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AN EXPERIMENTAL INVESTIGATION 0N FLOATING CONCRETE USING LIGHTWEIGHT AGGREGATES

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Abstract - *This project deals with development of floating concrete by using lightweight aggregates (pumice stone) and other replacing material (scoria). There are many types of lightweight concrete which can be produced either by using lightweight aggregate or by using an air entraining agent. In this study we have worked on combination of above mentioned types. This concrete is a non-structural concrete. In this study, pumice stone is used as replacement materials in concrete where it is found in the abyssal of the red clay. The physical, mechanical and durability properties of concrete was investigated by conduction compressive strength on the ordinary and replaced concrete with varied percentage of pumice from 5% to 30%. It's observed that environmental and economical benefits can be achieved if waste materials can be used to replace the coarse aggregate in order to use the waste materials effectively in areas with abundant availability of materials. Along with pumice, The aim of this project is to analyse the suitability of scoria as a fine aggregate for concrete production and its effect on the properties of concrete. A differing ratio of scoria was considered as a partial replacement of fine aggregate with river sand after analysing its engineering properties, and its effect on the mechanical properties of concrete were examined. The test results on the engineering properties of scoria revealed that the material is suitable to be used as a fine aggregate in concrete production. The replacement of scoria with river sand also enhanced the compressive strength of the floating concrete.*

Key Words: *Pumice stone, Scoria powder, Conventional concrete, Compressive strength.*

1.INTRODUCTION

Concrete can be defined as composite material, composed of cement, aggregate, water and admixtures in required proportions. It is considered to be most important and useful materials for many constructional activities . The basic ingredients for a concrete are Portland cement, water, and aggregates. Concrete is generally considered to be the most widely used material on Earth. It can be easily moldable to any shape in the elastic stage. Aggregate is a broad category of coarse particulate material most widely used in constructional activities. Aggregate act as a reinforcement in a concrete contributing compressive strength to concrete. With the increasing urban development and population, demand of sustainable structures increased. However, by use of the waste materials, the environmental impact may be reduced. Sustainable by products from various industries reduces overall cost and energy. By incorporating industrial by products in concrete meet out the requirement of creating the environmental awareness in the society. Now a days more awareness has been paid to the development of light weight aggregate structure having low unit weight and sufficient strength. One of the way to reduce the weight of the structure is by using the light weight aggregate concrete which is most probable method in reducing the weight of the structure.

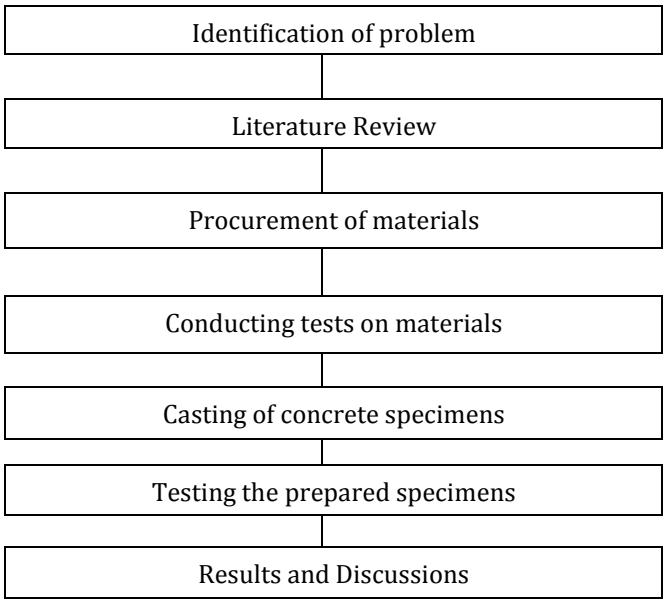
2.OBJECTIVE

The main objective of this project is to increase compressive strength of the Floating concrete by using lightweight aggregates.

3.SCOPE

The present data indicates that there is significant improvement in the strength properties of the lightweight concrete by using different admixtures. Further improvement in the study can help to increases the mechanical properties of lightweight concrete by adding different combination of materials.

4.METHODOLOGY



5.EXPERIMENTAL PROGRAMME

5.1 Materials used

5.1.1 Ordinary Portland cement (43 Grade)

The cement used in the experimentation was Ordinary Portland cement. The physical properties of tested cement are given in Table.1

Table.1.Physical properties of OrdinaryPortland cement

Sl.No.	Properties	Value
1	Fineness	93.5%
2	Specific Gravity	3.15
3	Normal Consistency	27%
4	Setting time Initial Final	 30min 8hrs

5.1.2 Fine Aggregates

Manufacturess and purchased from the supplier was used as fine aggregate.The sand used confirmed to grading zone-2 as per IS:383-1970 specification.

5.1.3 Coarse Aggregates

The crushed stone aggregate by locally quarry purchased from the supplier. The coarse aggregates used in the experimentation was 20mm and downsize aggregate. The physical and mechanical properties are given in Table.2

Table.2:.Physical and mechanical properties of Coarse Aggregate.

Properties	Results	Permissible limit
Impact value	10.1%	Should not be more than 30%
Crushing value	17.84%	Should not be more than 30%
Specific Gravity	2.79	2.6-2.8

5.1.4 Pumice stone

Pumice is a material created by the arrival of gases during the cementing of magma. The cell structure of pumice is made by the development of air pockets or air voids when gases are trapped in the liquid magma spilling out of volcanoes become caught on cooling. Cells are lengthened and corresponding to each other and sometimes interconnected. Once the rock hardens, the result is a very light, buoyant material. The main use of pumice is for making lightweight construction materials such as concrete. Pumice has a chemical composition similar to that of obsidian, or volcanic glass. It has very thin, translucent bubble walls of extrusive igneous rock. The main research objective was to develop light weight concrete using Pumice stone to reduce the self weight of the structures. The focus was on to develop the floating concrete with good strength, less porous, less capillarity so that the concrete that will floats should be durable.

5.1.5 Scoria powder

Scoria, which is a product of explosive volcanic eruptions, has been used for centuries in the world as a construction material. Different researchers have examined the use of scoria as a construction material in concrete production. According to researches, scoria used as a coarse aggregate was found to be very useful in the production of lightweight concrete, with sufficient strength giving it the advantage of reducing the dead load in building structures. Scoria is also used as a lightweight aggregate with silica fume and fly ash mineral admixture in the production of lightweight structural concrete in which an outstanding performance was observed with regards to the strength to unit weight ratio. Improvements in the mechanical strength of mortar were also observed when using volcanic scoria as sand in the production of Portland cement mortar.

6. MIX PROPORTION

Design of concrete mix needs not only the knowledge of material properties and properties of concrete in plastic condition, It also needs wider knowledge and experience of concreting. Even then the proportion of the materials of concrete found out at the laboratory requires modification and read just meant to suit the field conditions.

Table.3.Mix Proportion for M25

Grade	Cement (kg/m3)	Fine Aggregate (kg/m3)	Coarse Aggregate(kg/m3)	Water (l/m3)	w/c ratio
M25	350	788.50	1192.26	186	0.47

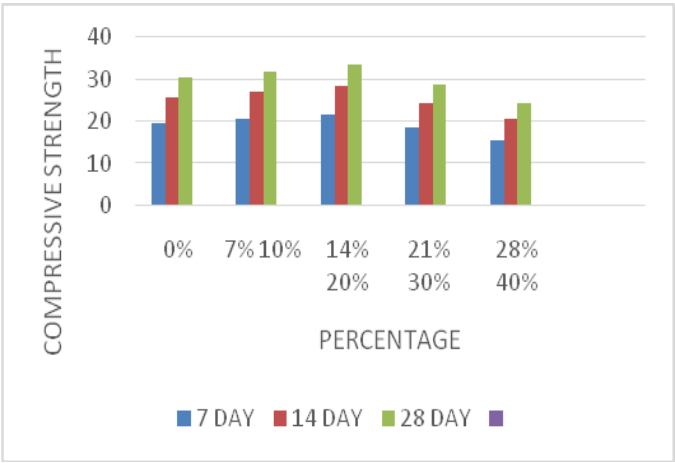
5.1.6 Casting of Concrete Specimen

Concrete was prepared by a mix proportions of M25 grade concrete. The different percentage of fiberslike0.1,0.2,0.3 were adopted in the experimental programme. Glass fibers were added in the mix by weight of cement. The entire mix was homogeneously mixed with calculated amount of water. The compressive strength test specimens were of dimensions 150×150×150mm.These specimens were cast and tested after 7 days, 14 days and 28 days of curing as per IS specification.

7. RESULTS AND DISCUSSIONS

7.1 Compressive Strength test

Using cube samples of M25 Grade concrete, compression strength tests were carried out using a compression testing equipment. The average strength values were evaluated on three samples each batch. As the proportion of Scoria and pumice to cement weight rises up to 0.2%, the compressive strength of Floating concrete at 7 days, 14 days, and 28 days exhibits an increasing trend. Further observation reveals that after 28 days of curing at M25, the highest compressive strength is attained.



Graph.1.Average Compressive Strength

Sl. No	Percentage of aggregate		Average Compressive strength (N/mm2)		
			M25		
	PUMICE	SCORIA	7days	14 days	28 days
1	C.C		19.7	25.8	30.4
2	7	10	20.6	27.03	31.8
3	14	20	21.7	28.4	33.5
4	21	30	18.7	24.4	28.8
5	28	40	15.7	20.6	24.3

Table.4. Average Compressive Strength of M25

8. CONCLUSION:

In this study, it is concluded that the density of concrete is very much reduced as compared to nominal concrete so the self-weight of structure is also reduced. Concrete density was decreases as we increase the replacement percentage of normal coarse aggregate with pumice aggregate and Fine aggregate with Scoria powder. By replacing 14% and 20% of normal aggregate with pumice aggregate and Fine aggregate with Scoria the compressive strength is Promising and gives better results compare to nominal concrete.

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