

TRANSLUCENT CONCRETE AS AN INNOVATIVE MATERIAL USED IN CIVIL ENGINEERING

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Abstract: Concrete has been used since Roman times for the development of infrastructure and housing, but its basic components have remained the same. Three ingredients make the day mix; coarse aggregate, consisting of large pieces of material like stone or gravel; fine aggregate, made up of smaller particles such as sand; and cement, a very fine powder material that binds the mix together when water is added. The transparent concrete mainly focus on transparency and its objective of application to green technology and artistic finish. It is the combination of optical fibers and fine concrete at present, green structure focus greatly on saving energy with indoor thermal systems. Therefore it is imperative to develop a new functional material to satisfy the structure in terms of safety monitoring. The normal concrete is replaced by translucent concrete, which has natural lighting and art design.

KEYWORDS: *Optical fiber, fine aggregate, cement, water, Attractive building material, energy saving, Green construction material, Translucent Concrete.*

I INTRODUCTION

Translucent concrete is a combination of Optical Fibre and fine concrete. Number of fibres run side by side transmitting light between the two surfaces of each element. Because of their small size the fibres blend into concrete becoming a component of the material like small pieces of ballast. In theory, a wall structure created out of translucent concrete blocks can be a couple of meter thick as the fibres work almost without any loss in light. Moreover the block are load bearing and provide same effect with the natural and artificial light . Plastic Optical fibres lead light by point between the wall surface. Shadows on the lighter side will appear with sharp outline on the darker one. Even the colour remains the same. Such a wall with Optic Fibres pixels act as if scanner and screen are united. This special effect creates the general impression that thickness and weight of this concrete wall appear. Translucent concrete blocks are produced depending on the aesthetical wishes and structures needs of the architect's projects. Translucent concrete blocks have same technical data used for them. The same flexibility

occurs with the fibres. The diameter of fibres can be chosen 2.5 mm. Moreover translucent concrete elements are joining together through splicing or agglutinating or in conjunction with any common formwork. Talented architects and engineers should feel challenged to create structures of extraordinary beauty and innovation. Translucent concrete is the first step to what might become the building material of the future.



Fig.1 Translucent wall at sunlight as aesthetic view

Table 1: Properties of Translucent concrete block by Litracon Company.

Product	Litracon-Light Translucent concrete
Ingredients	96% concrete, 4% optical fibre
Density	2100-2400kg/m ²
Block Size	15cmx15cmx15cm
Thickness	25-500mm
colour	Grey
Compressive strength	24 N/mm ²
Tensile strength	7 N/mm ²

II. LITERATURE REVIEW

1.Neha R. Nagdiveand shekhar D. Dhole(2013) ISSN(P):2347-4599 Vol.1, issue 7 Dec 2013.23-30. “ To Evaluation Property of Transparent concrete and their panels”.To evaluate that the property of translucent concrete and manufactured with optical fibre by drilling through the cement and mortar in order to utilized the light guiding ability of optical Fibre.They concluded that the smart transparent concrete has good light guiding property.

2.M.N.V.Padma Bhushan (2013), “ Optical Fibre is the modelling of translucent Concrete Block.” ISSN:22489622www.ijera.com,vol.3 issue-3 May-June 2013,pp.013-017(studied that the Translucent concrete is a concrete based material with light transmitting property ,obtained due to embedded light optical elements like optical fibre in it.They concluded that Translucent concrete block can be used in many way and implements into many forms and be highly advantageous. But the Drawback its cost is high.

3.patil Gaurao s.Patil swpanil v.(2015) (Light Transmitting concrete – A New Advanced Research Journal of Engineering Research and General science vol.3,issue 2.Part 2March-April.2015 ISSN2091-2730 Studied that the light transmitting concrete has new innovative materal.Based on excellent property of light guiding and elasto-optic effect of optical fiber the light guiding on white light test ,durability based on

freezing and thawing test and chloride ion penetration test. They concluded that A smart translucent concrete had good transparency is aesthetically pleasing.

4.M.Sangeeta(2014) “ An experimental Investigation Energy Efficiency Light Weight Light Translucent Concrete”. IJSRD- international journal for Science Research and Development vol.3 issue 2,2015 ISSN(online):2321-0613 studied that light weight concrete.This is lighter than conventional concrete it has low density and thermal conductivity . They concluded that light weight weight concrete to reduced dead weight of the structure by using light weight material like Portland Pozzolana cement,natural sand , and optical fibre etc used fpr decorative purpose.

III .FUTURE SCOPE

1. New research and developments are developing of simple cheap and productive optical fiber specially according to production of the transparent concrete.
2. It is much of importance of developing a new kind of building material which can integrate green energy saving with self sensing functional material.
3. The experiment result show that the smart. Translucent concrete of good transference and mechanical property.



Fig.2– Translucent concrete at hotels as aesthetic view

IV .MATERIALS

Constituent Material of Translucent Concrete

The light transmitting concrete produced consists of ordinary cement with specific contents

Cement: For construction purposes the meaning of the term cement is restricted to the bonding material used with stones , sand, bricks, building blocks, etc The principal cement compounds of lime, so that in building

and civil engineering.. The cement has property of setting in under water by chemical reaction releasing heat of hydration. So called as hydraulic cement.

Optical Fibre: An optical Fibre is a flexible, transparent fibre made of glass (silica) or plastic, slightly thicker than a human hair. It functions as a waveguide or light pipe, to transmit light between the two ends of the fibre.

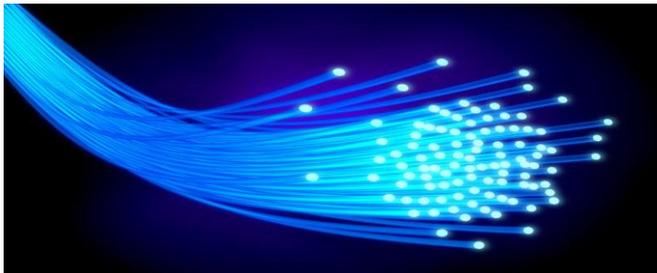
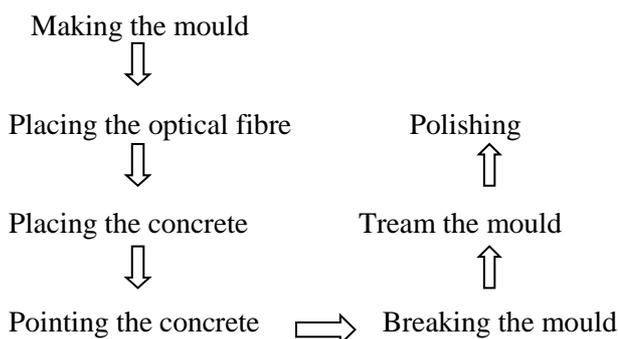


Fig.3 Optical fibre

Sand : Is a naturally occurring granular material composed of finely divided rock and mineral particles. The Composition of sand is highly variable, usually in the form of quartz. Sand particles range in diameter from 4 mm to 2 mm. The sand used is the normal sand available in Gaza strip.

Water : Is the key ingredient, which when mixed with cement, forms a paste that binds the aggregate together. The water needs to be pure in order to prevent side reactions from occurring which may weaken the concrete, the role of water is important

V .METHODODOLOGY



VI. COMPRESSIVE STRENGTH

The compressive strength of sample was then determined after measuring the light transmitted by using compressive testing machine and test results were obtained as given in Table 2 . As it can be seen from Table 2 the compressive strength of Light Transmitting Concrete was found to be ranging between 20-23 N/mm² with optical fibre specimen

and with glass rods specimen the compressive strength was found to be ranging between 24-26 N/mm², which indicates that the concrete satisfies the compressive strength requirement for M20 grade concrete.



fig.6 Cube during compressive test

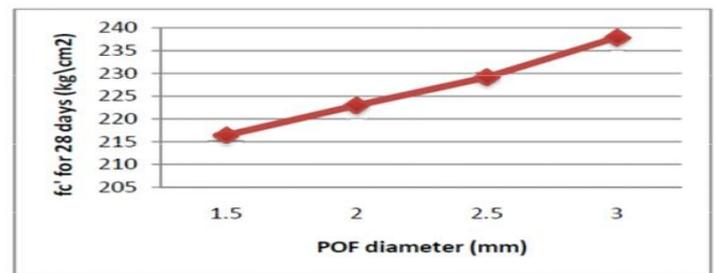


Fig.7: 7-day compressive strength compressive strength versus fiber diameters at fiber content of 4%

VII.APPLICATION:

1. Translucent concrete blocks suitable for floors, pavement 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 sidewalks at night.
6. Increasing visibility in dark subway stations.
7. Illuminating speed bumps on roadways at night.

VIII.CONCLUSION

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 colour etc.. A architectural material called translucent concrete can be developed by adding optical fibre or large diameter glass fibre in the concrete mixture. The translucent concrete has good

light guiding property and the ratio of optical fibre volume to concrete is proportion to transmission. It can be used for the best architectural appearance of the building. Also used where the light cannot reach with appropriate intensity. This new kind of building material can integrate the concept of green energy saving with the usage self-sensing properties of functional materials.

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