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Experimental Investigation on Light Weight Concrete by using Natural and Artificial Light Weight Aggregates

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ABSTRACT

The changes of moisture content for the duration of drying are experimentally investigated in the current work. Particular emphasis is placed on the preliminary stage of drying of saturated concrete, when moisture contents are high, on account that the resistance of the fabric to numerous deterioration methods is reduced at high moisture content material levels, and experimental records for this stage of drying is lacking.

The experimental investigation is carried out for concrete cylinders of one of a kind lengths with one give up uncovered to drying. In this way, moisture float is compelled to be unidirectional. The gravimetric approach is employed to gain moisture content distribution in the material at exceptional times of drying. The cylinders are made of lightweight concrete with varying water-to-cement ratios and moist curing times, and the influence of these variables upon the drying method is assessed. Higher preliminary water content and more speedy modifications of water content take place in light-weight concrete with a greater w/c ratio. An elevated moist-curing period consequences in a minimize of drying fees during the drying process.

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1. INTRODUCTION

Lightweight concrete is described in accordance to NP EN 206-1 [1] as a concrete that has a density, after oven drying, that isn't large than 2000 kg/m3, complete or partly produced with porous shape aggregate. The major distinction between light-weight concrete and regular concrete is the decrease density mass, except its distinguishable thermal and sturdiness characteristics. In addition, the popular NP EN 13055-1 defines light-weight combination as having a particle density now not exceeding 2000 kg/m3 or a unfastened bulk density now not exceeding 1200 kg/m3.

Concrete is the most versatile man-made building cloth in the world and being drastically used in all sorts of development activities. The strength, sturdiness and different traits of concrete rely upon the residences of its ingredients, the combine proportions, the technique of compaction and different controls at some point of placing, compaction and curing. The advances in concrete technological know-how have paved the way to make the first-class use of regionally handy substances with the aid of perfect combine proportioning and workmanship so as to produce a strong, long lasting and uniform concrete. One of the foremost thrust areas of lookup in concrete has been in the use of supplementary cementing substances or mineral admixtures or substitute of ingredients. The makes use of of industrial wastes which are pozzolanic in persona and strengthen cementations homes are used to exchange cement and aggregates partly enhance strength, sturdiness and assist to shield the environment. The environmental influences of extracting river sand and overwhelmed stone mixture come to be a supply of growing subject in most components of the country. Thus the manufacturing of mild weight concrete with alternate aggregates is enormously endorsed by means of researchers.

2. METHODOLOGY

This chapter temporarily explains the methodology adopted in this experimental work. It has already been mentioned in the preceding chapter about use of LWC concrete and their impact on electricity parameters of concrete in the core goal of this experimental work. The following methodology has been adopted to reap above objective. In the first segment physical, chemical and mechanical houses of all ingredient of concrete have been discovered out. In the sound phase, at the start compressive electricity of cubes and cylinders, break up tensile electricity had been located out. The experimental investigation is performed as specified below. The whole fabric checks have been performed in the laboratory as per applicable Indian well known codes. Basic take a look at have been performed on cement, satisfactory aggregates, coarse aggregates to test their suitability for concrete making. The learn about goals to look at electricity associated property of concrete of M25 grade made the use of LWC. The proportions of elements of the manage concrete of grade M25 had to decide by means of combine graph as per IS code. Totally the combine proportions had been calculated. From the compressive electricity of cubes, cylinder, and prisms, the gold standard proportion (0%, 25%, 50%, 75%, 100%).

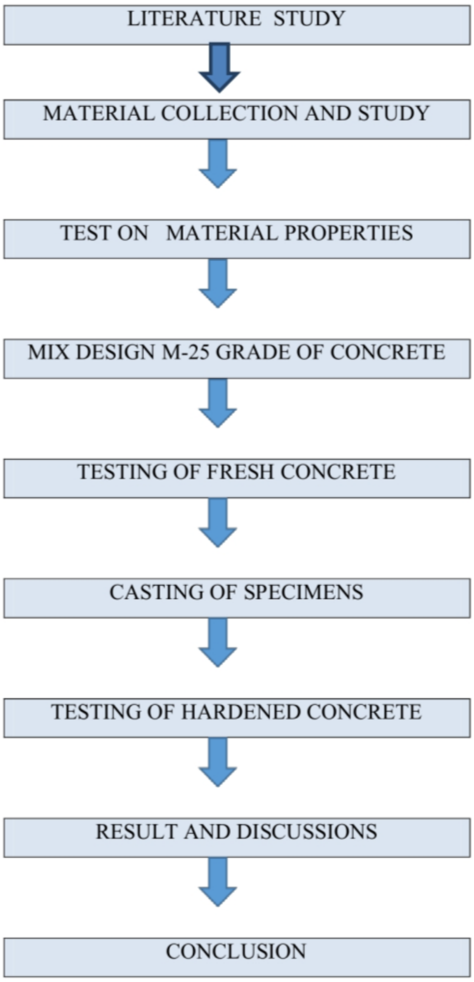


Fig. 1 Methodology

3. MATERIAL AND PROPERTIES

3.1. Physical properties of OPC 53 grade cement

S. No	Test for Cement	Apparatus	Value Obtained
1.	Standard consistence test	Vicat apparatus	5.7mm
2.	Initial setting time	Vicat apparatus	30 minutes
3.	Final setting time	Vicat apparatus	550 minutes
4.	Specific gravity test	Conical flask	3.12

Table 3.1 Physical properties of OPC 53 grade cement

3.2. Physical properties of fine aggregates

S. No	Test for fine aggregates	Apparatus	Value obtained
1.	Fineness modulus	Sieve	2.39
2.	Specific gravity	Pycnometer	2.55
3.	Water absorption	-	1.00%

Table 3.2 Physical properties of fine aggregates

3.3. Physical properties of coarse aggregates

S. No	Test for coarse Aggregates	Apparatus	Value obtained
1.	Fineness modulus	Sieve	2.78
2.	Specific gravity	Cylindrical container	2.80
3.	Water absorption	Pan	0.5%
4.	Impact value	Impact testing machine	30%

Table 3.3 Physical properties of coarse aggregates

3.4. Physical properties of Pumice Aggregates

S. No	Characteristics	Experimental value of pumice aggregates
1.	Specific gravity of CA	0.78
2.	Specific gravity of FA	2.54
3.	Sieve analysis for FA	2.7
4.	Impact test for CA	44%

Table 3.4 Physical properties of Pumice Aggregates

4. TEST FOR FRESH AND HARDENED CONCRETE

4.1. SLUMP TEST

Fig 4.1 Slump

Test Fig 4.2 Slump

% OF REPLACEMENT				Slump in mm
FINE AGGREGATES		COARSE AGGREGATES		
Pumice powder	Steel Slag	Pumice stone	Polystyrene beads	
0%	0%	0%	0%	93mm
50%	50%	50%	50%	85mm
50%	50%	0%	100%	90mm

Table 4.1 Test Results for Slump of concrete

4.2. COMPACTING FACTOR TEST:

Fig 4.3 Compaction Factor Test

PERCENTAGE OF REPLACEMENT				Compaction Factor
FINE AGGREGATES		COARSE AGGREGATES		
Pumice powder	Steel Slag	Pumice stone	Polystyrene beads	
0%	0%	0%	0%	0.9
50%	50%	50%	50%	0.86
50%	50%	0%	100%	0.79

Table 4.2 Test Results for Compaction Factor of concrete

4.3. COMPRESSIVE STRENGTH TEST

Fig 4.4 Compressive Strength Test

Conventional concrete   Light weight concrete

Fig 4.5 Specimen for Compressive Strength

4.4. FLEXURAL STRENGTH TEST

Fig 4.6 Flexural Strength Test

Conventional concrete   Light weight concrete

Fig 4.7 Specimen for Flexural Strength

5. RESULTS AND DISCUSSIONS

5.1. COMPRESSIVE STRENGTH ANALYSIS

The end result of the take a look at that used to be carried out on trial mixes of M25 grade of concrete to consider their workability and power homes are introduced in this chapter. Trial mixes with various percentages of pumice stone, metal slag, polystyrene beads delivered in concrete through (0%, 50%, 100%) was once studied. The houses of the concrete combos LWC in concrete are mentioned in this chapter.

PERCENTAGE OF REPLACEMENT				SPECIMEN	COMPRESSIVE STRENGTH F_{ck}=P/A (N/mm²)
FINE AGGREGATES		COARSE AGGREGATES			
Pumice powder	Steel slag	Pumice stone	Polystyrene beads		
0%	0%	0%	0%	SP I	18.6
50%	50%	50%	50%	SPII	11.78
50%	50%	0%	100%	SPII	9.57

Table 5.1 Result Obtained By Compressive Strength At 7 Days

5.2. RESULT OBTAINED BY COMPRESSIVE STRENGTH AT 14 DAYS

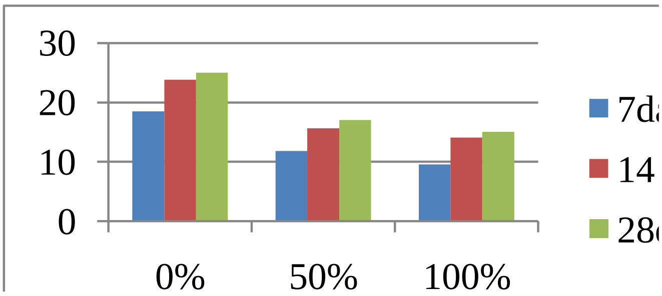
PERCENTAGE OF REPLACEMENT				SPECIMEN	COMPRESSIVE STRENGTH F_{ck}=P/A (N/mm²)
FINE AGGREGATES		COARSE AGGREGATES			
Pumice powder	Steel slag	Pumice stone	Polystyrene beads		
0%	0%	0%	0%	SP I	23.9
50%	50%	50%	50%	SPII	15.7
50%	50%	0%	100%	SPII	14.06

Table 5.2 Result Obtained By Compressive Strength At 14 Days

5.3. RESULT OBTAINED BY COMPRESSIVE STRENGTH AT 28 DAYS

PERCENTAGE OF REPLACEMENT				SPECIMEN	COMPRESSIVE STRENGTH F_{ck}=P/A (N/mm²)
FINE AGGREGATES		COARSE AGGREGATES			
Pumice powder	Steel slag	Pumice stone	Polystyrene beads		
0%	0%	0%	0%	SP I	25
50%	50%	50%	50%	SPII	17.02
50%	50%	0%	100%	SPII	15

Table 5.3 Result Obtained By Compressive Strength At 28 Days



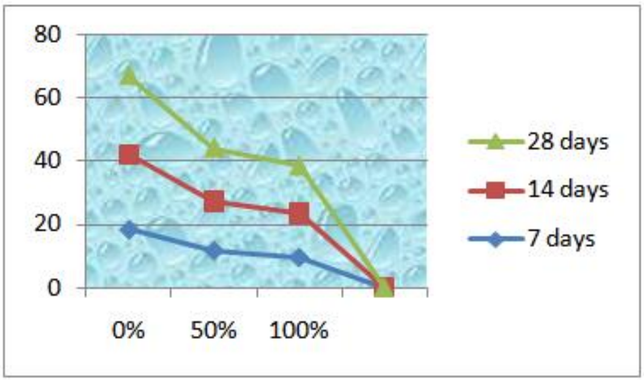
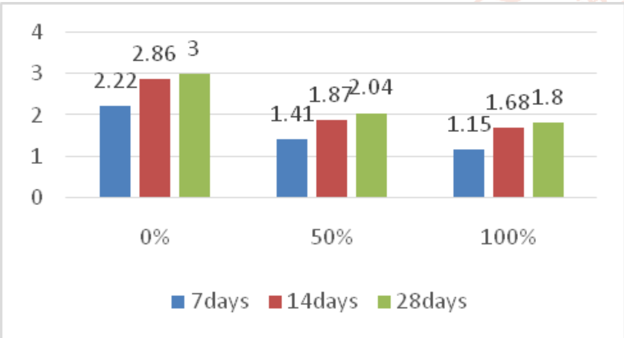


Fig5.1Compressive strength

5.4. SPLIT TENSILE STRENGTH ANALYSIS



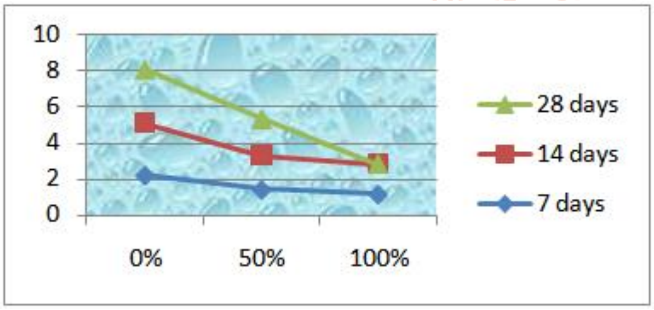
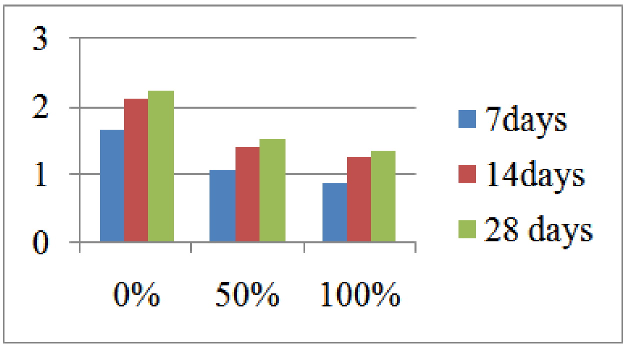


Fig 5.2 Split Tensile Strength

5.5. FLEXURAL STRENGTH ANALYSIS



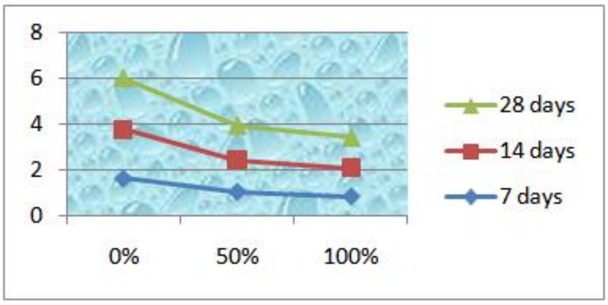


Fig 5.3 Flexural strength

6. CONCLUSION

Pumice concrete can be used in lintels, sunshades, Partition walls. Pumice concrete can be used in earthquake resistant structures. The mild weight concrete has low thermal conductivity and has an capacity to take in sound. So, it can be used for acoustic structures. Compressive power cost is in contrast to everyday concrete and alternative of coarse aggregates with the aid of pumice stone and polystyrene beads from extraordinary percentages 0%, 25%, 50%, 75%,100%. Maximum cost of energy is received in 50% changed via pumice stone and polystyrene beads with coarse aggregates. Concrete with 50% substitute of polystyrene beads, overwhelmed pumice powder the compressive power in related with regular concrete. This kind of concrete can be utilized in wall panel of non-load bearing kind for use in precast buildings. The density of concrete is discovered to minimize with the expand in proportion substitute of herbal aggregates pumice aggregates. With the addition of mineral admixtures the compressive strength, cut up tensile power and flexural energy of concrete has discovered 50% by way of weight of a number combine of concrete. We obtained ideal cost of these electricity and fee additionally economical. It is very appropriate for concrete and building work.

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