

e-ISSN: 2319-8753 | p-ISSN: 2347-6710

TEDIA

International Journal of Innovative Research in SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 6, June 2022

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.118

9940 572 462

6381 907 438

 \bigcirc





| e-ISSN: 2319-8753, p-ISSN: 2320-6710| <u>www.ijirset.com</u> | Impact Factor: 8.118|

||Volume 11, Issue 6, June 2022||

| DOI:10.15680/IJIRSET.2022.1106206 |

Experimental Investigation of Concrete Using Coconut Shell as a Partial Replacement of Fine Aggregate

Mr.P.Vijay, Manikandan R, Naresh G, Rexline A R, Santha G

Department of Civil Engineering, Anna University Regional Campus, Madurai, India

ABSTRACT: A concrete mix of 1:1.5:3 with water cement ratio 0.5 was used,twelve cubes were casted and tested and compressive strength at 7 days,14 days and 28 days. In our work, coconut shell is partially replaced as fine aggregate for four different percentages 5%,15% ,20%,25% has been used based on its workability, physical and mechanical properties. As superplasticizers is a water reducers, the superplasticizer is added by decreasing the water by 4%,5%,6%. The challenge in making Light Weight Concrete is in decreasing the density while maintaining strength and without adversely affecting cost. The result of this project showed that the density of the use of coconut shells as a partial replacement for Fine aggregates should be encouraged as an environmental protection and construction cost reduction measure

KEYWORDS: Coconut shell, Fine aggregate, Partial Replacement, Super plasticizer, Compressive strength, Light weight concrete (LWC).

I. INTRODUCTION

Concrete is the most important building material in civil engineering. The production of concrete involves the consumption of raw materials such as cement, fine aggregate, coarse aggregate, water and admixtures.Here,We replaced the coconut shellas fine aggregate and investigated the properties of concrete. Coconut shells have excellent durability, high toughness and abrasion resistance. The purpose of this project is to develop concrete using coconut shells as fine aggregate. The purpose of this project is to determine the feasibility of using coconut shell waste as a fine aggregate. Replacing the coconut shell with fine aggregate concrete is used in lightweight structures.

II. MATERIALS AND METHODS

CEMENT:

Commercially available ordinary Portland cement of 43 cement grades according to IS 8112: 1989 was used in the field (Specifications, Bureau of Indian Standards, New Delhi).

S.NO	TEST CONDUCTED	OBSERVED VALUES	
1	Specific gravity of cement	3.16	
2	Consistency	28%	
3	Initial setting time	30 min	
4	Final setting time	More than 10 hours	

Table 1: Properties of Cement

FINE AGGREGATE

Fine aggregate is usually composed of natural sand, crushed sand, or artificial sand. The maximum particle size and size distribution of fine aggregate depends on the type of product manufactured. Sizes from 4.75 mm to less



| e-ISSN: 2319-8753, p-ISSN: 2320-6710| <u>www.ijirset.com</u> | Impact Factor: 8.118|

Volume 11, Issue 6, June 2022

DOI:10.15680/IJIRSET.2022.1106206

than 150 microns are called fine aggregates. Easily available River sand which has passed a 4.75 mm IS sieve is used as fine aggregate according to the requirements of IS 383: 1970.

Table 2: Properties of Sand

S.NO	PARAMETERS	RESULTS
1	Specific gravity	2.65
2	Fineness modulus	3.25
3	Water absorption(%)	1.05

COARSE AGGREGATE:

The coarse aggregate are obtained from quarry which conforming to IS 383:1970.Sizes from 20mm to 4.75mm are used as coarse aggregate. Coarse aggregate occupies 35% to 70% of the total volume of concrete.

COCONUT SHELL:

The coconut Shell is first dried for 5 to 6 days. The coconut shell is cleaned with sand paper and outer face is cleaned with water. The outer shell is broken into smaller parts with the help of hammer and grind using grinding machine to make it as fineness.

SUPERPLASTICIZER:

Superplasticizer is a high range water reducers. The superplasticizer is added by reducing the water by 4%,5%,6%. Superplasticizers retard the curing of concrete.

SPECIFIC GRAVITY TEST:

It gives the information to check whether the material will float or sink.specific gravity has unit less.It is the ratio between the density of material and the standard liquid(water).

Table 3 Specific Gravity test

Material	Specific gravity
Fine aggregate	2.56
Coarse aggregate	2.73
Cement	3.16

WATER ABSORPTION:

Absorption of aggregate affect the water cement ratio and also the workability of concrete .It is measured in accordance with IS 2386(part III):1963.

Table 4 Water absorption

Material	Water absorption
Fine aggregate	1.50
Coarse aggregate	2.50



| e-ISSN: 2319-8753, p-ISSN: 2320-6710| <u>www.ijirset.com</u> | Impact Factor: 8.118|

Volume 11, Issue 6, June 2022

| DOI:10.15680/IJIRSET.2022.1106206 |

SIEVE ANALYSIS ON FINE AGGREGATE(SAND)

Table 5 Sieve analysis

Sieve no	Weight Retained	Weight Passing	% Passing	
	(kg)		Retaining	Passing
4.75mm	0.02	0.02	2	98
2.36mm	0.2	0.22	22	78
1.18mm	0.29	0.51	51	49
600μ	0.16	0.67	67	33
300μ	0.198	0.868	86.8	13.2
150μ	0.102	0.97	97	3
pan	0.030	-	-	-
_	1kg	-	325	

Fineness modulus = 325/100 = 3.25

MIX DESIGN:

The grade used was M20 - 43 grade. The water cement ratio was 0.5 and the cement content was 300kg/m3.The cement, fine aggregate and coarse aggregate and partially replaced aggregate is tabulated below.

Table 6 Mix proportioning:

MATERIAL	PER CUBE
Cement	1.36
coarse aggregate	4.34
Fine aggregate	2.23
5% of Recycled aggregate	0.12
15% of Recycled aggregate	0.33
20% of Recycled aggregate	0.44
25% of Recycled aggregate	0.55

CASTING:

Taken the Samples from the mix, while concreting. Poured concrete into the cubes. Compacted each layer with tamping rod. Finished the top surface after compaction of the last layer. After 24 hours, removed the specimen from the Mould. Submerged the Specimen in clean , freshwater until the time of testing. Tested the specimens for 7 days and 14 days and 28 days.



Fig 1 :Casting of Cubes



| e-ISSN: 2319-8753, p-ISSN: 2320-6710| www.ijirset.com | Impact Factor: 8.118|

Volume 11, Issue 6, June 2022

| DOI:10.15680/IJIRSET.2022.1106206 |

CURING:

The cubes are cured in a water for 7 days,14 days and 28 days,The results from compressive strength test are used to determine the strength of concrete.



Fig 2: Curing of cubes

Table 7 : Partial replacement of coconut shell

TESTING ON CONCRETE:

CUBE MATERIAL 0% 5% 15% 20% 25% 2.23kg Sand(Per cube) 2.119kg 1.78 kg 1.9kg 1.67kg coconut shell(per cube) 0 0.1115 kg 0.44 kg 0.33kg 0.55kg Superplasticizer (when water is reduced by 0 40ml 40ml 40ml 40ml 4%) Superplasticizer (when water is reduced by 0 50ml 50ml 50ml 50ml 5%) 0 Superplasticizer (when water is reduced by 60ml 60ml 60ml 60ml 6%)

III. RESULT AND DISCUSSION

COMPRESSIVE STRENGTH TEST:

Compressive strength test were done on compression testing machine using cube samples and cylinder samples. The natural fine aggregates were replaced with coconut shell of 0%, 5%, 15%, 20%, 25% by M20 grade concrete and adding superplasticizer by reducing the water content by 4%, 5%, 6%.



Fig 3: Compression testing machine (CTM)



| e-ISSN: 2319-8753, p-ISSN: 2320-6710| <u>www.ijirset.com</u> | Impact Factor: 8.118|

Volume 11, Issue 6, June 2022

| DOI:10.15680/IJIRSET.2022.1106206 |

COMPRESSIVE STRENGTH (N/mm²) 7, 14, 28 DAYS:

Table 8 Compressive strength

S.no	SPECIMEN	7 days	14 days	28 days
1	0% Aggregate Replaced with Coconut Shell	15.5 N/mm ²	15.5 N/mm ²	15.5 N/mm ²
2	5% Aggregate Replaced with Coconut Shell	14.4 N/mm ²	13.7 N/mm ²	13.2 N/mm ²
3	15% Aggregate Replaced with Coconut Shell	14.1 N/mm ²	13.0 N/mm ²	12.4 N/mm ²
4	20% Aggregate Replaced with Coconut Shell	13.6 N/mm ²	12.5 N/mm ²	12.1 N/mm ²
5	25% Aggregate Replaced with Coconut Shell	12.4 N/mm ²	11.7 N/mm ²	11.9 N/mm ²





T



| e-ISSN: 2319-8753, p-ISSN: 2320-6710| <u>www.ijirset.com</u> | Impact Factor: 8.118|

Volume 11, Issue 6, June 2022

| DOI:10.15680/IJIRSET.2022.1106206 |

IV. CONCLUSION

On 5% partial replacement of natural fine aggregate with coconut shell ,compressive strength of coconut shell concrete has obtained 14.5 N/mm²@7days. On further replacement the compressive strength of coconut shell is observed to be decreased. Experimental result on coconut shell shows that as coconut shell is not a pozzolonic material it does not attain strength. So it can be used as a Light weight concrete.

REFERENCES

- 1. Sanjay kumar," The investigation of use of coconut shell as partially substitution of coarse aggregate", 2019.
- 2. Ichhpal singh, Sukhdeep singh, Ipandeep singh"Experimental Study of coconut shell as a partial replacement of coarse aggregate in road construction" 2020.
- 3. R Prakash, "Study on properties of coconut shell aggregate and compressive strength of coconut shell concrete" IJETSR, ISSN2394 -3386, volume4, Issue7 July 2017.
- 4. K.Gunasekaran, R. Annadurai, S. Prakash Chandar, S. Anandh, "Study for the relevance of coconut shell aggregate concrete non-pressure pipe," ELSEVIER/ASEJ, 2016.
- Damre Shraddha, Firake Hitali, Dode Pradeep, ShrikantVarpe, "Sustainable Concrete by Partially Replacing Coarse Aggregate Using Coconut Shell," Journal on Today's Ideas – Tomorrow's Technologies, Vol. 2, No. 1, June 2014 pp. 1–14.
- 6. Pravin V. Khandve, Shrikant M. Harle, "Coconut Shell As Partial Replacement Of Coarse Aggregate In Concrete: Review," IJPRET, 2014; Volume 2 (9): 62-66.
- 7. Cordilia Marboh, Amrita Agnihotri, Rajni Raja Tomar, Rahul Kumar Satbhaiya, "Behaviour Of Reinforced Concrete Beams With Coconut Shell As Coarse Aggregates," in IJEMMR Vol-1, Issue-6, JUNE -2015.
- Parag S. Kambli1, Sandhya R. Mathapati, "Compressive Strength of Concrete by Using Coconut Shell," IOSR Journal of Engineering (IOSRJEN) ISSN (e): 2250-3021, ISSN (p): 2278-8719 Vol. 04, Issue 04 (April. 2014), ||V7|| PP 01-07.
- Daniel Yaw Osei, "Experimental assessment on coconut shells as aggregate in concrete," in International Journal of Engineering Science Invention ISSN (Online): 2319 – 6734, ISSN (Print): 2319 –6726 Volume 2 Issue 5 || May. 2013 || PP.07-11.
- Anjali S. Kattire, Priyanka A. Bhujugade, Shashiraj S. Chougule, "Investigation Of Coconut Shell As A Replacement Of Coarse Aggregate In Concrete," in Journal Of Information, Knowledge And Research In Civil Engineering 0975 – 6744 NOV 14 TO OCT 15 Volume 3.





Impact Factor: 8.118





INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY





www.ijirset.com