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Performance of Concrete by Partially Replacing Manufacturing Sand with Sea Shell (Cockle Calm)

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Abstract: This research goal deals to investigate the performance of concrete by partially replacing manufacturing sand with sea shell (cockle calm). For this study, three samples were prepared from each mix in the ratio of 0%,10%,20% & 30% of cockle calm was added in the concrete as M.Sand with a water cement ratio of 0.41 for compressive strength, split tensile strength,, flexural strength tests are carried out. The mix is designed by IS10262:2009.The weight of specimens was also calculated and in this report also compared with weight and strength of the specimen. The specimens are tested after 28th days of curing in water.

Keywords: Cockle shell, compressive strength, flexural strength, split tensile strength, manufacturing sand (M.Sand).

I. INTRODUCTION

For the past decade, numerous studies are being carried out on the Fine aggregate. Now a day, manufacturing sand was used as Fine aggregate in many constructions due to lack of fine aggregate. Manufacturing sand is nothing but coarse aggregate quarries dust particles. The Quarries dusts are consider as waste so, after many research the dust particles are used in construction. Many types of shells including calm, snail, scallops and mussel shells in form of complete powered in concrete were investigated previously [14],[3]. In this study, the seashell is used as Manufacturing sand (M.Sand) in the ratio of 0%, 10%, 20% & 30%. Sea shell which is naturally have more calcium oxide, is improve more strength in concrete as recorded in previous research. In this research, the density of the concrete also investigated.

II. EXPERIMENTAL CAMPAIGN

A. Material Used and Properties of the Material

OPC 53 grade cement, Manufacturing Sand (M.Sand), coarse aggregate was used. Cement had specific gravity 3.15; M.Sand had specific gravity 2.73, fineness modulus 3.2 and water absorption 2.2%. Course aggregate had specific gravity 2.59, water absorption 2.1%. Sea shell had specific gravity 2.67, fineness modulus 2.4 and water absorption 2.3%. Super Plasticizer was Polycarboxylate Ether 0.1% of weight of cement was used. Concrete containing Cockle shell of 0%, 10%, 20% and 30% as manufacturing sand in concrete. Water cement ratio is 0.41.Size of cockle shell was maximum 1.18mmwhich is pass through 2.36mm sieve and size of manufacturing sand is 0.6mmwhichispass hrough2.36mm.slump value is75mm

Table 1: Chemical Composition of Cockle Clam *[14]

Oxides	%
CaO	51.91
SiO ₂	0.38
Al ₂ O ₃	0.65
Fe ₂ O ₃	0.05

B. Mix Design

Mix design was done by IS10262:2009 and prepared three specimens for each mix.M₃₀ was used.C0 refers has 0% of calm shell in concrete, C10 refers has 10% calm shell by the weight of manufacturing sand, C20 refers 20% calm shell by the weight of manufacturing sand,C30 refers 30%calm shell similarly like above.

Table 2: Mix design

Materials	Quantity (kg/m ³)
Cement	341
Manufacturing Sand	1098
Coarse Aggregate	863



Fig.1: Materials for concrete

III. RESULT AND DISCUSSION

A. Density of Concrete

Manufacturing of sand concrete has more density, due to that dead load on structure may increase. In addition of calm shell the density gradually decrease and strength of the concrete also increase up to certain point. In future study, C10 and C20 has given high strength with loss of density 0.673% and 1.187% compare with C0. C30 also decrease in weight and also decrease in strength.

$$\text{Density} = \frac{\text{weight of the specimen}}{\text{volume of the specimen}} \quad \text{-----(1)}$$

$$\text{Weigh of loss} = \frac{\text{Density of M0} - \text{density of M10}}{\text{density of M0}} * 100 \quad \text{-----(2)}$$

Table 2: Density of concrete

Concrete Mix	Density(kg/m ³)	Weight of loss (%)
C0	2596.74	-
C10	2579.25	0.673
C20	2565.92	1.187
C30	2543.4	2.054

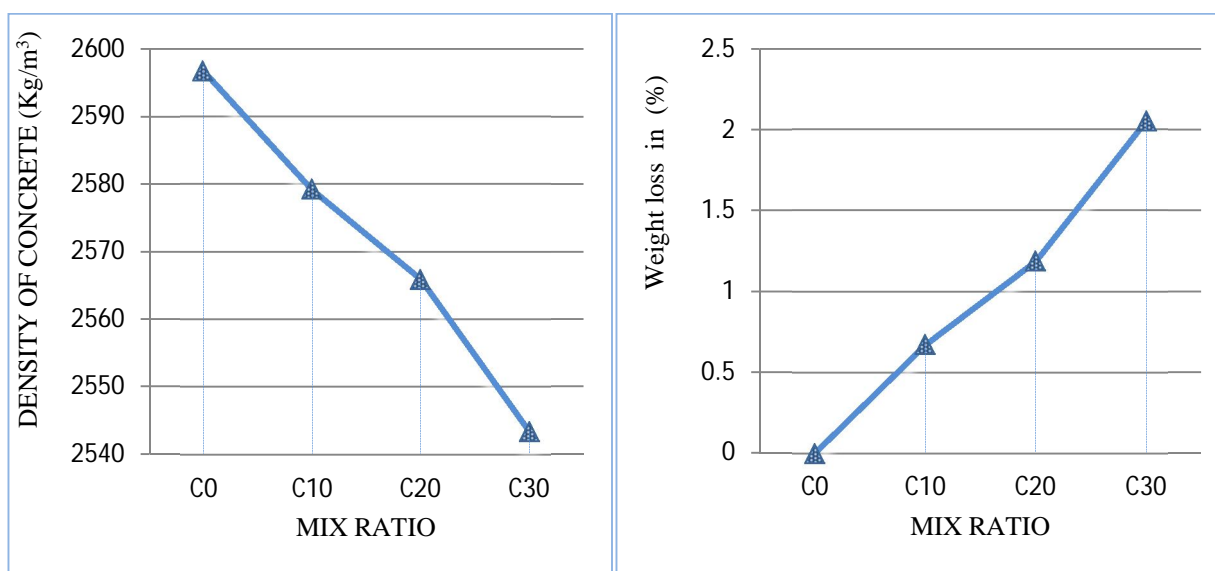


Fig.2: Density of concrete and percentage of weight loss

B. Compressive Strength

C0 has compressive strength of 36.2N/mm² and C10 has 42.47N/mm². Compare to C0 and C10, C20 has the higher compressive strength of 44.5 N/mm² and C20 has increasing Percentage strength of 23% in compressive strength than C0 and 4.7% than C10. Finally C30concrete gradually decreasing and has 39.9N/mm² in compressive strength.

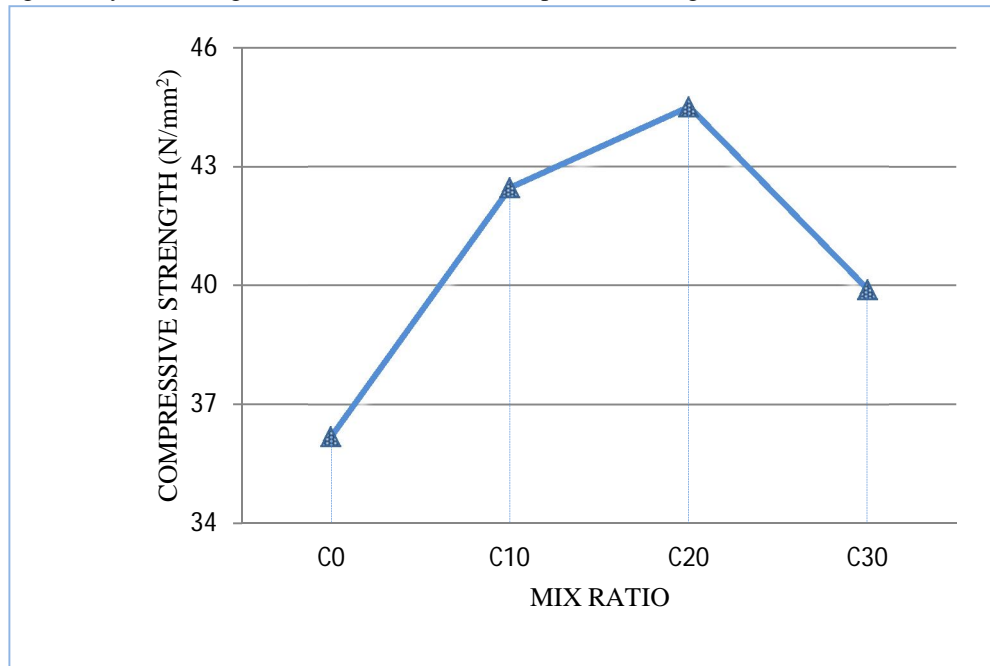


Fig.3: Compressive Strength

C. Split Tensile Strength

M0 has Split tensile strength of 2.62N/mm² and C10 has 2.9N/mm². Compare to C0 and C10, C20 has the higher compressive strength of 3.4 N/mm² and M20 has increasing Percentage strength of 30% in compressive strength than C0 and 17% than M10. Finally C30concrete gradually decreasing and has 3.18N/mm² in compressive strength. The bond between materials is very well

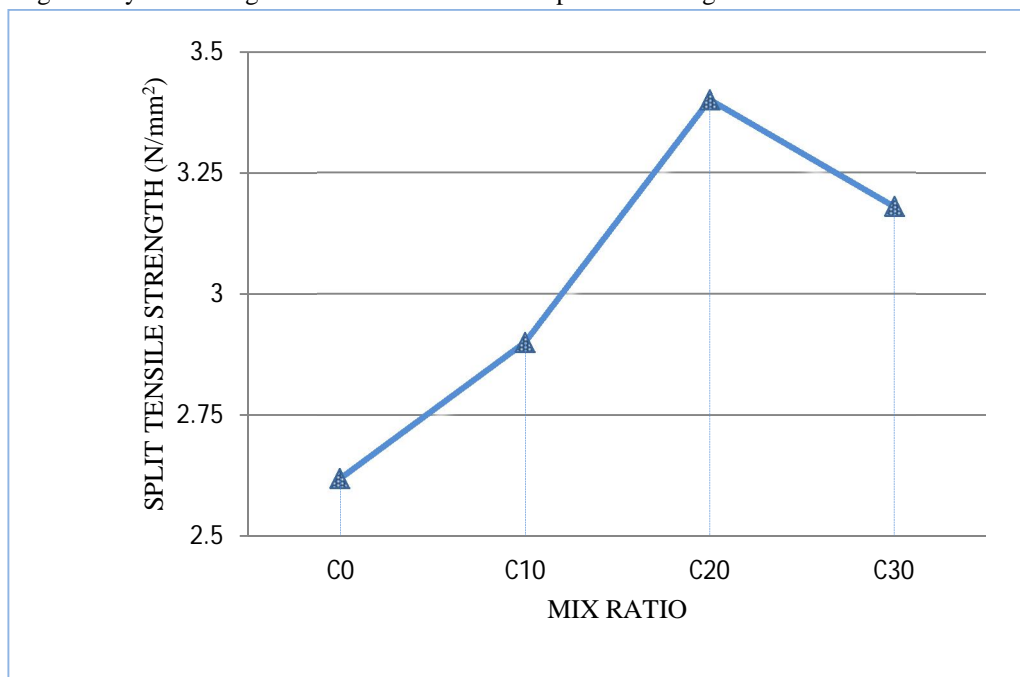


Fig.4: Split Tensile Strength



Fig.5: Failure pattern of specimen

D. Flexural Strength

C0 has Flexural strength of 5.42N/mm^2 and C10 has 7.82N/mm^2 . Compare to C0 and C10, C20 has the higher compressive strength of 15.5N/mm^2 and M20 has increasing Percentage strength of 44% in compressive strength than C0 and 14% than C10. Finally C30 concrete gradually decreasing and has 9.42N/mm^2 in compressive strength.

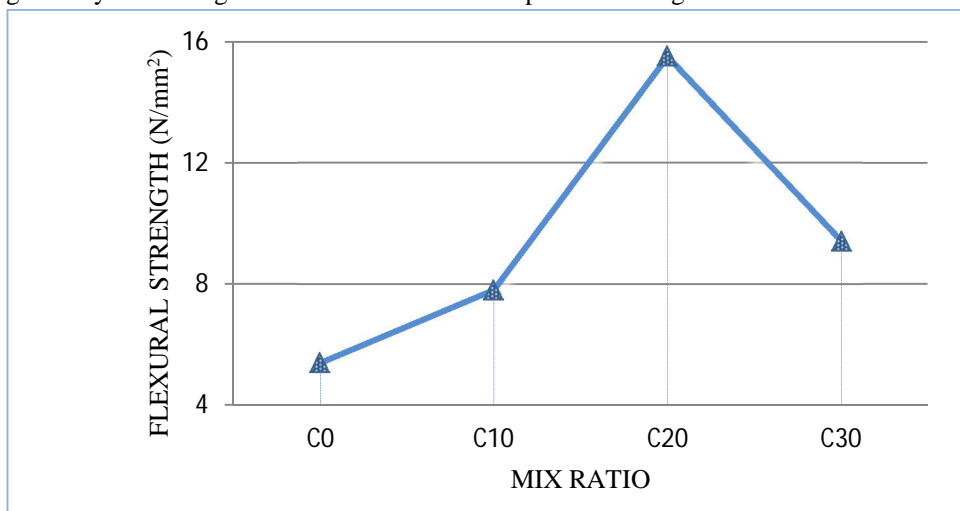


Fig.6: Flexural Strength

IV. CONCLUSION

Based on these studies we conclude that,

- A. C20 had greater strength than C0 and C10 concrete.
- B. C30 had gradual lower strength above 20% of clam shell in concrete will be fail
- C. Bond between concrete is good
- D. Clamshell concrete have lower density compare to M0 and also attain high strength up to 20% of clamshell as Manufacturing sand

REFERENCES

- [1] Mahmoud B.A. Alhasanat and Arabi N. Al Qadi, (2016), "Impact behavior of high strength concrete slabs with pozzolana as coarse Aggregate", American Journal of Applied Sciences. DOI:10.3844/ajassp.2016.754.761
- [2] G. Murali, A. S. Santhi and G. Mohan Ganesh, (2014), "Impact Resistance and Strength Reliability of Fiber Reinforced Concrete Using Two Parameter Weibull Distribution", ARPN Journal of Engineering and Applied Sciences, ISSN 1819-6608, Vol. 9, No. 4, pp.554-559.
- [3] Adekunle P. Adewuyi, Shodolapo O. Franklin Kamoru A. Ibrahim, (2015), "Utilization of Mollusc Shells for Concrete Production for Sustainable Environment", International Journal of Scientific & Engineering Research, ISSN 2229-5518 , Volume 6, Issue 9, pp. 201-208.
- [4] Md. Zakaria Hossain, (2013), "Waste Shell Husks Concrete: Durability, Permeability and Mechanical Properties", Journal of Building Construction and Planning Research, pp.61-66. <http://dx.doi.org/10.4236/jbcpr.2013.13009>
- [5] Measurement of properties of fiber reinforced concrete, (1989), ACI Committee 544.2R-89. detroit: American concrete institute.
- [6] IS: 10262-2009.Recommended Guidelines for Concrete Mix Design. Bureau of Indian Standards (BIS), India.
- [7] G. Murali, E. Vinodha, (2018), "Experimental and Analytical Study of Impact Failure Strength of Steel Hybrid Fibre Reinforced Concrete Subjected to Freezing and Thawing Cycles" Arabian Journal for Science and Engineering, <https://doi.org/10.1007/s13369-018-3202-6>
- [8] IS: 456-2000. Indian Standard Plain and reinforced concrete—code of practice (Fourth Revision)
- [9] F. A. Olutoge, S. E. Nwabueze, S. O. A. Olawale, B. E. Yabefa (2016), "Performance of Clam (Egeria Radiata) Shell Ash (CSA) as a Substitute for Cement in Concrete", International Journal of Recent Development in Engineering and Technology, ISSN 2347-6435(Online), Volume 5, Issue 9,pp 33-38.
- [10] F.A Olutoge, B.E. Yabefa, E.N Nwabueze, (2016), "Investigation on the Suitability of Crushed Clam (Egeria Radiata) Shells (CCS) As Partial Replacement for Coarse Aggregates in Concrete Production", IOSR Journal of Mechanical and Civil Engineering, e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 13, Issue 6, pp 28-32.
- [11] Bee poh ong, Umar kassim,(2019), "Performance of concrete incorporating of clam shell as partially replacement of ordinary Portland cement", Journal of Advanced Research in Applied Mechanics 55, ISSN:2289-7895, Issue 1 , pp 12-21
- [12] K. Sai Abhinav, N. Srinivasa Rao, (2016), "Investigation on Impact Resistance of Steel Fibre Reinforced Concrete", International Research Journal of Engineering and Technology, e-ISSN: 2395 -0056, p-ISSN: 2395-0072, Volume: 03 Issue: 07, pp 954-958.
- [13] G. Murali, A. S. Santhi, G. Mohan Ganesh, (2014), "Impact Resistance and Strength Reliability of Fiber-reinforced Concrete in Bending under Drop Weight Impact Load", *IJTech* Vol 5, No 2, <https://doi.org/10.14716/ijtech.v5i2.403>
- [14] Monita Olivia, Revina Oktaviani, Ismeddiyanto, (2016), "Properties of Concrete containing ground waste cockle and clam seashells", Sustainable Civil Engineering Structures and Construction Materials, Procedia Engineering 171, pp658-663.
- [15] Zarafath Zimar, Shiran Jayakody, (2018), "Effect of Manufactured Sand As A Replacement For Fine Aggregates In Concrete", ICSECM2017- 90



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