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An investigational study on "Litracon"

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ABSTRACT: *Currently, small buildings are replaced by high rise buildings and sky scrapers. This arises one of the problem in driving natural light in building due to obstruction of nearby structures. As a result use of artificial sources for illumination of building is increased by great amount. Litracon (light transmitting concrete) successfully produced the first transparent concrete block in 2003. It is very essential to reduce the artificial light consumption in structure, since concrete is strong in compression and week in tension and flexure. The present study aims at producing the light transmitting concrete specimens by reinforcing optical fibers and comparing it with the conventional concrete. The concrete specimens were subjected to different tests such as compressive strength test, split tensile strength test. The results of the transmission test were satisfactory as the POF retain its efficiency. That's why it is evident that the transparency of the concrete structures can be introduced with the insertion of optical fiber without compromising the strength, which is a step forward to the aspiration of achieving some few feet in urban architecture.*

KEYWORDS *– Energy savings, Modern Technology, Light transmitting Concrete, Optical Fibers, Smart Construction, Translucent Concrete*

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I. INTRODUCTION

In moment's advanced world energy consumption is veritably high. Clear substantial comes in as a gift answer for supplement day lighting. Clear concrete is a substantial grounded structure material having light transmissive property. Light transmissive property is generally because of invariant rotation of high fine optic beaches all through its body light transmissive property is unnaturally because of invariant appropriation of numerical optic filaments throughout its body. In 2001, the idea of straightforward cement was first put forward by Hungarian mastermind Aron Losozi, also, the main straightforward substantial forecourt was effectively delivered by blending huge measure of glass fiber into concrete in 2003, named as Litracon. JoelS. Likewise, SergioO.G. Fostered a straightforward substantial material, which can permit 80 light through and just 30 of weight of normal cement. Concrete has an important part in the development of structure, Due to rapid-fire population growth; little structures are superseded by elevated structures. Light communicating concrete is one of the new, most practical procedure and not the same as anticipated cement. This substantial permits all the further light and lower weight discrepancy with typical cement. A light communicating concrete is elegantly satisfying; it's anything but an exceptionally appealing out look to the structures.

II. LITERATURE REVIEW

Figure of the jotting on light communicating concrete was to assess the capacity of the light transfer concrete. This assessment unites the discoveries and assessments plant in the jotting, distributed primarily during the once certain times, concerning the strength and swish parcels of Litracon alongside negotiation of concrete mind silica seethe concerning expanding strength. This review likewise indicates the progressions thathave happed in conclusions on the under examination.

Litracon was first introduced in 2003. Litracon nominated as light transmitting concrete is cement grounded material which consists of cement, fine total, optic fiber and water. Its light transmitting parcels depends on the large figures of optic filaments as Beaches which transmit the light through the fine concrete. Optic fiber used in fine concrete may be plastic, glassy or organic fiber. It transmits light which may be natural or artificial from one end of concrete element to another end.

Shen Juan andet.al (2013) check the advancement of smart straightforward cement grounded on its superb parcels of straightforward and shrewd detecting. By managing its use and likewise the benefits it acquires the field of brilliant development it lessens the force application of cheering and uses the optic filaments to sense the stress of structures. And this concrete is also used for a structural reason for great

aesthetical appearance of the structure. It can also be employed where the light cannot reach with proper intensity. It has some disadvantages similar as bear professed supervision and also its cost is veritably grandly due to the optic filaments used in it.

Kashiyani BhavinK.et.al (2013) deliberate light transmitting concrete, its colorful constituents, manufacturing process, construction, operations, advantage and disadvantages, etc. Light transmitting concrete was made by blending together the concrete and 4 to5 optic filaments. The consistence of optic filaments being 2micrometre to 2 mm. Alternate layers of POF and concrete are placed to form light transmitting concrete. This concrete grounded on star of total internal reflection of optic filaments.

Bhushan Padma JohnsonD. (2013) demonstrated translucent concrete blocks using concrete and plastic optic filaments. They bandied about the operation of these concrete blocks similar as in the walls, ceilings to make it architecturally pleasing, illuminating speed bumps, use on sidewalks, on colorful innards and surface shells of the structures to make it aesthetically beautiful.

Ghutke and Bhandari (2014)check the impact of silica rage on concrete. Results showed that the silica seethe is a decent negotiation of concrete. The pace of solidarity acquire in silica smolder concrete is high. Plasticity of substantial declines as proliferation with of silica rage. The ideal worth of compressive strength can be fulfilled in 10replacement of silica rage. As strength of 15 negotiation of concrete by silica rage is further than ordinary cement. The ideal silica seethe negotiation rate differs from 10 to15 negotiation position.**Amarkhaili (2015)**Noticed impacts of silica rage on parcels of high strength concrete. Tracked down that up to 10 concrete. Might be superseded by silica rage without hurting the substantial utility. Concrete containing 10 silica smolder negotiation fulfilled the most noteworthy compressive strength followed by 15 silica rage displacing with a little distinction. Concrete with 15 silica rage content fulfilled the most noteworthy flexural strength. 10 and 15 silica rage. Content as negotiation of concrete were discovered to be the ideal sum for basically enhancement of compressive strength and flexural strength independently.

Gurpreet Singh,et.al (2016) contemplated optic beaches projecting by concrete, FA, CA, optic fibers. Projecting of regular cement (0of plastic optic fiber), projecting of 3 of plastic optic fiber content, projecting of 4 of plastic optic fiber concrete, pressure test, and light transmission test are the means in question. Thelight transmission through 3 fiber is10.51 and 4 beaches is12.55. It saves power cost of a private structure for the duration of its life time. Compressive strength of 0 fiber, 3 fiber.

Kavya S, Karthik D,et.al (2016) completed an exploratory examination on light transferring substantial exercising optic fibers. The adventure was completed by adding2.5, 5 optic fibers and inferred that the strength of cement is high at4.5 and continuously decline at5.5 collectively. The proficiency of the application of the optic fibers was concentrated by differing the strength and typical M30 grade concrete and the test issues demonstrated that the effectiveness is more in all angles. Accordingly the application of optic fiber will make the substantial beautifying just as make the substantial design complete.

Ravikumar.N (2018) delved that the compressive strength of cement block reduces with the increase in chance of filaments used in the concrete block. The compressive strength reduces for further than4 of optic fiber and hence optimum is optimum is about 3 of optic filaments.

III. INDENTATIONS AND EQUATIONS

3.1 METHODOLOGY

Assembling measure for acquired blend extent M20 [1:2.85:2.17] concrete. Shape planning: during the time spent creating light sending concrete the initial step included is arrangement of form. The shape model can be made with various materials, for example, cast iron or play wood in the mould preparation, fix the essential components of form. The standard size of cube and cylinder according to IS456:2000 is 15 cm×15cm×15cmand 30 cm height with 15cm diameter for concrete respectively.

(1) Mould is prepared of size 150×150×150mm cube.

(2) The shape is comprised of two pressed wood faces with a plywoodbase plate.

(3) The two essences of compressed wood are bored at a uniform dividing to hold the discretionary fiber set up during projecting cement into the shape.

(4) The two drilled plywood face are put inverse to one another so as to place optical fiber in signal direction.

(5) The optical fiber are cut into adequate length and set separately through the openings in the two compressed wood side facing opposite to each other. Now the concrete is prey and poured into the mould.

(6) The mould is compacted to avoid improper filling and void formation. The specimen is then allowed to harden for 24 hours and then the mould is removed and specimen is kept for curing.

(7) Properties of Material

• Technical specifications.

• Material performance

• Environment Impact.

3.2 Estimation of material quantity:
3.2.1 Material:-
On the basis of mix design of $1m^3$
Volume of block $= 3.375\times10^{-3}$
For 96% concrete& 4% optical fiber $= 3.375 \times 10^{-3}\times\frac{4}{100}$
Volume of fiber= $1.35\times 10^{-4}m^3$
$= 3.375\times 10^{-3}\text{-}1.35 \times 10^{-3}$
$= 3.24 \times 10^{-3}m^3$

1) Cement $= 440 \times 3.24 \times 10^{-3}$ $= 1.425$ kg

2) Sand $= 704\times 3.24 \times 10^{-3}$ $= 2.280$ Kg

3) Crushed stone $= 827.90 \times 3.24 \times 10^{-3}$ $= 2.682$ Kg

4) Water $= 220 \times 3.24 \times 10^{-3}$ $= 0.7128$Kg

3.2.2 Concrete cubes are cast in 15cm size
Specially used Moulds size = 15cm × 15cm × 15 cm

IV. FIGURES AND TABLES



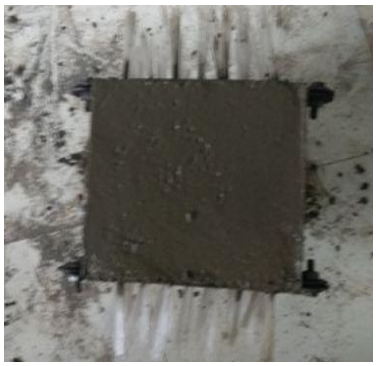

Fig 1. Mould showing fiber insertion **F ig 2.**Inside view of fiber concrete block **Fig 3**. Casting of block

3.2.3 Casting of blocks:

The casting process of transparent concrete is almost same as regular concrete. Only optical fibers are spread throughout the aggregate and cement mix. Small layers of the concrete are poured on top of each other and infused with the fibers and are then connected. Thousands of strands of optical fibers are cast into concrete to transmit light, either natural or artificial. Light- transmitting concrete is produced by adding required amount of optical fibers by volume into the concrete mixture. The concrete mixture is made from fine materials only it does not contain coarse aggregate. Then place one layer of concrete at the bottom of mould. Then the optical fibers are woven in the holes made on the faces of the mould. When the layer of concrete is placed it is compacted by the iron rod to avoid the air gaps between the concrete. Repeat this process of alternate placing of concrete and optical fibers up to the top of the mould. Place the last layer of concrete on top of mould. Make the top level smooth.

3.2.4 Mix design for block:

Materials	Weight per cube (15×15×15cm)
Cement	1.42
Fine aggregate (sand)	2.28
Crushed stone	2.68
W/C	0.5

V. CONCLUSION

The Light Transmitting concrete don't loses strength boundary when contrasted with standard cement. It has great light communicating property and the proportion of optical fiber volume to concrete is extent to transmission. It has essential property for the stylish perspective. It tends to be utilized for the best compositional appearance of the structure. Likewise utilized where the light can't reach with proper force. Optical fiber additionally goes about as support for the substantial.

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