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Cost Simulation in an Item Based Project Involving Construction Engineering and Management

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ABSTRACT: In the construction project, time and cost are the most important factors to be considered in the planning of every project. The cost of construction using conventional building materials and construction is becoming beyond the affordable limits particularly for low-income groups of population as well as a large cross section of the middle – income groups. Therefore, there is a need to adopt cost-effective construction methods either by up-gradation of traditional technologies using local resources or applying modern construction materials and techniques with efficient inputs leading to economic solutions. For my project one commercial building construction was chosen. For the purpose of controlling the cost of construction, comparison were made between the cost of construction by using conventional construction and by using the alternative techniques, materials and technologies. Brick work construction was replaced by AAC blocks. And finally cost simulation was done.

I. INTRODUCTION

Time and cost are two main concerns in construction and they are used for planning a project. This has increase the importance of time and cost optimization in construction project. It is necessary to estimate the cost and time of each activity through which the whole duration and total cost of project are determined to complete the planning risk. The main aim of cost optimization of a project is to gain the maximum profit within the design period and within satisfactory quality of work.

Cost effective is achieved through four ways

- By replacing conventional materials with alternative materials
- By good construction skills
- By proper building design
- By proper planning and management of construction

II. LITERATURE REVIEW

The study about cost optimization were carried out from various literatures. The various literatures examined the cost effectiveness of using low cost housing technologies in comparison with traditional construction methods. In paper “Cost effective and innovate housing technology”, the author describes the various cost effective technologies. By using these technologies, about 30-35% of total cost of construction can be saved. Now a days various low cost technologies such as precast elements are used in bigger construction projects. Because of precast elements the total cost and duration of the project is lesser than the conventional construction. This was explained by the author AshikAhamed in paper “Planning and scheduling with optimization of cost and time of six lane bridge with cast insitu

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and precast elements at kolathur, Chennai. From various case studies in the literature review, it is clearly showed that cost and time of construction was saved by using alternative and low cost materials, methods and technologies.

III. METHODOLOGY

The step by step procedure used for executing the project is,

1. Literature review
2. Data collection of a finished construction project
3. Study of alternative techniques, materials and technologies
4. Resource allocation using primavera
5. Implementation of alternate techniques, materials and technologies
6. Calculation of cost difference
7. Cost simulation

CONVENTIONAL CONSTRUCTION METHODS

Conventional Construction Methods are used are described in the following steps:

- Foundation is the first step of the construction which is provided to distribute loads of superstructure and all others load (dead and live) to the soil thus providing base. Excavation work is first carried out, then earth-work is filled with available earth and ends with watering and compaction in a 6” thick layer.
- After this plain cement concrete is used to form a leveled surface on the excavated soil. The volumetric concrete mix proportion of 1:4:8 (cement: sand: aggregate), with a 6” thick layer for masonry foundation and column footings is used. Plain cement concrete is finished on the excavated soil strata and mixed by manual process.
- Stone masonry for foundation is constructed for outer walls and burnt brick masonry of a 9” thick layer for main walls and a 4 1/2” thick layer for all internal walls. First class bricks are used for the construction.
- The normal procedure to cast reinforced cement concrete slab is to make shuttering and provide reinforcement and concreting. Formwork is used, with proper cover blocks between bars. Both aggregate and sand used are 3/4” graded.
- Plastering is used for the ceiling, inside and outside walls.
- For the flooring, the earth is properly filled and consolidated in the ratio of 1:4:8 (cement: sand: aggregate) concrete.
- After the plastering the painting process is started, for this surface is prepared with putty and primer. These conventional steps take at least 2 to 3 months; however, the requirement of houses is much higher than the supply chain. There is requirement of some alternate method of the construction techniques.

AAC BLOCKS BASED LOW COST CONSTRUCTION

The advantages of using AAC blocks instead of brickwork are,

- Light weight AAC reduces the dead weight of the building, resulting into the reduction of 25% structural cost savings.
- Being 8 times the size of clay brick, AAC wall construction involves 1/3rd the joints thus overall mortar saving upto 66%.
- Sound proof
- Thermal insulation
- Cost saving
- No need of interior plastering

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IV. RESULTS AND DISCUSSION

Table1: comparison of cost of different methods of construction

s.no	Task name	Brick work construction	AAC block construction
1	Earthwork excavation	126140	126140
2	PCC in foundation and basement	204000	204000
3	Basement filling	85800	85800
4	Brick work in superstructure	986700	1308913
5	Wood doors	225400	225400
6	Wood windows and ventilators	808300	808300
7	RCC in column footing, column, beam, lintel, sunshade and roof slab	90664000	7251200
8	Brick jelly concrete over terrace	172040	172040
9	Brick masonry Plastering	1025280	526680
10	Ceiling plastering	498560	498560
11	White washing and colour washing	374400	374400
12	Wood or iron work with primer	285480	285480
13	Floor finishing with tiles	1158300	1158300
14	Wall and floor tiles in toilet	119000	119000
15	Flooring tiles in terrace	111320	111320
16	Drainage fittings	55000	55000
17	Sewage and drainage lines	55000	55000
18	Electrification and fitting arrangements	70000	70000
19	Borewell motor with plumbing arrangements	65000	65000
20	Overhead tank with plumbing works	65000	65000
21	Grill doors and compound gate	90000	90000
22	Sump work arrangements	80000	80000
23	Compound wall arrangements	659400	659400
24	Unforeseen items of work fluctuation	15880	15880
Total		16400000	14410814
Time of completion		7 months	6 months

On comparison of data in the above table, it can be calculated that about 12% of the total cost (Rs.19,89,186) is lesser in AAC blocks wall construction as compared that of brick masonry work. The time of completion also reduced.

V. CONCLUSION

- From the results obtained, it is observed that when the AAC blocks are used for wall construction of a commercial building, the total project cost and the duration of the project is lesser than the construction of building by normal brick masonry wall construction.
- Interior plastering is not required for AAC block wall construction and hence the structure duration could be reduced by 1 month over the construction of building by brick masonry construction.
- AAC block based construction can achieve not only faster rate of construction and can also bring down the estimated cost by Rs.1,44,10814 (12%) over the construction by conventional construction with lesser labour inputs.

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