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Light Transmitting Concrete

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Abstract: *This paper reviews the Light Emitting Concrete. The increase in population leads to the growth of construction sector and hence construction activities increases day by day. Construction of tall storied and multi storied buildings result in obstructing natural light in the building, thus leading to increase in artificial light. Light-transmitting concrete has property of passing artificial as well as natural light due to optical fibers present in it. Light Transmitting concrete, also known as translucent concrete. Light – transmissive properties due to embedded light optical elements. This paper describes historical development of Light Transmitting concrete. Light transmitting concrete (LTC) or 'LiTraCon' is an example of such phenomenal innovation. The aim is to promote translucent concrete as an attractive, promising, and innovative building material for the construction industry.*

Keywords: Light Transmitting concrete, Cement, Fine aggregate, Optical Fiber.

I. INTRODUCTION

Concrete is the most commonly used construction material in construction industry due to its strength, durability and economy. The advancement of concrete application makes it popular to be implemented in many construction structures such as high-rise buildings, tunnels, bridges, and pavements, especiallyin urban area. Light emitting concrete or transparent concrete or Translucentconcrete or light-transmitting concrete is a concrete based building material with light-Tranmissive properties due to embeddedlight optical elements usually Optical fibers. Conventional concrete made withthe mixture of cement sand aggregate and water which is unable to transmit lights, transparent concrete is made with cement, very fine sand and thousand of optical fiberreinforced in concrete from one face toanother face which guide the light passing through it It is used in fine architecture as afacade material and for cladding of interiorwalls. Light transmitting concrete (LTC) isa new technology that allows light to pass through concrete structures, offering many benefits for modern architecture. The mainpurpose 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. Optical fiber is a transparent, flexible fiber slightly thicker than a human hair made of plastic or glass (silica). These optical fibres are spread uniformly through the concrete and are visible on both sides of the LTC block. Due to various inventions and infrastructure development new material for building like Light-transmitting concrete has come up as decorative material. Idea of light- transmitting concrete was first introduced in2001 by Aron Losonczi and further in 2003 first light-transmitting concrete block was produced named LiTraCon. Light transmitting concrete isn't unique in relationto ordinary concrete it has same material with expansion of optical fiber. Light- transmitting concrete has same strength as normal concrete. The results show that LTC can be both structurally efficient and decorative, offering promising future benefits for the construction industry. Toreduce the consumption of power of illumination, effective and efficient materialusage introduced Light Transmitting concrete, making use of such elements which has high illuminative power. In order to reduce energy consumptions from the useof artificial light, different approaches had been carried out including the development of new innovative construction materials such as light transmitting concrete (LTC) which can transmit light

II. LITERATURE REVIEW

Bankar Snehal Nandram and Satish Kumar(2018), They studied on the "A review study of Light Transmitting Concrete". They states that Light transmitting concrete is also named as translucent concrete, because of its transparent property. The main purpose is to use natural sunlight as a light source to reduce the power consumption of illumination and to use concrete, because of its transparent property. The main purpose is to use natural sunlight as a light source to reduce the power consumption of illumination and to use optical fiber to sense the stress of structure and also use this

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concrete for good aesthetic view of the building as architectural purpose. The transparent concrete mainly focuses on transparency and its objective of application pertains to green technology and artistic finish. It is combination of optical fibers and fine concrete. At present, green structures focus greatly on saving energy with indoor thermal systems.

Avinaba Bhattacharyya and Dr.Biman Mukherjee(2022), They studied on the "A Review of Light Transmitting Concrete". They states that Researchers have focused on the concept of sustainable development looking forward to innovate something using energy conservation. Light transmitting concrete (LTC) or LiTraCon is an example of such phenomenal innovation. This review evaluates the principals involved in this, manufacturing process, pros and cons and applications of LitraCon. It has been described how the Litracon developed from 90's and further. Embedding optical fibers in the concrete reduces electricity demands. Hence, it can be used as an eco -friendly alternative to traditional concrete in the near future. The applications of LiTraCon, illustrates its positive impact worldwide. LiTraCon can become an affordable alternative for both commercial and residential projects.

Shradha Nimbalkar and Mr. Sanjeev Raje (2019), They studies on the "A Brief Review of Light Transmitting Concrete." They states that The increase in population leads to the growth of construction sector and hence construction activities increases day by day. Construction of tall storied and multi storied buildings result in obstructing natural light in the building, thus leading to increase in artificial light. To overcome the issue, light transmitting concrete can be used. Light- transmitting concrete has property of passing artificial as well as natural light due to optical fibers present in it. Optical fiber is flexible made of glass or plastic to diameter marginally thicker than that of human hair. Light theory of optical fiber is based on internal reflection. The properties of light- transmitting concrete are marginally not the same as ordinary cement. This type of concrete gives pleasing aesthetics to the structure. Light- transmitting concrete can plays an important part in construction and environment fields.

Prof. Rakesh Kumar and Mr. Onkar Shinde (2019), They studies on the "A Review on Light Transmitting Concrete." They states that this emerges one of the issue in driving normal light in working because of impediment of close by structures. Because of this issue utilization of fake hotspots for light of building is expanded by lot. "LiTraCon" (light sending concrete) effectively created the main straight forward substantial square in 2003. It is fundamental to lessen the counterfeit light utilization in structure, since concrete is solid in pressure and week in tension and flexure. The current examination targets delivering the light sending substantial examples by supporting optical filaments and contrasting it and the regular cement. The substantial examples were exposed to various tests, for example, compressive strength test, split elasticity test.

Awadhesh Kumar, Rahul Ahlawat (2017), They studies on the "Experimental Study on Light Transmitting Concrete" They states that light transmitting concrete using 4% to 5% optical fibers. The fibers of diameter from 2 μ m to 2 mm were used in alternate layers with concrete. The concrete was based on the principle of total internal reflection of optical fibers.

Yamini Nirmal and K. Nehemiya (2017), In this paper study on light transmitting concrete was carried out with the use of 0.38 mm diameter. Compression strength and flexural strength was studied in this paper. Compressive strength test results were conducted for 7 day, 14 days and 28 days whereas Flexural strength test results were compared for 7 days and 28 days respectively. Cement mortar cubes were used. Cement used was 1100gm and fine aggregate 3300gm respectively for one cube. 2% and 4% optical fibers were used in different configurations. For 2%, 36 strands of optical fibers were embedded in different configurations and for

4%, 72 strands of optical fibers. These cubes of different optical fiber configuration were compared with conventional concrete for varying w/c ratio. It was investigated that compression strength of light transmitting concrete was increased than ordinary concrete up to certain limit and after that limit, the compressive strength decreases with increase volume of optical fiber.

III. CONCLUSION

Based on the study it can be concluded that The use of light transmitting concrete (LiTraCon), which incorporates optical fibers into concrete for aesthetic and functional purposes, has been the subject of numerous research papers. The studies have investigated the effects of fiber content, diameter, and orientation on the strength and light transmission properties of LiTraCon, and have shown that it is possible to create concrete that is both decorative and

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structurally efficient. The research concludes that LiTraCon can transmit light, potentially replacing windows and reducing the need for artificial lighting, and that it has potential applications in energy-saving and smart construction. Construction of buildings and monuments with LTC shows magical effect during non-light hours. In future, LTC may be seen to be used worldwide. Using it in partition walls, panels ,treads of staircase, halls, and other areas of commercial buildings

Concrete is no longer the heavy, cold and grey material of the past; it has become beautiful and lively. By research and innovation, newly developed concrete has been created which is more resistant, lighter, white or colored. The transparent concrete has good light guiding property and the ratio of optical fibre volume to concrete is proportion to transmission. The transparent concrete not looses the strength parameter when compared to regular concrete and also it has very vital property for the aesthetical point of view. It can be used for the best architectural appearance of the building.

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