

Design and Comparison of Mix Proportion of Mortar between River Sand and Crushed Sand used in Ferrocement

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Abstract— Ferrocement is a versatile construction material and its mix proportion plays a crucial part in it. Our project is intended for design of mix proportion of mortar by using conventional river sand and artificial sand. Basically river sand has been used since its origin now going beyond this trend artificial sand is used to analyse the properties of mortar. Experimental investigation is carried out by using different grades of mortar to determine various characteristics of mortar like crushing strength and compare the results among river sand mortar and crushed sand mortar.

Keywords: Ferrocement, Crushed Sand, Natural Sand

I. INTRODUCTION

Ferrocement has a history of more than 170 years. The idea of impregnating closely spaced wire meshes with rich cement mortar is similar to the Kood type of age-old method of walling. Ferrocement in the form of mesh-reinforced cement mortar was used in Europe by Mr. J. L. Lambot in France. He constructed a ferrocement rowing boat in 1848, in which reinforcement was in the form of flexible woven wire mat and small size bars. He had patented this process.

ACI committee-549 describes it- 'Ferrocement is a form of reinforced concrete using closely spaced multiple layers of mesh and/or small diameter rods completely infiltrated with, or encapsulated, in mortar. The most common reinforcement is steel mesh' (reference – ACI 549.1R-93- Guide for the design, construction and repair of ferrocement).

Cement mortar strongly bonded and encased in layer of fine wire meshes making it homogeneous and ductile composite.

The concerned project work has not been in research as no one has performed the addition of new material instead of conventional material. A lot of investigation have done on concrete as compared to ferrocement furthermore in addition to this mortar examination are least consisting addition of new material and there different proportion of their constituents. In consideration with environmental factor if the project runs satisfactory there will huge success in regarding of getting option to natural river sand which ultimately leads to the reduction of quarrying of river bed also the effective Alternative material will be our newly tried material called as artificial sand i.e. crushed sand.

In this work we are going to add artificial sand in ferrocement and compare the upcoming result with conventional ferrocement for compressive strength.

II. PROBLEM STATEMENT

Previous research is a strong base for any project to get proper guidelines, procedures, reference results. in case of our project no previous research are made hence we are facing problem of standard results.

This project is experimental one there is no surety of test result may always find the favourable side. Mostly artificial sand is expected to improve property of mortar. The controlled laboratory and standard test procedure has also major influence on this investigation by proper care elimination of this problem is possible.

III. REVIEW OF LITERATURE

B.N.Divekar written a book on ferrocement which consist the basic information about ferrocement, specification of their constitute material and use of ferrocement in different structures.

Gursewak Dass, Mohit Talwar Gursewak Dass & Mohit Talwar has discussed in there study, Ferrocement is a good material. Further modification in ferrocement can make it best materials in structure as compared to RCC or other type of material and also ferrocement is economical in nature and having a good performance against lateral load.

Handbook on ferrocement technology by Maharashtra state dept. states test on ferrocement, methods used for construction and research work.

IV. OBJECTIVE AND SCOPE OF PROJECT WORK

- 1) The ferrocement has wide future scope in upcoming era and very least research are made on its mix proportion and they are based on only conventional river sand. The scope will be favoured if artificial sand enhanced the characteristics of mortar.
- 2) Resources are now on the verge of extinguishment as plenty of river sand has been explored for construction and it causes the need to find better alternatives. The better alternative might be found in artificial sand. The crushed sand is available easily in any locality and it is economical, also it has least environment hazard.
- 3) The vast scope of the project is, it may get inclusive in IS code in future as committee is continuously working on ferrocement. Also any new research are always welcomed in particular section of mortar because mortar research is not done jurisdictionally, generally practical methods or thumb rules are applied.

V. METHODOLOGY

A. Materials Used

The materials used in this experiment were locally available. In the material Ordinary Portland Cement (OPC), river sand and crushed sand as fine aggregate, mesh reinforcement, Potable water was used for mixing and curing.

B. Cement

Ordinary Portland cement 53 grade in one lot was procured and stored in air light container. The cement used was fresh i.e., used within three month of manufacture.

Sr No.	Physical Properties	Test result
1	Consistency	33%
2	Initial & Final Setting Time	59 & 290 min
3	Soundness Test	0.5mm
4	Fineness	2%

C. Experimental Program

After taking test on material the very next step is to determine proportion for river sand mortar and artificial sand mortar respectively. E.g. For proportion 1:6 quantities are shown.

Cement	Sand	Water
150gm	900gm	118.2gm

The compressive strength test are taken on these mortar cube. The results are as following table (3 cube for each day strength)



Fig. 1: IMG-Testing of crushed sand mortar



Fig. 2: IMG-Testing of natural sand mortar

VI. RESULT

Proportion	7 day Strength	
	Natural sand	Artificial sand
1:3	33.82	38.98
1:4	27.82	32.54
1:6	19.12	23.64

From the above, it is clearly seen that crushed sand mortar gives higher value than natural sand mortar at each grade.

VII. CONCLUSION

The compressive strength of artificial sand mortar is greater than compressive strength of natural sand mortar and integrity of crushed sand is good with the mortar.

It turned to be crushed sand is an effective alternative to river sand and hence we can use artificial sand in ferrocement mortar.

REFERENCES

- [1] GursewakDass, MohitTalwar "Review paper on ferrocement in construction". Vol. 8, no. 4 may 2017.
- [2] Ganesh O. Lonagre, Abhijit N. Bhirud "Ferrocete technology best for conventional technology" Feb. 2016. vol. 4 issue: 2
- [3] Dr. Jacques, Prof. Ricardo "Journal of Ferrocement" July 1982.
- [4] Ar. Laxmisalgia, Ar. AparnaPanganti "Ferrocement as a cost effective alternative to RCC" 12 June 2018 vol. no. 7 issue special 1, pp: 89-93
- [5] M.Saleem, "flexural behaviour of ferrocement sandwich panel", cement concrete composites, jan-1991pp21-28.
- [6] Experimental evaluation of the effect of mix design ratios on compressive strength of cement mortars containing cement strength class 42.5 and 53.5
- [7] Ferrocement chapter in concrete technology and design vol.2. by S.P.Shah
- [8] Research paper "ferrocete technology development in oune region" by B.N.Divekar
- [9] "Construction manual on ferrocete technology" book presented by B.N.Divekar
- [10] M.kameshwar and K.kartik research paper on "Experimental impact study and model of ferrocement slabs".
- [11] UNHCR-Large ferrocement Water tank Manual July 2006
- [12] 'State of art report on Ferrocement' and 'Guide for design, construction and repair of Ferrocement' Reports by ACI Committee 549, No. 549-R-97.
- [13] Ferrocete Technology-A construction Manual by Dr B N Divekar
- [14] Nervi, Pier Luigi. 'Ferrocement, Its characteristics and potentialitis' Library translation No 60, Cement and Concrete Association London. July 1956. 17pp
- [15] 'Ferrocement- Applications in developing countries' National Academy of Science, Washington D.C. Feb 1973, 90pp.