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Review on: Advance Concrete Aggregate Replaced by Coconut Shell

Aquib Ansari[1], Dilip Suryavanshi [2]
[1]M.Tech.Scholar, [2]Assistant Professor Department of Civil Engineering.
[1.2]Millennium Institute of Technology, Bhopal

Abstract - In this Project there were many experimental work conducted to improve the properties of the concrete by putting new materials, whether it is natural materials or recycle materials or synthetic materials in the concrete mix. There were many experimental work conducted to improve the properties of the concrete by putting new materials, whether it is natural materials or recycle materials or synthetic materials in the concrete mix. The additional material can be replacing the aggregate, cement or just as additive is natural material. A large amount of agricultural waste was disposed in most of tropical countries especially in Asia. Coconut shell is hard in nature and does not deteriorate easily once bound in concrete and therefore, it does not contaminate or leach to produce toxic substances.

Keywords:- Coconut Shell, Aggregate, Concrete, Strength.

INTRODUCTION

This has necessitated research into alternative materials of construction. There is an increasing interest in what happens to products at the end of their useful lives, so natural materials have an advantage in that they can biodegrade or burnt in a carbon-neutral manner. Natural material like coconut shell and palm kernel shell are not commonly used in the construction industry but still are often dumped as agricultural wastes, However, with the quest for affordable housing system for both the rural and urban population of India and other developing countries, various proposals focusing on cutting down conventional building material costs have been put forward. One of the suggestions in the forefront has been sourcing, development and use of alternative, non- conventional local construction materials including the possibility of using some agricultural wastes and residues As construction materials. As the natural fibres are agricultural waste, manufacturing natural product is, therefore, an economic and interesting option.

II LITERATURE REVIEW

Vishwas P. Kukarni and Sanjay kumar B. Gaikwad (2013):

Concrete is the widely used number one structural material in the world today. The demand to make this material lighter has been the subject of study that has challenged scientists and engineers alike. The challenge in making a lightweight concrete is decreasing the density while maintaining strength and without adversely affecting cost. Introducing new aggregates into the mix design is a common way to lower a concrete density.

Basri H.B., Mannan M.A. and Ganapathy (2000):

Concrete is the widely used number one structural material in the world today. The demand to make this material lighter has been the subject of the study that has challenged scientist and engineers alike. The challenge in making lightweight concrete is decreasing the density while maintain the strength and without adversely affecting cost. Introducing new aggregate into the mix design is a common way to lower a concrete density. Conventional concrete contains mainly four components namely cement, coarse aggregate, river sand (fine aggregate), and water.

Gopal Charan Behera and Ranjan Kumar Behera (2013):

Abundant availability of natural resources has become a dream for present day engineering society due to large scale consumptions. The unaccountable population growth rate makes problem of availability of coarse aggregate for construction more severe. Due to rapid Urbanization and industrialization, consumption of aggregates increased to manifold. So, the researchers must find the alternatives for the coarse aggregate. The increase in population also increases the industrial by- products, domestic wastes etc.

Kulkarni Parag Pramod and Sanap Santosh Tukaram (2011):
The paper presents the effective way of utilising crushed coconut shell aggregate in concrete. Presently, coconut shell is available at a low price in most of the tropical countries. Also the concrete obtained using coconut shell aggregates satisfy the minimum requirements of lightweight concrete. Hence it is possible to made lightweight concrete making use of coconut shells as an aggregate in concrete. The high cost of conventional building materials is a major factor affecting housing delivery in world.
K.Gunasekaran, P.S.Kumar (2008):
The high cost of conventional building material is a major factor affecting housing delivery in India. In developing countries where abundant agricultural and industrial waste are discharged, these wastes are can be used as potential material or replacement material in the construction industry.
Majid Ali (JUNE 2010):
The versatility of coconut fibres and its applications in different branches of engineering, particularly in civil engineering as a construction material. Coconut fibre is one of the natural fibres abundantly available in tropical regions, and is extracted from the husk of coconut fruit. Coconut fibre is extracted from the outer shell of a coconut. The common name, scientific name and plant family of coconut fibre is Coir, Cocosnucifera and Arecaceae (Palm), respectively. [2]

III METHODOLOGY

The project work requires preliminary investigations in a methodology manner.

3.1 Material and grade of mix

1. Selection of type of grade of mix, mix design by an appropriate method, trial mixes, final mix proportions.
2. Easting total quantity of concrete required for the whole project work.
3. Easting quantity of cement, fine aggregate, coarse aggregate, coconut shells required for the project work.
4. Testing of properties of cement, fine aggregate, coarse aggregate and coconut shells.

3.2 Production of concrete mixes

Production of mix (normal concrete of grade M-20) in the laboratory is carried out by IS method of concrete mix design (IS 10262-1982). Coconut shell concrete is produced by adding coconut shells in different percentage (i.e. 25% and 50%) replacement in concrete.

3.3 Test on ingredients materials

The ingredients of concrete i.e. cement, fine aggregate, fine aggregate, coconut shells are tested before producing concrete. The respective Indian standard codes are followed for conducting various test on ingredients materials of the concrete.

Fig 1: Coconut Aggregates.

3.4. Mix Design for M20 Grade of Conventional Concrete
Assumptions:
Compressive strength required for 28 days = 20Mpa Maximum size of aggregate = 20mm (angular) Degree of quality control = Good
Types of exposure = Mild
Data:
Specific Gravity of Cement = 3.15 Specific Gravity of fine Aggregate = 2.60
Specific Gravity of Coarse Aggregate = 2.75 Water Absorption of Fine Aggregate = 0.5% Water Absorption of Coarse Aggregate =1% Slum required =50-100mm
Free moisture in sand =2%

3.5 Mix Design for M20 Grade of Coconut Shell Concrete
Assumptions:
Compressive strength required for 28 days = 20Mpa
Maximum size of aggregate = 20mm (angular) Degree of quality control = Good
Types of exposure = Mild
Data:
Specific Gravity of Cement = 3.15 Specific Gravity of fine Aggregate = 2.60
Specific Gravity of Coarse Aggregate = 2.75 Water Absorption of Fine Aggregate = 0.5% Water Absorption of Coconut shell =1% Slum required =50-100mm
Free moisture in sand =2%

3.6. Preparation of Specimen
3.6.1. Measurements of Ingredients:
All cement, sand, coarse aggregate and coconut shell measured with digital balance. Water is measured measuring cylinder of capacity 1 lit and measuring jar of capacity 100 ml and 200 ml.
3.6.2. Mixing of concrete:
The ingredients are thoroughly mixed in concrete mixer. The sand, cement and aggregate are measured accurately and are mixed in dry state for normal concrete. Whereas for coconut shell concrete, first measured quantity of cement and other required ingredients as per mix design and then added in concrete mixer. Care is taken to avoid segregation of concrete.
3.6.3. Placing of Concrete:
The fresh concrete is placed in the moulds by trowel. It is ensured that the representative volume is filled evenly in all the specimens to avoid accumulation of aggregate, segregation etc. While placing concrete in moulds compaction is done to remove entrapped air or voids in concrete.
3.6.4. Finishing of Concrete:
Concrete is worked trowel to give uniform surface. Care is taken not to add any extra cement, water or cement mortar for achieving good surface finish. The additional concrete is chopped off from the top surface of the mould for avoiding over sizes etc. Identification marks are given on specimens by embossing over the surface after initial drying.
3.6.5 De-moulding of Specimens:
The plain cement concrete specimens are de- moulted after 24 hours of casting and kept in water tank for curing. Similarly coconut shells concrete specimens are de-moulded after 24 hours of casting and kept in water tank for curing at 7 days and after 28 days.
3.6.6. Curing of Specimens:
The specimens are de-moulded after 24 hours of casting and immediately stored for curing. M 20 grade conventional concrete and coconut shell concrete (CSC) specimens with partial replacement of 25% and 50% are cured in curing tank for 7 days and 27 days.
3.6.7. Testing
Compressive testing slit tensile test are carried out on compressive testing machine (CTM) of capacity 2000 KN. Cube

and Cylinders are tested for 7 days and 28 days.[2]

IV EXPERIMENTAL WORK

4.1. Test Conducted On Hardened Concrete: Confirming to IS 516-1959

In present study cube compression test, flexural test on beams, slit tensile test on cylinders on conventional concrete and coconut shell concrete are carried out. The experimental results and discussion results for various tests are described below.

4.2. Compressive Strength Test:

A cube compression test is performed on standard cubes of conventional concrete and coconut shell concrete with partial replacement of 25% and 50% of size 150mm x 150mm after 7 days and 28 days of immersion in water for curing. The results for the test are shown in Table No. 20 to Table No. 22. The compressive strength of the specimen is calculated by the following formula:

$f_{cu} = P/A$ Where,

P = Failure load in compression (KN) A = Loaded area of cube (mm2)

4.3. Split Tensile Test:

The split tensile test is well known indirect test used to determine the tensile strength of concrete. Due to difficulties involved in conducting the direct tension test, a number of indirect methods have been developed to determine the tensile strength of the concrete. In these tests, in general a compressive force is applied to a concrete specimen in such a way that the specimen fails due tensile stresses induced in the specimen.

The tensile strength at which failure occurs is the tensile strength of concrete. In this investigation the test is carried out on cylinder by splitting along it's middle plane parallel to edges by applying the compressive load to opposite edges. The arrangement for the test is as shown in fig. The split tensile strength of cylinder is calculated by the following formula.

$Ft = 2P/\pi LD$

Where,

Ft= Tensile Strength (N/mm2) P= Load at Failure (N)

L= Length of Cylinder (mm)

D= Diameter of Cylinder (mm)[3]

V SCOPE FOR FUTURE WORK

1. When CSC is used along with reinforcement, the surface bonding between coconut shell aggregates and steel comes into play. Therefore study about bond properties of these can be useful.
2. Furthermore the action of coconut shell aggregates in cement matrix is also an area requiring future research.
3. Checking the strength of concrete by adding fly ash in same work.
4. Study of resistance to chemical attack.
5. Durability studies on coconut shell concrete should be carried out to assess its behavior in aggressive environments.[4]

VI CONCLUSION

1. The average moisture content and water absorption of crushed coconut shell was found to be 4.20% and 24% respectively. The coconut shell aggregates have higher water absorption because of higher porosity in its shell structure.

2. The specific gravity under SSD condition of coconut shell and crushed granite was found to be 1.05 and 2.82 respectively.

3. The aggregate impact value (AIV) and aggregate crushing value (ACV) of coconut shell aggregates are much lower compared to crushed stone aggregate which indicates that this aggregates have good absorbance to shock.

4. The fresh concrete density and hardened concrete density after 28 days (under SSD condition) using coconut shell was found to be in the range of 1975-2110kg/m3 and 1880-1930kg/m3.

5. The 28 days compressive strength of coconut shell concrete was found to be 22.81 and 21.80 for 25% and 50% replacement by coconut shell aggregate under full water curing and it satisfies the requirement for structural lightweight concrete.

REFERENCES:-

1. Abdullaha A. A. (1984) "Basic Strength Properties of light weight concrete Using Agricultural Waste as Aggregate" International conference on Low Coast Housing in developing countries, Roorkee, India, app624- 623
2. Basri H.B. et al (1999), "Concrete using waste oil palm shells as aggregate", International Journal of Cement and Concrete research, pp 619-622.
3. E.A Olanipekun, K.O. Oluola, et al 2006. "A comparative study of concrete properties using coconut shell and palm kernel shell as coarse aggregate", Building and environment 41, pp.297-301.
4. K.Gunasekaran, P.S. Kumar et al 2008, " Proceedings of International Conference on Advances in Concrete and Construction, ICACC-2008",2008, Hyderabad, India pp 450-459
5. Asokan Pappu (2007), "Solid wastes generation in India and their recycling potential in building materials", International Journal of Building and Environmental 42 (2007), pp 2311-2320.