

An Experimental Study on Light Translucent Concrete by using Optical Fiber

Akshay A. Jadhav¹ Mahesh M. Mane² Ganesh v. Shewale³ Mahavir D. Damakale⁴

Prof. B. M. Mohite⁵

^{1,2,3,4}Student ⁵Head

^{1,2,3,4,5}Department of Civil Engineering

^{1,2,3,4,5}Adarsh Institute of Technology and Research Centre, Vita, Maharashtra, India

Abstract— This project deals with lighth translucent property of concrete by using optical fiber. This project study which not only includes aesthetical consideration but also the strengthening property of optical fiber in concrete by increasing the percentage of concrete from 1.5% to 2.5%. The study aims at producing the concrete specimens by optical fiber and comparing it with the conventional concrete. The concrete specimens were subjected to different tests such as compressive strength test, flexure strength test, and lighth translucent test etc. optical fiber are one which help for transmission of light through fiber. The concept of lighth translucent concrete. When it is used in ceiling or side wall, it is exposed to direct sun lighth which transmit the image but not completely transparent. In this paper the smart translucent concrete can be regarded as a green energy saving construction material. It is promising technology for field application in civil infrastructures.

Key words: Translucent Concrete, Normal Concrete, Optical Fiber, Compressive Strength, Flexure Strength

I. INTRODUCTION

Light Translucent Concrete is a combination of fibre optics and concrete. It can be produced as prefabricated building blocks and panels. Due to the small size of the fibres, they blend into concrete becoming a component of the material like small pieces of aggregate. Because of their parallel position of fibre, the light information on the brighter side of a wall appears unchanged on the darker side. The sharp display of shadows will fall on the opposing side of the wall. Concrete is the most use building material all around, it takes on nearly any shape and forms the backbone of the variety of world's construction. It is the mixture of cement, fine aggregate and coarse aggregate. It is used to construct Massive bridges, manmade water ways, Mega dams, Super highways, the world's tallest Skyscrapers and so on over all around the world.

II. OPTICAL FIBRE

It is a composition of fibre and optics, where the light are travelled in the kind of glass or plastic fibre. Optic fibres are worked in the principal of total internal reflection. When light incident at the interface between the core and cladding at the different angles. Some power or light is reflected back and some power is entered into cladding, which is known as refracted. When we increase the incident angle greater than the critical angle, no more light enters into the cladding. This phenomenon is called total internal reflection. Generally there are two types of optical fibre. Glass optical fibre (GOF) and Plastic optical fibre (POF). In this project, we used Plastic optic fibres, because of low cost when compared to glass optical fibre. It is an optical fibre which is made out of plastic.

III. APPLICATION OF LTC

- Light sidewalks at night & lamps
- Increasing visibility in dark subway stations
- Lighting indoor fire escapes in the event of a power failure
- Illuminating speed bumps on roadways at night
- Stairs & Decorative tiles

IV. OPTICAL FIBRE ELEMENTS

- 1) Core - The thin glass centre of the fibre where the light travels is called core.
- 2) Cladding-The outer optical material surrounding the core that reflects the light back into the core. To confine the reflection in the core, the refractive index of the core must be greater than that of the cladding.
- 3) Buffer Coating- This is the Plastic coating that protects the fibre from damage and moisture shows the different part of optical fibre and ray path.

V. OBJECTIVE OF THE PROJECTS

- 1) To study the following properties of translucent concrete.
 - Compressive strength of the concrete
 - Flexural strength of concrete
 - Light transmitting property of concrete
- 2) To study the conventional concrete block.
- 3) To compare the compressive strength test, flexural strength test results of conventional concrete block with the translucent block made of optical fibre.

VI. METHODOLOGY

- 1) Estimating quantity of optical fiber, sand, cement and aggregate required for preparing one block.
- 2) Casting of cube size (15cmx15cmx15cm) with optical fiber in proportion 0%, 1.5%, 2.5%. replace by fine aggregate for compressive strength test.
- 3) Casting of beam size (50cmx10cmx10cm) with optical fiber in proportion 0%, 1.5%, 2.5%. replace by fine aggregate for flexural strength test.
- 4) cube specimen are tested for compressive strength test and beam specimens are tested for flexural strength test.

VII. MIX PROPORTION FOR M20 GRADE CONCRETE:

Water	Cement	Sand(fine aggregate)	Coarse Aggregate
154 kg/m ³	385 kg/m ³	633.13 kg/m ³	1136.85kg/m ³
0.4	1	1.64	2.95

VIII. TESTING

A. Compressive Strength Test:

The compression strength test is conducted on a specimen of size 15cmx15cmx15cm concrete cube for 0%, 1.5%, 2.5% of fibre and the test result can be compared with that of nominal concrete cube 28 days curing respectively.



Fig. 1: Compression test on concrete

B. Flexure Strength Test:

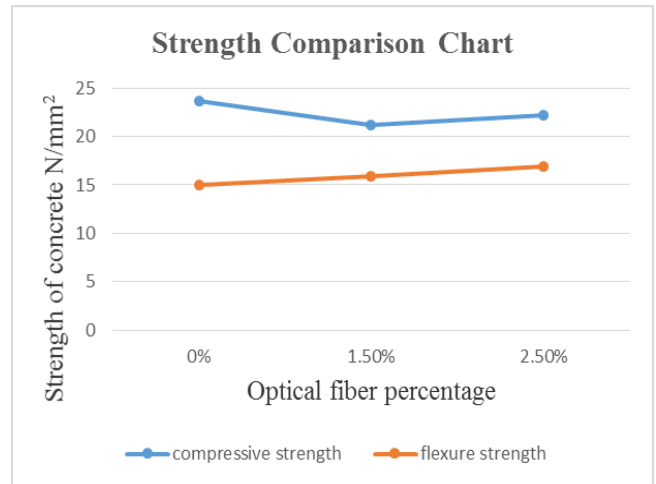
The flexure strength is carried out on a standard size of beam 50cmx10cmx10cm and the test result obtained can be compared with percentage replacement of optical fiber after 28 days respectively. For this, M20 grade of concrete is used.



Fig. 2: Flexure test result for concrete

Sr.no.	Percentage replacement of fine aggregate by optical fiber	Compressive strength N/mm ²	Flexure strength N/mm ²
1	0%	23.7	14.95
2	1.5%	21.17	15.86
3	2.5%	22.22	16.86

Table 1: Strength comparison



IX. CONCLUSION

- 1) The strength of light translucent concrete was found to be as same as the normal concrete strength.
- 2) Yet, the only drawback would be its high cost.
- 3) This type of concrete is mostly used in commercial and public areas such as Hotels, Malls, Showrooms, Theaters etc.
- 4) It has very good architectural properties for giving good aesthetical view to the building.
- 5) Energy saving can be done by utilization of translucent concrete in building.

Casting of translucent concrete block is difficult for the labour so special skilled person is required.

X. FUTURE SCOPE

- 1) This technique have more scope on making glowing sidewalks and speed bumps for drivers at night.
- 2) Use of suitable technique and equipments for speed in work.
- 3) Availability of low cost plastic optical fiber for making good concrete.

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