Applied GIS

ISSN: 1832-5505
Vol-5 Issue-03 July 2017

A LABORATORY EXPERIMENT ON SUBSTITUTING MOLLUSC SHELL FOR ROUGH AGGREGATE

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ABSTRACT

Concrete is the most often utilized synthetic building material worldwide. By adapting the concrete mix to the intended function.Concrete's characteristics may be modified as well. Normal-weight concrete is the workhorse of the construction industry.Cement may be added to concrete to make it stronger.The work on the project is on developing an efficient method of incorporating mollusk shells into concrete. Since mollusk shells may be found in abundance in the environment.coarse aggregates made from mollusk shells are being studied for their role in increasing concrete density.

Mollusk shell characteristics have been identified and compared to those of aggregates. Using the IS code approach, design a concrete mixture for the M25 grade in which the coarse particles are replaced with mollusk shell at percentages of 0%, 5%, 10%, 15%, and 20% by weight. Cubes of concrete are tested for their compressive strength after 7 and 28 days.

I. INTRODUCTION

Concrete, together with any additional admixtures, is the most widely used man-made construction material in the world. When this mixture is placed into molds and allowed to cure, it hardens into what is known as concrete. As it dries, concrete not only cements the particles of coarse aggregates together in a compact mass, but it also covers the surface of the fine aggregates and bonds them together.

Concrete's strength, durability, and other characteristics are determined by its materials, the mix proportions, the compaction technique, and other factors controlled during the putting, compacting, and curing processes. Concrete's widespread use may be attributed to the fact that its qualities can be adjusted according to need using just ordinary materials. Concrete's malleability means it can easily be shaped into a wide range of building shapes. Thanks to developments in concrete technology, it is now possible to build concrete that meets performance standards while still making the most of locally accessible resources via the use of prudent mix proportions and skilled labor.However, natural sand supplies are steadily diminishing, and river erosion caused by farming is a particularly pressing issue today; meanwhile, the price of coarse aggregates continues to rise. Keeping this in mind, the emphasis of the current effort is on replacing some of the aggregates in a course with mollusk shell due to the abundance of this material.

Objectivesandscopeofproject:

The proposed research aims to determine the optimal percentage of shell for the selected size and type of shell aggregate, especially in coastal areas, by investigating the effect of percentage of shell as partial replacement of coarse aggregate on mechanical properties of concrete.

Below is a brief overview of the study's scope.

The mechanical characteristics of a coarse aggregation of mollusk shells will be studied experimentally.

- Testing the mechanical qualities of concrete by varying the percentage of mollusk shell used as a partial replacement of coarse aggregate from 0% to 20%.
- Investigating and analyzing the results of using varied amounts of molluskshell

and contrasting such findings with those obtained using unaltered concrete.

The workability characteristics of concrete with partly replaced shell as coarseaggregate may be obtained by conducting a slump test and measuring the variance of slump for various percentages of mollusc hell.

Test-result-informed optimization of seashell content includes:

II LITERATURE REVIEW

P. Gurikini Lalitha, C. Krishna Raju studied the performanceof M30 concrete with partial replacement of seashells and coconutshells. They found that the compressive strength of the concrete cubeshas gradually decreased from addition of 10% (5% + 5%) of coconutshells and sea shells. Whereas comparing to traditional concrete,compressive strength of 10% (5% + 5%) of coconut shells (5%) and seashells (5%) increased. It can be observed that very few experimentalstudies have been reported in the literature. Hence,a detailedexperimental investigation has been carried out on mechanicalproperties of concrete by varying the percentages of seashell.Recommendations on the optimum seashell content as a coarseaggregate is made based upon experimental results. The presentproposed study is expected to produce results to enhance theunderstanding of the seashell as a coarse aggregate in concrete alongwith partial replacement of cement by flyash of 25%. Further it wasplanned to extend the studies into workability

ISSN: 1832-5505
Vol-5 Issue-03 July 2017

characteristics while usingseashell as partial replacement. This can be effectively used for theimprovedconcreteconstructionwithlocalmaterial s.

FESTUS ,Oriyomi Olatunji conducted experiments to assessthe suitability of periwinkle shell ash as partial replacement for OrdinaryPortland cement and found that that the crushing strength decreases asthe percentage of Periwinkle Shell Ash (PSA) increases and the crushingstrength increases as the age of curing increases for each of thepercentage replacement. Also the initial and final setting time of theOPC/PSA mixes (at 5% and 10%) was found to increase with increasingreplacement, this means that PSA concrete is not susceptible to theproblemofflash and falseset.

Ettu, O. M. Ibearugbulem, J. C. Ezeh, and U. C. Anya et al(2013)concluded that the density of the concrete decreased with increase inthe percentage of periwinkle shells, from 2466.67 Kg/m for 25%periwinkle shell replacement at a mix ratio of 1: 1.5: 3 to 2103.33 Kg/m3for 75% periwinkle shell replacement at a mix ratio of 1: 2.5: 3. Values of28-day compressive strength ranged from 24.15 N/mm2 for 75%periwinkle shell replacement to 33.63 N/mm2 at 25% replacement. Mostofthesevalueshardly satisfytheminimum25N/mm2requirement.

III: MATERIALS AND METHODOLOGY

The following materials are used for the present work

- **Cement**
- **Fine Aggregates**
- **Coarse Aggregates**
- **Water**
- **Mollusc Shell**

Cement

A concrete is a folio, a substance utilized in development that sets, solidifies and sticks to different materials, restricting them together. Bond is only from time to time utilized exclusively, however is utilized to tie sand and rock (total) together. In this undertaking we employed Commercially accessible 53 review common Portland bond produced by Ultra Tech Cement with Specific Gravity of 3.2 and Fineness Modulus of 225m2/kg utilized in all solid blends.

Coarse Aggregate

Totals are fundamentally normally happening, idle granular materials, for example, sand, rock, or smashed stone. Yet, innovation is expanding to incorporate the make utilization of reused materials and man-made items.

Fine Aggregate

Fine Aggregate can be common or produced sand, yet it must be of uniform reviewing. The molecule fineness than 150um sifter are considered as fines. To accomplish a harmony between deformability or ease and security, the all out substance of fineness must be high, generally around 520 to 560kg/m3

Glass powder: Waste glass accessible locally in Pondicherry shops is been gathered and made into glass powder. Glass squander is hard material. Before including glass powder in the solid it must be powdered to wanted size. In this examinations glass powder ground in ball/pulverizer for a time of 30 to 6o minutes brought about molecule sizes not exactly estimate 150 µm and sieved in 75 µm.

MOLLUSC SHELL

Mollusc shell is a waste obtained from at Nellore which is near pulicat lake, formed as the result of disintegration of dead animals. Mollusc shell consists of three layers outer, intermediate and inner layer.Outer layer is made up of calcite material whereas inner layer is otherwise known as nacre which is made up of calcium carbonate. Since 95% of calcium carbonate present in mollusc shell, it has the strength nearly equal to coarse

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Vol-5 Issue-03 July 2017

aggregate. The mollusc shell of 20 mm & 12.5 mm size were sieved and used .

Batching and Mixing

Once concrete mix design is carried out, the first task is batching of concrete materials like cement, aggregates, admixture, etc. The batching of concrete is done by measuring and combining required concrete ingredients either by weight or by volume as per the mix design.
Proper Batching improves the workability of concrete by reducing the segregation or bleeding in concrete. It helps to get a smooth surface of the concrete. It also increases the speed of construction and minimizes the wastage of concrete ingredients.
Volumetric batching of concrete is done by using measurement boxes, locally known as “farmas” or “gauge boxes”. In an ideal case, the volume of the farma is made equal to the volume of one bag of cement i.e., 35 litres or multiple thereof. Concrete ingredients like fine aggregates (sand), 10 mm Coarse aggregates or 40mm Coarse aggregates (Kapachi) are measured by farmas or gauge boxes. Care must be taken to see that the farmas or gauge boxes are not overfilled. In volumetric batching, water is measured either in Kg or litres. To measure the quantity of water, the water meter is used while batching or use cans of water having the fixed volume.
Weigh batching system facilitates simplicity, flexibility and accuracy. On large projects, automatic batching plants are usually installed, which helps in achieving ultimate quality and consistent.
Depending upon the type of job, different types of weigh batchers are available in the market. I.e. manual weigh batching, semi-automatic weigh batching, and fully automatic weigh batching (batching plant).

MIXING

The mixing procedure includes the type of

IV EXPERIMENTAL INVESTIGATION

Compressive Strength Test

Concrete cubes ofsizes150mm×150mm×150mm were tested for crushing strength. Compressive strength depends on loads of factor such as w/c ratio, cement strength, excellence of concrete material and excellence control during manufacture of concrete. These cubes are tested by compression testing machine after 7 days, 14 days 28 days and 56 days curing. The sample is placed centrally on the base plate of machine and the load have to be apply gradually at the rate of 140 kg/cm2 per minute till the specimen fails.

mixer, the order of introduction of the materials into the mixer, and the energy of mixing (duration and power). To control the workability or rheology of the fresh concrete, for example, it is important to control how the concrete is processed during manufacture.

Two main types of batch mixer can be distinguished by the orientation of the axis of rotation: horizontal or inclined (drum mixers) or vertical (pan mixers). The drum mixers have a drum, with fixed blades, rotating around its axis, while the pan mixers have either the blades or the pan rotating around the axis.

Curing of Specimens

While curing is important for all concrete, the problems that arise from not curing are most obvious with horizontal surfaces. An uncured slab, whether decorative or plain grey, is likely to develop a pattern of fine cracks (called crazing) and once it's in use the surface will have low strength that can result in a dusting surface that has little resistance to abrasion. The other important aspect of curing is temperature-the concrete can't be too cold or too hot. As fresh concrete gets cooler, the hydration reaction slows down. The temperature of the concrete is what's important here, not necessarily the air temperature. Below about 50 F, hydration slows down a lot; below about 40 F, it virtually stops. If curing is neglected in early period of hydration, the quality of concrete will experience a sort of an irreparable loss. An effective curing in the early period of hydration can be compared to a good whole some feeding given to a new born baby.

Compressive strength

V RESULTS

The following sections present the results of experimental study

1. The Workability in terms of slump values for different percentages of mollusc shell as a partial replacement of coarse aggregates are given below.

2. The % of replacement of mollusc shell 0,5,10,15,20,25% are given below in table form

Values for 0 % replacement of coarse aggregates with mollusc shell.

Values for 5% replacement of coarse aggregates with mollusc shell

Values for 10% replacement of coarse aggregates with mollusc

Values for 15% replacement of coarse aggregates with mollusc shell

Values for 20% replacement of coarse aggregates with mollusc shell

Test results of replacement of coarse aggregates with mollusc shell

VI. CONCLUSION

CONCLUSION:

The mechanical behaviour of concrete with partial replacement of mollusc shell as coarse aggregate were investigated and presented. The following conclusions can be drawn based on the analysis of results.

1) The addition of mollusc shell as partial replacement for coarse aggregate decreases the compressive strength of concrete for both 7 days and 28 days.
2) The compressive strength of concrete decreases with the addition of mollusc shell.
3) The workability reduces as the mollusc shell are replaced due to their rough texture.
4) This reduces the construction cost by reducing the cost of coarse aggregate and it also reduces the environmental pollution due to mollusc shell.

The compressive strength of the concrete gives satisfactory results when the coarse aggregates is partial replaced with mollusc shell , for M25 grade concrete the test results shown in results . so for M25 mix the actual compressive strength at 28 days .So , the coarse aggregates can be replaced up to 25% with mollusc shell

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