

Analysis and Cost Effectiveness by using Ferrocement Construction Technology in Feasible Construction

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ABSTRACT: Most developing countries are faced with problems of low standards of living, abject poverty, environmental degradation and housing shortage. In developing India we are facing the problems of infrastructure and shelter to growing migration of the people to urban areas. India would require about 11 crore housing units on India basis by 2022 to achieve the government's vision of "housing for all". Ferrocement technology has been established as environmentally friendly affordable cost technology. Ferrocement has emerged as one of the popular construction materials due to its unique properties. Due to less thickness, high tensile and compressive strength, excellent resistance to cracking and easy casting without formwork have made ferrocement popular material. The current study shows the results of technique of ferrocement panels armoured with different number of layers of wire mesh. The efficiency of the construction process is increased due to method employed at every stage of process. The main goal of this work is to compare ferrocement technique with conventional methods with respect to Strength, Time, Cost for affordable cost housing. Also construction of ferrocement structure is rapid and economical as compared with conventional structure for affordable housing. The current project aims to identify and analyze the economy in construction by using ferrocement construction technology.

I. INTRODUCTION

In any construction projects economy in constructions is most important task. To achieve this economy various investigation and innovation have been done since decades by various investigators and scientist. Out of the various constructions technique ferrocement is emerging now days as a widely used technique. The whole projects show the importance of using ferrocement technology in construction process.

1.1 General Overview

While creating India we are confronting the issues of framework and sanctuary to developing relocation of the individuals to urban zones. According to Govt. Own assessments that is a deficiency of in excess of 25 million houses generally in low pay bunch classification. At present lodging deficiency in the nation is to the tune of around six crore units with level of yearly interest in the lodging division being about USD 110 to 120 billion at present. India would require around 11 crore lodging units on India premise by 2022 to accomplish the administration's vision of "housing for all".

Ferrocement is a flexible material of development which has one of kind auxiliary properties. It is a composite shaped with intently sew wire work firmly twisted round skeletal steel and impregnated with rich concrete mortar. Welded work, gentle steel edges or bars are utilized for shaping skeleton while chicken work, square work or extended metal are utilized as work fortification. Mortar blend might be (1:1.5) to (1:4) by volume. With ferrocement it is conceivable to create the assortment of basic components might be utilized in establishments, dividers, floors, rooftops, shells and so on. They are slim walled, light-weight, solid and have serious extent of impermeability. It consolidates the property of slim areas just as it gives the quality of steel, fold ability of solid, it is light-weight give simplicity of working, it has high elasticity limit of prestressed concrete and break control. Ferrocement needs no formwork or covering for throwing. Ferrocement is being changed over the heterogeneous fragile material like R.C.C into a homogeneous, bendable, and composite. This is because of a little difference in supplanting steel bars by constant cross sections of fine steel wires. It has expanded the bond among wires and mortar to such a degree, that intension wires break yet won't get pulled out of the grid. Up to the yield purpose of steel the steel and mortar remain fortified together and offer pliability to the composite. The structure may twist or divert however won't bomb out of nowhere.



II. OBJECTIVES

1. To study ferrocement development and this innovation and understand the ferrocement technique and importance of various mega structures briefly in nation abroad.
2. To adopt an effective methodology for ferrocement construction techniques for analyzing the project.
3. To collect the data from the construction sites for analysis purpose and study the current construction technology used on the site.
4. To analyze the collected data for calculating the total cost of construction by ferrocement and conventional method and investigate the factors causing the ferrocement techniques of the structure and analyze the loss incurred by conventional technique
5. Finally to give the outcome from the analysis and provide suggestions to used ferrocement construction techniques rather than normal techniques. To investigate cost of ferrocement structure as contrast with the ordinary structure.

III.METHODOLOGY

1. Methodology consist of firstly studying the concept of Ferrocement construction, various important terms related to Ferrocement construction, as given below

- Overview on Ferrocement technique
- Ferrocement construction process
- Compare Ferrocement construction technique with feasible construction
- Brief study of Ferrocement technique of various major structures and causes

Above study will be by analyzing the data from previous research studies from various national and international journals and research papers. This will help in understanding of basic terminologies and further research work.

2. Preparing the data collection report on the basis of the required data collected by visiting the construction site, work projects. Collecting all the required data of projects which mainly include sites that uses Ferrocement construction technique which will further be helpful for carrying out research analysis work.

3. Drafting analysis report on the basis of the data collected, by adopting the numerical analysis technique so as to compare the performance of projects in various construction fields. Finally arranging the analyzed data in tabular form.

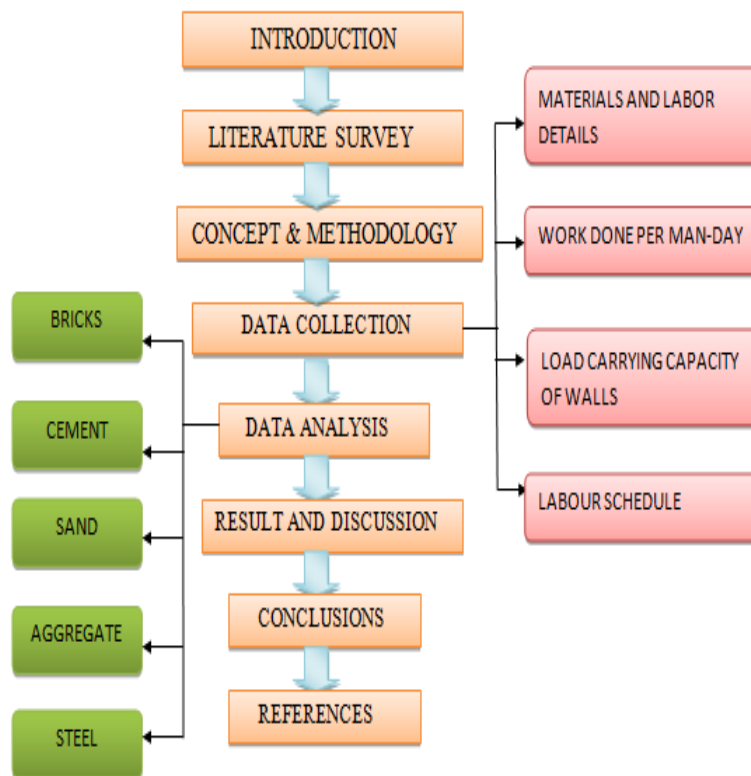


Fig 1 Flow Chart of Project



IV. PROBLEM STATEMENT

Nandkumar Shankar Jadhav At. Post-Gove Tq-Satara, Dist-Satara is a self ferrocete contractual worker of developed to the own Banglow territory 2377 Sq. feet being used of ferrocete innovation is one of the most economical and elective development strategy as correlation with the customary innovation.

4.1 Details of Site

- Location of site = Post Gove, Tq-Satara, Dist-Satara, Maharashtra.
- Plot area = 6000 Sq. feet.
- Built up area = 2377 Sq. feet
- Starting date = 4 Nov 2017
- Completion date = Oct 2019
- Owner and Developer = Nandkumar Jadhav
- Total cost = 29, 85512 Rs.
- Scheduled = 2yr. (self-contractor)
- Mortar specification = 1:1.2 and 1:1.5
- Saving 40% economical comparing to the conventional construction.

V. DATA ANALYSIS

5.1 Calculation of Carbon Dioxide Emission in Brick Masonry Area of wall = 200 Sq. m

Table 1 Quantities of material in brick masonry

A	Brick wall	Quantity	Unit
1	Cement	115	Bags
2	Sand	345	Bags
3	Bricks	166290	N0.
4	Steel	-	Kg

5.2 Calculation of Carbon Dioxide Emission in Ferrocete wall Area of wall = 200 Sq-m

Table 2 Quantities of material in ferrocete wall.

B	Ferrocete wall	Quantity in Ferro wall	Unit
1	Cement	95	Bags
2	Sand	275	Bags
3	Bricks	-	Nos
4	Steel	1109	Kg

5.3 Outcome from the data analysis by using conventional method of construction

Table 3 Recapitulation sheet for Conventional Work

Sr. No.	Particulars	Amount (Rs.)
1	Estimated Cost of the Abstracted items	428282.39
2	Total Cost For Ground Floor	428282.39
3	Water Supply & Sanitary Charges @ 4%	17131.29
4	Electrification Charges@ 5%	21414.11
5	Other Special Service Charges for AC, Lift @ 1%	8565.64
	Total Cost Of All Item	475393.43
6	Add 5% Contingencies	23769.67
7	Add 2% to 5% For work Charged Establishment	9507.86
8	Total Estimated Cost of The Project	508670.96

From table we have done the calculation of cost of construction materials and further calculated the final cost of construction of project by adding total cost for ground floor, water supply & sanitary charges at 4%, electrification charges at 5%, other special service charges for AC, Lift at 1%, add 5% contingencies, add 2% to 5% for work charged establishment by using conventional method of construction.



5.4 Outcome from the data analysis by using ferrocrete technique of construction

Table 4 Recapitulation sheet for Ferrocrete Work

Sr. No.	Particulars	Amount (Rs.)
1	Estimated Cost of the Abstracted items	337261.83
2	Total Cost For Ground Floor	337261.83
3	Water Supply & Sanitary Charges @ 4%	13490.47
4	Electrification Charges@ 5%	16863.09
5	Other Special Service Charges for AC, Lift @ 1%	3372.61
	Total Cost Of All Item	370988/-
6	Add 5% Contingencies	18549.4
7	Add 2% to 5% For work Charged Establishment	7419.76
8	Total Estimated Cost of The Project	396957.16/-

From table we have done the calculation of cost of construction materials and further calculated the final cost of construction of project by adding total cost for ground floor, water supply & sanitary charges at 4%, electrification charges at 5%, other special service charges for AC, Lift at 1%, add 5% contingencies, add 2% to 5% for work charged establishment by using ferrocrete construction technique.

5.5 Outcome of comparison between conventional methods and ferrocrete technology

Table 5 Comparison of working Quantity

SR.NO.	PERTICULAR	CONVENTIONAL WORK		FERROCRETE WORK	
		Qty.	Rate	Qty.	Rate
1	Site clearance	L.S.	5000	L.S.	5000
2	Excavation	28.81	2881	21.74	3723.9
3	Foundation	12.16	32224	12.16	32224
4	P.C.C. Work	5.98	27508	5.98	27508
5	R.C.C. Column	5.05	29088	-	-
6	Plinth Filling	28.58	7716.6	40.243	10868.04
7	R.C.C. Ground beam	6.02	36872.5	2.709	16595.89
8	II nd Class Brickwork	5.89	22382	-	-
9	Coping Work	1.07	4413.75	-	-
10	Providing BBM, Partition Wall	82.52	57764	-	-
11	R.C.C. Lintel	1.692	10118.16	-	-
12	R.C.C. Slab	10.68	69847.2	13.6	85418
13	Ferrocrete Wall	-	-	142.29	142290
	Total		428282.39/-		396957.16/-

From table we have done the comparison of quantity and rate between conventional method and ferrocrete technique and determine the final cost of the construction by using both the methods.

VI. CONCLUSION

1. By studying the concept, it can be concluded that, the Ferrocrete structures are better than RCC, they absolutely waterproof structure, protection from earthquake of exceptionally high force, oppose of temperature for significant stretch. There is no marvel of weakening because of fire, splitting, and erosion.
2. The ferrocrete development innovation is ongoing strategy embraced during development work to make different stylish shapes in development which is beyond the realm of imagination in R.C.C.
3. Literatures of various researchers are studied and on the basis of the research done, further project is done to compare the ferrocrete technology with convention one to get the final output.
4. Data is collected from construction site for doing analysis work, which includes actual site comparative statements of materials and labour, work done per man-day by labor in ferrocrete, load carrying capacity for ferrocrete walls, labor schedule for mason and other secondary data.
5. Analysis is done by calculating quantities and cost of construction work and adding various other costs to get estimated cost this is done for both conventional method and ferrocrete technique of construction.
6. On the basis of the analysis work the final outcome can be concluded that ferrocrete technology seems to be effective as compare to conventional construction method.

7. Also it's seem to be economical with respective its cost of construction, methods of construction, rather than conventional method.

8. The productivity of the development procedure is expanded because of strategy utilized at each phase of procedure.

6.1 Suggestions

1. It is suggested that the utilization of ferrocement as a structure material is profitable and can give wellbeing to the inhabitants and furthermore more prominent measure of cost decrease.

2. The utilization of admixtures as a construction material in ferrocement construction technology increases the strength and life of the structure.

3. Skilled work such as cutting bars, tying of bars, shuttering and de-shuttering operations, and reinforcement placement etc. should be done by skilled laborers only.

It is concluded that the ferrocement construction technique applied and successfully implemented on the case study selected and suggestion are implemented accordingly.

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