EXPERIMENTAL INVESTIGATION ON ROOFING TILES BY PARTIAL REPLACEMENT OF SEASHELL AND USING COCONUT FIBRE AS AN ADMIXTURE

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Abstract: In order to reduce the cost of roofing tiles construction we use the sea shell as a replacement for fine aggregate and use the coconut fibre as an admixture to the total volume of concrete in the percentage of 0.5% , 0.6%. We preferred to use 1:4 mix proportion of mortar. These tiles were casted by using 20% & 30% replacement of sea shell over sand. By replacing the river sand in making roofing tiles would reduce its manufacturing cost as well as selling price and makes it more affordable. Thus preparation of such sand replaced roof tiles will significantly reflect healthy environmental and economic benefits. In this we are planned to test compressive strength test water absorption, soundness and durability test at an age of 7 days and 28 days.

1. **General:** Roof tiles are designed mainly to keep out rain, and are traditionally made from locally available materials such as terracotta or slate. Modern materials such as concrete and plastic are also used and some clay tiles have a water proof glaze. Roof tiles are "hung" from the framework of a roof by fixing them with nails. The tiles are usually hung in parallel rows, with each row overlapping the row below it to exclude rain water and to cover the nails that hold the row below. There are also roof tiles for special positions, particularly where the planes of the several pitches meet. They include ridge, hip and valley tiles. Slate roof tiles were traditional in some areas near sources of supply, and give thin and light tiles when the slate was split in to its natural layers. It is no longer a cheap material, however and is now less common.

2. INTRODUCTION

Materials used

21 Coconut fibre: Large amount of environmental waste generated every year all over the world, coconut fibre is one among such environmental wastes. Also coconut fiber is locally and economically available. The intention of this parametric study is to spread awareness of use of coconut fiber as construction material.

Because till today, byproducts of industries and domestic waste materials have been utilized in concrete widely, but still natural waste utilization is in its immaturity stage. Coconut fiber is an agricultural waste produced in a large quantity every year; hence proper utilization of waste coconut fiber in construction industry will reduces the environmental waste.

Fig: 2.1.1 coconut fibre

2.2 Seashell

Composition of seashell

Composition	% of weight
CaO	61.44
SiO_2	20.66
Al_2O_3	5.85
Fe_2O_3	3.05
SO_3	2.71
MgO	0.93
K_2O	0.97
TiO_2	0.28
MnO_3	0.20
P_2O_5	0.17
Na_2O	0.14

Sea shell is a waste obtained near the seashore area as the result of disintegration of dead animals. It is naturally deposited along the coast by tides and waves. Recent investigation of Indian sea shells has indicated greater scope for their utilization as a construction material. Greater utilization of sea shells will lead to not only saving such construction material but also assists in solving the problem of disposal of this waste product.

So the need for the replacement of the present material that is the concrete manufacturing has to be changed to meet the needs of the structures.The cheap availability of the raw material can also reduce the production costs and hence the housing expenditure on roofing, which is otherwise the most expensive part in building Construction.

Fig:2.2.1 Crushed Seashell

3. Objectives

- To produce cost effective roofing tiles without compromising their quality.
- An eco-friendly product was developed using locally available material
- Healthy environmental and economic benefits.

4. Features

- Cost effective
- High durability
- Easy maintenance
- Anti skid
- User friendly
- Good Anti-fungal property
- Non ceramic material
- Good abrasion resistance

5. Mix design

Trial	cement (kg)	Coire fibre (kg)	sand (kg)	Sea shell (kg)
R_0	2.16	0	8.64	0
R_1	1.944	0.216	6.912	1.73
R_2	1.9008	0.2592	6.048	2.59

Mix proportions 1: 4

R_0 - Conventional concrete

R_1 - 20 % of seashell + 0.5 % of fibre

R_2 - 30% of seashell + 0.6 % of fib

6. Water absorption test

Fig 6.1: Tiles immersed in water for water absorption test

Trial	Weight of the dry tiles (w_1) (kg)	Weight of the tiles after 24 hours immersed in clean water (w_2)(kg)	Water absorption (%)	
			7 days	28 days
R_0	2	2.102	5.1	5.4
R_1	2	2.121	6.05	6.09
R_2	2	2.132	6.6	6.8

7. Crushing strength test

Cube size : 7 x 7 x 7 cm

Trial	% of replacement of sea shell	% of coir fiber admixture is Added	crushing strength	
			7 days	28 days
R_0	0	0	5.5	7.95
R_1	20	0.5	6.12	8.7
R_2	30	0.6	6.53	9.1

Fig: 7.1 Cube tested in UTM machine

8. Conclusion

- An eco-friendly product was developed using locally available material.
- To produce **cost effective** roofing tiles without compromising their quality.
- An **eco-friendly** product was developed using locally available material sharpness and this physical observation lead to this conclusion.
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- An **eco-friendly** product was developed using locally available material sharpness and this physical observation lead to this conclusion.
- In this project we tried to replace fines aggregate partially by sea shell (10%, 20%, & 30%) respectively to increase the strength of concrete
- Addition of coconut fibers as an admixture will result increase in strength.
- Properties like breaking load and ductility were improved with the addition of fibers. From the difference in cracking pattern of tiles which used coir fiber and those without coir fiber it was observed that the cracks are sharper in the latter.
- This can be justified because of the presence coir fibers in the roofing tile it has shown a cracking pattern with less.

References

- **AS 2049 – 2002 Roof tiles, Standards** Australia, Sydney, 2002.
- **AS2050 – 2002 Installation of Roof tiles,** Standards Australia, Sydney, 2002.
- **AS 4046.1 – 2002 Methods of testing Roof tiles – Determination of Distortion,** Standards Australia, Sydney, 2002.
- **AS 4046.3 – 2002 Methods of testing Roof tiles – Determination of Transverse strength,** Standards Australia, Sydney, 2002.
- **AS 4046.4 – 2002 Methods of testing Roof tiles – Determination of Water Absorption,** Standards Australia, Sydney, 2002.
- **AS 4046.5 – 2002 Methods of testing Roof tiles – Determination of Permeability,** Standards Australia, Sydney, 2002.
- Sugo, H.O & Colyvas, K. **A Comparison of Cooling Loads – Imposed by Corrugated Metal and Concrete Tiled Roofs on Residential Buildings.** Report in confidence for the RTAA, School of Engineering. The University of Newcastle.
- **Eun-Ik Yang, Seong- Tae Yi Young – Moon Leem (2005) "concrete characteristics are found by the effect of oyster shell substituted for fine aggregate on concrete "in cement and concrete research V. 35 PP 2175 – 2182.**
- **IS10262-2009 Recommended Guidelines for Concrete mix design bureau of Indian Standards.**