

COMPRESSIVE STRENGTH OF TRANSLUCENT CONCRETE

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ABSTRACT

In this study, the compressive strength of translucent concrete was compared with that of conventional concrete to find out the potential of using translucent concrete for construction of green buildings. Translucent concrete was prepared by embedding plastic optical fibres in concrete. Concrete cubes of size 7cm x7cm x7cm were prepared and POFs of diameter 1mm were embedded in it. Through the study, it was observed that the strength of light transmitting concrete was similar to that of conventional concrete and can transmit sunlight passing through it without any significant dissipation of energy, thereby saving energy of the building. It is prepared by embedding plastic optical fibres in concrete.

KEYWORDS: *optical fibres, transparent concrete, compressive strength*

I. INTRODUCTION

Energy conservation has become an important issue in today's world. A study estimated that by 2050, the carbon released by commercial, institutional and residential buildings will amount to 3800 tonnes and this carbon will consume 38% of the global energy. To reduce the consumption of energy by buildings and the upcoming construction in future, development of a new construction material which will consume less amount of energy has attracted the attention of many researchers. Transparent concrete is one such material. Concrete is one of the most basic materials required during all types of construction. Transparent concrete is an innovative concrete which has the ability of letting light pass through it.

Concrete is made transparent by embedding optical materials such as optical fibres in it. This is because optical fibres can transmit sunlight without any heat, light or photochemical reaction. The light gets transmitted from one end of the optical fibre to another [1-6]. Because of its light transmitting ability translucent concrete is also known as transparent or light transmitting concrete. Aron Losonzi was the first person to put forward the concept of transparent concrete in 2001. The first transparent concrete block was named as LiTraCon [3].

In this study, the effect of including optical fibres on compressive strength of the concrete has been studied. The optical fibres were added to the concrete layer by layer distributed uniformly throughout the surface of concrete block. The compressive strength of transparent concrete block was then compared to that of control concrete block. It was observed that the compressive strength of transparent concrete was same as that of regular concrete.

II. MATERIALS

- Concrete:
Ordinary Portland cement concrete was used for the manufacturing of concrete blocks of size 7cm*7cm*7cm. Three cubes were made, among which two cubes were of control concrete and one was of transparent concrete. The weight of these cubes was varied, the weight of control concrete cubes being 760 gm and 780 gm and that of transparent concrete being 750 gm.
- Plastic optical fibres (POFs):

POFs are long hollow cylindrical fibres which can transmit light without any significant loss of energy. The diameter of POFs was 1mm.

III. EXPERIMENTAL PROGRAM

Three cubes of size 7cm*7cm*7cm were made. Two of these cubes were of control concrete and one was of transparent concrete. The optical fibres in transparent concrete were distributed in horizontal direction equally at a distance of 8mm. They constituted 1% volume of the concrete cube.

For transparent concrete cube, wooden moulds of size 7cm*7cm*7cm were prepared, each cube separated by perforated plates. The optical fibres were passed through the holes of these perforated plates. Before filling these cubes with concrete they were coated with oil, so that, the concrete cubes would not adhere to the moulds. The compressive strength of these cubes was found out using Compression Testing Machine.



Fig.1 Mould For Light Transmitting Concrete Cube



Fig. 2 arrangement of optical fibers



Fig. 3 how to pour concrete?

IV. RESULTS

Table 1. Compressive strength results

Weight of cube	Load	Compressive Strength(N/mm ²)	Remarks
760 gm	190KN	38.77	Control Concrete
780 gm	200KN	40.23	Control Concrete
750gm	180KN	36.70	LIGHT TRANSMITTING CONCRETE

The compressive strength of the concrete blocks was determined using the compression testing machine (CTM). It can be seen in table 1 that 750gm cube block and 780gm cube block of control concrete had compressive strength of 38.77Mpa and 40.23Mpa and 750gm of transparent concrete block had a compressive strength of 36.70Mpa. It can be concluded that the compressive strength of transparent concrete is similar to that of control concrete.

V. CONCLUSION

The study showed that the transparent concrete can reduce electricity bills without compromising with the strength of the building. It will reduce the energy consumption of both residential and industrial buildings. It can be used for construction of green buildings since it will save energy and will also provide aesthetic beauty to the building.

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