

# To Study the Mechanical Properties of Translucent Concrete

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Submitted: 30-08-2021

Revised: 03-09-2021

Accepted: 05-09-2021

## ABSTRACT:-

Translucent concrete is a concrete based on building materials with light- transmission properties due to embedded light optical elements such as optical fibers. Light is conducted through the stone from one end to the other. The fibers have to go through the whole objects. Its have many more advantages over convectional type of partition wall. In previous studies of translucent concrete the use of optical fiber used up to 5% only. we have use optical fiber bound 5% that is up to 5.5% and 6% and check the behaviors of translucent concrete like strength characteristic of concrete and light transmitting property. Normally this used for aesthetic purpose. This project was performed and submitted in the academic year 2017-18.

**Keywords:**(Translucent concrete , optical Fibers, LDR,PhotoelectricCell, compression).

## I. INTRODUCTION:-

Translucent concrete is a combination of optical fiber and fine grade concrete. The number of fiber runs side by side transmitting light between the two surfaces of elements. Because of their small size the fiber blend into concrete becoming a component of a material like small piece of ballast. In theory, a wall structure created out of translucent concrete block can be a couple of meter thick as the fiber work almost without loss in light. Moreover the block can be used in load bearing as well as in framed structural and, provide the some effect with

both natural and artificial light. Plastic optical fiber leads light by point between the light surfaces. Shadow on the lighter side will appear with sharp outline on the darker one. Even the color remains the same. Such a wall with optical fiber pixels act as if scanner and screen are united. This special effect creates the general impression that thickness and weight of the concrete wall disappear.

Translucent concrete blocks are produced depending on aesthetic wishes and structural need of project. Basically all size of precast concrete is possible. Translucent concrete block have some technical data are used for them. The some flexibility occurs with fiber.

## Objectives:-

- To cast a special type of concrete with light transmitting properties.
- To study compression strength characteristics of translucent concrete.
- To study the intensity of light transmitted by fibers present in block.

## Mix Design:-

Concrete was designed for developing, 20 N/mm<sup>2</sup> characteristic compressive strength on 28<sup>th</sup> day. The mix design was carried out in accordance with IS: 10262-2009, also tabular values from IS: 456- 2000 were used.

Therefore actual quantity of materials and proportion changes to,

Materials	Cement (kg/m3)	Sand (kg/m3)	CA (kg/m3)	Water (lit)
Quantity	395.74	581.19	1224.35	196.51
Ratio	1.00	1.3	2.9	0.50(w/c)

(Table.01)

**Preparation of formwork:-**

As this type of concrete comes under the domain of special type of concretes, so formwork for this type of concrete to be use is of special charters which can allow the fibers to pass threu it. Without any chance of leakage or seepage of material and obtain adequate size, shape and

smooth surface. Single formwork is made for total 6 cubes by following dimension – 290mm X 250mm X 150mm and drilled by 3mm bit machine on each side to pass plastic optical fibers of 0.75mm diameter and it can striped and hold or pinned on each edges by support.



(Fig.01 formwork)

**Material used for translucent concrete:-**

1. Optical fiber:-
  - Optic fiber is a kind of optical transmission material, light transmission through optical fiber can form a new light effect.
  - Optical fiber itself is not charged and does not light, so it is safe for people to use.
  - It is soft and flexible, easy to create whatever shape or design you want.
  - Our optic fiber is super bright fiber, high brightness and light transmission distance reaches 1-3m (depending on light color or light source power), great for short distance high-brightness products.
  - Perfect for different kinds of decoration. Widely used to make curtain, screen, cinema, ceiling sky decoration. Product Dimension: 150/200/300Pcs x 0.75mm diameter x 2m long.
2. Cement:-
  - Cement is used as binding material in this concrete. The ordinary Portland cement (OPC) of a particular brand is used to cast various molds as per the mix design.

3. Sand:-
  - Natural sand is used to cast translucent concrete blocks, which is locally available near the city.
4. Course Aggregate:-
  - As we have to pass the fibers threu the concrete so we decided to use aggregate less than 10mm and design the concrete accordingly.

**Various tests perform on translucent concrete:-**  
 The following test are performed to check the various properties of translucent concrete,

1. Compression Test:-  
 Concrete gains strength with time after casting. It takes much time for concrete to gain 100% strength and the time for same is still unknown. The rate of gain of concrete compressive strength in higher during the first 28 days of casting and then it slows down. The table below shows the compressive strength gained by concrete after 1, 3, 7, 14 and 28 days with respect to the grade of concrete we use.

Age	Strength per cent
1 day	16%
3 days	40%

7 days	65%
14 days	90%
28 days	99%

From above table, we see that, concrete gains 16 percent strength in one day, 40 percent in 3 days, 65% in 7 days, 90% in 14 days and 99% strength in 28 days.

Thus, it is clear that concrete gains its strength rapidly in the initial days after casting, i.e.

90% in only 14 days. When, its strength have reached 99% in 28 days, still concrete continues to gain strength after that period, but that rate of gain in compressive strength is very less compared to that in 28 days.



(Fig.02. Compressive test)

Sample Calculation:-

Compressive Strength of concrete = Maximum compressive load / Cross Sectional Area

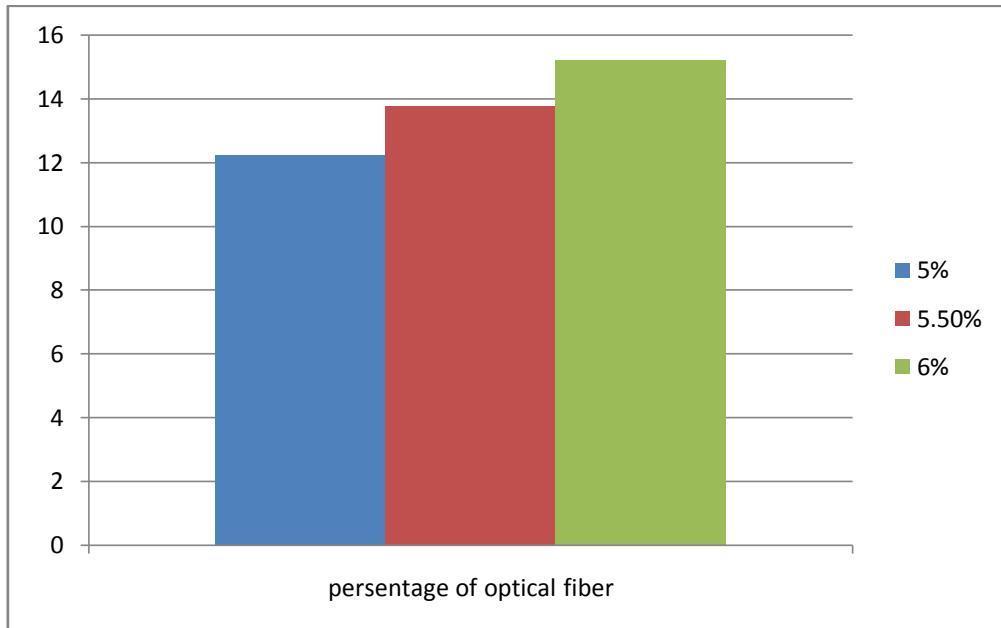
Cross sectional Area = 43500mm<sup>2</sup>

Assume the compression load is 450 KN,

Compressive Strength = 15.21N/mm<sup>2</sup>

Sr. No	For 5% OF OPTICAL FIBER IN N/MM <sup>2</sup>	FOR 5.5% OF OPTICAL FIBER IN N/MM <sup>2</sup>	FOR 6% OF OPTICAL FIBER IN N/MM <sup>2</sup>
1	12.23	13.75	15.21

(Table no.2)



(Graph no:-1)

2. L.D.R TEST :-

The light transmittance through the sample can be measured by measuring the current corresponding to the light which can be measured by a photo diode or a Light Dependent Resistors

(LDR). The use of photo diode would require a separate sensor which would increase the cost of the project. The most apt choice would be LDR. The LDR are soldered onto a PCB board.



(fig.03. light source and LDR reviser).

[fig.shows experimental setup for calculating light transmission property] A 60 w incandescent bulbs taken here, throughout the test, to ensure no light escapes. At the top of the specimen light source and at the bottom LDR is placed. Between light and LDR concrete is placed and test is carried out. Reading are taken by differing the voltage. Two values are taken, one without concrete sample (R1) and one with concrete sample (R2). Amount of light transmitted is calculated as follows:

$$\text{Light transmittance} = \frac{I_2/I_1 = R_2/R_1}{I_2/I_1 = 12/2}$$

$$I_2/I_1 = 6/1 \text{ or } 6:1$$

Where,  
 R1 = ammeter reading without specimen. [2 ohm]  
 R2 = ammeter reading with specimen. [12 ohm]

Therefore the rate of passing light threwh the blocks is 6:1 by L.D.R test, passes from one end to other end of block.

3. Photoelectric Cell Test:-

$$\begin{aligned} I1/I2 &= E2/E1 \\ &= 13.9/58 \\ &= 23.96\% \end{aligned}$$

Where,

E1= ammeter reading without specimen. [58 V]

E2 = ammeter reading with specimen. [13.9 V]

Therefore the light transference by photoelectric cell method is 23.96% of voltage passes from one end to other end of block.

**Result of L.D.R and photoelectric cell the tests:-**

Percentage of optical fibre	L.D.R in Ohm	photoelectric cell in %
6%	6:1	23.96

(Table no.2)

**II. CONCLUSION:-**

- Compressive strength after 5% of optical fiber of total volume of blocks, strength will go on increasing.
- The rate of passing the light threw the L.D.R test is 6:1.
- The light transference by photoelectric cell method is 23.96%

**Scope:-**

- To reduce the initial cost of translucent concrete.
- To cast a high strength concrete.
- To replace natural sand with waste foundry sand.

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