

INVESTIGATIONAL APPROACH ON TRANSPARENT CONCRETE

Submitted in partial fulfillment of the requirements for the award of

Bachelor of Engineering degree in

Civil Engineering

by

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SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **CHIDHAMBARAM S** (Reg.No:37200015) and **RATHIKA C** (Reg.No:37200059) who carried out the project entitled "**INVESTIGATIONAL APPROACH ON TRANSPARENT CONCRETE**" under our supervision from December 2020 to March 2021.

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DECLARATION

We **CHIDHAMBARAM S** (Reg.No.37200015) and **RATHIKA C** (Reg.No.37200059) hereby declare that the Project Report entitled “**INVESTIGATIONAL APPROACH ON TRANSPARENT CONCRETE**” done by us under the guidance of **Mrs. M.PRABA M.E.** is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Civil Engineering.

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ABSTRACT

Transparent concrete is that the concrete based artifact with light transmissive properties during which the sunshine transmitted either manually artificially from one end to a another end of the concrete. Transparent concrete is additionally referred to as translucent concrete and lightweight transmitting concrete (LiTraCon). Two types of mould are prepared for this project such as cube, cylinder. The M30 grade concrete is poured into the mould. The concrete mix contains 4% of optical fibres and glass powder is partially replacement of cement with different percentage (5%, 10%, 15%) using this properties concrete is formed and that they are tested to seek out the mechanical properties. it's ready to use prefabricated buildings and panelling. the most advantages is to scale back the facility consumption during the daytime by utilizing sunlight. It gives good aesthetic view of the building as totally eco-friendly also as green building. Our study involves the experimental analysis strength of concrete cubes, cylinders and comparative strength analysis of an equivalent with conventional concrete for 7, 14 and 28 days. The strength analysis of the concrete is completed by the tests on compressive strength, split tensile using the casted moulds for the analysis.

TABLE OF CONTENTS

CHAPTER. No.	TITLE	PAGE. No
	ABSTRACT	V
	LIST OF FIGURES	IX
	LIST OF TABLES	X
	LIST OF SYMBOLS AND ABBREVIATIONS	XI
1	INTRODUCTION	1
	1.1 General	1
2	LITERATURE STUDY AND METHODOLOGY	2
	2.1 Literature Review	3
	2.2 Methodology	6
3	AIM AND SCOPE	7
	3.1 Objective	7
	3.2 Scope of Study	7
4	MATERIALS AND METHODOLOGY	8
	4.1 Materials Used	8
	4.1.1 Fine Aggregate	8
	4.1.2 Coarse Aggregate	9
	4.1.3 Cement	9
	4.1.4 Glass Powder	10
	4.1.5 Optical Fibres	11
	4.2 Test on Materials Property	12
	4.2.1 Cement	12
	4.2.1.1 Specific Gravity Test for Cement	12

4.2.1.2 Consistency of Cement	13
4.2.2 Fine Aggregate	14
4.2.2.1 Specific Gravity Test	14
4.2.3 Coarse Aggregate	15
4.2.3.1 Specific Gravity Test	15
4.2.4 Glass Powder	16
4.2.4.1 Specific Gravity Test	16
4.3 Mix Design	17
4.4 Casting and Curing	19
4.4.1 Casting	19
4.4.2 Demoulding	21
4.4.3 Curing	21
4.5 Test on Fresh Concrete	23
4.5.1 Slump Test	23
4.6 Test on Hardened Concrete	24
4.6.1 Compressive Strength Test	24
4.6.2 Split Tensile Strength Test	27
5 PERFORMANCE ANALYSIS & DISCUSSION	30
5.1 Test Results & Analysis	30
5.2 Cement Testing	30
5.3 Fine Aggregate Testing	30
5.4 Coarse Aggregate Testing	30
5.5 Compressive Strength Testing	31
5.6 Split Tensile Strength Testing	32
6 CONCLUSIONS	33

6.1 Conclusion	33
REFERENCE	34

LIST OF FIGURES

FIGURE. No.	TITLE	PAGE. No.
2.1	Methodology	6
4.1	Fine Aggregate	8
4.2	Coarse Aggregate	9
4.3	Cement	10
4.4	Glass Powder	10
4.5	Optical Fibres	11
4.6	Specific Gravity Test for Cement	12
4.7	Consistency of Cement	13
4.8	Specific Gravity Test for Fine Aggregate	14
4.9	Specific Gravity Test for Coarse Aggregate	15
4.10	Specific Gravity Test for Glass Powder	16
4.11	Casting of Specimens	20
4.12	Demoulding of Specimens	21
4.13	Curing of Specimens	22
4.14	Slump Test	23
4.15	Comparison of Compressive Strength for 7,14,28 days	25
4.16	Compressive Strength Test	26
4.17	Comparison of Tensile Strength for 7,14,28 days	28
4.18	Tensile Strength Test	29

LIST OF TABLES

FIGURE. No.	TITLE	PAGE. No.
4.1	Specific Gravity Observed for Cement	12
4.2	Cement Consistency Observed	13
4.3	Specific Gravity Observed for Fine Aggregate	14
4.4	Specific Gravity Observed for Coarse Aggregate	15
4.5	Specific Gravity Observed for Glass Powder	16
4.6	Mix Design	18
4.7	Average Compressive Strength Values Observed	25
4.8	Average Split Tensile Values Observed	28
5.1	Cement Test Results	30
5.2	Fine Aggregate Results	30
5.3	Coarse Aggregate Results	30
5.4	Average Compressive Strength Values Observed	30
5.5	Average Split Tensile Values Observed	31

LIST OF SYMBOLS AND ABBREVIATIONS

ACRONYMS

EXPANSIONS

Gm	grams
N	Newton
%	Percentage
°	Degree
KN	Kilo Newton
Mm	Millimeter
Km	Kilometer
OPC	Ordinary Portland Cement
M	Meter
Fig	Figure
OP	Optical Fiber
GP	Glass Powder

CHAPTER 1

INTRODUCTION

1.1 GENERAL

Translucent light-weight Concrete could be a new material with numerous applications within the construction field, design, decoration and even in article of furniture business. In today's time wherever whole of the analysis is targeted towards non utilization of natural resources the maximum amount as attainable and to cut back its consumption that area unit decreasing with time, light-weight LiTraCon ("Lightweight light-weight transmission Concrete") could be a light-weight semi transparent concrete artefact fabricated from concrete with embedded with up to completely different percentages by weight of concrete combine that area unit fertilized concrete cubes and cylinders in order that light-weight are often transmitted from the surface in and within out of the building. associate plastic optical fibers slightly thicker than a person's hair & could be a 3 bedded cable created of Buffer coating, facing and core with transmits light-weight through the core of fibers. Our project of casting transparent concrete aims at analyzing the compressive and tensile strength of samples by varied the share by volume of 4% optical fibres and partly replacement of glass powders for cement numerous percentages (5%, 10%, 15%).

CHAPTER 2

LITERATURE STUDY AND METHODOLOGY

2.1 LITERATURE REVIEW

Shreyas K (March 2018) has studied Transparent Concrete main aim of the study is to design translucent concrete blocks with the use of glass rods with sand and cement then analyse their various physical and engineering properties with respect to conventional concrete blocks by adding glass rods of 1%, 2%, 3%, 4%, 5% at 1.5cm spacing respectively. Mechanical behaviour of plain concrete cubes were studied for Compressive, Split tensile and Flexural strength test with curing time of 7 days, 14 days, 21 days and 28days which shows characteristic increase in its strength behaviour. In this study, it can be concluded that the Optical fibers can be used in concrete mix up to 5% replacement will give an excellent results both in strength and quality aspects.

Poornima D, Shailaja T, Pooja H P, Santhosh G, Sachidananda B, Rashmi M P (May 2019) has studied Experimental Study On Light Transmitting Concrete using Optical Fibers casting of concrete involves the preparation of M25 grade concrete by cement, fine aggregate, coarse aggregate, optical fibers. Adding 4% or 5% plastic fiber content & cement is replaced by 10%, 15% of silica fume. They observed that LiTraCon with replacement of silica fume by 15% gives high compressive strength that of 10% and split tensile strength of concrete with 10% replacement of cement by silica fume increased by 13.61% compared to conventional concrete and 8.26% for 15% replacement.

P Dileep Kumar, E Venkatalakshmi, Ch Sravya (2019) has studied Evaluation of Strength Characteristics of Transparent Concrete. They study the strength characteristics of Transparent Concrete and Conventional Concrete. And also compare the strength characteristics of Transparent Concrete and Conventional Concrete and also study the energy saving for illumination by using transparent block for building and they observed the compressive strength of transparent concrete is slightly higher than the conventional concrete and This new kind building material can

integrate the concept of green energy saving with using the self-sensing properties of functional materials.

Durga Raghavi T, Dr.K.Rajasekar (Feb 2019) has studied Experimental studies on Strength and Durability properties of Transparent Concrete. In this project they study the strength characteristics of transparent concrete and workability of transparent concrete. And compare the strength characteristics of Transparent Concrete and Conventional Concrete. Workability of Transparent Concrete shown higher slump values as the percentage of addition of Optical Fibers increases. Compressive strength of concrete increases with increase in percentage of plastic optical fiber used in concrete mixes. The compressive strength and for 4% plastic optical fiber; it is slightly more than conventional concrete.

Soumyajit Paul, Avik Dutta (October 2013) Translucent Concrete, they has studied to cast a special type of concrete with light transmitting properties, to study their characteristics and to develop a functioning material that isn't solely energy saving however offers out inventive end. The translucent has concrete has good light guiding property and the ratio of optical fiber volume to concrete proportion to transmission. The translucent concrete not loses the strength parameter when compared to regular concrete and also it has very vital property for the aesthetical view.

Dinesh w. Gawatre et al, Transparent concrete as an eco-friendly material for building, The main purpose was to use sunlight as a light source in order to reduce the power consumption of illumination. Light is conducted through the stone from one end to the other end. The clear concrete has smart light-weight guiding property and also the magnitude relation of fiber volume to concrete is proportion to transmission. The clear concrete not loses the strength parameter compared to regular concrete and additionally it's terribly important property for the esthetical purpose of read.

Riya Gite, Shilpa Kewate (March-2017) Critical Study on Transparent Concrete, This paper presents the study on addition of waste glass with optical fibre in transparent concrete. The transparent concrete has good light guiding property and the ratio of optical fibre volume to concrete is proportional to transmission. This

innovative kind of building material can merge the idea of green energy saving with the usage of self-sensing properties of working material.

Sandeep sharma, Dr. O.P.Reddy (March 2017) This paper confines with the need of transparent concrete at present utilize the sunlight and for architecture technologies. The new type of concrete can satisfy the green energy saving with its own natural properties. Transparent concrete can be produced by adding optical fiber in the fine concrete mixture. It has good light transmitting property, which is directly depended on the ratio of presence of optical fibre to the total volume of concrete. It can be used as an awesome architecture work, with attractive looks. Can also be used in the area where natural sunlight cannot reach in the desired intensity. This new type of concreting representing the concept of green building with self-sensing property of it.

Sasidharan J et al, This report focuses on various material that can be used to transfer light in concrete and at the same time to retains its compressive strength. Translucent concrete is fabricated by mixing optical fibers along with cement mixture, this process involves the use of more advanced techniques which leads the method to be more costly difficult. In order to reduce the cost of and the difficulty of preparation methodology we have used Acrylic glass strips and ordinary 60 μ m optic fiber instead of the conventionally used optic fiber. Thus the project concludes with the fact that the usage of acrylic strips will provide fair illumination, better strength and is comparatively of low cost.

Amlan Kumar Sahoo et al, In this experimental study of light transmitting concrete using optical fiber, this project aims at producing the concrete specimens by reinforcing optical fibers and comparing it with the conventional concrete. With the advancement of technology, our infrastructures should be modified. For sustainable development, they have to emphasize the use of renewable energy sources to meet the growing demand for energy.

Shanmugavadivu et al, has studied an experimental study on light transmitting concrete, make the concrete decorative by luminating on the surface and check whether the introduction of fiber wire into concrete will help or influence to change in the engineering properties of the member. The efficiency of the application

of optical fibre is studied by comparing the strength with the normal M20 grade concrete and the test results proved that the efficiency is more in all aspect. The main purpose of light transmitting concrete is created as a model and the light transmission made of the illuminating side of the concrete.

Vandhiyan R, et al, has studied experimental study on replacement of cement by glass powder, the recycled glass has been used in the form of powder. The glass powder was tested with concrete & mortar. Cement was replaced by the glass powder in the proportion of 5%, 10%, 15%. The compressive strength, split tensile strength, consistency and flexural strength were conducted from the replacements. Concluded from the research that 10% replacement of cement by glass powder is the best proportion. Alkali-silica reactivity effect is controlled when glass powder with high Na₂O used.

Dilna R D, et al, has studied partial replacement of cement by glass powder in concrete, this project investigates the effect of using combination of glass powder & seashell powder as partial replacement for cement in M35 grade concrete. Various tests conducted on the laboratory casted concrete specimens and their behaviour will be observed and documented for 7&28 days testing. As the percentage of replacement increases the workability decreases. Super plasticizer is necessary to maintain workability with restricted water cement ratio. Compressive strength of concrete increases up to 20 % then decreases in 28 days test. Split tensile strength of concrete initially decreases compared to conventional concrete then a sudden increases in 20 % replacement. Then decreases slowly. Flexural strength increases gradually up to 20 % replacement then slowly decreases.

Subramani T, et al, has studied experimental study on concrete using cement with glass powder, Glass powder was partially replaced as 10%, 20%, 30% and 40% and tested for its compressive, Tensile and flexural strength up to 28 days of age and were compared with those of conventional concrete, ; from the results obtained, it is found that glass powder can be used as cement replacement material up to particle size less than 75µm to prevent alkali silica reaction. The compressive strength of concrete cube up to a replacement proportion of 10% of cement. In case of cement mortar the strength improves up to 15% replacement of cement. There was marginal improvement in the Split tensile strength.

2.2 METHODOLOGY

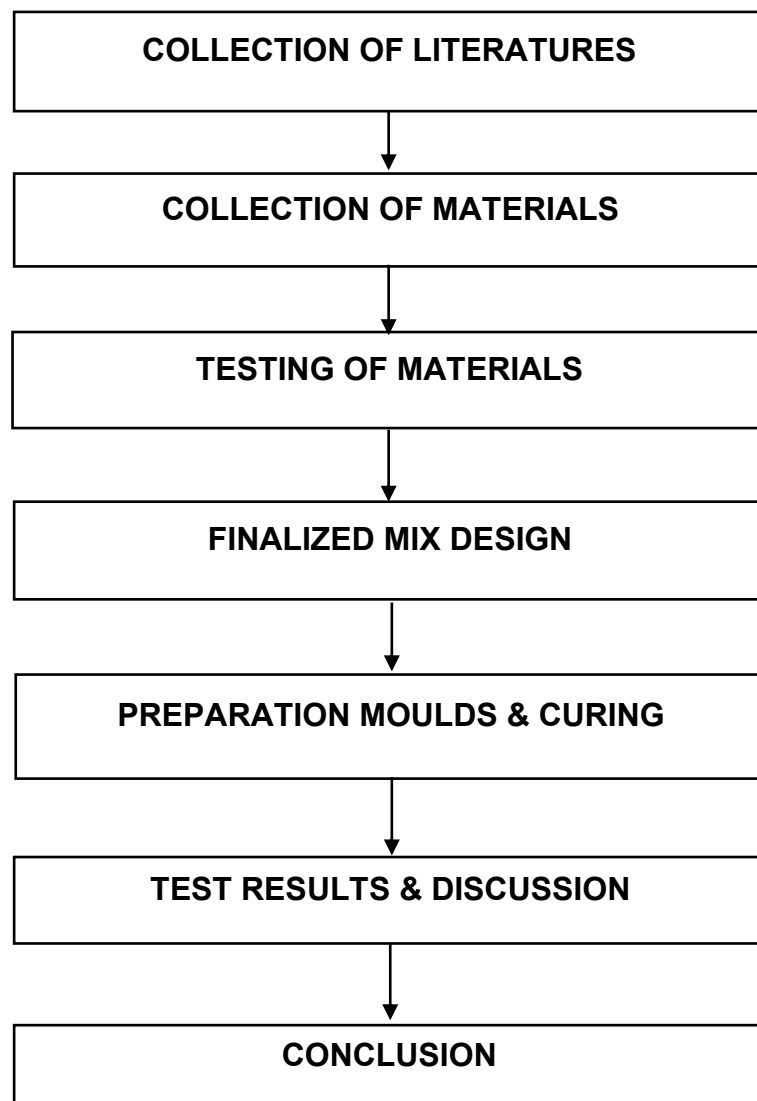


Fig:2.1 : Methodology

CHAPTER 3

AIM AND SCOPE

3.1 OBJECTIVE

1. To determine the mechanical properties of concrete. Such as compressive strength, split tensile strength
2. To compare strength characteristics of translucent concrete and conventional concrete
3. To determine the optimum percentage of addition of fibers based on compressive strength
4. To check the transmittance of the translucent concrete

3.2 SCOPE OF STUDY

1. Light weight – increasing the strength and life span of the concrete
2. Cracking control
3. Light transmitting concrete

CHAPTER – 4

EXPERIMENTAL TESTING

4.1 MATERIALS USED

The materials used in the study included ordinary portland cement, fine aggregate, coarse aggregate, water, optical fiber and glass powder.

4.1.1 FINE AGGREGATE

Manufactured sand (M-Sand) is artificial sand made from crushing hard stones into tiny sand sized angular formed particles, washed and finely hierarchic to be used as construction aggregates. It's superior different to watercourse Sand for construction purpose. M-sand has higher compressive and flexural strength. M-sand is hierarchic with exactitude and consistency therefore it's higher Fineness Modulus compared to natural sand and crushed dirt. This provides sensible workability for concrete. The form of crushed sand is cubicle and angular and encompasses a rough texture and thence it's higher for concrete. It's well hierarchic within the needed proportion for construction. It doesn't contain Associate in Nursing organic and soluble compound that have an effect on cement setting time. It's a cost-effective and eco-friendly material.



Fig:4.1 : Fine Aggregate

4.1.2 COARSE AGGREGATE

Coarse aggregates are any particles bigger than 0.19inch, however usually vary between 3/8 and 1.5 inch. in diameter. Gravel represent the majority of coarse mixture utilized in concrete with crushed stone making up most of the remainder. throughout this 20mm size aggregates has been used throughout this experiment. Crushed stones were used as coarse mixture and conjointly the physical properties were determined.



Fig:4.2 : Coarse Aggregate

4.1.3 CEMENT

Ordinary portland cement is factory-made by combination of pozzolanic materials. this sort of cement is factory-made to powder by compounding rock and alternative raw materials that consists of argillaceous, carbonate and mineral. OPC fifty three grade cement is needed to substantiate to BIS specifications IS:12269-1987 with a designed strength for twenty eight days being a minimum of fifty three MPa. fifty three grade OPC provides high strength and sturdiness to structures owing to its optimum particle size distribution and superior preserved structure.



Fig:4.3 : Cement

4.1.4 GLASS POWDER

A glass is a solid, non-crystalline, typically transparent, amorphous material. The most common type of glass is soda-lime glass, which comprises mostly of silicon dioxide, SiO_2 , along with sodium oxides, calcium oxide and alumina. Another class of compounds used as concrete additives are pozzolans – a group of siliceous or aluminous which can react in water with calcium hydroxide (present in the cement) to produce a material with concrete-like properties. Waste glass is one material when ground to a very fine powder shows pozzolanic properties which can be used as a partial replacement for cement in concrete.



Fig:4.4 : Glass Powder

4.1.5 OPTICAL FIBERS

An fiber might be a flexible, clear fiber created by drawing glass or plastic to a diameter slightly thicker than that of a human's hair. AN fibre is additionally a versatile, clear fiber created by drawing glass or plastic to a diameter slightly thicker than that of AN human's hair. It functions on the principle total internal refraction, it permits light-weight wave to travel through it whereas not overwhelming energy from it. Its kind is identical as cylindrical, the within a section of this may be factory-made from glass or plastic that is really refractive i.e. the core of the fibre is of high magnitude relation, that cause the passage of sunshine through it whereas not of abundant loss within the P.E. of sunshine. The outer a section of this cylindrical core is assumed to be protection and has low refraction. Either then this fibre has an additional quality that makes it fully fully totally different from others and far helpful than the other material, it permits the sunshine to travel through it even at angle extra then 60° . In our project 4% of plastic optical fibres used in mix.



Fig:4.5 : Optical Fibers

4.2 TEST ON MATERIALS PROPERTY

4.2.1 Test on Cement-

4.2.1.1 Specific Gravity Test For Cement

Table 4.1 : Specific Gravity Observed For Cement

SI.NO	weight of empty flask g(W1)	weights of flask filled by cement in g(W2)	Weight of flask + cement + kerosene in g(W3)	Weight of Flask + kerosene in g(W4)
1	30	46	87	76
2	31	45	85	78

$$\text{Specific Gravity} = (W2-W1)/(W2-W1) - (W3-W4)$$

From the table 4.1 The Specific Gravity of Cement is 3.1

IS: 2720 – Part 3, A good cement should have the Specific Gravity of 3.1 – 3.6 g/cc



Fig:4.6 : Specific Gravity Test For Cement

4.2.1.2 Consistency of Cement

The basic aim is to travel looking out out the water content required to provide a cement paste of normal consistency as specific by the IS: 4031 (Part 4) – 1988. The principle is that normal consistency of cement is that consistency at that the Vicat plunger penetrates to some extent 5-7mm from bottom of Vicat mould.



Fig:4.7 : Consistency of Cement

Table 4.2 : Cement Consistency Observed

S.NO	PERCENTAGE OF WATER (%)	PENETRATION DEPTH (MM)
1	25	30
2	26	27
3	27	24
4	28	19
5	29	15
6	30	11
7	31	7

4.2.2 Test on Fine Aggregate

4.2.2.1 Specific Gravity Test for Fine Aggregate

Table 4.3 : Specific Gravity Observed for Fine Aggregate

Sl.NO	weight of fine aggregates in g(a)	weights of glass container filled by water in g(b)	Weight of glass container + aggregates +water in g(C)	Weight of water in g(D)
1	597	1277	1964	1557
2	590	1268	1960	1550

$$\text{Specific Gravity} = (B-A)/(B-A)-(C-D)$$

From the table 4.2 The specific gravity of fine aggregate is 2.63



Fig:4.8 : Specific Gravity Test For Fine Aggregate

IS: 2386 (Part-3): 1963, Methods of test for aggregates for concrete, The specific gravity of aggregates normally used in construction ranges from around 2.5 to 3.0 with an average value about 2.68

4.2.3 Test on Coarse Aggregate

4.2.3.1 Specific Gravity Test for Coarse Aggregate

Table 4.4 : Specific Gravity Observed for Coarse Aggregate

Sl. No	weight of fine aggregates in g(a)	weights of glass container filled by water in g(b)	Weight of glass container + aggregates +water in g(C)	Weight of water in g(D)
1	597	1165	1916	1557
2	590	1260	1890	1450

Specific gravity=(b-a)/(b-a)-(c-d)

From the table 4.2 The specific gravity 20mm size coarse aggregate is 2.7



Fig:4.9 : Specific Gravity Test For Coarse Aggregate

IS: 2386 (Part-3) – 1963, Methods of test for aggregates for concrete, The specific gravity of aggregates normally used in construction ranges from around 2.4 to 3.0 with an average value about 2.7

4.2.4 Test on Glass Powder

4.2.3.1 Specific Gravity Test For Glass Powder



Fig:4.10 : Specific Gravity Test For Glass Powder

Table 4.5 : Specific Gravity values Observed for Glass Powder

SI.NO	GLASS POWDER IN GM (W)	INITIAL VALUE (W1)	FINAL VALUE (W2)	SPECIFIC GRAVITY OF GLASS POWDER
1	45	0.3	19.2	2.3
2	45	0.3	18.9	2.4
3	45	0.3	19.0	2.4

$$\text{Specific gravity} = \frac{W2 - W1}{W}$$

4.3 MIX DESIGN

Mix design is the process of selecting suitable ingredients of concrete and determining their relative quantities through conducting preliminary laboratory test for obtaining the economical mix as per IS: 10262-1982.

4.3.1 Design Parameters

Grade Designation	: M30
Type of Cement	: OPC 53 grade
Characteristic Strength required	: 30N/mm ²
Maximum Nominal size of Aggregate	: 20mm
Maximum Cement Content	: 320 Kg/m ³
Maximum water-cement ratio	: 0.45
Shape of Coarse Aggregate	: Crushed angular aggregate
Workability in terms of slump	: 110mm
Degree of quality control	: Good
Degree of exposure	: Severe

4.3.2 Test Data Materials

Specific gravity of Cement	: 3.15
Specific gravity of Fine Aggregate	: 2.7
Specific gravity of Coarse Aggregate	: 2.8
Specific gravity of Glass Powder	: 2.4

4.3.3 Mix Proportioning

The mix was proportioned for M30 grade concrete, as per IS 10262(2009). The mix proportion selected was 1:0.75:1.5 with a water cement ratio of 0.45. Table shows the mix details of the M30 mix. The process of selecting suitable materials of concrete and determining their relative proportion with the object of producing concrete of certain minimum strength and durability as economically as possible and the mix design for this study has been given in the table:

Table 4.6 : Mix Design

% of Glass Powder replacement in Cement	Cement in Kg/m ³	Glass Powder in Kg/m ³	Fine Aggregate in Kg/m ³	Coarse Aggregate in Kg/m ³	Optical Fiber in Kg/m ³
0	13.98	0	24.52	33.69	0
10%	12.59	1.39	24.52	33.69	1.16
15%	11.89	2.09	24.52	33.69	1.16
20%	11.18	2.8	24.52	33.69	1.16

4.3.4 Quantity of Materials

Cement	- 437 Kg/m ³
Fine Aggregate	- 766 Kg/m ³
Coarse Aggregate	- 1053 Kg/m ³
Water	- 197 Kg/m ³

4.4 CASTING AND CURING

Testing plays an important role in controlling the quality of concrete work. Systematic testing of raw material, the fresh and hardened inseparable part of any quality control program for concrete which helps to achieve higher efficiency and Test Method should be simple, direct and convenient to apply.

In considering, all the above, the preparation test specimen is the major role. it involves, Batching and Weighing, Mixing, Casting, Demoulding and Curing. These all activities should be carried out as per code recommendation and design mix requirement. The different kind of concrete test specimen is involved in preparation for evaluating the strength and durability parameters.

The additional care should be taken while preparing test specimen and nothing shall be neglected. The preparation test specimen should be with good workmanship as well as strict supervision. The preparation of concrete test specimen of each activity is directly connected with strength parameters.

4.4.1 Casting

The casting of concrete specimens like cubes, cylinders. The specimens prepared b cubes of a 150x150x150 mm linear unit and cylinders of height 300mm and diameter 150mm. The cube mould plates need to be removed, properly cleaned assembled and each one the bolts need to be completely tight. a thin layer of oil then shall be applied on all the faces of the mould. The concrete mix was prepared as per the dance band proportion throughout a machine. This was done by adding the specified amount of all the materials inside the machine in correct Order. once obtaining a regular mix, the concrete was crammed into the standard specimens in 3 layers followed by tamping for each layer using a vibrator. In inserting each scoop of concrete, the news shall be emotional around the prime fringe of the mould as a result of the concrete slides from it, therefore on make sure a symmetrical distribution of the concrete with inside the mould. each layer shall be compacted by the vibrator.



Fig:4.11 : Casting of Specimens

4.4.2 Demoulding

Test concrete check specimens ought to be demoulded between sixteen and twenty four hours once they need been created. If once this era of your time the concrete has not achieved spare strength to alter demoulding while not damaging the specimens then the demoulding ought to be delayed for an extra twenty four hours. once removing the concrete specimens from the mould, take the mould apart fully. lookout to not harm the specimens as a result of, if any cracking is caused, the all strength parameters could also be reduced. once demoulding, every check concrete specimens ought to be marked with a decipherable identification on the highest or bottom employing a waterproof crayon or ink. The mould should be completely cleansed once demoulding. make sure that grease or dirt doesn't collect between the faces of the flanges, otherwise the 2 halves won't match along properly associate degreed there'll be escape through the joint and an on an irregular basis formed could result.



Fig:4.12 : Demoulding of Specimens

4.4.3 Curing

Curing plays a significant role regarding concrete strength development and sturdiness. action of Concrete may be a methodology by that the concrete is protected against loss of wetness needed for association and unbroken at intervals the counseled temperature vary. action can increase the strength and reduce the porosity of hardened concrete.

Action observe involves keeping the concrete damp or dampish till the association of concrete is complete and strength is earned. action of concrete ought to begin shortly when initial setting time of concrete. As per IS 456 – 2000 concrete shouldn't be cured but seven days for ordinary portland cement, and it should be a minimum of ten days for concrete.



Fig:4.13 : Curing of Specimens

4.5 Test on Fresh Concrete

4.5.1 Slump Test

This procedure covers the tests methodology of crucial the workability of concrete by victimization slump cone equipment in laboratory. the interior surface of the mould shall be completely cleansed and free from wetness before commencing the take a look at. The mould shall be placed on a swish, horizontal and thoroughly levelled non absorbent metal surface. The mould shall be crammed in four equal layers with concrete sample and every layer shall be tamped with twenty 5 strokes of the rounded finish tamping rod of forty seven 16mm diameter and 600mm long.

The strokes shall be distributed uniformly over the cross-sectional of the mould and for the second and resulting layer shall penetrate into the underneath lying layer. rock bottom layer shall be tamped throughout it depth. once the highest layer

had been rodded, the surplus amount of concrete shall be affected off and level with a trowel or the tamping rod, in order that the mould is strictly crammed. Any mortar which can have leaked out between the mould and therefore the base plate shall be cleansed away. The mould shall be off from the concrete straight off by raising it slowly and thoroughly in vertical direction. The slump shall be measured straight off by crucial the distinction between the peak of mould which of the very best purpose of the specimen being tested. The slump measured shall be recorded in terms of millimetres of subsidence of the specimen throughout the take a look at.

Slump

The height of the slump cone = 300mm

The height of concrete after subsidence = 190mm

Hence, the slump measured = 110mm



Fig:4.14 : Slump Test

4.6 Test on Hardened Concrete

The hardened concrete test consists of both the strength and durability properties of the concrete. The strength properties of concrete is carried out by compressive strength test, split tensile strength test.

4.6.1 Compressive Strength Test

This procedure is applicable for establishing testing methodology for the compressive strength of concrete specimens. Specimens hold on in water shall be tested straight off on removal from the water and whereas they're still within the wet condition. Wet condition is additionally maintained by covering the specimens with wet bagging.

The bearing surfaces of the testing machine shall be cleaned and dry loose sand or different material off from the surfaces of the specimen that square measure to be involved with the compression platens. just in case of the cubes, the specimen is placed within the machine in such a way that the load shall be applied to opposite sides of the cubes as solid that's, to not the highest and bottom. The axis of the specimen shall be fastidiously aligned with the middle of thrust of the spherically sitting platen. No packing shall be use between the faces of the check specimen and therefore the steel platen of the testing machine.

The load shall be applied while not shock, and augmented ceaselessly till the resistance of the specimen to the increasing load breaks down and no larger load is sustained. the most load applied to the specimen shall then be recorded and therefore the look of the concrete and any uncommon options within the style of failure shall be noted.

$$\text{Compressive strength (N/mm}^2\text{)} = \frac{\text{Ultimate load in N}}{\text{Area of cross section (mm}^2\text{)}}$$

Table 4.7 : Average Compression Strength Values Observed

Glass Powder in %	7 days (N/mm ²)	14 days (N/mm ²)	28 days (N/mm ²)
0	26.28	33.78	38.96
10	27.90	32.67	37.28
15	29.83	34.53	40.62
20	26.20	33.17	36.70

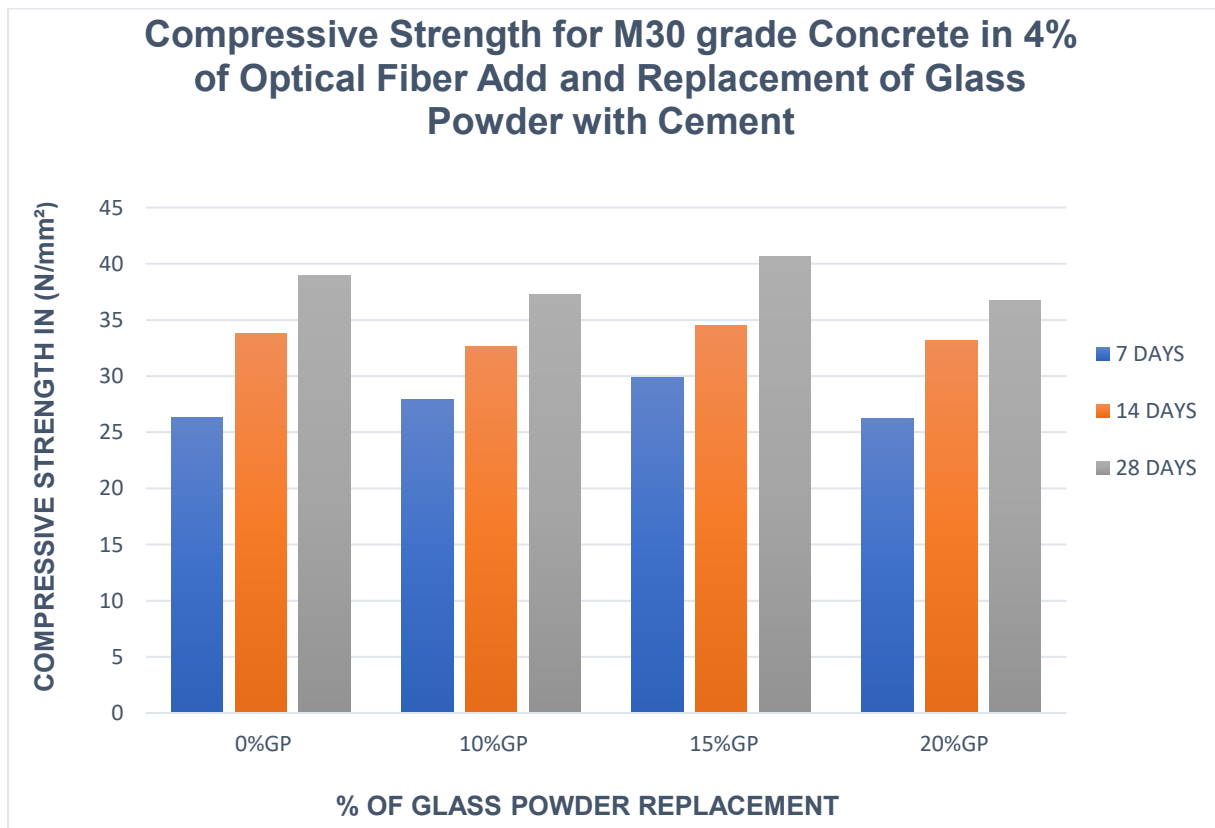


Fig:4.15 : Comparision of Compressive Strength for 7, 14 and 28 days



Fig: 4.16 Compressive Strength Test

4.6.2 Split Tensile Test

This procedure is applicable for establishing testing technique for the split tensile strength of concrete specimens.

Specimen once received dry shall be unbroken in water for twenty-four hours before they're taken for testing. Unless alternative conditions are needed for specific laboratory investigation specimen shall be tested straightaway on removal from the water while they're still wet. Surface water and grit shall be wiped off the specimens and any sticking fins faraway from the surfaces that are to be in reality with the packing strips. Marking - Diametral lines shall be drawn on the 2 ends of the specimen victimization any appropriate procedure and device that may make sure that they're within the same axial plane. putting of the specimen within the Testing Machine- The bearing surfaces of the testing machine and of the packing strips shall be wiped clean— one in all the laminate strips shall be cantered on the centre of the lower platen. The specimen shall be placed on the laminate strip and aligned so the lines marked on the ends of the specimen are vertical and centred over the laminate strip. The second laminate strip shall be placed lengthwise on the cylinder, centred on the lines marked on the ends of the cylinder. The assembly shall be portioned to confirm the subsequent conditions:

- The lines marked on the ends of the specimen are vertical which the projection of the plane of the 2 lines marked on the ends of the specimen intersects the centre of the platens, and
- The supplementary bearing bar or plate, when used, and also the centre of the specimen are directly at a lower place the centre of thrust of the spherical bearing block.

The measured tensile strength (T_{sp}) of the specimen shall be calculated to the closest 0.01 N/mm^2 victimization the subsequent formula

$$\text{Split tensile strength (N/mm}^2\text{)} = \frac{2P}{\pi L D}$$

Where,

P= maximum load in N applied to the specimen,

d= measured diameter in mm of the specimen, and

l = measured length in mm of the specimen

Table 4.8 : Average Split Tensile Values Observed

Glass Powder (%)	7 days (N/mm ²)	14 days (N/mm ²)	28 days (N/mm ²)
0	2.26	3.32	3.72
10	2.41	3.46	3.83
15	2.96	3.61	3.98
20	2.32	3.34	3.79

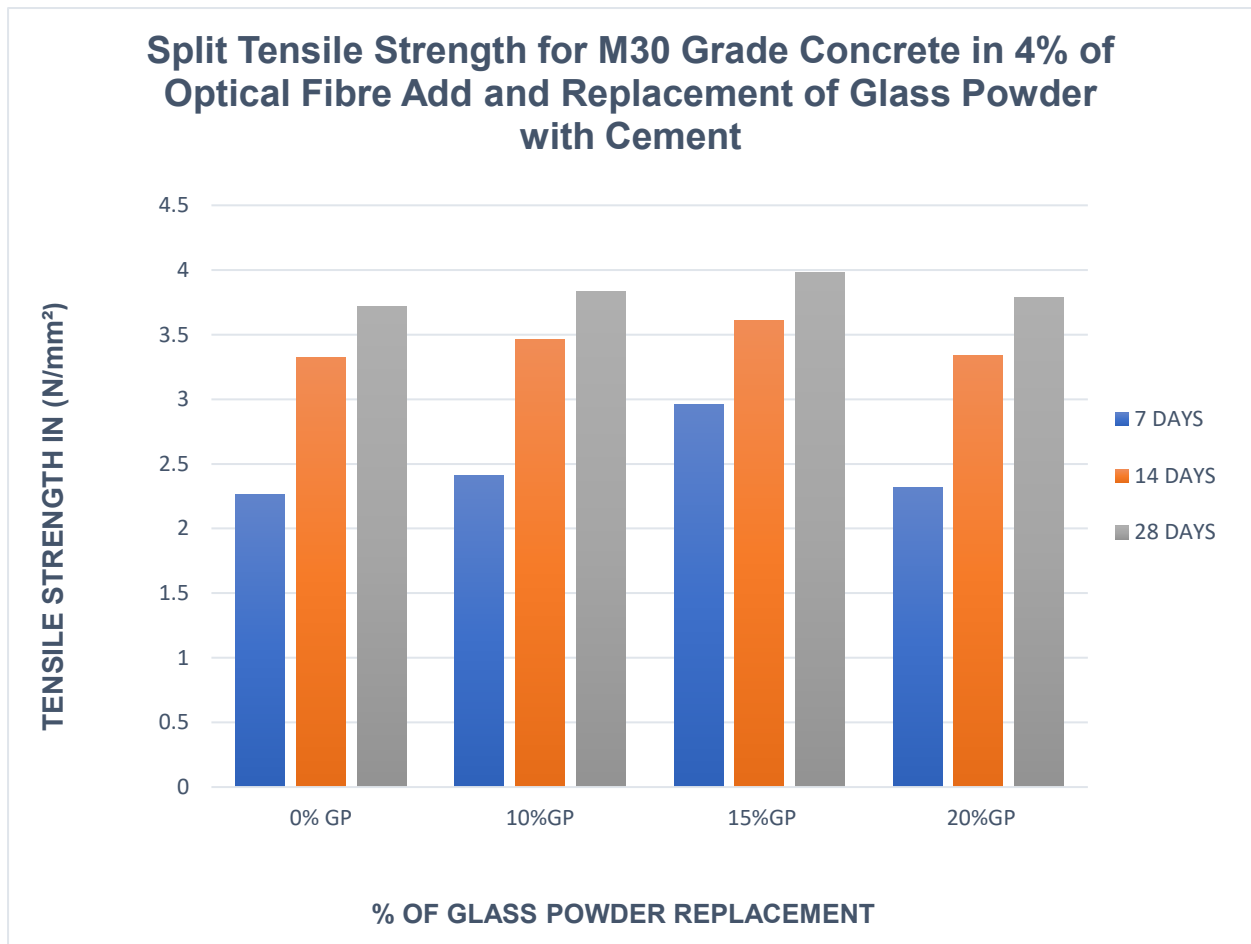


Fig:4.17 : Comparision of Tensile Strength for 7 ,14 and 28 days



Fig:4.18 : Split Tensile Test

CHAPTER 5

PERFORMANCE ANALYSIS & DISCUSSION

5.1 Test Results & Analysis

5.1.1 Cement Testing

Table 5.1 : Cement Test Results

SI.NO	PROPERTY	VALUES
1	Specific Gravity	3.1
2	Consistency	31%

5.1.2 Fine Aggregate Testing

Table 5.2 : Fine Aggregate Test Results

SI.NO	PROPERTY	VALUES
1	Specific Gravity	2.62
2	Water Absorption	2.65%

5.1.3 Coarse Aggregate Testing

Table 5.3 : Coarse Aggregate Results

SI.NO	PROPERTY	VALUES
1	Specific Gravity	2.76
2	Water Absorption	0.33%

5.1.4 Compressive Strength Testing

Table 5.4 : Average Compression Strength Values Observed

Glass Powder in %	7 days (N/mm ²)	14 days (N/mm ²)	28 days (N/mm ²)
0	26.28	33.78	38.96
10	27.90	32.67	37.28
15	29.83	34.53	40.62
20	26.20	33.17	36.70

5.1.5 Split Tensile Testing

Table 5.5 : Average Split Tensile Values Observed

Glass Powder (%)	7 days (N/mm ²)	14 days (N/mm ²)	28 days (N/mm ²)
0	2.26	3.32	3.72
10	2.41	3.46	3.83
15	2.96	3.61	3.98
20	2.32	3.34	3.79

CHAPTER 6

CONCLUSION

6.1 CONCLUSION

The conclusions made out from the experimental observation are as follows. The conclusions made out from the experimental observation are as follows. Mechanical behaviour of conventional & translucent concrete cube and cylinders were studied for compressive & split tensile strength with curing time of 7, 14, 28 days which shows characteristic increase in its strength behaviour. The 7,14 & 28 days compressive & split tensile strength of translucent concrete increases initially as the replacement percentage of cement with glass powder increases and become maximum at about 15% and then decreases. At the level of 15% replacement of cement by glass powder & additional 3% of optical fibres meets maximum strength us compare to that of conventional concrete and other percentage of replacement of concrete. Beyond 20% there is a decrease in compressive & split tensile strength for 7,14&28 days curing period. There is a decrease in workability as the replacement level increases and water consumption will be more for higher replacements.

It can be concluded from the above result that 15% replacement of glass powder with cement is the best proportion. The glass powder & optical fibres loaded in to concrete which makes its useful. The partial replacement of glass powder as cement makes concrete strengthen. Thus our project states the translucent concrete can be strengthen by glass powder replacement.

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13-03-2021

Dr. K. Balasubramanian
Managing Director

Project Certificate

This is to certify that Ms. S. Chidhambaram, Department of Civil Engineering, M/s Sathyabama Institute of Science & Technology, Chennai has undergone her project work in our laboratory in the name of "Partial Replacement of Glass Powder with Cement and Optical Fiber as Additional Material in Concrete" under the guidance of our engineers at Hitech Concrete Solutions Chennai Pvt. Ltd., Chennai during the period between February 2021 and March 2021.

For Hitech Concrete Solutions Chennai Pvt. Ltd.,



Dr. K. Balasubramanian
(Managing Director)



13-03-2021

Dr. K. Balasubramanian
Managing Director

Project Certificate

This is to certify that Ms. C. Rathika, Department of Civil Engineering, M/s Sathyabama Institute of Science & Technology, Chennai has undergone her project work in our laboratory in the name of "Partial Replacement of Glass Powder with Cement and Optical Fiber as Additional Material in Concrete" under the guidance of our engineers at Hitech Concrete Solutions Chennai Pvt. Ltd., Chennai during the period between February 2021 and March 2021.

For Hitech Concrete Solutions Chennai Pvt. Ltd.,



Dr. K. Balasubramanian
(Managing Director)

