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LITRACON-Light Transmitting Concrete

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ABSTRACT: Transparent concrete is also known as the translucent concrete and light transmitting concrete because of its properties. Transparent concrete is a concrete based building material with light-transmissive properties due to embedded light optical elements usually optical fibers. In this paper, to integrate the merits of concrete and optical fiber, for developing transparent concrete by arranging the high numerical aperture plastic optical fibers (POF) or big diameter glass optical fiber into concrete. Light is conducted through the stone from one end to the other. The main purpose is to use sunlight as a light source to reduce the power consumption of illumination and to use the optical fiber to sense the stress of structures and also use this concrete as an architectural purpose for good aesthetical view of the building.

KEYWORDS: Transparent, Light, Optical fiber, Concrete.

I. INTRODUCTION

Concrete has been used since Roman times for the development of infrastructure and housing, but its basic components have remained the same. Translucent concrete (transparent concrete) is a new technique different from normal concrete. Translucent concrete allows more light and less weight compared to normal concrete. Translucent concrete is a combination of optical fiber and fine concrete. Optical fibers are 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. Thousands of fibers run side by side transmitting light between the two surfaces of each element. Because of their small size the fibers blend into concrete becoming a component of the material like small pieces of ballast. The use of sunlight source of light instead of using electrical energy is the main purpose of translucent concrete, so as to reduce the load on non-renewable sources and result in energy saving. But since that time, concrete has made considerable progress, not only in technical terms, but also in aesthetic terms. Just a few decades ago concrete was often misunderstood, disliked and captured by its image fixed due to the rapid urbanization of the 1960s. In this manner, the result is not only having the two materials mixed glass in concrete but a third, new material, which is homogeneous in its inner structure and on its main surfaces as well.

II. METHODOLOGY

Light transmitting concrete is produced by adding 1%, 2%, 3%, 4% & 5% of glass rods by weight into the concrete mixture, the translucent concrete mixture is made from fine aggregate materials only & does not contain coarse aggregates.

- To calculate the split tensile strength of M25 grade plain concrete & translucent concrete by laboratory experiments as per IS specifications.
- To calculate the flexural strength of M25 grade plain concrete & translucent concrete by laboratory experiments as per IS specifications. After 24 hours the samples of both normal conventional concrete & translucent concrete were demoulded and put in curing tank for the respective periods of 7, 14, 21 and 28 days & a set of 5 samples were prepared for each stage of curing.



The main aim of the methodology :- To calculate the compressive strength of M25 grade plain concrete & translucent concrete by laboratory experiments as per IS specifications. The moulds were cleaned initially and oiled on all the sides before concrete sample is poured in to it.

III. SCOPE & OBJECTIVES

Light Transmitting concrete, also known as translucent concrete. Engineers have now developed concrete mixtures that are capable of transmitting light. Concrete, that traditionally solid, substantial building material, is getting a makeover. By switching the ingredients of traditional concrete with transparent ones, or embedding fiber optics, translucent concrete has become a reality. To cast a special type of concrete with light transmitting properties, to study their characteristics and to develop a functioning material which is not only energy saving but gives out artistic finish. It is the brightest building material development in recent years. In this paper the manufacturing, uses and future scope of transparent concrete is widely given. It is one of the newest, most functional and revolutionary element in green construction material.

IV. GOALS

Light transmitting concrete aims to meet such requirement which helps in bringing the minimisation of artificial energy usage by directly allowing the sunlight to project through a concrete material.

V. ADVANTAGES

1. Transparent concrete blocks suitable for floors, pavements and load-bearing walls.
2. Facades, interior wall cladding and dividing walls based on thin panels.
3. Partitions wall and it can be used where the sunlight does not reach properly.
4. In furniture for the decorative and aesthetic purpose.
5. Light fixtures.
6. Light sidewalks at night.
7. Increasing visibility in dark subway stations
8. Lighting indoor fire escapes in the event of a power failure.
9. Illuminating speed bumps on roadways at night.
10. It has very good architectural properties for giving good aesthetical view to the building.
11. Where light is not able to come properly at that place transparent concrete can be used.
12. Energy saving can be done by utilization of transparent concrete in building.
13. Totally environment friendly because of its light transmitting characteristics, so energy consumption can be reduced.

VI. DISADVANTAGES

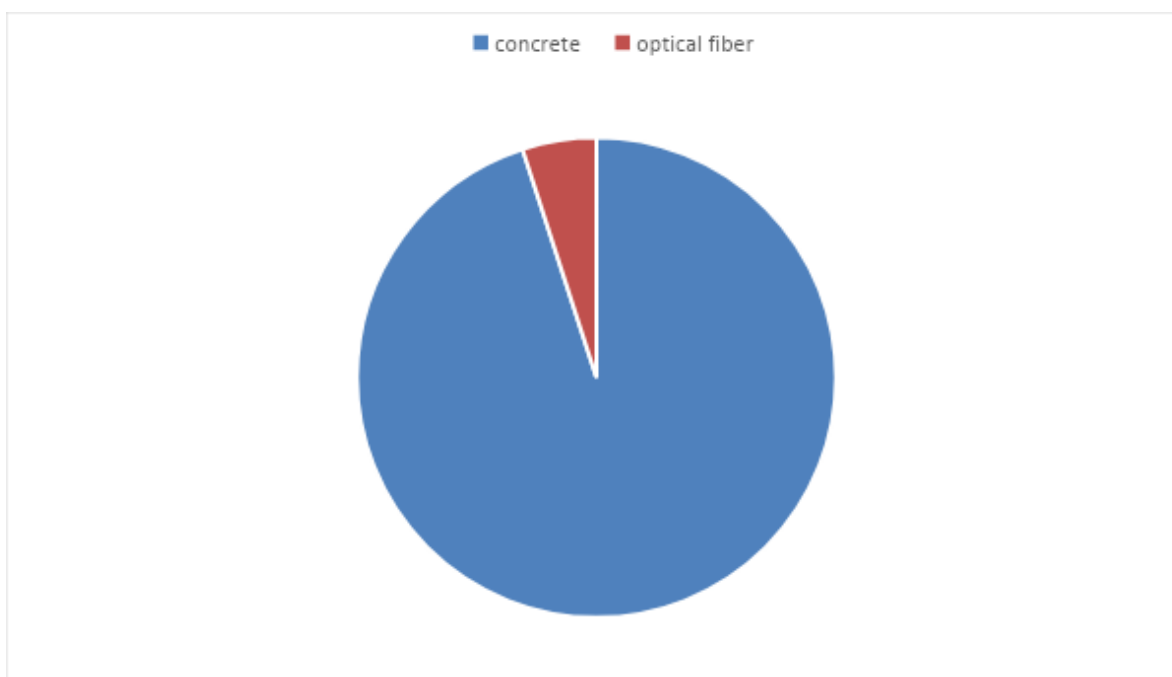
1. The main disadvantage is these concrete is very costly because of the optical fibers.
2. Casting of transparent concrete block is difficult for the labor so special skilled person is required.

VII. EXPERIMENTAL RESULTS

1. Physical properties of optical fibers.
Size-The diameter of single optical fiber is 0.026mm.
The length of optical fiber is 10cm.
No of fibers in bunch of hole 7mm diameter = 270
Wt of bunch -6.2 gm
Wt of single fiber -0.036 gm
Length of single fiber -270mm
Diameter of single optical fiber -0.026mm
Volume of single fiber -Area x Length - 14.33mm³
Weight-Volume x Density



0.036-14.33 x Density
Density-2.5 kg/m³



2. TABLE DETAILS OF CASTING AND STRENGTH

PRODUCT	LITRACON
FORM	Prefabricated block
Ingredient	95% concrete & 5 % optical fiber
Density	2100-2400 kg/m ³
Block size	100 x 100 x100 mm
Colour	Grey
Fiber distribution	Grid pattern
Finish	Plain
Compressive strength	14.4 N/mm ²

3. Compressive strength of concrete block

DAY	NORMAL CONCRETE	TRANSPARENT CONCRETE
7 DAYS	9.75 N/mm ²	9.3 N/mm ²
14 DAYS	13.5 N/mm ²	13.05 N/mm ²
28 DAYS	14.85-15 N/mm ²	14.44 N/mm ²

VIII. APPLICATIONS

The successful designs using the light transmitting concrete were a jewel and a concrete bench. You can also create a logo with colorful figures, inscriptions, and pictures and can be used for beautification purpose. The building units are versatile and can be used in many areas of design.



IX. CONCLUSION

The transparent concrete has good light guiding property and the ratio of optical fiber volume to concrete is proportion to transmission. A novel architectural material called transparent concrete can be developed by adding optical fiber or large diameter glass fiber in the concrete mixture. This new kind of building material can integrate the concept of green energy saving with the usage self-sensing properties of functional materials. The transparent concrete not loses the strength parameter when compared to regular concrete and also it has very vital property for the aesthetical point of view. Also used where the light cannot reach with appropriate intensity. It can be used for the best architectural appearance of the building.

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