

EXPERIMENTAL STUDY ON BEHAVIOUR OF PAVER BLOCK USING POLY PROPYLENE FIBRE

Submitted in partial fulfilment of the requirements for the award of
Bachelor of Engineering degree in civil engineering.

by

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**DEPARTMENT OF CIVIL ENGINEERING
SCHOOL OF BUILDING AND ENVIRONMENT**

SATHYABAMA

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

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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 A.GUGANATHAN(37200910) , JUDIS RAJ.S.M(37200903) carried out the project entitled **EXPERIMENTAL STUDY ON BEHAVIOUR OF PAVER BLOCK USING POLY PROPYLENE FIBERS** under my supervision from SEPTEMBER 2020 TO APRIL 2021

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DECLARATION

We A.GUGANATHAN(37200910) , JUDIS RAJ.S.M(37200903) hereby declare that the Project Report entitled **EXPERIMENTAL STUDY ON BEHAVIOUR OF PAVER BLOCK USING POLY PROPYLENE FIBERS** done by us under the guidance of Ms. ASS.PROF.MS.P.ESHANTHINI and is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering / Technology degree in civil engineering

1.

2.

DATE:

PLACE:

SIGNATURE OF THE CANDIDATE

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ABSTRACT

Poly propylene fibres is now extensively used in paver blocks. in order reduce cracking effects polypropylene fibres can be used. Polypropylene fiber is a light weight synthetic fibre. It prevents crack formation and provides reinforcement to the concrete structure. Due to its high tensile and pull-out strength, the pp fibres even reduce the early plastic shrinkage cracking by enhancing the tensile capacity of fresh concrete to resist the tensile stresses caused by the typical volume changes.

Interlocking Pavers are the modern-day solution for low cost outdoor application. Paver block is solid, unreinforced pre-cast cement concrete paving units used in the surface course of pavement. They are high strength concrete precast paver block elements in various shapes, sizes & colours to suit the imagination of landscape architects & nature's essence. By improving its compressive strength, it can be used in heavy traffic area also. Interlocking pavers are manufactured concrete product that is individually placed in a variety of patterns and shapes as per the requirement. The study shows that use of poly propylene fibre added as various percentages **2%, 4%,6% and 8%** and tests were conducted on paver blocks.

TABLE OF CONTENTS

CHAPTER No.	TITLE	PAGE No.
	<u>ABSTRACT</u>	<u>v</u>
	<u>LIST OF TABLES</u>	<u>viii</u>
	<u>LIST OF FIGURES</u>	<u>x</u>
	<u>LIST OF SYMBOLS AND ABBREVIATIONS</u>	<u>xi</u>
 1	 INTRODUCTION	
1.1	GENERAL	1
1.2	FIBER	2
1.3	TYPES OF FIBER	2
1.4	OBJECTIVE	2
 2	 LITERATURE REVIEW	
2.1	GENERAL	3
2.2	REVIEW OF LITERATURE REVIEW	3
2.3	INFERENCE FOR LITERATURE REVIEWS	5
 3	 AIM AND SCOPE OF STUDY	
3.1	AIM	6

3.2	SCOPE OF STUDY	6
3.3	COLLECTION OF MATERIALS	6
3.3.1	Cement	6
3.3.2	Fine aggregate	7
3.3.3	Coarse aggregate	7
3.3.4	Water	9
3.3.5	Poly propylene fibers	9
4	METHODOLOGY	
4.1	GENERAL	11
4.2	FLOW CHART	11
4.3	TESTS ON MATERIALS	12
4.4	WATER ABSORPTION TEST	12
4.5	FINENESS TEST ON CEMENT	13
4.6	MIX DESIGN	16
4.7	CASTING DETAILS	21
4.8	COMPRESSION TEST	26
4.8.1	Strength calculation (7 days)	29

4.8.2	Strength calculation (14 days)	31
4.8.3	Strength calculation (28 days)	33
4.9	FLEXURAL STRENGTH TEST	34
4.9.1	Strength calculation (7 days)	36
4.9.2	Strength calculation (14 days)	38
4.9.3	Strength calculation (28 days)	39
5	RESULTS AND DISCUSSIONS	
5.1	GENERAL	40
5.2	FLEXURAL STRENGTH TEST	40
5.3	COMPRESSION STRENGTH TEST	41
6	CONCLUSION	42
	REFERENCES	43

LIST OF TABLES

TABLE NO	TITLE	PAGE NO
3.1	Chemical properties of cement	7
3.2	Chemical properties of fine aggregate	8
4.4.5	Water absorption tabulation	14
4.1	Tabulation of casting details	21
5.1	Flexural strength maximum values	40

LIST OF FIGURES

FIG.NO	TITLE	PAGE NO
3.1	cement	7
3.2	Fine aggregate	8
3.3	Coarse aggregate	9
3.4	Poly propylene fibre	9
4.1	Mix design	21
4.2	Preparation of moulds	22
4.3	casting	23
4.4	Weighing of paver block	24
4.5	curing	25
4.6	CTM	29
4.7	CTM	31
4.8	Flexural rigidity test	37
5.1	Flexural test graph	41
5.2	CTM values graph	41

LIST OF SYMBOLS AND ABBREVIATIONS

FA	-	Fine aggregate
C _A	-	Coarse aggregate
PP	-	Poly propylene fibre
S	-	Specific gravity
W	-	Water content
Kg	-	Kilogram
F	-	Force
mm	-	millimetres
N	-	Newton
Hz	-	Hertz
Pa	-	Pascal
%	-	Percentage
μ	-	Micron
°C	-	Celsius

CHAPTER 1

INTRODUCTION

1.1. GENERAL

Concrete is the world's most widely used construction material. It is now extensively used in paver blocks. So, in order to reduce cracking effects, polypropylene fibres can be used. Concrete is a brittle material with low tensile strength and low strain capacity that result in low resistance to cracking. To improve such properties, Polypropylene fibre reinforced concrete (PPFRC) was used. Polypropylene fibres are actually man-made synthetic fibres resulting from research and development in the petrochemical and textile industries. These fibres derived from organic polymers which are available in a variety of formulations.

Polypropylene fiber is a light weight synthetic fiber. It prevents crack formation and provides reinforcement to the concrete structure.

Due to its high tensile and pull-out strength, the pp fibers even reduce the early plastic shrinkage and cracking by enhancing its tensile capacity of fresh concrete to resist the tensile stresses caused by the typical volume changes.

Interlocking Pavers are the modern-day solution for low cost outdoor application. Paver block is solid and unreinforced pre-cast cement concrete paving units used in the surface of pavement. They are high strength concrete precast elements in various shapes, sizes & colours to suit the imagination of landscape architects & nature's essence. By improving its compressive strength, it can be used in heavy traffic area also. Interlocking pavers are a manufactured concrete product that is individually placed in a variety of patterns and shapes as per the requirements. They do not absorb water and it can be placed so that excess water is taken away from the garden and patio area rather than over-saturating it. This type of pavement will absorb stresses such as small type earthquakes, freezes and thaws, and slight ground erosion by flexing. Therefore, they will not easily crack, break or buckle like pouring asphalt or poured concrete. Polypropylene fibre is used in the construction industry as a secondary type reinforcement which arrests cracks, increases resistance to impact & greatly improves quality of construction.

1.2 FIBER

Fibres are usually used induced in concrete to control cracking due to plastic shrinkage and to drying shrinkage. They also reduces the permeability of concrete and thus reduce the bleeding of water. Some types of fibre produce greater impact on abrasion and shatter resistance in concrete. The purpose for the addition of short fibres is to improve the tensile strength and impact resistance and reduce the brittleness of concrete.

1.3 TYPES OF FIBERS

Some of the different types of fibers used for concrete reinforcements are as follows;

- Natural fiber
- Polypropylene fiber
- Steel fiber
- Glass fiber
- Asbestos fiber
- Carbon fiber

1.4. OBJECTIVES OF THIS STUDY

- To determine the flexural strength of poly propylene fiber in paver block.
- To study the variation of strength by using poly propylene fiber.
- To determine the load carrying capacity of PPF paver block.

CHAPTER 2

LITERATURE REVIEW

2.1 GENERAL

This chapter deals with the study of literatures about the behaviour of the kenaf fiber. The various information's taken from this literature study are used for the experimental investigation.

2.2 REVIEW OF LITERATURE

NURAIN JAMIL ET AL ,(2019) Presented the paper on investigates the effect of fiber percentage on compressive strength of fiber reinforced concrete and the relationship between compressive strength and time of fiber reinforced concrete immersion in seawater. FRC concrete cubes were prepared using four different percentage of fiber (0%, 1.5%, 3.0% and 4.5%). These Fiber reinforced were immersed in seawater for 7, 14 and 21 days for three consecutive weeks. Based on the experiment, it was found that there was improvement in compressive strength of Fenaf fiberwhen compared to plain cement concrete.

G.VINOTH KANNA ET AL., (2018) this paper presents Coconut fiber in PAVER BLOCK for building material and to protect environment and natural resource like clay and sand. The basic waste used in this project is coconut fiber in addition with polymer as used to attain the strength of the brick. At first we have to shredded coconut fiber into the small pieces, mix them at the right proportion to make this brick, bricks are allowed to laid on the ground with the help of the mold, wet bricks are dried for seven days and the bricks are fired for another seven days after this process, the bricks have to be burnt for 15 to 20 days to attain the good strength. After these process bricks carried to the testing process as per Indian Standard codes 3495 part 1&2, 1077. The tests are Compression Test and Water Absorption Test, Output of this project has attain the strength 10% less than the Conventional Bricks, by this project we can reduce the usage of clay and sand considerably reduce the Environmental pollution and reduce the usage of resource.

JOKHIO ET AL., (2018) presented the paper on The effect of kenaf fibers in PAVER BLOCK with different thickness is discusses and presented in this paper. Kenaf fiber is a type of natural fiber and is added in the reinforced concrete slab to improve the structure strength and ductility. For this study, three types of mixtures were prepared with fiber volume fraction of 0%, 1% and 2%, respectively. The design compressive strength considered was 20 MPa. Six cubes were prepared to be tested at 7th and 28th day. A total of six reinforced concrete slab with two variances of thickness were also prepared and tested under four-point bending test. The differences in the thickness is to study the potential of kenaf fiber to serve as part of shear reinforcement in reinforced concrete slab that was design to fail in shear. It was observed that, addition of kenaf fiber improves the flexural strength and ductility of the reinforced concrete slab. In the slab with reduction in thickness, the mode of failure change from brittle to ductile with the inclusion of kenaf fiber.

SHANMUGA PRIYA(2015) Glass Fiber is used as an admixture in paver block for strengthening purpose. The usage of glass fiber in concrete is found from last two decades in the industry. By using glass fiber in paver block, various properties of concrete are improved like compressive strength. and tensile strength.

N DAYANANDA(2018) The primary objective of this study is to investigate the effect of reinforcing raw propylene fibers on the mechanical properties of cement concrete paver blocks. The mixed specimens are casted for different volume content of fibers (0.2%, 0.4%, 0.6%, 0.8%, 1%, 1.2%, 1.4%, 1.6% and 1.8%) and cured for 3, 7 and 28 days.

R.MAHADEVI ,ET.AL{2016} 'PLASTIC IN PAVER BLOCK".The aim of this research is to reduce the unit weight, cost of block and also to reduce the environmental pollution.The plastic is used in the form of powder as partial replacement in M-Sand as fine aggregate in percentage of 0, 10 and 30 to manufacture paver blocks

DINESH W.GAWATRE, ET.AL(2017) The concept is to make sustainable use of concrete waste in concrete which can be used in manufacturing of interlocking paver blocks , After crushing , this concrete waste can be used as a replacement of coarse and fine aggregate in one stage as half replacement in paver block by considering is specification

RAMESHA ET AL., (2013) The aim of this study is to evaluate mechanical properties such as tensile and flexural properties of hybrid glass fiber-sisal/jute reinforced epoxy composites. Microscopic examinations are carried out to analyze the interfacial characteristics of materials, internal structure of the fractured surfaces and material failure morphology by using Scanning Electron Microscope (SEM). The results indicated that the incorporation of sisal fiber exhibited superior properties than the jute fiber reinforced Glass fiber composites in tensile properties and jute fiber reinforced Glass fiber composites performed better in flexural properties. The sisal composite samples possess good tensile strength and can withstand the strength up to 68.55 MPa. The jute composite specimen is holding the maximum flexural load of 1.03KN slightly higher than the sisal composite sample. The failure morphology of the tested samples is examined by using Scanning Electron Microscope.

CHAPTER 3

AIM AND SCOPE OF THE STUDY

3.1. AIM

1. To study the effect on the properties of paver block by adding the different percentage of polypropylene fibers.
2. To study the effect on compressive strength and water absorption by adding polypropylene fibre in paver blocks.
3. To increase life span of paver block.

3.2. SCOPE OF STUDY

1. Uses eco-friendly materials for stabilization, hence no harm to environment
2. Uses materials which are isolated as rarely used materials, hence economic.
3. Reduction in the permeability, compressibility and with increase in shear strength; it makes the reinforced concrete more stable thus enhancing the ultimate strength of concrete.
4. Polypropylene is one of the most widely used fibres because of its low cost, acceptable tensile properties, and chemical inertness

3.3 COLLECTION OF MATERIALS

In this stage various materials used for making the concrete such as cement, fine aggregate, coarse aggregate, water is collected.

3.3.1 CEMENT

We use ordinary Portland cement of grade 43. Cement is a binder substance that sets and hardens and can bind other materials together. It is a material with adhesive and cohesive properties. Cement is manufactured through a closely controlled chemical combination of calcium, silicon, aluminium, iron and other ingredients. It has high compressive strength and good durability and can be used as a load bearing member or structure for long term use.



Fig 3.1 cement

Table 3.1 Chemical properties of cement

SI. No	COMPOUND	OPC (%)
1	CaO	64
2	SiO ₂	18.8
3	Al ₂ O ₃	4.6
4	Fe ₂ O ₃	3.7
5	MgO	3.6

3.3.2 FINE AGGREGATE

Fine aggregate is a major component of concrete and without it the concrete cannot function intended. Fine aggregate for concrete can be classified as smooth on the individual granules. Usually the fine aggregate used in concrete must be clean. Impurities in the fine aggregate such as silt or organic matter will weaken the final hardened concrete.



Fig 3.2 fine aggregate

Table 3.2 chemical properties of fine aggregate

Sl. No	CHEMICAL COMPOSITION	SAND (%)
1	Loss of ignition	48.83
2	SiO ₂	0.77
3	Al ₂ O ₃	0.11
4	Fe ₂ O ₃	0.36
5	CaO	54.71
6	MgO	0.21
7	SO ₃	Nil

3.3.3 COARSE AGGREGATE

It is well recognized that coarse aggregate plays an important role in concrete typically occupies over one third of the volume of concrete and research indicates that changing coarse aggregate can change the strength and fracture properties of concrete. In high strength concrete, a smaller maximum aggregate size is yields higher compressive strength, however in normal concrete aggregate size as much less effect on compressive strength.



Fig 3.3 coarse aggregate

3.3.4 WATER

Water plays an important role in mixing of concrete .water should be clean, fresh and free from impurities .Reduction of water increase in strength of concrete and decreases workability .The ratio of minimum quantity of water required to the weight of the cement to obtain a desired concrete mix is called water cement ratio. The standard rate of water cement ratio is 0.45 to 0.55.

3.3.5. POLY PROPYLENE FIBRES

Polypropylene fiber is used in the construction industry as a secondary reinforcement which arrests cracks, increases strength and resistance to impact/abrasion & greatly improves quality of construction. Polypropylene is a thermoplastic polymer used in a wide variety of applications. Polypropylene fibre/filament possesses all the outstanding properties associated with the Polypropylene Polymer.



Fig.3.4 poly propylene fibers

3.3.6. *PROPERTIES OF POLY PROPYLENE FIBERS*

1. Softening point -150' C
2. melting point - 160-170°C
3. Specific heat- 0.46 calories/gram
4. Decomposition temperature- 324-410°C
5. Density -0.91
6. Moisture absorption - 0-0.05%
7. Elongation – 40-100

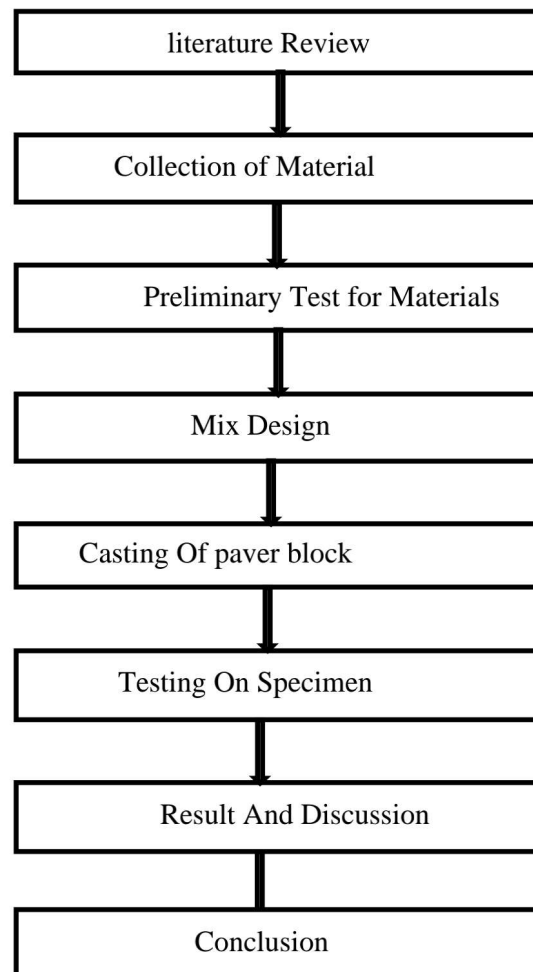
CHAPTER 4

METHODOLOGY

4.1 INTRODUCTION

The chapter briefly explains the methodology adopted in this experimental work. It also includes material collection, testing of material, result and discussion, summery and conclusion.

4.2. FLOW CHART



TESTS ON MATERIALS

4.3 GENERAL

Several tests were conducted in constituent materials to suit the requirement of the preparation of mix.

4.4. WATER ABSORPTION TEST

For the **water absorption test**, the specimens are dried in an oven for a specified time and temperature and then placed in a desiccator to cool. Immediately upon cooling the specimens are weighed. The material is then emerged in **water** at agreed upon conditions, often 23°C for 24 hours or until equilibrium.

Water absorption gives an idea on the internal structure of aggregate. Aggregates having more absorption are more porous in nature and are generally considered unsuitable, unless found to be acceptable based on strength, impact and hardness tests.

4.4.1. Procedure:

1. About 2 kg of aggregate sample is taken, washed to remove fines and then placed in the wire basket. The wire basket is then immersed in water, which is at a temperature of 22°C to 32°C.
2. Immediately after immersion the entrapped air is removed from the sample by lifting the basket 25 mm above the base of the tank and allowing it to drop, 25 times at a rate of about one drop per second
3. The basket, with aggregate are kept completely immersed in water for a period of 24 ± 0.5 hour.
4. The basket and aggregate are weighed while suspended in water, which is at a temperature of 22°C to 32°C.
5. The basket and aggregates are removed from water and dried with dry absorbent cloth.
6. The surface dried aggregates are also weighed.

7. The aggregate is placed in a shallow tray and heated to 100 to 110°C in the oven for 24 ± 0.5 hours. Later, it is cooled in an airtight container and weighed

4.4.2. Water absorption

% percentage of water absorption

$$W\% = \frac{W_1 - W_2}{W_2} \times 100$$

4.4.3. Calculation Trail 1 water absorption

1. Percentage of water absorption for conventional paver block

$$\begin{aligned} &= \frac{(5.836 - 5.776)}{5.776} \times 100 \\ &= 1.04 \end{aligned}$$

2. Percentage of water absorption for paver block (2% PP)

$$\begin{aligned} &= \frac{(5.338 - 5.264)}{5.264} \times 100 \\ &= 1.40 \end{aligned}$$

3. Percentage of water absorption for paver block (4% PP)

$$\begin{aligned} &= \frac{(5.534 - 5.468)}{5.468} \times 100 \\ &= 1.21 \end{aligned}$$

4. Percentage of water absorption for paver block (6% PP)

$$\begin{aligned} &= \frac{(5.169 - 4.993)}{4.993} \times 100 \\ &= 3.52 \end{aligned}$$

5. Percentage of water absorption for paver block (8% PP)

$$\begin{aligned} &= \frac{(5.354 - 5.286)}{5.286} \times 100 \\ &= 1.28 \end{aligned}$$

4.4.4. Trail 2 water absorption

1. Percentage of water absorption for conventional paver block

$$= \frac{(5.368 - 5.217)}{5.217} \times 100$$

$$= 2.89$$

2. Percentage of water absorption for paver block (2% PP)

$$= \frac{(5.342 - 5.278)}{5.278} \times 100$$

$$= 1.21$$

3. Percentage of water absorption for paver block (4% PP)

$$= \frac{(5.494 - 5.442)}{5.442} \times 100$$

$$= 0.95$$

4. Percentage of water absorption for paver block (6% PP)

$$= \frac{(5.267 - 5.110)}{5.110} \times 100$$

$$= 3.07$$

5. Percentage of water absorption for paver block (8% PP)

$$= \frac{(5.368 - 5.220)}{5.220} \times 100$$

$$= 2.83$$

4.4.5. TABULATION:

DESIGNATION	% OF PPF	SATURATED WEIGHT	DRY WEIGHT	% OF WATER ABSORPTION
PP0	0	5.836	5.776	1.04
PP1	2	5.338	5.264	1.40
PP2	4	5.534	5.468	1.21
PP3	6	5.169	4.993	3.52
PP4	8	5.359	5.286	1.28

Average Percentage of water absorption per paver block = **1.40**

4.5 FINENESS TEST ON CEMENT

100grams of cement is weighed accurately and placed on IS: Sieve size 90μ. Any air set lumps are broken using fingers. Now gentle sieving is done continuously for 15 minutes. The residue left is weighed. This shall not exceed 10 % by weight of the sample of cement.

Calculation:

Weight of cement sample taken	=	100g
Weight of retained on 90μ sieve	=	7g
Fineness of cement	=	$\frac{\text{Weight of cement Retained}}{\text{Total weight of cement}} \times 100$
		$= \frac{7}{100} \times 100$
Fineness of cement	=	7%

4.6. MIX DESIGN OF CONCRETE FOR PAVER BLOCK

MIX DESIGN PROCEDURE FOR M30 GRADE CONCRETE

❖ **STEP 1 : DETERMINE THE TARGET STRENGTH FOR MIX PROPORTIONING**

$$F_{ck} = f_{ck} + 1.65 * S$$

F_{ck} – Target average compressive strength at 28 days

f_{ck} – Characteristics compressive strength at 28 days

S - Assumed standard deviation depending upon the grade of concrete, the value of ' S ' can be obtained from table 1 of BIS 10262 – 2009 table 1

❖ **STEP 2 : SELECTION OF WATER CEMENT RATIO**

From table 5 of IS 456, Max water cement ratio is 0.5

Table 1 Assumed Standard Deviation
(Clauses 3.2.1.2, A-3 and B-3)

Sl No. (1)	Grade of Concrete (2)	Assumed Standard Deviation N/mm ² (3)
i) ii)	M 10 M 15	3.5
iii) iv)	M 20 M 25	
v) vi) vii) viii) ix) x)	M 30 M 35 M 40 M 45 M 50 M 55	5.0

NOTE — The above values correspond to the site control having proper storage of cement; weigh batching of all materials; controlled addition of water; regular checking of all materials, aggregate grading and moisture content; and periodical checking of workability and strength. Where there is deviation from the above, values given in the above table shall be increased by 1 N/mm².

**Table 2 Maximum Water Content per Cubic
Metre of Concrete for Nominal
Maximum Size of Aggregate**
(Clauses 4.2, A-5 and B-5)

Sl No.	Nominal Maximum Size of Aggregate mm	Maximum Water Content ¹⁾ kg
(1)	(2)	(3)
i)	10	208
ii)	20	186
iii)	40	165

NOTE — These quantities of mixing water are for use in computing cementitious material contents for trial batches.

¹⁾ Water content corresponding to saturated surface dry aggregate.

❖ STEP 3 : SELECTION OF WATER CONTENT

Strength of concrete primarily depends upon the strength of cement paste. The strength of paste increases with cement content decreases with water content. Various parameters like types of cement, aggregate, maximum size of aggregate, surface texture aggregate etc. and influencing the strength of concrete, when water cement ratio constant. Hence it is desirable to establish a relation between concrete strength and free water cement ratio with materials and condition to be used. From IS 456-2000 table 5 water cement ratio is 0.38 which is less than 0.45

The water normally lies between 6 and 8% moisture of the total mix weight.
i.e Estimated water content

$$= 208 + (7/100) * 208$$

$$= 222 \text{ litres}$$

❖ STEP 4 : CALCULATION OF CEMENT CONTENT

The cement content per unit volume of concrete may be calculated from free water cement ratio. And the quantity of water per unit volume of concrete (cement by mass = water cement / water cement ratio)

Water cement ratio = 0.50

Water content from step 3 i.e 222 litres

Cement content = water content / w.c ratio

$$= 222/0.50$$

$$= 444 \text{ kgs}$$

From table 5 of IS 456,

Minimum cement content for moderate exposure condition +300 kg/m³

444 kg/m³ > 300 kg/m³, hence ok

As per clause 8.2.4.2 of IS 456

Maximum cement content = 450 kg/m³

444 kg/m³ < 450 kg/m³

❖ **STEP 5 PROPORTION OF VOLUME OF COARSE AGGREGATE AND FINE AGGREGATE CONTENT**

DETERMINATION OF COARSE AGGREGATE AND FINE AGGREGATE

Volume of coarse aggregate corresponding to 20mm size aggregate and fine aggregate zone 1. For w/c ratio 0.5 is found out to be 0.60. In the present case w/c is 0.45. Therefore volume of coarse aggregate is required to be increased to decrease the fine aggregate content. As the w/c is lower by

0.05, the proportion of volume of coarse aggregate is increased by $\frac{0.01}{0.05} \times 0.05 = 0.01$.

Table 3 of IS -10262 – 2009

Volume of coarse aggregate corresponding to 10mm size and fine aggregate (zone 4) = 0.50

**Table 3 Volume of Coarse Aggregate per Unit
Volume of Total Aggregate for Different
Zones of Fine Aggregate
(Clauses 4.4, A-7 and B-7)**

Sl No.	Nominal Maximum Size of Aggregate mm	Volume of Coarse Aggregate ¹⁾ per Unit Volume of Total Aggregate for Different Zones of Fine Aggregate			
		Zone IV	Zone III	Zone II	Zone I
(1)	(2)	(3)	(4)	(5)	(6)
i)	10	0.50	0.48	0.46	0.44
ii)	20	0.66	0.64	0.62	0.60
iii)	40	0.75	0.73	0.71	0.69

¹⁾ Volumes are based on aggregates in saturated surface dry condition.

❖ **STEP 6 : ESTIMATION OF CONCRETE MIX CALCULATIONS**

1. Volume of concrete = 1m³
2. Volume of cement = (Mass of cement/ sp.gravity of cement)*(1/1000)
= (444/3.15) * (1/1000)
= 0.140m³
3. Volume of water = (Mass of water/sp.gravity of water)*(1/1000)
= (222/1)*(1/1000)
= 0.22m³
4. Total volume of aggregate = 1 - (b + c)
= 1 – (0.140 + 0.22)
= 0.64m³
5. Mass of coarse aggregate = d * vol of C.A * Sp.gravity of C.A * 1000
= 0.64 * 0.58 * 2.80 * 1000
= 1039.36 KGS/M³
6. Mass of fine aggregate = d * vol of F.A * Sp.gravity of F.A * 1000

$$= 0.64 * 0.42 * 2.72 * 1000$$

$$= 731.13 \text{ kgs/m}^3$$

CEMENT = 444 kg/m³
 WATER = 222 kg/m³
 FINE AGGREGATE = 731.13 kg/m³
 COARSE AGGREGATE = 1039.36 kg/m³
 WATER CEMENT RATIO = 0.50

Cement required for 1m³ = 444 kg
 C.A required for 1m³ = 1039.36 kg
 F.A required for 1m³ = 731.13 kg
 Water required for 1m³ = 222 kg

Volume of 1 mould = 0.0027 m³

Cement required for 0.0027 m³ = **1.19** kg

Coarse aggregate required for 0.0027 m³ = **2.80** kg

Fine aggregate required for 0.0027 m³ = **1.97** kg

Water required for 0.0027 m³ = 0.59 kg



Fig.4.1 mix design

TABULATION OF MIX PROPORTIONS

% of PP REPLACEMENT	CEMENT VOLUME KG/ 0.0027m³	PP%	FINE AGGREGATE FOR KG/ 0.0027m³	COARSE AGGREGATE FOR KG/ 0.0027m³	WATER VOLUME KG/ 0.0027m³
0%	444	0	731.13	1039.6	0.59
2%	14.28	0.473	23.167	33.6	0.59
4%	14.28	0.945	22.269	33.612	0.59
6%	14.28	1.418	22.222	33.612	0.59
8%	14.28	1.891	21.749	33.612	0.59

4.7. CASTING DETAILS

By its nature concrete is placed under many differing environmental conditions. In winter, concrete is often placed at cool temperatures and cured at even lower temperatures. In summer, concrete is often placed at warm temperatures and cured at even higher temperatures due to either heat of hydration effects or ambient

temperature conditions. Considering the volume of research done on concrete, surprisingly little has been done on the effects of placing and curing temperatures on fresh and hardened concrete. By far, most research on concrete has been done under controlled laboratory conditions where casting and curing temperature are always at or near 23°C (73°F). This work was undertaken recognizing the importance of producing data that would help predict the performance of concrete at temperatures often encountered in normal construction practice. To isolate the effects of temperature, no adjustments were made to the concrete mixes to offset the change in workability due to temperature effects. In actual construction adjustments are often made to a concrete mix to maintain its workability at the anticipated casting temperature. Typical adjustments may include change in water content, use of a chemical admixture(s), and/or change in cement content



Fig.4.2. preparation of moulds

All materials used in producing concrete were stored in controlled laboratories at the desired temperature of 10, 23 or 32°C (50, 73, or 90°F) for at least 24 hours

prior to mixing of concrete to ensure the fresh concrete was at the correct temperature. Prior to temperature conditioning, the aggregates were oven-dried and the needed quantity weighed. Dried aggregates were then inundated with a known amount of water. Excess water was drawn off and weighed just prior to mixing. A horizontal open pan mixer was used to produce 0.50 m³ (1.75 f~) of concrete for each batch. All mixing was conducted in laboratories maintained at the desired temperatures. A 3-minute mix, 3-minute rest, 2-minute mix cycle was used for all mixes. At the completion of mixing, slump, unit weight, air content by the pressure method, and concrete temperature were determined. Fifteen 102x203-mm (4x8-in.) cylinders were then cast in single-use plastic moulds.

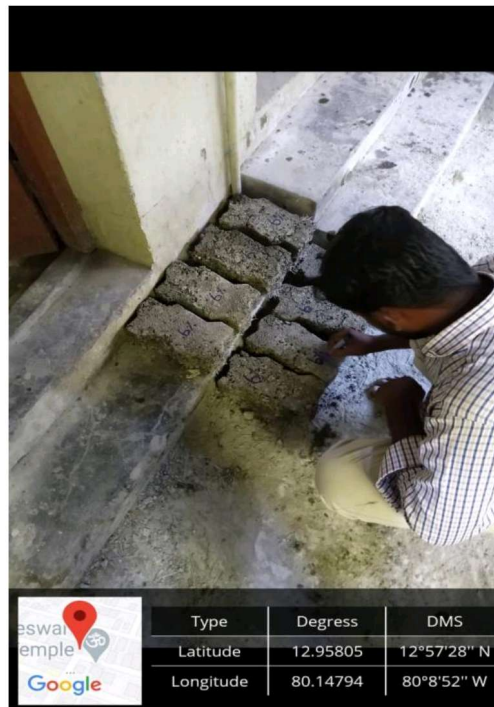


Fig.4.3. casting

Curing is the maintenance of a satisfactory moisture content and temperature in concrete for a period of time immediately following placing and finishing so that the desired properties may develop (Fig. 12-1). The need for adequate curing of concrete cannot be overemphasized. Curing has a strong influence on the properties of hardened concrete; proper curing will increase durability, strength, watertightness, abrasion resistance, volume stability, and resistance to freezing and thawing and de-icers. Exposed surfaces are especially sensitive to curing as

strength development and freeze-thaw resistance of the top surface of a slab can be reduced significantly when curing is defective.



Fig.4.4 weighing paver block

When portland cement is mixed with water, a chemical reaction called hydration takes place. The extent to which this reaction is completed influences the strength and durability of the concrete. Freshly mixed concrete normally contains more water than is required for hydration of the cement; however, excessive loss of water by evaporation can delay or prevent adequate hydration. The surface is particularly susceptible to insufficient hydration because it dries first. If temperatures are favorable, hydration is relatively rapid the first few days after concrete is placed; however, it is important for water to be retained in the concrete during this period, that is, for evaporation to be prevented or substantially reduced. With proper curing, concrete becomes stronger, more impermeable, and more resistant to stress, abrasion, and freezing and thawing. The improvement is rapid at early ages but continues more slowly thereafter for an indefinite period. Fig. 12-2 shows the strength gain of concrete with age for different moist curing periods and Fig. 12-3 shows the relative strength gain of concrete cured at different temperatures.

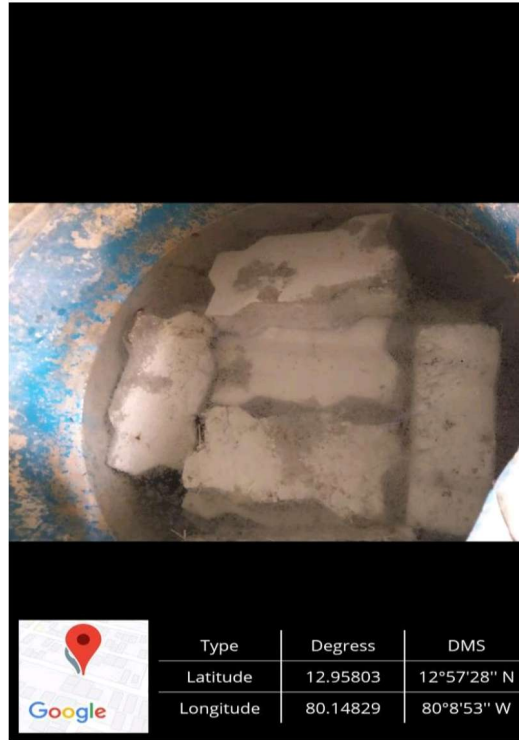


Fig.4.5 curing

Table 4.1 casting details

Sl.NO	Description for M ₃₀ grade concrete	Specimens for each proportion
1.	Flexural strength (7,14&28 days)	12 Specimens
2.	compression Test (7,14&28 days)	12 Specimens

4.8. COMPRESSION TEST

Compressive strength tests were performed on compression testing machine using paver block samples. Four samples per batch were tested with the average strength values reported in this paper. The block has been stored for 24 ± 4 h in water maintained at a temperature of $20 \pm 5^\circ\text{C}$. The bearing plates of the testing machine shall be wiped clean. The specimens are aligned with those of the bearing plates. The load would be applied without shock and increased continuously at a rate of $15 \pm 3 \text{ N/mm}^2 / \text{min}$ until no greater load can be sustained by the specimen or delamination occurs. The maximum loads applied to the specimen were noted.

Care must be exercised in the interpretation of the significance of compressive strength determinations by this test method since strength is not a fundamental or intrinsic property

of concrete made from given materials. Values obtained will depend on the size and shape of the specimen, batching, mixing procedures, the methods of sampling, moulding, and fabrication and the age, temperature, and moisture conditions during curing

1. Objective

The compressive strength of concrete is given in terms of the characteristic compressive strength of 150 mm size cubes tested at 28 days (f_{ck})- as per Indian Standards (ACI standards use cylinder of diameter 150 mm and height 300 mm). The characteristic strength is defined as the strength of the concrete below which not more than 5% of the test results are expected to fall. Characteristic strength of concrete is the strength of concrete specimens casted and tested as per given code of practice and cured for a period of 28 days; 95% of tested cubes should not have a value less than this value

2. Apparatus Required

The testing machine may be of any reliable type, of sufficient capacity for the tests and capable of applying the load at the specified rate. The permissible error shall be not greater than ± 2 percent of the maximum load.

3. Reference

IS 516:1959 Methods of Tests for Strength of Concrete (Eighteenth revision). Reaffirmed- May 2013

4. Procedure

1. All materials shall be brought to room temperature, preferably 27 ± 3 °C before commencing the test.
2. Samples of aggregates for each batch of concrete shall be of the desired grading and shall be in an air-dried condition. The cement samples, on arrival at the laboratory, shall be thoroughly mixed dry either by hand or in a suitable mixer in such a manner as to ensure the greatest possible blending and uniformity in the material. Care being taken to prevent intrusion of foreign materials.
3. The proportions of the materials, including water, in concrete mixes used for determining the suitability of the materials available, shall be similar in all respects to those to be employed in the work.
4. The quantities of cement, each size of aggregate, and water for each batch shall be determined by weight, to an accuracy of 0.1 percent of the total weight of the batch.
5. The concrete shall be mixed by hand, or preferably, in a laboratory batch mixer, in such a manner as to avoid loss of water or other materials. Each batch of concrete shall be of such a size as to leave about 10 percent excess after moulding the desired number of test specimens.
6. Each batch of concrete shall be tested for consistency immediately after mixing, by one of the methods described in IS:1199-1959. Provided that care is taken to ensure that no water or other material is lost, the concrete used for the consistency tests may be remixed with the remainder of batch before making the test specimens. The period of re-mixing shall be as short as possible yet sufficient to produce a homogeneous mass.
7. Test specimens cubical in shape shall be $15 \times 15 \times 15$ cm. If the largest nominal size of the aggregate does not exceed 2 cm, 10 cm cubes may be used as an alternative. Cylindrical test specimens shall have a length equal to twice the diameter. They shall be 15 cm in diameter and 30 cm long. Smaller test specimens shall have a ratio of diameter of specimen to maximum size of aggregate of not less than 3 to 1, except that the diameter of the specimen shall be not less than 7.5 cm for mixtures containing aggregate more than 5 percent of which is retained on IS Sieve 480.
8. The test specimens shall be made as soon as practicable after mixing, and in such a way as to produce full compaction of the concrete with neither segregation nor excessive laitance. The concrete shall be filled into the mould in layers

approximately 5 cm deep. In placing each scoopful of concrete, the scoop shall be moved around the top edge of the mould as the concrete slides from it, in order to ensure a symmetrical distribution of the concrete within the mould. Each layer shall be compacted either by hand or by vibration.

9. The test specimens shall be stored in a place, free from vibration, in moist air of at least 90 percent relative humidity and at a temperature of $27^{\circ} \pm 2^{\circ}\text{C}$ for 24 hours $\pm \frac{1}{2}$ hour from the time of addition of water to the dry ingredients.

10. The ends of the specimen shall be capped before testing. The material used for the capping shall be such that its compressive strength is greater than that of the concrete in the core. Caps shall be made as thin as practicable and shall not flow or fracture before the concrete fails when the specimen is tested. The capped surfaces shall be at right angles to the axis of the specimen and shall not depart from a plane by more than 0.05 mm.

11. The bearing surfaces of the testing machine shall be wiped clean and any loose sand or other material removed from the surfaces of the specimen which are to be in contact with the compression platens.

12. In the case of cubes, the specimen shall be placed in the machine in such a manner that the load shall be applied to opposite sides of the cubes as cast, that is, not to the top and bottom.

13. The axis of the specimen shall be carefully aligned with the centre of thrust of the spherically seated platen. No packing shall be used between the faces of the test specimen and the steel platen of the testing machine.

14. The load shall be applied without shock and increased continuously at a rate of approximately 140 kg/sq cm/min until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained. 15. The maximum load applied to the specimen shall then be recorded and the appearance of the concrete and any unusual features in the type of failure shall be noted.



Fig.4.6 CTM

4.8.1. STRENGTH TEST CLACULATION (7 DAYS)

Cross – sectional area of paver block = 0.348 sq.ft

$$= 0.348 \times 0.092903$$

$$= 0.032330$$

$$= 32330 \text{ mm}^2$$

❖ Average ultimate load of conventional paver block for 7 days curing

$$= \frac{774 + 810}{2}$$

$$= 792 \text{ KN}$$

Compressive strength of conventional paver block for 7 days curing

$$= \frac{792 \times 1000}{32330}$$

$$= 24.5 \text{ N/mm}^2$$

- ❖ Average ultimate load of paver block replacing 2% of polypropylene fiber

$$\begin{aligned}\text{For 7 days curing} &= \frac{790 + 825}{2} \\ &= 807.5 \text{ KN}\end{aligned}$$

Compressive strength of the paver block replacing 2% of polypropylene

$$\begin{aligned}\text{For 7 days curing} &= \frac{807.5 \times 1000}{32330} \\ &= 25 \text{ N/mm}^2\end{aligned}$$

- ❖ Average ultimate load of paver block replacing 4% of polypropylene fiber

$$\begin{aligned}\text{For 7 days curing} &= \frac{830 + 864}{2} \\ &= 847 \text{ KN}\end{aligned}$$

Compressive strength of the paver block replacing 4% of polypropylene

$$\begin{aligned}\text{For 7 days curing} &= \frac{847 \times 1000}{32330} \\ &= 26.2 \text{ N/mm}^2\end{aligned}$$

- ❖ Average ultimate load of paver block replacing 6% of polypropylene fiber

$$\begin{aligned}\text{For 7 days curing} &= \frac{670 + 685}{2} \\ &= 677 \text{ KN}\end{aligned}$$

Compressive strength of the paver block replacing 6% of polypropylene

$$\begin{aligned}\text{For 7 days curing} &= \frac{677 \times 1000}{32330} \\ &= 20.94 \text{ N/mm}^2\end{aligned}$$

- ❖ Average ultimate load of paver block replacing 8% of polypropylene fiber

$$\begin{aligned}\text{For 7 days curing} &= \frac{562 + 540}{2} \\ &= 551 \text{ KN}\end{aligned}$$

Compressive strength of the paver block replacing 8% of polypropylene

$$\begin{aligned}\text{For 7 days curing} &= \frac{551 \times 1000}{32330} \\ &= 17.04 \text{ N/mm}^2\end{aligned}$$



Fig.4.7 CTM

4.8.2. COMPRESSIVE STRENGTH TEST CLACULATION (14 DAYS)

- ❖ Average ultimate load of conventional paver block for 14 days curing

$$= \frac{1040 + 997}{2}$$

$$= 1018.5 \text{ KN}$$

Compressive strength of conventional paver block for 14 days curing

$$= \frac{1018.5 \times 1000}{32330}$$

$$= 31.5 \text{ N/mm}^2$$

- ❖ Average ultimate load of paver block replacing 2% of polypropylene fiber

For 14 days curing

$$= \frac{1025 + 960}{2}$$

$$= 992 \text{ KN}$$

Compressive strength of the paver block replacing 2% of polypropylene

For 14 days curing

$$= \frac{992 \times 1000}{32330}$$

$$= 30.68 \text{ N/mm}^2$$

- ❖ Average ultimate load of paver block replacing 4% of polypropylene fiber

$$\begin{aligned}\text{For 14 days curing} &= \frac{1070 + 1010}{2} \\ &= 1040 \text{ KN}\end{aligned}$$

Compressive strength of the paver block replacing 4% of polypropylene

$$\begin{aligned}\text{For 14 days curing} &= \frac{1040 \times 1000}{32330} \\ &= 32.17 \text{ N/mm}^2\end{aligned}$$

- ❖ Average ultimate load of paver block replacing 6% of polypropylene fiber

$$\begin{aligned}\text{For 14 days curing} &= \frac{784 + 790}{2} \\ &= 787 \text{ KN}\end{aligned}$$

Compressive strength of the paver block replacing 6% of polypropylene

$$\begin{aligned}\text{For 14 days curing} &= \frac{787 \times 1000}{32330} \\ &= 24.34 \text{ N/mm}^2\end{aligned}$$

- ❖ Average ultimate load of paver block replacing 8% of polypropylene fiber

$$\begin{aligned}\text{For 14 days curing} &= \frac{692 + 570}{2} \\ &= 631 \text{ KN}\end{aligned}$$

Compressive strength of the paver block replacing 8% of polypropylene

$$\begin{aligned}\text{For 14 days curing} &= \frac{631 \times 1000}{32330} \\ &= 19.5 \text{ N/mm}^2\end{aligned}$$

4.8.3. COMPRESSIVE STRENGTH TEST CLACULATION (28 DAYS)

- ❖ Average ultimate load of conventional paver block for 28 days curing

$$\begin{aligned}&= \frac{1120 + 1010}{2} \\ &= 1065 \text{ KN}\end{aligned}$$

Compressive strength of conventional paver block for 28 days curing

$$\begin{aligned}&= \frac{1065 \times 1000}{32330} \\ &= 32.94 \text{ N/mm}^2\end{aligned}$$

- ❖ Average ultimate load of paver block replacing 2% of polypropylene fiber

$$\text{For 28 days curing} = \frac{1032 + 990}{2}$$

$$2$$

$$= 1011 \text{ KN}$$

Compressive strength of the paver block replacing 2% of polypropylene

$$\text{For 28 days curing} = \frac{1011 \times 1000}{32330}$$

$$32330$$

$$= 31.27 \text{ N/mm}^2$$

- ❖ Average ultimate load of paver block replacing 4% of polypropylene fiber

$$\text{For 28 days curing} = \frac{1154 + 1170}{2}$$

$$2$$

$$= 1162 \text{ KN}$$

Compressive strength of the paver block replacing 4% of polypropylene

$$\text{For 28 days curing} = \frac{1162 \times 1000}{32330}$$

$$32330$$

$$= 35.94 \text{ N/mm}^2$$

- ❖ Average ultimate load of paver block replacing 6% of polypropylene fiber

$$\text{For 28 days curing} = \frac{830 + 816}{2}$$

$$2$$

$$= 823 \text{ KN}$$

Compressive strength of the paver block replacing 6% of polypropylene

$$\text{For 28 days curing} = \frac{823 \times 1000}{32330}$$

$$32330$$

$$= 25.46 \text{ N/mm}^2$$

- ❖ Average ultimate load of paver block replacing 8% of polypropylene fiber

$$\text{For 28 days curing} = \frac{765 + 734}{2}$$

$$2$$

$$= 749.5 \text{ KN}$$

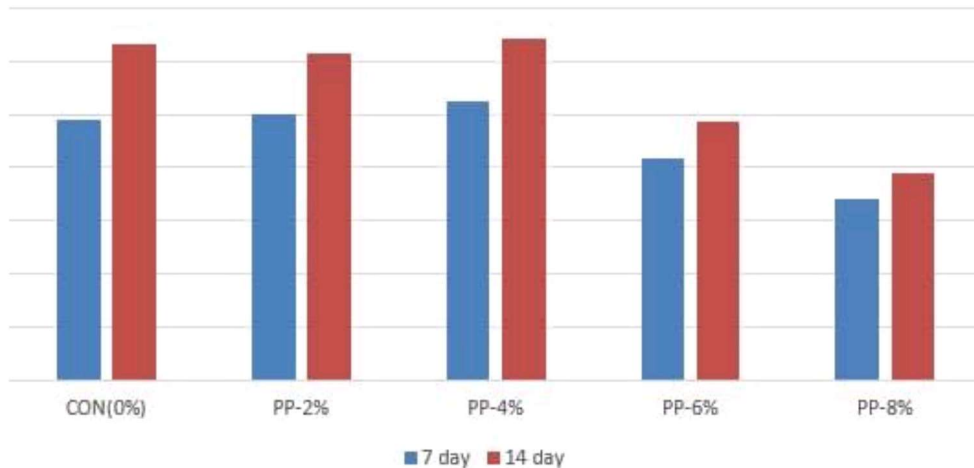
Compressive strength of the paver block replacing 8% of polypropylene

$$\text{For 14 days curing} = \frac{749.5 \times 1000}{32330}$$

$$32330$$

$$= 23.18 \text{ N/mm}^2$$

The following chart shows the test result of compressive strength test



4.9. FLEXURAL RIGIDITY TEST

OBJECTIVE

To determine the Flexural Strength of Concrete, which comes into play when a road slab with inadequate sub-grade support is subjected to wheel loads and / or there are volume changes due to temperature / shrinking.

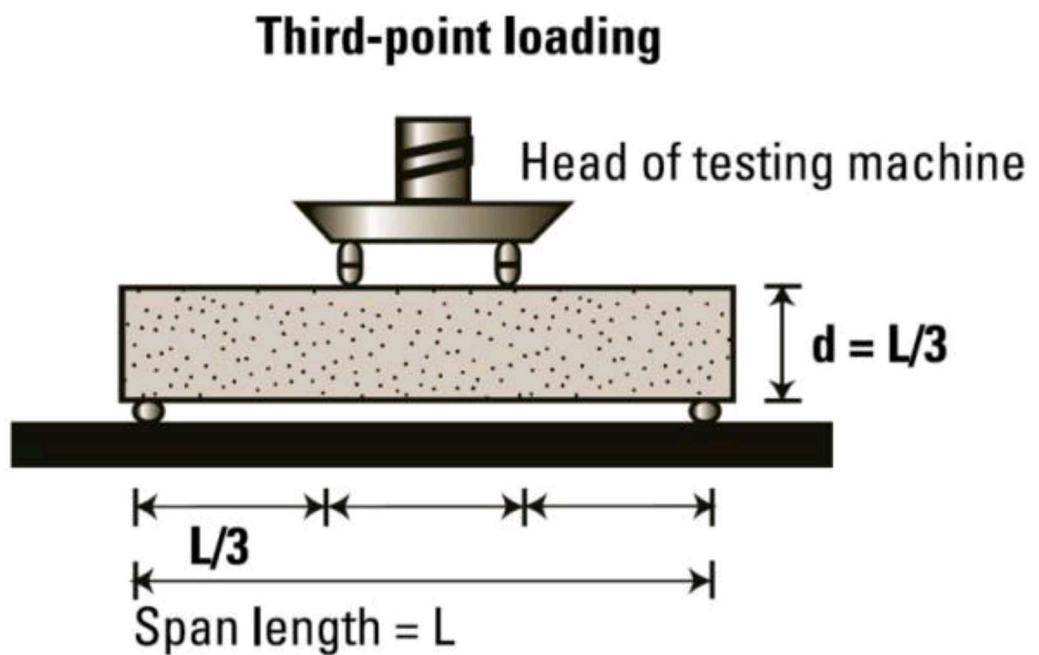
REFERENCE STANDARDS

IS: 516-1959 – Methods of tests for strength of concrete

EQUIPMENT & APPARATUS

- **Beam mould** of size 15 x 15x 70 cm (when size of aggregate is less than 38 mm) or of size 10 x 10 x 50 cm (when size of aggregate is less than 19 mm)
- **Tamping bar** (40 cm long, weighing 2 kg and tamping section having size of 25 mm x 25 mm)
- **Flexural test machine**– The bed of the testing machine shall be provided with two steel rollers, 38 mm in diameter, on which the specimen is to be supported, and these rollers shall be so mounted that the distance from centre to centre is

60 cm for 15.0 cm specimens or 40 cm for 10.0 cm specimens. The load shall be applied through two similar rollers mounted at the third points of the supporting span that is, spaced at 20 or 13.3 cm centre to centre. The load shall be divided equally between the two loading rollers, and all rollers shall be mounted in such a manner that the load is applied axially and without subjecting the specimen to any torsional stresses or restraints.



PROCEDURE

1. Prepare the test specimen by filling the concrete into the mould in 3 layers of approximately equal thickness. Tamp each layer 35 times using the tamping bar as specified above. Tamping should be distributed uniformly over the entire cross-section of the beam mould and throughout the depth of each layer.
2. Clean the bearing surfaces of the supporting and loading rollers, and remove any loose sand or other material from the surfaces of the specimen where they are to make contact with the rollers.
3. Circular rollers manufactured out of steel having cross section with diameter 38 mm will be used for providing support and loading points to the specimens. The length of the rollers shall be at least 10 mm more than the width of the test specimen. A total of four rollers shall be used, three out of which shall be

capable of rotating along their own axes. The distance between the outer rollers (i.e. span) shall be **3d** and the distance between the inner rollers shall be **d**. The inner rollers shall be equally spaced between the outer rollers, such that the entire system is systematic.

4. The specimen stored in water shall be tested immediately on removal from water; whilst they are still wet. The test specimen shall be placed in the machine correctly centered with the longitudinal axis of the specimen at right angles to the rollers. For moulded specimens, the mould filling direction shall be normal to the direction of loading.
5. The load shall be applied at a rate of loading of 400 kg/min for the 15.0 cm specimens and at a rate of 180 kg/min for the 10.0 cm specimens.

CALCULATION

The Flexural Strength or modulus of rupture (**f_b**) is given by

$$f_b = \frac{pl}{bd^2} \text{ (when } a > 20.0\text{cm for 15.0cm specimen or } > 13.0\text{cm for 10cm specimen)}$$

or

$$f_b = \frac{3pa}{bd^2} \text{ (when } a < 20.0\text{cm but } > 17.0 \text{ for 15.0cm specimen or } < 13.3 \text{ cm but } > 11.0\text{cm for 10.0cm specimen.)}$$

Where,

a = the distance between the line of fracture and the nearer support, measured on the center line of the tensile side of the specimen

b = width of specimen (cm)

d = failure point depth (cm)

l = supported length (cm)

p = max. Load (kg)

REPORTS

The Flexural strength of the concrete is reported to two significant figures.

SAFETY & PRECAUTIONS:

- Use hand gloves while, safety shoes at the time of test.
- After test switch off the machine.
- Keep all the exposed metal parts greased.
- Keep the guide rods firmly fixed to the base & top plate.
- Equipment should be cleaned thoroughly before testing & after testing.



Fig,4.8. FRTM

4.9.1. FLEXURAL RIGIDITY TEST CALCULATION (7 DAYS)

$$F = 3 PL$$

$$2bd^2$$

- ❖ Flexural strength of the conventional paver block
= $3 \times 6.5 \times 1000 \times 220$

$$\frac{2 \times 120 \times 80 \times 80}{2 \times 120 \times 80 \times 80} = 2.79 \text{ N/mm}^2$$

- ❖ Flexural strength of paver block replacing 2% of polypropylene fiber
For 7 days curing

$$\frac{3 \times 6.7 \times 1000 \times 220}{2 \times 120 \times 80 \times 80} = 2.87 \text{ N/mm}^2$$
- ❖ Flexural strength of paver block replacing 4% of polypropylene fiber
For 7 days curing

$$\frac{3 \times 7.1 \times 1000 \times 220}{2 \times 120 \times 80 \times 80} = 3.05 \text{ N/mm}^2$$
- ❖ Flexural strength of paver block replacing 6% of polypropylene fiber
For 7 days curing

$$\frac{3 \times 5.7 \times 1000 \times 220}{2 \times 120 \times 80 \times 80} = 2.45 \text{ N/mm}^2$$
- ❖ Flexural strength of paver block replacing 8% of polypropylene fiber
For 7 days curing

$$\frac{3 \times 4.9 \times 1000 \times 220}{2 \times 120 \times 80 \times 80} = 2.10 \text{ N/mm}^2$$

4.9.2. FLEXURAL RIGIDITY TEST CALCULATION (14 DAYS)

- ❖ Flexural strength of the conventional paver block

$$\frac{3 \times 8.7 \times 1000 \times 220}{2 \times 120 \times 80 \times 80} = 3.74 \text{ N/mm}^2$$
- ❖ Flexural strength of paver block replacing 2% of polypropylene fiber
For 14 days curing

$$\frac{3 \times 8.2 \times 1000 \times 220}{2 \times 120 \times 80 \times 80} = 3.52 \text{ N/mm}^2$$
- ❖ Flexural strength of paver block replacing 4% of polypropylene fiber
For 14 days curing

$$\frac{3 \times 9.4 \times 1000 \times 220}{2 \times 120 \times 80 \times 80} = 4.04 \text{ N/mm}^2$$
- ❖ Flexural strength of paver block replacing 6% of polypropylene fiber

$$\begin{aligned}
 \text{For 14 days curing} &= 3 \times 8.2 \times 1000 \times 220 \\
 &2 \times 120 \times 80 \times 80 \\
 &= 3.52 \text{ N/mm}^2
 \end{aligned}$$

- ❖ Flexural strength of paver block replacing 8% of polypropylene fiber

$$\begin{aligned}
 \text{For 14 days curing} &= 3 \times 7.8 \times 1000 \times 220 \\
 &2 \times 120 \times 80 \times 80 \\
 &= 3.35 \text{ N/mm}^2
 \end{aligned}$$

4.9.3. FLEXURAL RIGIDITY TEST CALCULATION (28 DAYS)

- ❖ Flexural strength of the conventional paver block

$$\begin{aligned}
 &= 3 \times 12.3 \times 1000 \times 220 \\
 &2 \times 120 \times 80 \times 80 \\
 &= 5.28 \text{ N/mm}^2
 \end{aligned}$$

- ❖ Flexural strength of paver block replacing 2% of polypropylene fiber

$$\begin{aligned}
 \text{For 28 days curing} &= 3 \times 11.1 \times 1000 \times 220 \\
 &2 \times 120 \times 80 \times 80 \\
 &= 4.76 \text{ N/mm}^2
 \end{aligned}$$

- ❖ Flexural strength of paver block replacing 4% of polypropylene fiber

$$\begin{aligned}
 \text{For 28 days curing} &= 3 \times 13.5 \times 1000 \times 220 \\
 &2 \times 120 \times 80 \times 80 \\
 &= 5.80 \text{ N/mm}^2
 \end{aligned}$$

- ❖ Flexural strength of paver block replacing 6% of polypropylene fiber

$$\begin{aligned}
 \text{For 28 days curing} &= 3 \times 10.2 \times 1000 \times 220 \\
 &2 \times 120 \times 80 \times 80 \\
 &= 4.38 \text{ N/mm}^2
 \end{aligned}$$

- ❖ Flexural strength of paver block replacing 8% of polypropylene fiber

$$\begin{aligned}
 \text{For 28 days curing} &= 3 \times 9.7 \times 1000 \times 220 \\
 &2 \times 120 \times 80 \times 80 \\
 &= 4.17 \text{ N/mm}^2
 \end{aligned}$$

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1. GENERAL

This chapter deals with the test result and discussion of M₃₀ grade paver block At the age of 7,14 and 28 days. In this present investigation the concrete specimens are casted and cured with Poly propylene fiber.

5.2 FLEXURAL STRENGTH TEST

The Flexural strength test was also carried out for the paver blocks produced with different proportions of poly propylene fiber in concrete for 7, 14 and 28 days of curing and the test results are tabulated as below.

Table.5.1.flexural strength max values

MIX DESIGNATION	% OF PP	MEAN FAILURE LOAD	FLEXURAL STRENGTH (N/mm ²)
PPO	0	8.7	3.74
PP1	2	8.2	3.52
PP2	4	9.4	4.04
PP3	6	8.2	3.52
PP4	8	7.9	3.35

After testing the paver block by adding various percentages and various curing days, the highest values were attained at addition of 4 % fibers.

The graph enlisting the values is given below for more precise and easy understanding

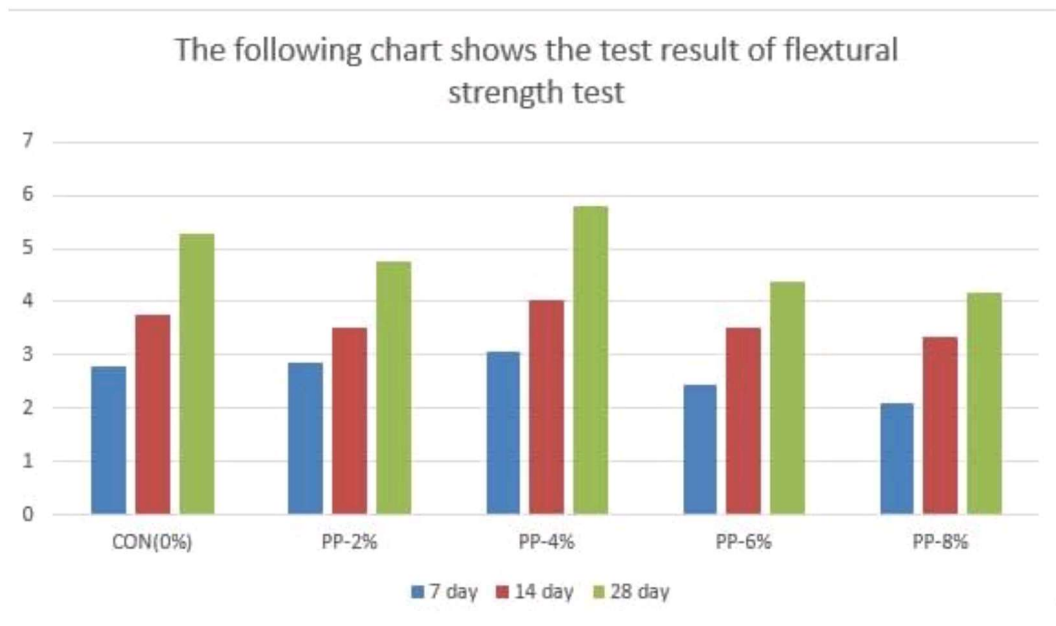


Fig.5.1.flexural rigidity test graph

5.3 COMPRESSION TEST

The compression strength test was also carried out for the paver blocks produced with different proportions of poly propylene fiber in concrete for 7, 14 and 28 days of curing and the test results are tabulated as below

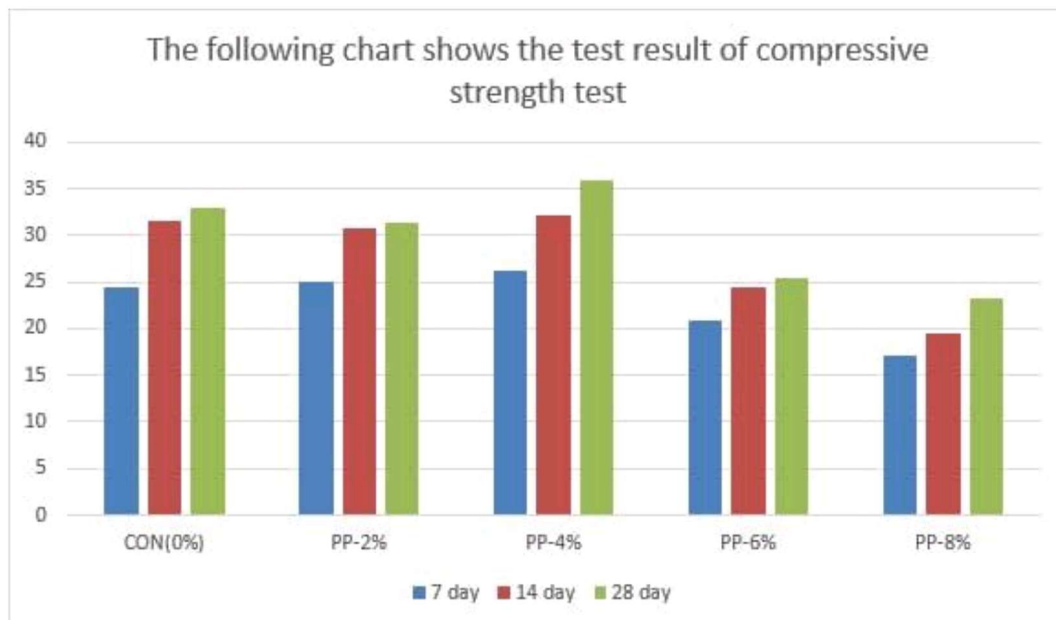


Fig.5.2. CTM values graph.

CHAPTER 6

CONCLUSION

The study shows that use of poly propylene fibers in paver block, fiber give strength to the paver member and also increases the service life. Cement, fine aggregate, coarse aggregate have been collected and its properties are studied. also adding fibers to the concrete paver block increases the flexural strength. Various percentages of poly propylene fibers are added as 2%, 4%,6% and 8% and tests were conducted on paver blocks.

Based on the test values and comparing them with conventional paver block, it is concluded that the maximum strength was obtained at 4% at period of 28 days curing. Hence 4% fiber added paver block was found to be more stable and durable over other ones.

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