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Experimental Investigation of Concrete using Coconut shell as Partial Replacement of Coarse Aggregate

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ABSTRACT: The economy of structure is impacted by the high cost of traditional building materials. The potential to use recycled the current study looks at using coconut shell aggregates as coarse aggregate in concrete. The study determines the ideal percentage of coconut shell aggregate to replace coarse aggregate with. Because coconut shell is a lightweight material, lightweight concrete is created. Substitution of 5% and 10% for the coarse coconut shell aggregate. M20 grade design mix is employed, and specimens are tested 7, 14, and 28 days after curing.Concrete's compressive strength and slump are measured through testing. The primary goal is to promote the use of these waste items as building materials for affordable homes.

KEYWORDS: coarse aggregate, coconut shell, utilizing, light weight concrete, M20, slump, compressive strength.

I. INTRODUCTION

The essential material for civil engineering is concrete. Cement, sand, aggregates, and water are among the ingredients used in its manufacture.There are certain drawbacks to increasing concrete production as the globe develops, such as the ongoing, massive extraction of aggregate from natural resources, which will cause its depletion and ecological imbalance. The help of construction also advanced. Various waste products are employed in construction nowadays. As a substitute, the greatest approach to lower the amount of raw materials utilized in the building sector is through the disposal of agricultural waste, which also helps to lower the pollution that results from this process. India is a divine land, and probably the primary object of adoration on all occasions is the coconut. India thus generates an amount of trash.

II. LITERATUREREVIEW

Ajay lone, aniketdeshmukh (2016): The coarse aggregate are the main materials of concrete. In authors of this paper discussed about replacing coconut shell for coarse aggregate. 25% and 50% of coarse aggregate replacement prepared by binding constantly along with water in the ratio of 0.45 per all mixes, density, workability and water adsorption. One week, two weeks and four weeks were determined compressive strength,tensile strength and flexuralstrength.

Satish shinde, ramizsayed,(2016): In this paper authors mainly discussed about basic things needed to make human alive like meal, lodging and clothes. They replaced M20 grade concrete by coconut shell as a coarse cluster. In a ratio of 1:1 cubes and circular solids were lobbed respectively and their confining and elastic strength at 4 weeks test. The confining strength and ductile strength of concrete reduced because the proportion replacement inflated. Concrete made by replacing 10%, 15%, 20% of coarse mixture by coconut shell earned by twenty eight days confining strength and ductile strength. They got the results which made big difference in price and more than that it is environment friendly.

Vinod b r, p.venkatakhyathi (2017): This has necessitated analysis work into various materials

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within the construction field. The prices of building materials area unit rising day by day. The coarse aggregates area unit the most ingredients of concrete. During this paper, the employment of coconut shell as a rough combination has been mentioned supported the results obtained from comprehensive review of literature. We tend to all need that our buildings should be robust and may build with the development material of cheap rates.

III. MATERIALS USED IN CONCRETE

3.1 CEMENT: The cement's surface area is measured using the fineness. The cement may be directly determined by looking at the surface areaelegance. Cement typically has a fineness of 350 to 500 sq/kg. Ordinary Portland Cement to grade 53 was the type of cement utilized throughout the trial (OPC-53). When there is no exposure to sulphates in the soil or ground water, this is the most popular form of cement used in conventional concrete building.

Fig.3.1 CEMENT

Sr. No.	Properties	Value
1.	Specific gravity	2.93
2.	Initial setting time(min)	30
3.	Final setting time(min)	560

Tableno.3.1:properties of cement

3.2 FINE AGGREGATE: For the current project, the fine aggregate is river sand that is readily available in the area. There is no silt, no clay in the sand. As well as organic contaminants. Numerous characteristics of the sand are examined, including its specific gravity, fines modulus, water absorption capacity, and compliance with IS2386-1963.

Fig.3.2 fine aggregate

Sr. No.	Properties	Value
1.	Specific gravity	2.65
2.	Fines modulus	3
3.	Water absorption	1%

Tableno.3.2:propertiesoffineaggregate

3.3 COARSE AGGREGATE: Crushed granular aggregate obtained from the local quarry is used as the coarse aggregate. The aggregates that are used satisfy the properties according to IS23861963. Machine crushed angular granite metal of 20mm nominal size from the local source is used as coarse aggregate in this project.

Fig.3.3 coarse aggregate

Sr.No.	Properties	Value
1	Specific gravity	2.83
2	Impactvalue	14.90%
3	Waterabsorption	0.50%

Tableno.3.3:propertiesofcoarseaggregate

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3.4 COCONUT SHELL: We typically used coconut shells from markets and certain temples to do the test. Next, we severed the break the coconut shell into fragments using a hammer. Once every piece has been shattered, the coconut shell is taken to the lab and left in the water for roughly a day. The coconut shell fragments ranged in size from 5 to 20 mm. We use about 13000g, or 13kg, of coconut in total for this project's three flexible pavement tests.

Fig 3.4 COCNUT SHELL

Sr.No.	Properties	Values
1	Specific gravity	1.05-1.20
2	Bulk density	650 kg/m^3
3	Impactvalue	8.15%
4	Abrasionvalue	1.63
5	Moisturecontent	4.20 %

Tableno.3.4:propertiesofcoconutshell

3.5 WATER: Fresh portable water that complies with IS: 30251964 part 22 and part23 and IS: 456-2000 is used for mixing and curing. Cement-paste is created through the hydration process, which involves mixing cementation components with water. The aggregate is held together by cement paste, which also fills in gaps and increases the aggregate's freedom of flow. More water results in a freeflowing concrete with a higher slump, whereas less water results in a stronger, more lasting concrete.

Fig. 3.5 water

IV. PREPARATION OF TESTING SPECIMENS

MIXING CONCRETE: General: Mix concrete by hand in batches of a size that allows for about 10% extra after molding, or in an appropriate mixer. The specimens used for testing. Concrete that has no detectable slump or that has air entrained cannot be mixed by hand. Batches of little more than 1/4 ft3 [0.007 m3] should be mixed by hand. Once the aggregate has been prepared, mix the batch using the following methods in a clean, moist, waterproof metal pan. Without adding any more water, fully incorporate the fine aggregate, powdered insoluble additive, and cement. When the coarse aggregate is evenly dispersed throughout the batch, add it and stir the entire mixture without adding any water.

Fig.4.1 mixing concrete

4.1 MIX DESIGN : Mix ratio (1:1.5:3)

Coconut Shell (%)	Cement (kg/m^3)	Fine aggregate (kg/m^3)	Coarse aggregate (kg/m^3)	Coconut shell (kg/m^3)	Water (kg/m^3)
0	492.5	605.7	1096	-	196
5	492.5	605.7	1042.2	55.8	196
10	492.5	605.7	985.4	110.2	196

Table 4.2: Mix design

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4.2 CASTING SPECIMENS: Dust particles are removed from the cast iron molds, and mineral oil or grease is applied on all sides before in the molds, concrete is poured. The level platform is where the molds are set. Three layers of well-mixed green concrete are poured into the molds. Three layers of concrete were poured into each mold, and each layer was pushed 25 times with a tamping rod. Using a trowel, the excess concrete was removed, and the top surface was leveled and smoothed in accordance with IS: 516-1969.Figure depicts the casting of test specimens.

Fig.4.3 casting specimens

4.3 CURING SPECIMENS: For roughly a day, the specimens are kept in the molds at room temperature without being touched. Take out the specimens taken 24 hours after casting out of the molds. Following removal, the specimens were promptly moved to curing ponds filled with fresh, clean water and allowed to cure for the necessary amount of time, in accordance with IS: 516-1959.

Fig.4.4 curing specimens

4.4 TESTING OF SPECIMENS: To guarantee that specimens are properly tested after they are received, a testing schedule is kept. Removed from the curing pond and, in accordance with IS: 516-1959, the surface water was wiped off. The test findings are totaled.

4.5 TESTING ON FRESH CONCRETE:

4.5.1 SLUMP TEST: The purpose of the concrete slump test is to evaluate the consistency or workability of the concrete mix that has been made in the lab or on the construction site as the project moves forwardlabor. A concrete slump test is performed on each batch of concrete to ensure that the material is consistently of a high quality throughout construction.

Fig.4.5.1 True slump

4.6 TESTING ON HARDEN CONCRETE:

4.6.1 COMPRESSIVE STRENGTH OF CONCRETE SPECIMENS: Concrete specimen cubes are manually tested to ascertain their compressive strength. Compressive testing apparatus in accordance with IS: 516-1969.And the following has a tabulation of the outcomes. The table and graph below display the outcomes of the performed compressive strength test. It demonstrates that compressive strength rises with the number of cube curing days and falls with the increase in ground nut shell ash percentage. Compressive strength increased at 0% ash and 100% cement, which was the control, from 6.27 N/mm2 at 3 days to 28.4 N/mm2 at 28 days.

Fig. 4.7.1 Compressive Strength

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Coconut shell mix	7days of curing	14days of curing	28days of curing
0%	16.62	19.75	25.89
5%	16.73	20.05	26.2
10%	18.26	21.65	27.47

Table: 4.7.1 Compressive Strength Test

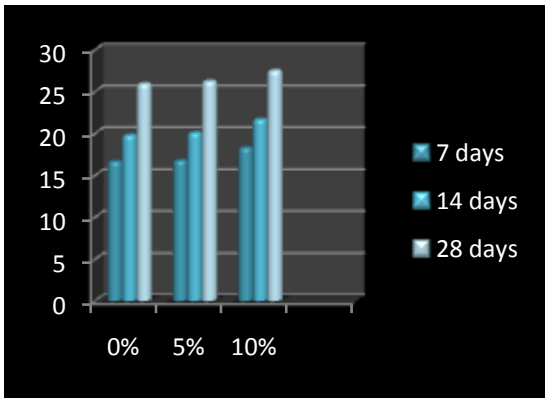

Chart: 4.7.1 Compressive Strength Flow Chart

V. CONCLUSION:

Based on research conducted through experiments on the flexural, split tensile and compressive strengths the following conclusions are drawn regarding the strength of concrete. When groundnut shell ash is added to concrete up to 10% of the cement weight, the concrete's compressive strength increases. Concrete's compressive strength, split tensile strength, and flexural strength all rise in proportion to an increase in the W/C ratio. Using groundnut shells as his more inventive and superior additional cement at ions—a building material used in concrete—can reduce the expense of disposing of agricultural waste and yield greener concrete for construction. According to the study's findings, groundnut shell ash can is a creative addition to cement as a construction material in concrete, but engineers must exercise caution when making these kinds of choices.

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