	Particulars	Properties
1	Form	Prefabricated concrete block
2	Ingredients	96% fine concrete, 4% optical fibers
3	Density	2100 -2400 kg/m3
4	Thickness	25-500 mm
5	Colour	Grey, black, white.
6	Fiber distribution	Organic
7	Finish	Polished

Applications of Litracon concrete blocks

Load-bearing plans can similarly be created using these blocks, as glass strands don't altogether influence the high compressive strength of concrete. The blocks can be conveyed in various sizes and moreover consolidate embedded heat-separation

Following are applications of optic fibers embedded light transmitting concrete.

- Side way
- Logos
- Screen wall
- Litracube lamps
- Arches
- Heat insulation. etc.

VII. Result

Compressive Strength Test:

The results of compressive strength test at 7 day and 28 days are as displayed in the table.

For M20 Grade of concrete

Table No: - 2 Compressive strength result

SR. NO.	Curing period (days)	**Compressive Strength (MPa)**		**Average Compressive Strength (MPa)**	
		Ordinary concrete	Translucent concrete	Ordinary concrete	Translucent concrete
1	7 days	13.00	12.35	12.80	12.23
2		12.50	12.10		
3		12.80	12.25		
4	28 days	19.80	19.65	19.35	18.93
5		19.00	18.75		
6		19.25	18.40		

Light Transmissibility Test:

It was found that the bulb's transmissibility at a specific distance was 5032 lux. Then, the contagiousness values were acquired by setting clear substantial examples.

$$\% \text{ Transmissibility} = \frac{\text{transmissibility through concrete}}{\text{transmissibility through the air}}$$

Table No:3 Transmissibility test result

Sr.No.	Transmissibility (lux)	Transmissibility (%)	AvarageTransmissibity (%)
1	192	3.9	4.07
2	217	4.3	
3	206	4.2	

VIII. Conclusion

Unlike normal concrete which gives a bulky mass due to its appearance, litracon renders soothing spacious feel on virtue of its light transmitting ability.

When the walls are constructed of litracon the roominess of room is felt is to be increased as the wall appears to be slender thin.

The only disadvantages hampering the universal acceptance of litracon is its economic aspect it is well known fact that the cost of material and labour is extensively more than that of normal concrete.

The cost of manufacturing for litracon can be minimising if an in-house plant for production of optical fibers is set up. Reuse of crushed sand and waste glass are also an avenue for greatly reducing the cost.

Refrences

Books:

1) S. Ravivarman :- Experimental study on light transmitting concrete (LiTraCon)
2) S KavithaKarthikeyan: - Light Transmitting Mortar Block
3) NimithaVijayaraghavan: - Properties of Concrete Cube by Using Optical Fibre
4) A.A. Momin: - Study on Light Transmittance of Concrete Using Optical Fibers &Glass Rod

Magazines:

1) Ambuja cement technical literature series (116); material for construction emerging technology- part II, Jan 2006.
2) Ambuja cement technical literature series (79); conquering concrete- Sept. 2005
3) Transmaterial ; light transmitting concrete,
4) National Building Museum Annual Report 2004