

Study of Light Transmitting Concrete

Himani P. Mohite¹, Nishita D. Hingane², Ragini M. Pendum³, Praful S. Misal⁴

Department of Civil Engineering

^{1,2,3} Smt. Radhikatai pandav college of engineering, Nagpur

⁴ Assistant Professor, Smt. Radhikatai pandav college of engineering, Nagpur

Abstract- This paper investigates the performance of light transmitting concrete (LTC). Light transmitting concrete is also known as translucent concrete. Translucent concrete is a new technique different from normal concrete. Use of sunlight as source of light instead of using electrical energy is main purpose of LTC, it result to minimize power consumption to decrease use of artificial light and LTC can provide high light transmitting ratio. Thus, the use of translucent concrete as an architectural purpose for good aesthetical view of building.

Keywords- Light transmitting concrete, translucent concrete, Power consumption

I. INTRODUCTION

Today we are living in world where energy outgoings and environmental problems are increasing rapidly to the entire world. The increase in the rate of development and modernization in the construction sector has large enough to be noticed in past few years. Part of the industry's advancement is the addition of optical fibres in concrete to make the translucent concrete (transparent concrete).

Aron Losonczy, the Hungarian Architect, was the first person who bring light on light transmitting concrete in 2001 and then he succeeded in his research in 2003 by producing the first transparent block which in known as LiTraCon. From this, he found that translucent concrete gives high compressive strength and weak in tension and flexure.

Translucent concrete is a concrete based building material have light transitive property. It is being used to create environmental friendly and dazzling bright building material. The main fundamental or motive of light transmitting concrete block is reserve energy using natural light and creating it as a green building material.

The new technology of Light transmitting concrete put up to diminished the negative profile of concrete as being a grey, dark, harsh, rigid and non-transparent material

In the present time, the rate of production of optical fibre is less, thus its cost is high in the current market. However, as the production cost of optical fibre will be

minimized in the future coming years, the LTC would be more economical.

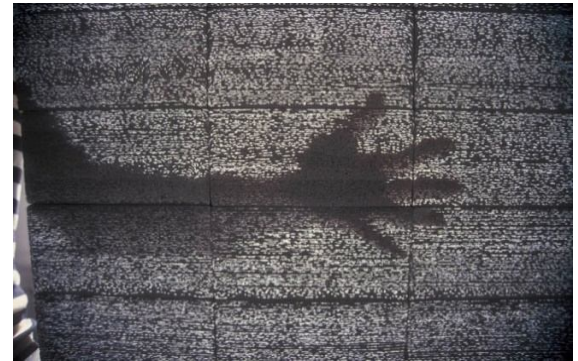


Fig. 1 TRANSLUCENT CONCRETE

II. CONCEPT OF LTC

The performance of LTC permit the transmission of light through the concrete block, known as litracon is made of 96% of concrete and 4% by weight of optical fibre. LTC is mainly used for various range of implementation, including Interior wall, partition wall, furniture, elevation, stairs and floors. Fine concrete and LTC material are two basic materials, which is used to manufacture translucent concrete.

The plastic optical fibres (POF) engross 2% to 6% of the concrete volume in light transmitting concrete. The advantage of POF is greater ductility for a inharmonious environment. The optical fibbers receive multiple inner reflections up to the ray of light become visible from other end of fibre

III. OBJECTIVE

In recent past concrete was examined as structural member only, but the idea of concrete has changed today. Decorative materials in building have come up with many innovative and smart building materials like litracon. Concrete with light transmitting property, provides delightful appearance to concrete and it also increase strength.

The use of optical fiber in the concrete makes it partially transparent and The optical fiber upgrade in the

development in performance of concrete, which also improve performance of structure to procure the natural light.

The focus of this project is to make concrete more attractive and energy efficient, then the normal concrete and eco-friendly green building material. According to Indian Green Building Council (IGBC), 50% day lighting is obligatory requirement in green building.

IV. LITRATURE REVIEW

The young HUNGARIN architect Aron Losonzi introduced the concept of LTC in 2001. There are few various previous studies that have addressed the topic of LTC(8-15)Basmaf.Bashbash et al (2013)examined the mechanical impact of adding plastic optical fibre(POF)into concrete. The result show that the compressive strength of LTC increase when the amount of fibre increases however flexural strength decreases as the fibre present increases. Overall, the mechanical property of concrete are not significantly affected after adding POF to LTC.

Basma F. Bash ashet al (2013) , discussed to reduce the power consumption by using plastic optical fire in concrete known as light transmitting concrete or translucent concrete. He also terminate that an optical fibre combined with concrete easily and that the plastic optical fibre could give a stable light transmitting ratio. Construction material can also be saved by smart transparent concrete considered as a green energy.

Jianping He et al (2011), studied the excellent properties of light guiding and effect of optical fibre.to assess the productiveness of smart transparent concrete is proportion to transmission. The quantity of plastic optical fibre has seriously affect the compressive strength of the corresponding concrete. The POFs have decreases the approachable of the concrete.

H.B. Valambhiy and P.V.Rayjada has discussed about the history and case study on light transmitting concrete and various methods to make translucent concrete. LiTraCon panel reduce cost of concrete panel by which it gives high strength and transparency of block compare to transparent cement by Italcementi group.

Varshara in a et al(2013) , investigated to developed the building an elegant in modern construction and usess of energy with ecofriendly way. The main purpose is to use natural light as a light source to decreases the power utilization of lighting and to use optical fibre to sense the

stress of structures and use of these transparent concrete as an architectural purpose for good aesthetical view of the building.

V. MATERIAL

- CEMENT
- SAND
- WATER
- PLASTIC OPTICAL FIBER (Dia 0.75)



Fig 2. PLASTIC OPTICAL FIBRE

VI. METHODOLOGY AND MODELLING

The manufacturing process of translucent concrete is same as regular concrete in which plastic optical fibre is introduced horizontally in the mould. In this method special formwork is to be made by using thick thermocol sheet, then the thermocol sheet is sliced as per the standard size of mould (15cmx15cmx15cm).

The sides of formwork are then gathered on stiff mount board.then thermocol and mount board are place on opposite side and holes are make on the thermocol, Plastic optical fibres are introduced through it.Opical fibers are fixed on opposite side from thermocol keeping the optical fibre in imperceptible rigidity. Concrete mixture(cement,water,sand) is poured into the formwork.conctere is allowed to set for 24 hours and further curing process is carried out on concrete after the formwork is removed, for more aesthetical look the sides of concrete blocks are well polished.



Fig 3 THERMOCOL MOULD

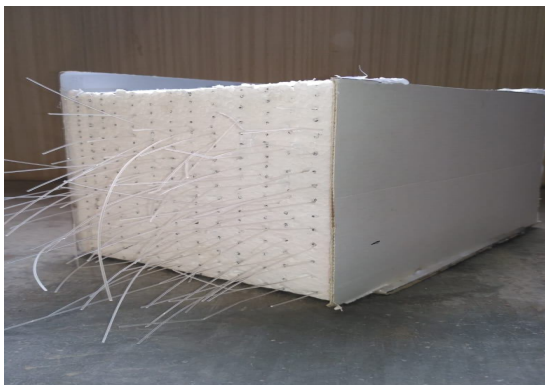


Fig 4 OPTICAL FIBRE INTRODUCING HORIZONTALLY IN MOULD



Fig 5 THERMOCOL MOULD



Fig. 6 CONCRTE BLOCK AFTER CASTING

ADVANTAGES OF LIGHT TRANSMITTING CONCRETE

- Most surfaces are of good adhesion.
- Power consumption can be reserved by transparent concrete.
- Light transmitting concrete can be used where light is not able to come adequately.
- Environmental friendly because of transparent concrete as light spreads characteristics.
- Transparent concrete has the power to potentially modify the interior of concrete building, making them appear fresh, attractive and unsound.
- Plastic optical fibres do not have a negative result on compressive strength of concrete.

DISADVANTAGES OF LIGHT TRANSMITTING CONCRETE

- The main advantage of these concrete is very costly because of its using smart material as plastic optical fibre.
- Casting of translucent concrete block cannot be done by unskilled labours so professional person is required.

VII. CONCLUSION

- It can be used for the best architectural feature of building and uses where light cannot reach expropriate intensity.
- The transparent concrete has good light guiding property.
- The translucent concrete does not loses strength parameter when it is compare to commonly used concrete and also has very vital property for the elegant point of view.

REFERENCES

- [1] YING HANG,ZHI ZHOU,GE OU GENDA CHEN,JINPING OU, Research and development of plastic optical fibre based smart transparent concrete, PROC.OF SPIE VOLUME 7293 72930F-2
- [2] SOUMYAJIT PAUL and Avik Dutta Translucent concrete, International journal of scientific and research publication. Volume 3, issue 10 October 2013 ISSN 2250-3153.
- [3] ABDELMAJEED ALTLOMATE ,FAESAL ALATSHAN,FIDELIS MASHIRIR,MOHAMED JADAN.Experimental study of light transmitting concrete,International journal of sustainable building technology and urban development, 7:3-4,133-139.
- [4] H.B.VALAMBHIYA,T.J.TUVAR,P.V.RAYJA(2017)HI STORY AND CASE ON LIGHT TRANSMITTING

CONCRETE, JANUARY 2017, VOLUME 4, ISSUE 01, JETIR (ISSN-2349-5162)

- [5] NEHA R. NAGDIVE AND SHEKAR D. BHOLE To Evaluate Properties Of Translucent concrete mortar And There Panels, vol.1, 2013
- [6] LOWE J. (1965), Method of making translucent concrete.
- [7] KAMDI A. (2013) transparent concrete as green material of building.
- [8] BASMA F. BASHBASH (2013) Basic of light transmitting concrete pp079-083
- [9] www.Lucem.de.in, LUCEM LICHBETON GERMANY (2015)