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INNOVATIVE MATERIAL USED IN CIVIL ENGINEERING: TRANSLUCENT CONCRETE

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Abstract: Even though its essential ingredients have changed throughout the centuries, concrete has been around since the Romans employed it to build houses and infrastructure. Cement, a fine powder that binds the mixture together when water is added, fine aggregate, which consists of finer particles like sand, and coarse aggregate, which consists of huge chunks of material like stone or gravel, are the three components that make up the day mix. Transparent concrete is primarily concerned with being transparent, as well as with its intended use in environmentally friendly technologies and as an aesthetic finish. Optical fibres and thin concrete are now the main focus of green building efforts aimed at reducing energy consumption via the use of indoor heating systems. Consequently, meeting the structure's safety monitoring requirements necessitates the development of a new functional material. Translucent concrete, which incorporates art design and natural illumination, replaces the regular concrete.

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

I INTRODUCTION

Optical fibres and thin concrete are the ingredients in translucent concrete. Light travels between the two surfaces of each element via a network of fibres that run parallel to one another. The fibres become an integral part of the concrete, much like tiny bits of ballast, due to their diminutive size. Since the fibres almost eliminate light loss, a wall construction built from see-through concrete blocks might theoretically be several metres thick. On top of that, the blocks can support weight and work equally well with both natural and artificial light. Optical fibres made of plastic guide light beams through spaces in the wall. The brighter side will cast shadows that the darker side will define sharply. The hue is also unaltered. A wall made of Optic Fibre pixels functions similarly to a scanner and a screen combined. This particular effect gives the appearance that the concrete wall is massive and heavy. Architects may have translucent concrete blocks made to suit their aesthetic preferences and structural requirements. All technical data utilised for transparent concrete blocks is the same. The identical adaptability takes place in the fibres. The fibres' diameter is 2.5 mm. Also, transparent concrete pieces are spliced or agglutinated together, or used with any standard formwork. It should be a challenge for gifted architects and engineers to design innovative and aesthetically stunning buildings. One substance that has all the makings of a future construction material is translucent concrete.

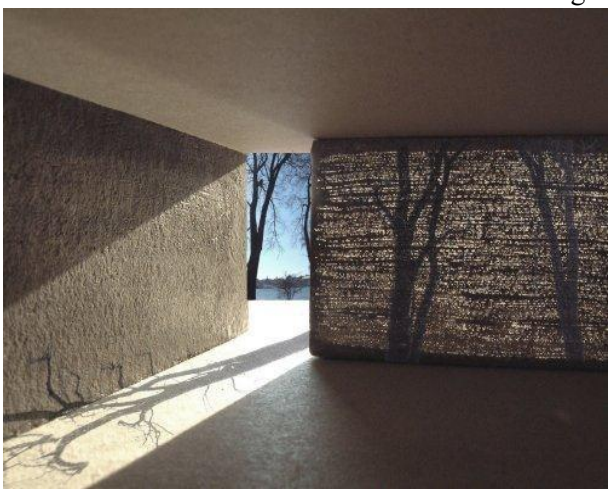


Fig.1 Translucent wall at sunlight as aesthetic view

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

Product	Litracon-Light Translucent concrete
Ingredients	96% concrete, 4% optical fibre
Density	2100-2400kg/m2
Block Size	15cmx15cmx15cm
Thickness	25-500mm
colour	Grey
Compressive strength	24 N/mm2
Tensile strength	7 N/mm2

II. LITERRATURE REVIEW

1.Neha R. Nagdiveand shekhar D. Dhole(2013) ISSN(P):2347-4599 Vol.1, issue 7 Dec 2013.23-30. " To Assess the Characteristics of See-through Concrete and Their Panels.We drilled holes in the cement and mortar to test the properties of optical fiber-made



transparent concrete, which allows us to take use of the fibres' light-guiding properties.Their research led them to the conclusion that clever transparent concrete effectively guides light. "Optical Fibre is the modelling of translucent Concrete Block," M.N.V. Padma Bhushan (2013) adds. Research published in the journal Ijera (ISSN:22489622, www.ijera.com, vol.3 issue-3 May-June 2013, pp.013-017) found that optical fibres and other embedded light optical elements give concrete its translucent quality.They came to the conclusion that there are several useful uses for transparent concrete blocks and that they may be formed into various shapes. The hefty cost is a drawback, however.

Light-transmitting concrete — A New Advanced Research Journal of Engineering Research and General Science, volume 3, number 3, by Patil Gaurao s. and V. Swapanil (2015) Section 2 (March–April 2015) ISSN 2091–2730 Research has shown that new novel materials can be used to make light-transmitting concrete.The light guidance on white light test, durability on freezing and thawing test, and chloride ion penetration test are all dependent on the superior properties of optical fibre and its elasto-optic effect. Based on their findings, they can say that smart translucent concrete is visually beautiful due to its high level of transparency.

4. M. Sangeeta (2014) investigated the energy efficiency of lightweight translucent concrete in an experimental study published in the International Journal of Scientific Research and Development (ISSN: 2321-0613).Due to its low density and excellent heat conductivity, this concrete is much lighter than regular concrete. They came to the conclusion that employing lightweight materials like as Portland Pozzolana cement, natural sand, and optical fibre for ornamental purposes might minimise the dead weight of the building, leading to the adoption of lightweight concrete.

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 finished product, known as light-transmitting concrete, is made from regular cement with added ingredients.

For the sake of this definition, "cement" should only refer to the binding substance used in conjunction with other building materials such as stones, sand, bricks, building blocks, etc. The lime's primary cement components, so that in construction civil engineering, and the like. Underwater, cement sets thanks to a chemical process that releases the heat of hydration. Hydraulic cement is another name for it.

A transparent, pliable fibre that is only a hair thicker than a human hair is called an optical fibre. Optical fibres may be constructed of plastic or glass (silica). It allows light to go from one end of the fibre to the other like a waveguide or light pipe.

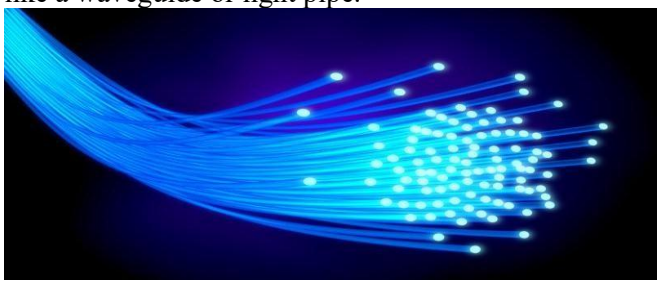


Fig.3 Optical fibre

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

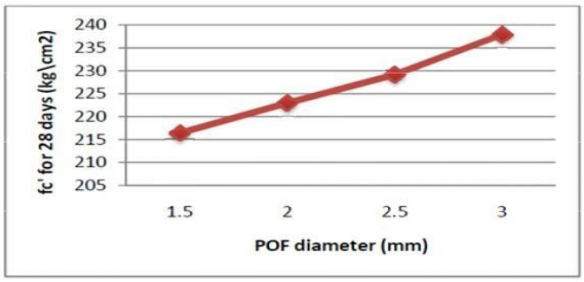
COMPRESSIVE STRENGTH

After measuring the light transmitted, the compressive testing equipment was used to estimate the sample's compressive strength. The test results are shown in Table 2. Table 2 shows that the compressive strength of Light Transmitting Concrete, when tested with optical fibre specimens, ranged from 20 to 23 N/mm2. The concrete meets the compressive strength requirement for M20 grade concrete, as shown by the compressive strength range from 24-26 N/mm2 when tested using glass rods specimen.



fig.6 Cube during compressive test

Fig.7: 7-day compressive strength compressive



strength versus fiber diameters at fiber content of 4%

VI. APPLICATION:

1. Pavement, flooring, and load-bearing walls may all benefit from these translucent concrete blocks.
2. Thin-panel facades, inner wall cladding, and partition walls.
3. A partition wall may be used in areas where natural light is inadequate.
4. In furniture for the sake of aesthetics and decoration.
5. Illuminate evening walkways.
6. Improving illumination at underground transportation hubs.
7. Nighttime illumination of speed bumps on roads.

VII. CONCLUSION

In contrast to its drab, lifeless past, modern concrete is light and vibrant. Concrete that is more resistant, lighter, white, or coloured, etc., has been produced by research and invention. Translucent concrete, a building material, is made by mixing the concrete with optical fibre or large-diameter glass fibre. Being see-through, the concrete has excellent

The transmission is directly proportional to the light-guiding quality and the volume-to-concrete ratio of optical fibres. It may be used to enhance the building's architectural appeal. Used as well in areas where strong enough illumination is not available. Green energy conservation and the self-sensing capabilities of practical materials may come together in an innovative new construction material.

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