

Light Transfer through Concrete by using Optical Fiber

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Abstract— In Country Population will increase and that's why it results in growth construction sector. therefore construction activities will increase day by day. In Construction of tall and multi-storey building ends up in obstructing natural light-weight to beat this issue, concrete that created by victimisation fiber is employed to form concrete clear. it's use to transferring the sunshine. And conjointly its used for decorating purpose. sizable amount of buildings and enormous size of building could obstructing the doorway of natural light-weight and therefore the concrete created by victimisation glass fiber will transmit the natural light-weight likewise as artificial light-weight. The glass fiber is incredibly skinny wire like hair. glass fiber created by plastic or fiber. The properties of this concrete is as same as concrete created by victimisation glass fiber.

Index Terms— Light Transmitting Concrete, Normal concrete, Compressive strength, Flexural strength, Light transmission test

I. INTRODUCTION

The concrete was thought about as material fabricated from mixture, sand, water and cement just for structural purpose in past. However today additional and additional inventions verify in construction fields thanks to significant population and significant demand. The house between buildings is scale back and leads to used of energy sources, artificial sources like electricity etc. We tend to try to create some new technique that immersion on saving energy by mistreatment concrete created up with facilitate of glass fibre. The concrete created by mistreatment material are as follows: cement, sand, water and glass fibre. With the assistance of glass fibre discovering that the concrete transferring the sunshine to different aspect. The concrete that created by mistreatment glass fibre saves twenty fifth of power throughout daily time and therefore the strength is same as traditional concrete this concrete typically employed in experienced building to avoid

wasting the electricity. However the properties of this concrete isn't same as traditional concrete. The glass fibre is versatile in nature and it's like skinny wire like human hair.

II. OBJECTIVES AND SCOPE OF INVESTIGATION

A. Objectives

- To study strength characteristics of TSC
- To compare strength characteristics of TSC & NCC
- To check the light transmittance of the TSC

B. Scope of the work

Light transmitting concrete is additionally a good insulating material that protects against out of doors extreme temperatures whereas additionally belongings in daylight. This makes

it a wonderful compromise for buildings in harsh climates, wherever it will keep heat or cold while not shutting the building aloof from daylight. It is used to illuminate underground buildings and structures, such as subway stations. The possibilities for light transmitting concrete are innumerable; the lot of it's used, the a lot of new

uses are discovered. In the next few years, as engineers more explore this exciting new material, it's absolute to use during a variety of fascinating ways in which can modification the opacity of design as we all know it.

III. EXPERIMENTAL PROGRAM

A. Ordinary Portland cement (OPC)

Cement is that the individual unit of fine and coarse combination into a solid mass by virtue of its inherent properties of setting or hardening in combination with water. it'll helps to fill the voids and gives

density to the concrete. during this study Ordinary Portland Cement-Grade 53, has been certified with IS: 12269 – 1987, Grade 53 that is known for its wealthy quality and high sturdiness is employed. It is used for constructing larger structures like building foundations, bridges, tall buildings, and structures style to face up to significant pressure. As such, Ordinary cement is employed for quite an wide range of applications in pre-stressed concrete ar drylean mixes, sturdy pre-cast concrete, and prepared mixes for general functions.

B. Fine Aggregate

The influence of fine aggregates on the contemporary properties of the concrete is considerably larger than that of coarse mixture. The high volume of paste in concrete mixes helps to scale back the inner friction between the sand particles however an honest grain size distribution remains important. Fine aggregates will be natural or factory-made. The grading should be uniform throughout the work and should tolerate 2.36 millimeter sieve size that confirms to the code IS: 383– 1970. Particles smaller than zero.125 millimeter size considered as fines that contribute to the powder content.

C. Optical fiber

Generally 200 μ Diameter Strands area unit used for construction of semitransparent concrete..An optical fibre is a cylindrical stuff wave guide fabricated from low-loss materials like silicon oxide glass. it's a central core in which the sunshine is guided , embedded in AN outer cladding of slightly lower index of refraction. Light rays incident on the core-cladding boundary at angles greater than the incidence angle endure total internal reflection and area unit guided through the core while not refraction. Rays of larger inclination to the fiber axis lose a part of their power into the facing adenosine triphosphate communications during a native space network. Each reflection and don't seem to be guided

D. Water

Water is that the key ingredient, that once mixed with the cement, forms a paste that binds the combination along. Potable water out there in laboratory was used for casting all the specimens. The quality of water was found to satisfy the wants of IS: 456-2000

IV. METHODOLOGY OF EXPERIMENT

Preparation of mould

In the method of constructing light-weight transmitting concrete, the primary step concerned is preparation of mould. The mould needed for the example are often made with totally different materials which may be of either tin or wood. within the mould preparation, it's necessary to fix the essential dimensions of mould. the quality minimum size of the cube in keeping with IS forty five 2000 is 15cm x 15cmx 15cm for concrete. within the mould, markings ar created precisely in keeping with the dimensions of the cube so the perforated plates are often used. Plates made of sheets that ar employed in controller boards is employed which can be useful in creating perforations and provides a swish texture to the mould, holes ar trained in to the plates.The diameter of the holes and variety of holes in the main depends on percentage

B. Manufacturing processe of fiber used.

The producing method of clear concrete is nearly same as regular concrete. Only fibers area unit unfold throughout the combination and cement mix. tiny layers of the concrete area unit poured on high of every different and infused with the fibers and are then connected. Thousands of strands of optical fibers area unit forged into concrete to transmit light-weight, either natural or artificial. light-weight sending concrete is produced by adding four-dimensional to five optical fibers by volume into the concrete mixture. The concrete mixture is formed from fine materials solely it doesn't contain coarse mixture. Thickness of the optical fibers is varied between a pair of a pair of and a couple of millimetre to suit the particular needs of sunshine transmission .Automatic production processes use woven fibers cloth rather than single filaments. Fabric and concrete area unit alternately inserted into molds at intervals of roughly .5cm to 1cm .Smaller or diluent layers permit associate multiplied quantity of sunshine to go through the concrete. Following casting, the fabric is take panels or blocks of the desired thickness and therefore the surface is then generally polished, leading to finishes starting from semi-gloss to high-gloss.

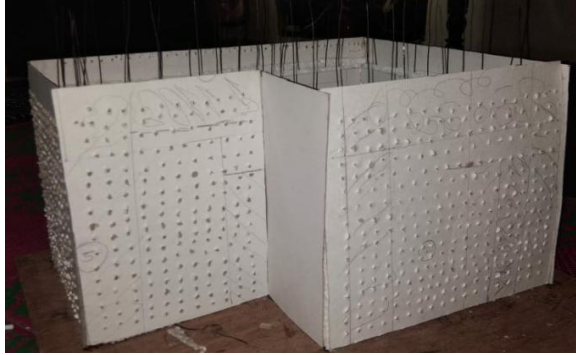


Fig 1 Inserting of optical fibers



Fig 2 optical fibre walls



fig.3 light transmitting wall

V. TESTS CONDUCTED

A. Compression test

By definition, the compressive strength of a cloth is that worth of uniaxial compressive stress reached once the fabric fails utterly. The compressive strength is typically obtained by experimentation by means that of a compressive check. The compressive strength of the concrete is set by solid the cubes of size 150mm x150mm x150mm.

Compressive strength = load/area

B. Light transmitting test

The light transmission through the sample may be measured by measurement the present adore the

sunshine which may be measured by a photograph diode or a light-weight Dependent Resistors (LDR). the utilization of exposure diode would need a separate device which might increase the price of the project. the foremost apt selection would be LDR. The LDR square measure soldered onto a PCB board. LDR measures the sunshine transmitted through the sample and converts it into the present, that during this case is measured in mili amperes (mA). therefore 2 readings square measure taken, one while not sample (A1) and one with sample (A2). The supply of sunshine here is taken as one hundred w incandescent bulbs, a resistance of one hundred Ω is applied within the circuit and a regular DC voltage of two.5 V is unbroken between the circuits. to make sure no light-weight escapes throughout the take a look at, a box created from plyboard is created. the sunshine supply is mounted at the highest of the box and LDR is placed at rock bottom. The sample is placed between supply and LDR and take a look at is dole out.

Light transmission = one hundred $-(A1-A2/A1) \times 100$
Where;

A1= light-weight transmitted while not sample

A2= light-weight transmitted with sample

C. Flexural strength test

Flexural strength is one live of the durability of concrete. it's a live of associate degree unreinforced concrete beam or block to resist failure in bending. it's measured by loading half-dozen x half-dozen in. (150 x 150-mm) concrete beams with a span length a minimum of 3 times the depth. The flexural strength is expressed as Modulus of Rupture (MR) in psi (MPa) and is decided by commonplace check strategies ASTM C seventy eight (third-point loading) or ASTM C 293 (center-point loading). Flexural Strength of Concrete Flexural adult male is concerning ten to twenty % of compressive strength looking on the sort, size and volume of coarse combination used. However, the simplest correlation for specific materials is obtained by laboratory tests for given materials and blend style. The adult male determined by third-point loading is not up to the adult male determined by center-point loading, typically by the maximum amount as 15 August 1945. The flexural strength of the concrete is decided by conducting the check on prism by 2 points loading. Flexural strength = Pl/bd^2

Where,

P – Load

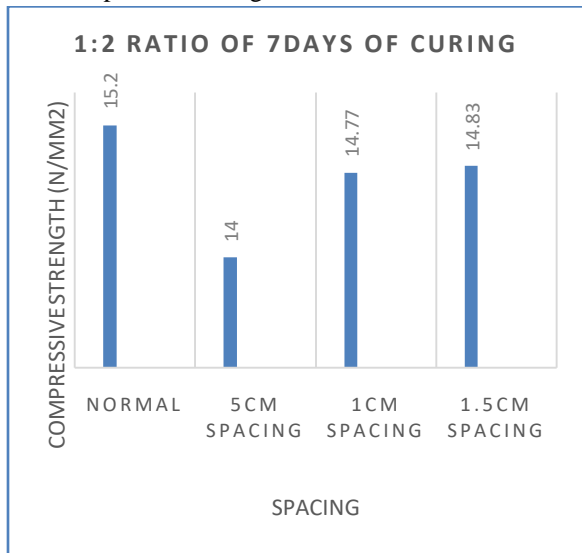
l – Length of the specimen

b – breadth of the beam

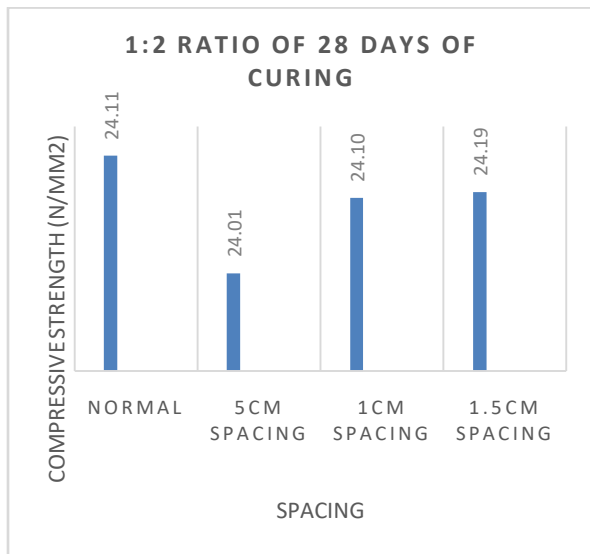
d – Depth of the beam

VI. RESULTS AND DISCUSSION

A. Compressive strength test results



Comparison of strength between light transmitting concrete & normal concrete



Comparison of strength between light transmitting concrete & normal concrete

B. Light transmission test results figure light testing results of optical fibre concrete

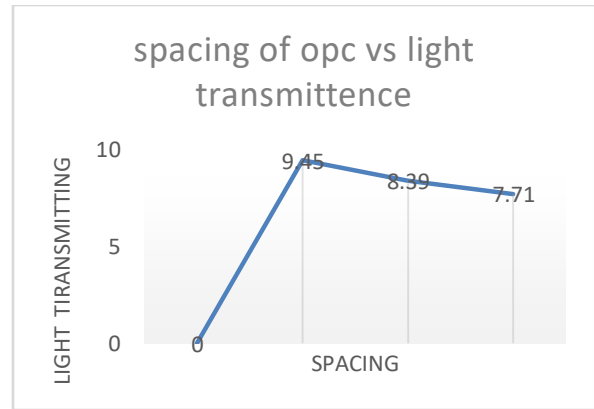
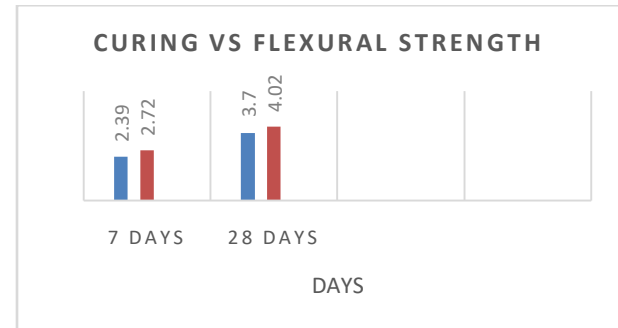


Fig. of Light transmitting result of optical fibre concrete

C. Flexural strength test

Table of Flexural strength results of translucent concrete

Curing	Flexural strength(mpa)	
Normal concrete	Light transmitting concrete	
7 days	2.39	2.72
28 days	3.7	4.02



Flexural strength comparison of normal concrete with light transmitting concrete

VII. ADVANTAGES AND LIMITATIONS

1. Advantages

- the most advantage of those merchandise is that on giant scale objects the feel remains visible - while the feel of finer semitransparent concrete becomes faint at distance.
- once a solid wall is imbued with the power to transmit lightweight, it implies that a home will use fewer lights in their house throughout daytime.
- it's smart|excellent|superb} study properties for giving good beautiful read to the building.

- wherever lightweight isn't ready to return properly at that place clear concrete is used.
- Energy saving is done by utilization of clear concrete in building.
- all surroundings friendly attributable to its lightweight sending characteristics, therefore energy consumption is reduced.

2. Limitations

- the most disadvantage is these concrete is extremely pricey thanks to the optical fibers.
- Casting of clear concrete block is troublesome for the labour therefore special good person is needed.

VIII. CONCLUSION

Translucent concrete blocks may be employed in some ways and enforced into several forms and be extremely advantageous. Yet, the sole disadvantage would be its high value. That doesn't stop high category architects from victimization it. It's an excellent sign of attraction and inventive evolution. Any structure with atiny low hint of clear concrete is certain to create heads flip and create them change awe.

The compressive strength of sunshine sending concrete is adequate to the strength of the normal concrete and it's the sunshine. If the share of the optical fibers redoubled than the strength of the concrete starts decreasing thus we will conclude that the strength of clear concrete is reciprocally proportional to lightweight coefficient. solely fine aggregates square measure used as a result of if we tend to use coarse aggregates then it should destroy the optical fibers and changes their properties. clear concrete achieves most result once employed in AN setting with a high degree of sunshine distinction, like this lit table in a very dimly lit space.

The strength results of ornamental concrete square measure correlative with results of normal plain cement concrete. The results plainly show that the ornamental concrete additionally performance supported the strength side is additionally significantly high. therefore the applying of fiber can create the concrete ornamental similarly as will create the concrete structural economical.

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