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ENHANCEMENT OF LIGHT INTENSITY BY USING LIGHT TRANSMITTING CONCRETE-A Review

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Abstract: The aim of this paper is to investigate the performance of concrete which incorporates plastic optical fibre (POF). In this study, the performance of light-transmitting concrete specimens made by using different dosages and spacings of plastic optical fibre is investigated. The properties of plastic optical fibre are investigated and discussed. The experimental results will show that light-transmitting concrete can provide a high light-transmitting ratio. This paper contributes to the determination of alternatives for sustainable construction around the world. To Build energy-saving and safe evaluation for engineering, structures have obtained worldwide attention. This new kind of building material is of much importance, which can integrate green energy saving with self- sensing properties of functional material. The objectives for this concrete are to cast a special type of concrete with light-transmitting properties and study their characteristics and to develop a functioning material which is not only energy saving but gives out artistic look. Its results show that smart transparent concrete has good transparency. In addition, the use of plastic optical fibre can lead to an increase in compressive strength of concrete

Index Terms - Plastic optical fiber, light-transmitting concrete, energy-saving, Green Construction Material, Smart Transparent Concrete

I. INTRODUCTION

Concrete has adapted to almost all new challenges that appeared. In 2001, first, the concept of transparent concrete was put forward by Hungarian architect Aron Losonzi, and the first transparent concrete block was successfully casted by mixing a large amount of glass fibre into concrete in 2003, named as" LiTraCon". Joel S. and Sergio O.G. casted a transparent concrete material, which can allow 80% light through and only 30% of the weight of common concrete. While discussing LiTraCon it's worth mentioning that the Italian Pavilion in Shanghai Expo 2010 shows a kind of transparent concrete developed by mixing glass into concrete in 2010."LitraCon" has the strength same as traditional concrete and an embedded array of glass fibres that can display a view of the outside world, such as the silhouette of a tree. Thousands of optical glass fibres form a matrix and run parallel to each other between the two main surfaces of every block. Shadows on the lighter side will appear with sharp outlines on the darker side. Even the color's remain the same. This special effect creates the general impression that the thickness and weight of a concrete wall will disappear. The hope is that the new material will transform the interior appearance of concrete buildings by making them feel airy and light rather than heavy and dark.

Light transmitting concrete was first mentioned on October 27, 1922, a patent filed under United States Patent office Paul Liese of Tempeloh of Germany. His inventions were related to transparent building blocks or panels for concrete walls and ceilings and in the structures made there from the detailed research of P. Liese in his approved Patent on August 4, 1925. Later in 1965, a method of constructing a translucent panel by James N. Lowe, London, England; was patented in United States Patent Office. The invention relates to a method of making translucent concrete panels which are used, for example, like church windows, and which can comprise a mosaic of pieces of stained glass or translucent ceramic material supported by a concrete formwork. Initially, the pieces of glass have been set directly in a matrix of concrete but difficulties have arisen in making the panel strong enough to be load-bearing and in making the bond between inside and outside of large buildings in the walls of which the panels are set. In the early 1990s forms of Light transmitting

concrete depending upon the pattern of fibres arranged size of fibres and the size of structure were developed. The advanced inventions have also overcome the problem of strength as well as durability. Today several companies produce with their own-patented processes and application with very different production systems.

AIM

To assess viability of Light Transmitting Concrete and Enhance the Light Intensity and to achieve mentioned objectives.

OBJECTIVES

1. To cast a special type of concrete with light transmitting properties.
2. To study their characteristics and to develop a functioning material which is energy saving.
3. To compare their strength characteristics with the conventional concrete.
4. To cast a concrete which gives artistic finish.

LITERATURE REVIEW

1) **ASHISH B. UGALE** was introduces that due to the increasing population in world and excessive use of energy, there can occur condition where all energy generating resources can be depleted. As mainly energy is generated by non-renewable energy resources and to save these resources, there is need to make alternative energy generating as well as energy saving material. In this paper he gives, one such construction material is reviewed which can be also called as energy saving construction material named as light transmitting concrete—Litracon. Also, its manufacturing, uses, its different properties, and its effect on power consumption are reviewed. In this paper, it is concluded that, various additives and replacement in material in manufacturing of Litracon which increases its efficiency and make it more effective.

2) **ANTON PILIPENKO** discussed the increasing demand for decorative materials among architects and designers has led to the development of various new building materials. The combination of types of functional significance was the reason for the creation of light transmitting concretes (known as LiTraCon), which are combined the light transmitting and constructive functions. Such concrete can be used in the decorative finishing of internal surfaces and the creation of decorative products.

3) **ABDELMAJEED ALTLOMATEA** in his paper aims to investigate the performance of concrete which incorporates plastic optical fibre (POF). In this study, the performance of light transmitting concrete (LTC) specimens made by using different dosages and spacings of POF is investigated. The properties of POF are investigated and discussed. The experimental results show that LTC can provide a high light-transmitting ratio. This paper contributes to the determination of new alternatives for sustainable construction around the world. LTC can help to reduce power consumption in buildings by allowing natural light to shine into the building interior through external walls. This paper adds distinctive knowledge to the area of sustainable construction by studying the effect of POF on the properties and performance of concrete. In addition, the use of POF in concrete can lead to an increase in compressive strength.

4) **SHREYAS KRISHWPPA** according to him transparent concrete is the new type of concrete introduced in modern era which carries special property of light transmitting due to presence of glass road and is also known as translucent concrete. Light is transmitted from one surface of the brick wall to the other due to glass rods along the overall width of wall which allows light to pass through without using optical fibre.

5) **SHREYAS KRISHWPPA** according to him transparent concrete is the new type of concrete introduced in modern era which carries special property of light transmitting due to presence of glass road or optical fibres and is also known as light transmitting concrete. The light guiding performance of concrete materials is completely determine by internal POFS area ratio and surface roughness in certain section.

6) **BHAVIN K. KASHIYANI** Transparent concrete is a concrete based building material with light-Tran missive properties due to embedded light optical elements usually Optical fibres. Light is conducted through the stone from one end to the other. Therefore, the fibres have to go through the whole object. Transparent concrete is also known as the translucent concrete and light transmitting concrete because of its properties. It is used in fine architecture as a facade material and for cladding of interior walls. In this paper, to integrate the merits of concrete and optical fiber, for developing transparent concrete by arranging the high numerical aperture Plastic Optical Fibres (POF) or big diameter glass optical fiber into concrete. 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.

7) **H.B. VALAMBHIYA** Light Transmitting concrete, also known as translucent concrete. Light-transmissive properties due to embedded light optical elements. Light is conducted through the concrete block from one end to another. Therefore, fibres have to go through the whole object, in order to achieve maximum penetration of light. It produces different light pattern on the surface, depending on the fibre structure, their arrangement and the size of fibres used. This paper describes historical development of Light Transmitting concrete and various methods to produce and given Light Transmitting concrete panel. Also discussed about two case studies on Light Transmitting concrete panel or block made project by LiTraCon and Italcementi Groups. These two companies made Light Transmitting concrete panel or block in different way.

8) **S. RAVIVARMAN** Now days, a Small building are replaced by high rise buildings and sky scrapers. This arises one of the problems in deriving natural light in building, due to obstruction of nearby structures. Due to this problem use of artificial sources for illumination of building is increased by great amount. LiTraCon (light transmitting concrete) successfully produced the first transparent concrete block in 2003, It is very essential to reduce the artificial light consumption in structure, since concrete is strong in compression and weak in tension and flexure

9) **MATTHEW STERLING** Light-transmitting concrete has the capability of letting light pass through it. It is produced by incorporating optical elements (e.g., optical fibers) into conventional concrete. The mechanical properties and durability of light-transmittingconcrete are slightly different from that of conventional concrete because the optical fibers only account for small volume of the concrete. Light-transmitting concrete allows using sunlight as a light source to reduce the power consumption of illumination. It also can be used in cold regions to transmit heat with sunlight or act as a decorative material. Light transmitting concrete can therefore play an important role in both construction and environment fields.

10) **JOHN COOK** - according to him uses of translucent compounds instead of light transmitting fibre scan in enhance the properties of material. The introduction of composition of mechanically and chemically activated crushed concrete fibres and slice fume to complex binder could lead to further decreasing cost of light transmitting concrete and to improve the process of hardening of concrete mix without loss of physical property

11) **SACHIN SAHU** introduced the study aims at producing the concrete specimen by reinforcing optical fibre and comparing it with the conventional concrete. In this which study that transparency of the concrete structure can be introduced with the insertion of optical fibres without compromising the strength, which is good property in modern structure.

12) **JERRY ALTON -** Concrete can have light-transmitting properties due to securing optical elements like optical fibres in it. Optical fibres in the concrete act like the slits and carry the light across throughout the concrete. Light-transmitting concrete combines the fluid potential of concrete with glass ability to admit light, and it also retains privacy and can be used as structural support

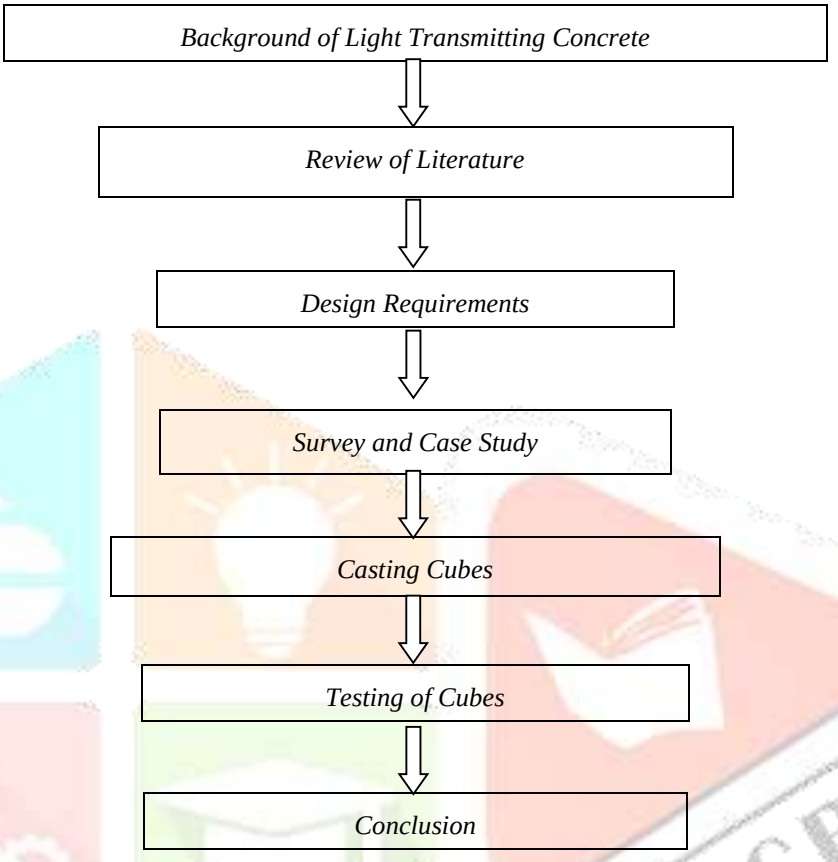
13) **BUSTON TRIGGER** POF based concrete can be a sustainable energy-saving replacement to the traditional concrete without jeopardising its strength parameters. The self-cleansing concrete keeps its surface clean by itself and besides, it removes pollutants from the air by tearing down the grime into molecules like oxygen, nitrogen, nitrates, sulphates etc.

14) **STORTEN MITH** supplementing POF to the concrete has a variable result on the compressive strength. Investigation shows that the transparency of light is possible in concrete without affecting its compressive strength, as the fibres and fibre reinforcement improve the strength and appearance. the optical fibres can reduce the anti-permeability of concrete

15) **WALTER CAGE** With the progress of technology, our infrastructures should be adjusted. For sustainable development, we have to maintain the use of renewable energy sources to meet the growing demand for energy. All the above concerns can be solved by Translucent Concrete, an innovative architectural material.

Methodology

The Main objective of this project is to learn to understand efficiency and viability of Light Transmitting Concrete and study proper design procedure of casting LITRACON Using concluded data to assess characteristic strength in next stage. The project study involved two stages. The primary data was gathered through a Literature survey targeted by web searches and review of e books, manuals, codes and journal papers. After reviewing the problem statement is defined. This project execution follows the flow chart given below



CONCLUSION

1.This paper presented an overview of Translucent concrete blocks can be used in many ways and implemented into many forms and be highly advantageous.

2. The application of optical fibre will make the concrete decorative as well as can make the concrete structural efficient.

3. Energy savings as well as heat insulation simply adds to the list of its amazing properties. Transparent concrete is the future.

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