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DEVELOPMENT OF LIGHT WEIGHT CONCRETE WITH AND WITHOUT LIGHT WEIGHT AGGREGATES

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ABSTRACT

The main objective of this project is to produce structural light weight concrete using natural aggregate and optimization of strength properties. The aim is to Produce such a light weight which in addition to its advantages poses construction possibilities as structural concrete in slabs,beams,etc..,In addition it is important for researchers that produced mix designs to be practical and has economical benefits. This project includes the identification of the aggregate from geological point of view measurement of water absorption in varieties of time Density defining aggregate water content and aggregate compressive strength.

1. INTRODUCTION

1.1. Lightweight Concrete

Lightweight concretes can either be lightweight aggregate concrete, foamed concrete or autoclaved aerated concrete (AAC). Such lightweight concrete blocks are often used in house construction. The use of LWC (Lightweight concrete) has been a feature in the construction industry for centuries, but like other material the expectations of the performance have raised and now we are expecting a consistent, reliable material and predictable characteristics. Lightweight concretes can either be lightweight aggregate concrete, foamed concrete or autoclaved aerated concrete (AAC). Such lightweight concrete blocks are often used in house construction. The use of LWC (Lightweight concrete) has been a feature in the construction industry for centuries, but like other material the expectations of the performance have raised and now we are expecting a consistent, reliable material and predictable characteristics.

1.2. Types Of Light Weight Concrete

Concrete of this type has the lowest density, thermal conductivity and strength. Like timber it can be sawn, screwed and nailed, but there are non-combustible. For works insitu the usual methods of aeration are by mixing in stabilized foam or by whipping air in with the aid of an air entraining agent. The precast products are usually made by the addition of about 0.2 percent aluminums powder to the mix which reacts with alkaline substances in the binder forming hydrogen bubbles. Air-cured aerated concrete is used where little strength is required e.g. roof screeds and pipe lagging. Full strength development depends upon the reaction of lime with the siliceous aggregates, and for the equal densities the strength of high pressure steam cured concrete is about twice that of air-cured concrete, and shrinkage is only one third or less.

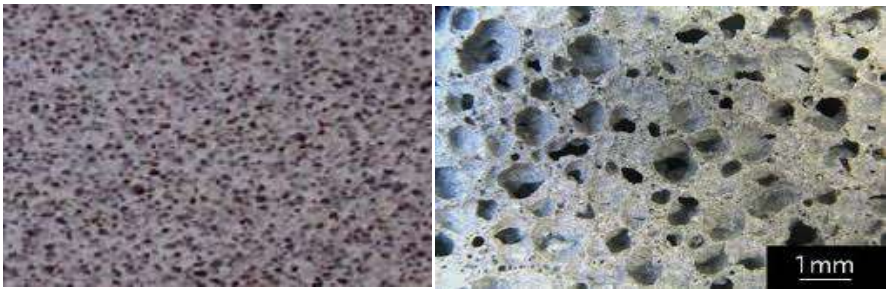

Fig 1.1. Aerated Concrete

Aerated concrete is a lightweight, cellular material consisting of cement and/or lime and sand or other silicious material. It is made by either a physical or a chemical process during which either air or gas is introduced into a slurry, which generally contains no coarse material. Aerated concrete used as a structural material is usually high-pressure steam-cured. It is thus factory-made and available to the user in precast units only, for floors, walls and roofs. Blocks for laying in mortar or glue are manufactured without any reinforcement. Larger units are reinforced with steel bars to resist damage through transport, handling and superimposed loads.

Fig 1.2. Cellular Light Weight Concrete – Fly Ash Based

Aggregates are generally cheaper than cement and impart greater volume stability and durability to concrete. The aggregate is used primarily for the purpose of providing bulk to the concrete. To increase

the density of the resulting mix, the aggregate is frequently used in two or more sizes. The aggregates provide about 75% of the body of the concrete and hence its influence is extremely important.

2. Admixtures

A material other than coarse or fine aggregate, cement of water added in small quantities during the mixing of concrete to produce some desired modification in one or more of its properties'. Admixtures are the materials other than the basic ingredients of concrete, cement, water, and aggregates. The use of admixture should offer an improvement not economically attainable by adjusting the proportions of cement and aggregates, and should not adversely affect any property of the concrete. Admixtures are no substitute for good concreting practice. An admixture should be employed only after an appropriate evaluation of its effects on the particular concrete under the conditions in which the concrete is intended to be used.

Fig.3. Pebbles And Reinforcement Bars

Control mix concrete and modified with various ratio of pebbles listed in Table 1 are prepared. By considering the use of pebbles in the mixes as much as possible and achieve suitable workability was attempted and strength criteria of Grade M15 concrete mix was analyzed.Water cement ratio is 0.5 and mix ratio is 1:2:4. Beam specimens of size 150 x 150 x 1800mm were cast for conducting compressive strength test for each mix. The compressive strength test was carried out as per IS: 516-1979. This test was carried at the end of 21days of curing. The compressive strength of any mix was taken as the average of strength of three specimens.

3. RESULTS

In this chapter the parameters studied on the control concrete and pebbles replaced Concrete are discussed. The parameters such as compressive strength, splitting tensile strength and flexural strength are discussed and comparison between the control concrete and pebbles added light weight concrete is represented.

The compressive strength for different replacement of broken glass added concrete and control concrete were tested at the end of 28 days. The values of compressive strength obtained are tabulated below.

MIX SPECFICATION	% OF PEBBELES REPLACED AS COARSE AGGREGATES	7 DAY	14 DAY	21 DAY
Control Mix	0%	10.74	13.70	19.83
A_1	40%	9.86	12.97	28.32
A_2	50%	6.80	8.45	11.76

Table 1. Compressive Strength

The split tensile strength for different replacement of broken glass added concrete and control concrete were tested at the end of 28 days.

4. CONCLUSION

It has been identified that various light weight aggregates such as can be used as effective construction materials. Hence the pebbles are suitable to replace coarse aggregate. Pebbles of various sizes are generated in large quantities in countries like India and this has been found as a useful replacement as coarse aggregate. Besides economical and strength criteria, concrete made from pebbles as aggregates, solves the economic problems because light weight concrete are considered as cost effective when compared to ordinary concrete. The compressive strength and split tensile strength of concrete containing pebbles as coarse aggregate is retained more or less in comparison with controlled concrete

specimens. However strength noticeably decreased when the pebble content was more than 40%. It has been concluded 40% of light weight aggregate can be incorporated as coarse aggregate replacement in concrete without any long term detrimental effects and with acceptable strength development properties respectively.

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