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Experimental Analysis Of Floating Concrete

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ABSTRACT

A floating concrete structure is usually a solid body made of reinforced concrete and an inner chain of chambers filled with a lightweight impermeable material. This is having a density less than 1000 kg/m³. Because of its low density and moderate range of compressive strength, it can be used in non-structural applications. In this study an attempt has been made to develop a Floating concrete based on trials with an emphasis on overall density. Also, to obtain floating concrete with considerable compressive strength. The primary aim of the project is to develop floating concrete by partial replacement of coarse aggregate by plastic materials and to achieve this, M25 mix proportions were adopted. Since its density is less than that of water (1000 kg/m³) the concrete in its hardened state can float in water. Due to its special ability to float, it can replace other less durable materials. Also, its lightweight property is suitable for use in non-load bearing walls, thermal insulation and sound insulation. Thus, density of floating concrete is about less compared to the conventional concrete. Floating concrete being light weighted, it can be used in partition walls. Thus, strength of floating concrete is compared with the normal partition wall segments for better understanding.

Keywords: Waste plastic bottles, Floating concrete, Partition walls, Compressive strength, floating concrete hollow block.

INTRODUCTION

The present-day world is witnessing construction of very challenging and difficult civil engineering structures. Concrete is the most widely-used composite material in the construction industry. It is durable, weather-resistant, environmentally neutral and economically affordable. There are many types of concrete each designed for fulfilling specific technical, structural and aesthetic requirements. Researchers all over the world are attempting to develop low density or lightweight concrete by using

different admixtures in concrete up to certain proportions. Lightweight concrete is a type of concrete contains expanded light weight aggregates which increase the volume of the mixture while giving additional qualities such as lowering the dead weight. Lightweight concrete maintains its large voids and not forming laitance layers or cement films when placed on the wall. Lightweight concrete is usually chosen for structural purpose where its use will lead to a lower overall cost of a structure than normal weight concrete.

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FLOATING CONCRETE

Floating concrete is a composite material composed of cement, water, aggregates and admixtures (both physical and chemical). Unlike the traditional Portland cement concrete (whose Density is about 2400 kg/m³), floating concrete contains lightweight aggregates and certain admixtures which make the composite lighter. The density of the floating concrete ranges from 600 kg/m³ to 1000 kg/m³. Since its density is less than that of water (1000 kg/m³) the concrete in its hardened state can float in water.

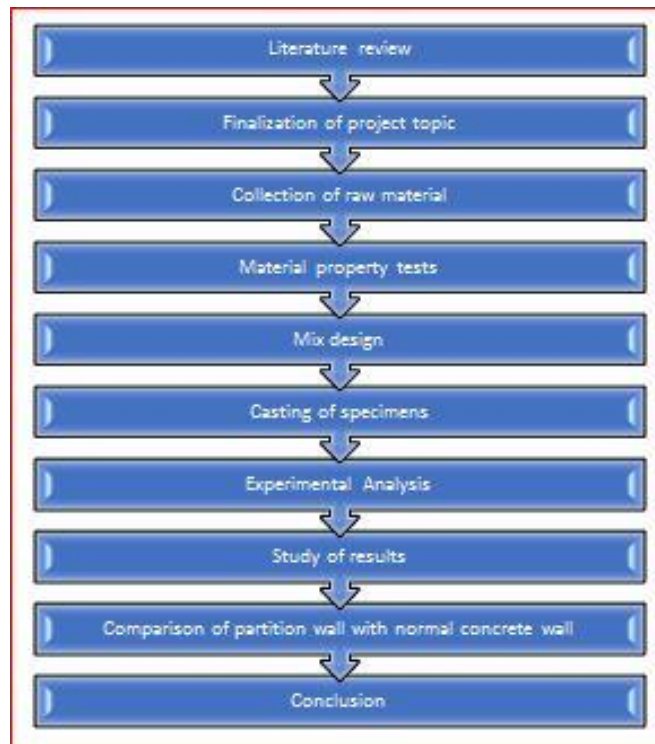
Due to its special ability to float, it can replace other less durable materials like wood in the applications where the material is desired to float. Also, its lightweight property is suitable for use in non-load bearing walls, thermal insulation and sound insulation. Floating concrete is a kind of concrete having thickness not as much as water and it coasts on water. There are numerous sorts of lightweight solid

which makes the solid buoy by utilizing lightweight aggregate or by utilizing air entraining specialist. The conventional aggregate is supplanted by light weight aggregate which makes the solid lighter than the ordinary concrete.

Aims And Objectives

- Partial replacement of coarse aggregate by plastic material to reduce the density of concrete.
- Reduction of density of the concrete with maintaining moderate compressive strength.
- To study the variation of compressive strength and density of floating concrete by partial replacement
- of coarse aggregate by plastic materials.
- Comparison of floating concrete with conventional floating concrete.
- The strength comparison between floating concrete partition wall and normal parti

METHODOLOGY



PROPERTIES OF MATERIALS USED

Cement

In this project Ambuja Cement used. The properties of cement used were given in table below.

SL. NO.	PROPERTIES	VALUES OBTAINED
1	Specific gravity	2.95
2	Initial setting time	30 minutes
3	consistency	31%

Coarse aggregate

The materials whose particles are of size are retained on IS sieve NO.480(4.75mm) is termed as coarse aggregates.

SL. NO.	PROPERTIES	VALUES OBTAINED
1.	Specific gravity	2.8
2	Water Absorption	1%

Fine aggregates

River sand passing through 4.75mm is used

SL. NO.	PROPERTIES	VALUES OBTAINED
1	Specific gravity	2.95
2	Fineness modulus	2.6 -2.9
2	Water Absorption	3%

Water

Water is an important ingredient in concrete as it actively participates in chemical reaction with cement. The water

which was used for making concrete was clean and free from harmful impurities such as oil, alkali, acid etc.

In general, the water which is fit for drinking should be used for making concrete.

Plastic

A plastic is constructed from high-density or low-density plastic. Here the plastic bottles are typically used to store liquids

such as water, soft drinks, motor oil, cooking oil, medicine, shampoo, milk, and ink. The size ranges from very small bottles

to large carboys. Consumer blow molded containers often have integral handles or are shaped to facilitate grasping.

SL. NO	PROPERTIES	VALUES OBTAINED
1.	Specific gravity	0.95
2	Water Absorption	0%

Mix design

Concrete mix design is defined as the appropriate selection and proportioning of constituents to produce a concrete with predefined characteristics in the fresh and harden states. In general, concrete mixes are designed

in order to achieve a defined workability, strength and durability.

- Cement = 336kg/m³
- Water = 158ltr/m³
- Chemical admixture = 1.344kg/m³
- Fine aggregate = 717kg/m³
- Coarse aggregate = 1303kg/m³
- Water cement ratio = 0.47
- Mix proportion by weight = 1: 2.13: 3.88
- Minimum cement content as per IS code 456 is 280 kg/m³

Mix design proportions

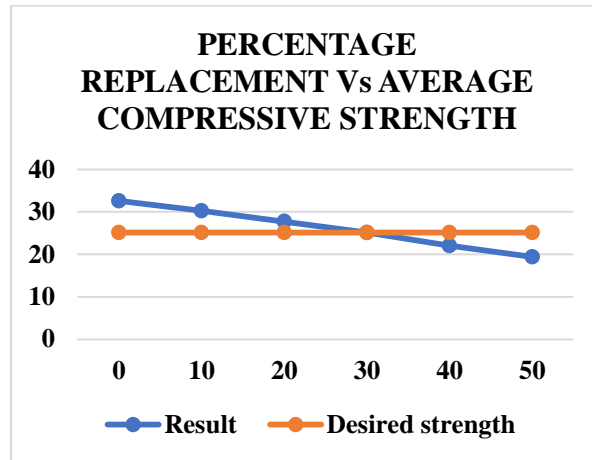
ANALYSIS AND RESULTS

Specimen study –

Compressive strength of Cubes: -

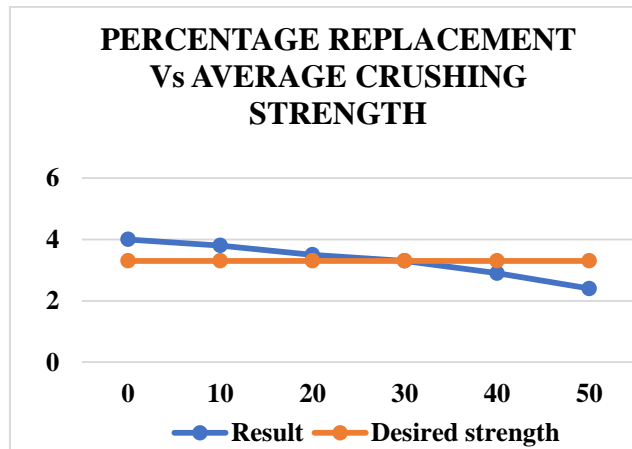
S L NO.	Percentage replacement of plastic in concrete (%)	T rail No.	Compressive strength (28 days, N/mm ²)	Average compressive strength (28 days, N/mm ²)
1	0	1	32.82	32.56
		2	31.98	
		3	32.88	
2	10	1	29.99	30.25
		2	30.43	
		3	30.33	
3	20	1	27.98	27.73
		2	26.30	
		3	28.91	
4	30	1	24.14	25.12
		2	25.88	

		3	25.34	
5	40	1	22.03	22.02
		2	21.86	
		3	22.17	
6	50	1	19.58	19.38
		2	18.23	
		3	20.33	



Crushing strength of floating concrete hollow block: -

S L NO.	Percenta ge replacement of plastic in concrete (%)	T rail No.	Crush ing strength (28 days, N/mm ²)	Averag e crushing strength (28 days, N/mm ²)
1	0	1	4.10	4
		2	3.94	
		3	3.96	
2	10	1	4.24	3.8
		2	3.26	
		3	3.90	
3	20	1	3.5	3.5
		2	3.45	
		3	3.55	
4	30	1	3.78	3.3
		2	3.26	
		3	2.86	
5	40	1	2.60	2.9
		2	3.01	
		3	3.09	
6	50	1	2.29	2.4
		2	2.51	
		3	2.40	



DISCUSSION

In this analysis of replacing aggregate by plastic was done in six stages. The first one with conventional concrete M25 and others where 10% replacement of aggregate by plastic followed by 20%, 30%, 40%, 50% respectively. From the results tabulated, it is found that up to 30% of replacement of aggregate by plastic retain the strength of M25 conventional concrete but in case of 40% and 50% of replacement the strength of concrete falls under strength of conventional M25 concrete. Similarly, in the case of floating concrete hollow block at 30% of replacement the block attains the strength of a conventional M25 concrete and above 30% the strength begins to reduce.

CONCLUSIONS AND RECOMMENDATIONS

Utilizing the plastic as partial substitute for coarse aggregate in concrete reduces the issues of disposing plastic waste which are non-biodegradable. Findings of this project can be concluded as follows:

From the specimen study of Cubes:-

- Compressive strength slightly decreased with increasing percentage replacement of plastic in aggregate.
- Weight of the modified concrete reduced with increasing percentage replacement of plastic in aggregate.
- From the results, 30% replacement of plastic

aggregate in concrete with W/C ratio 0.47 can be considered for industrial purpose

- From the Crushing strength of floating concrete hollow block:-
- When comparing to normal conventional concrete hollow blocks the weight of floating concrete hollow block is less.
- Upto 30% of replacement of aggregate by plastic, it gives the same strength as that of conventional concrete block. Hence it can be used as a partition wall.

Recommendations from this project are:-

- Floating concrete can be considered as a light weight concrete
- Floating cubes can be used in concrete with a replacement of 30% coarse aggregate.
- Reduce the use of non-renewable resources like natural aggregates.
- The impact due to destruction can be greatly reduced during a natural calamity.

In this project, M25 mix is used and further study can be done using higher grade mix. This project can be concluded that floating concrete can be used has a replacement of conventional concrete. Since floating concrete is weightless when compared to normal conventional concrete, it reduces the density by maintaining the design strength of concrete.

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