Implementation of Value Engineering For Residential And Commercial Building

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Abstract- *Infrastructure development in construction industry is a key driver in socio economic development of the country. As construction industry play a vital role in economic growth and development of the country. globally, the predicted growth in construction industry is 70% more by 2025 it is in need to have proper construction techniques which are value effective.Value engineering is a systematic application of recognized techniques which identify the functions of the product or service, establish the worth of those function and necessary function to meet the required performance at the lowest overall cost. Value engineering concentrates on the effectiveness through stating function, goals, need, required and desires. Value engineering concept was started by Mr. Lawrence D. Miles during 1940`s.He worked for general electric company (GCE),USA.which faced scarcity of strategic material needed to produce their products during world war-II. Indian Value Engineering Society (INVEST) is a professional society established in October, 1977 and dedicated to the advancement of value engineering through education. INVEST is affiliated to the society of American value engineering(SAVE).Various cost reduction technique are as follows- "Thinner walls or single brick thick walls", "Load bearing brick work", "Brick on edge cavity wall", "Precast stone masonry blocks", "Modular brick masonry walls", "hollow clay blocks of shell type houses", "Sundried brick walls with waterproof treatment", "precast hyperbolic shell for roofing". All these techniques comes under "Value Engineering*

Keywords- Value Technology, INVEST, SAVE capital project, scope creep, cost effectiveness

I. INTRODUCTION

1.1 General

Value engineering is a systematic application of recognized techniques which identify the functions of the product or service, establish the worth of those functions, and provide the necessary functions to meet the required performance at the lowest overall cost. Value engineering concentrates on the effectiveness through stating functions, goals, needs, requirements and desires.
Value (V) = Function (F)/Cost (C)

Where, V is Value, F is sum of total function performance and C represents cost paid for it.

The relation of F and C shows that lower the cost for optimum function, better the value.

VALUE ENGINEERING: VE is the process of finding systems or methods of achieving the same programmatic goals using a different system that do not materially affect the desired outcome.

Some examples might be:

- Looking at the cost differences between steel and concrete structural systems.
- Using different mechanical equipment with similar characteristics.
- Reducing the lighting levels due to day-lighting; combining office functions into one space.
- Changing the building shape to improve the exterior wall to floor area ration.
- Reducing finish allowances.

Value engineering is typically able to reduce the cost of a project by 5% to 10% beyond which more aggressive methods must be used Alternatives are portions of the work that can be deferred until later in the project when more is known about how much of the project contingency bidding can be applied to the desired work. Alternatives are often items that may have another source of funds such as Deferred Maintenance monies, which might be done separately. They might also be areas of planned programmatic growth that will not be needed when the building is finished and can be "shelled" for a future project. Alternatives are best applied at later stages of design because history has shown that many alternatives at this stage cannot be afforded later in the project, thus they become de facto scope reductions.

Scope Reductions are perhaps the most difficult aspect of any project because they are usually permanent reductions in quantity or quality of program space.
Scope reductions at this point might include:

- Reducing the number or size of rooms
- Eliminating special features that would enhance a program
- Reducing the volume of space
- Eliminating special mechanical systems or features
- Reducing the site area impacts.

`There is often a tendency on projects to try to gain more scope within the budget. This is known as "scope creep" and so it is important to verify the design against the original program plan on which the budget was based. The first round of scope reductions tend to be areas where the design exceeds the original program plan before moving into other reduction areas. Ultimately, most projects are able to achieve a balanced budget. If that is not the case, additional funds might be diverted out of project contingency or it may be necessary to raise the total project budget through a program plan amendment. This requires documentation and submission back through the Approval Phase causing a delay of four to six months, thus it is important that project team work diligently to contain project costs. Anyone concerned with the cost of a construction project has heard of value engineering. Does the original vision of a palatial structure threaten to exceed the budget? The answer is often, "Let's value engineer that "Sometimes, value engineering looks like the solution to every budget problem, the magic wand that makes costs shrink and budgets balance. But what is it really? Is value engineering just a marketer's spin on cost cutting, a way to make settling for less palatable? If so, the term is being misused. As the federal government defines it, "Value engineering attempts to eliminate, without impairing essential functions or characteristics, anything that increases acquisition, operation or support costs" So reducing the size of a building by 10 percent or eliminating a media canter would cut costs - but it would not be value engineering.

II. LITERATURE REVIEW

Amit Sharma, R.M. BelokarValue Engineering is an organized/systematic approach directed at analysing the function of systems, equipment, facilities, services, and supplies for the purpose of achieving their essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety[1]. Society of Japanese Value Engineering defines VE as: "A systematic approach to analysing functional requirements of products or services for the purposes of achieving the essential functions at the lowest total cost" In this paper we have discussed the concept of Value Engineering, its job plan and the effective implementation of it through a case study. Efforts have been put into the articulation of the paper to make it coherent which can be easily perceivable. A case study has been discussed in this paper involving a part used in the medical instruments. The material is chosen such that the cost is reduced without affecting the quality of the product. The best feasible solution from the available alternatives is chosen through the feasibility ranking table. Through the application of Value Engineering profits are maximized without hindering the reliability of the product. With the effective utilization of the technique the final outcomes comes out to be a successful showcase of value engineering.

K. Ilayaraja and MD. Zafar Construction industry is an index of growth of a nation. The real estate sector in India has assumed growing importance with the liberalization of the economy. Today, the construction industry is the second largest employing skilled and semiskilled labor after agriculture and plays an important role in nation's economy. Due to increase in business opportunity and migration of labor, the demand for commercial and housing spaces has also increased. According to the tenth five-year plan, the estimate of shortage in urban housing is accessed to be 8.89 million units. As of now, the housing and construction industry employs 30 million people and about 250 industries are associated with construction industry directly or indirectly. It includes hospitals, schools, townships, offices, houses and other buildings as well as urban infrastructure, highways, roads, ports, railways, airports, dams, power plants Value engineering is a methodology used to analyse the function of the goods and services and to obtain the required functions of the user at the lowest total cost without reducing the necessary quality of performance. Many a time, Value Engineering (VE)is confused with cost cutting exercises in construction industry. The essential difference between conventional cost cutting and VE is that it involves reducing the cost by improving the functionality through lesser consumption of energy in terms of manpower, materials and machines. In the initial stages VE was used by production engineers for reducing the cost of manufacture. However, it was found that the benefit of VE is much greater if multidisciplinary teams of engineers were involved which would also influence the design team that is normally the case in construction

Li Ning Value engineering, a subject about technology and economy dedicated to improve the function of product or system, and reduce the cost of product or system, therefore with the lowest life cycle cost to meet customers' requirements about function. The application of value engineering focuses on the design phase of the research of

development of the product, which is an important characteristic of value engineering. Compared with other countries, there is certain disparity in both the theoretical research and practical application of value engineering in the construction industry in our country. Therefore we have to catch up. So using value engineering methods to control cost in the most productive phase of value engineering design phase bears great practical significance. At abroad, the construction industry is the main area applying value engineering. In China, apart from industry business, the construction industry is the most important area involving the application of value engineering.

JianyuZhaoImproving the effectiveness of production control has attracted the interest of researchers and lean construction practitioners over recent years, through techniques such as Last Planner System (LPS) and Location-based Management System (LBMS). However, in these techniques, data collection and analysis still remain manual. Remotely locating workers on site has been suggested as a potential technology to collect crucial data required for production control. The purpose of this study is to test the applicability of a real-time tracking system for collecting data for production control in different types of construction projects. We applied Bluetooth Low Energy (BLE) technology in real-time tracking of workers in three case projects, including residential, office building, and plumbing renovation. We compared various tracking device placement strategies and analyzed the share of uninterrupted presence of workers in work locations based on the collected data

III. METHODOLOGY

1. CLC bricks

Use of CLC (Siporex) bricks, will increase the total cost of construction but, it decreases total dead load, as they are lighter in weight. At the time of earthquake, total load of the structure on the foundation, will be less thus, the intensity of earthquake would act to a lesser extent. Time required to construct any structure is less i.e., construction is easy & construction cost n labour cost also less.

Figure 3:Siporex brick

2. Cavity wall

We are using hollow CLC bricks for cavity wall. It will reducing the overall load of structure. It will be more beneficial because it gives better insulation resistance. Leakage can occur through the outer leaf through joints between bricks and mortar. It avoids moisture passing through the wall.

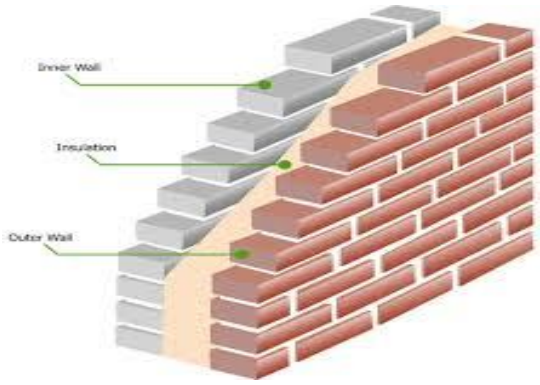


Figure 2: Cavity wall

3. 800 x 800 granite

Granite is an igneous rock formed from volcanic activity. Granite tile remains a popular flooring choice because of its overall resiliency, strength, and number of unique colour options. Our premium surface granite tile selection offers over 50 colour patterns. We Are using 800X800mm granite For flooring of project, whether it is for residential or commercial use

4. Mivan Technology

Mivan is basically Aluminium formwork system. Mivan system was invention by Construction Company from Europe. In 1990, Mivan Company from Malaysia start manufacturing formwork, then after give name MIVAN. This technology is extensively used in Europe, Gulf country and Asia. Formwork is defined as the temporary structure whose

purpose to support the building structure. The progress of the formwork equidistant with the progress of concrete construction through the 20th century. Modern technology must be required in this time because of increasing the population and land available for constructing houses in limitation. For mass housing project, it is essential to know the new technology for completion of project in fast rate, stand to good quality and able to withstand wear. Mivan technology is capable to constructing a huge no. of houses within short period. Mivan formwork is easily removed. All the activity can arrange in simple manner and get result more accurate, well regulate and high quality production at economically with less period

3.1 Problem Statement

Study Area 1 - Amar Landmark
Site Details:

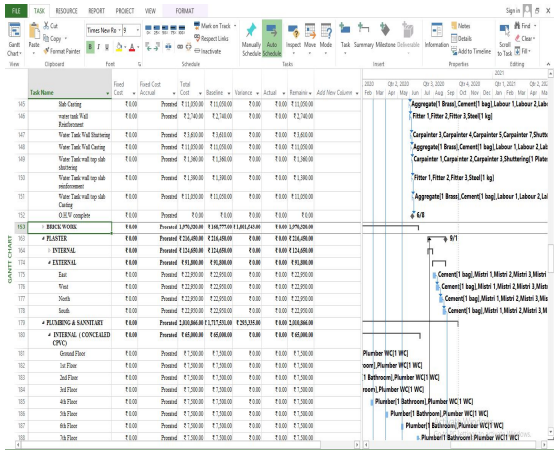
- Site name :Amar landmark
- Address: Near green park hotel pashan.
- Name of Builder: Amar Builder
- Name Contractor: SJ construction.
- Architecture: MOCO design
- Structural consultant: J+ W
- Total Area:2.8 acres
- Built-up Area:15570sq ft
- Type of building: Residential.

Study Area 2 - Devraai Residential Building
Site Information

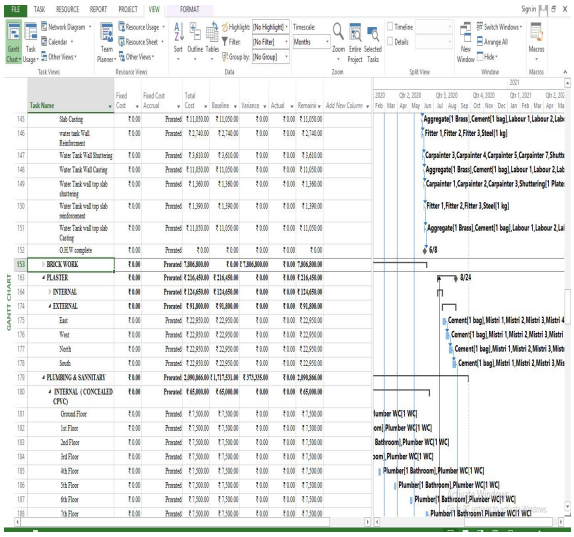
Name of the site: Devraai Phase-2
Location :Kiwale, Pune
Site Area : 2125 m2
Built up Area : 3103.48 m2
Air-conditioned Area : 0 m2
Non Air-conditioned Area : 3103.48 m2
Typology : Residential apartments
Energy consumption reduction : 84.5% reduction in energy consumption compared to
Energy Performance Index (EPI) : 15.5 kWh/m2/year
Renewable Energy : Rated capacity of solar PV installed on site – 3 kW
Solar hot water system met 96% of the conventional energy demand for hot water

IV. RESULT

4.1 DATA ANALYSIS OF CASE STUDY – 1

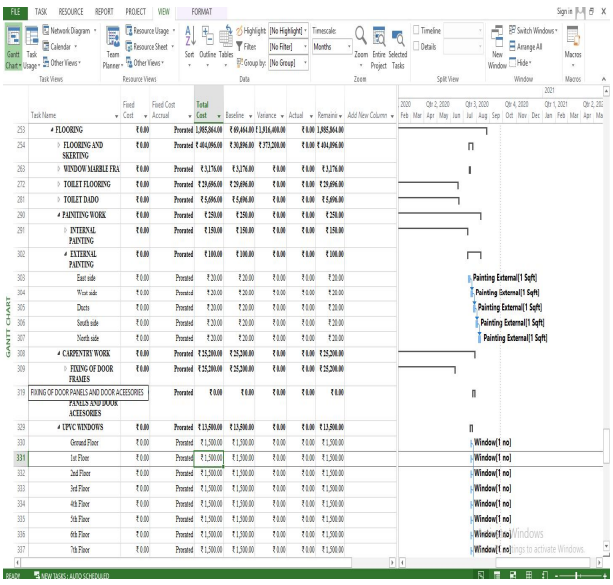


CLC Brick Work takes less Cost but take more Duration

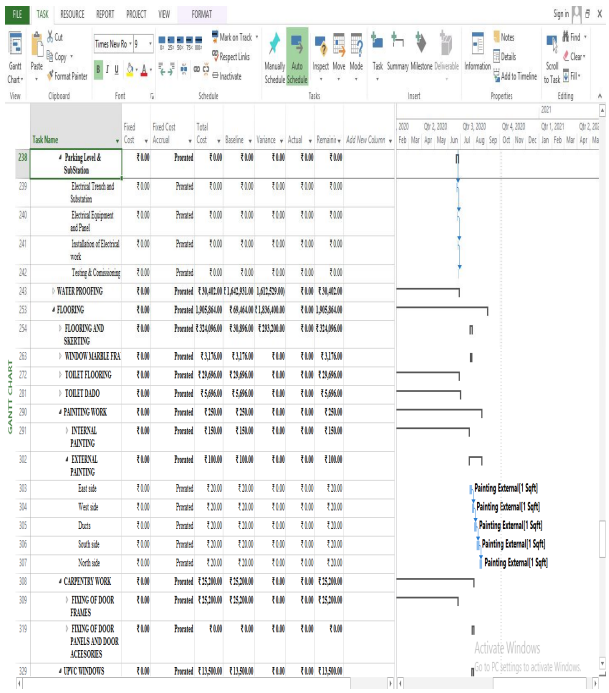


4'' (Conventional)Brick Work takes less Cost but take more Duration

In Above the MSP Scheduling we have use CLC Bricks to reduce time and cost of the project as compare to Conventional Brick Work



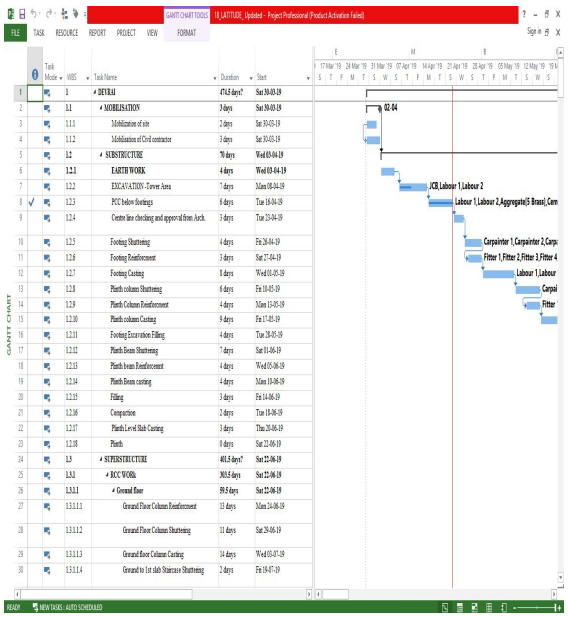
600 x 600 Flooring increase Cost and Duration too

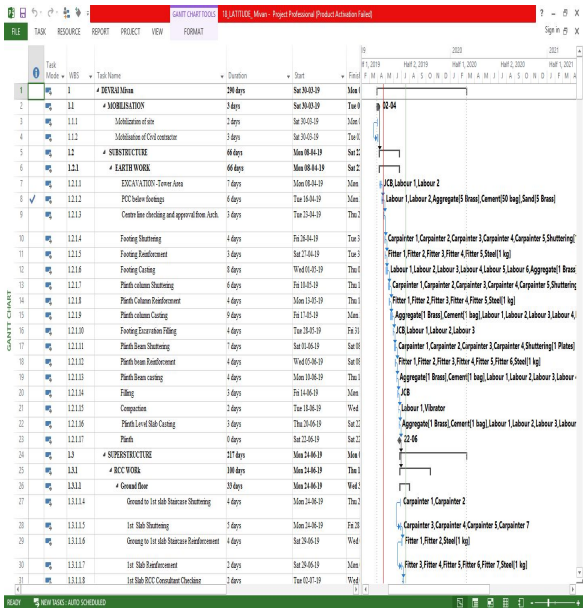


800 x 800 Granite tile use Flooring takes more Cost but less Duration

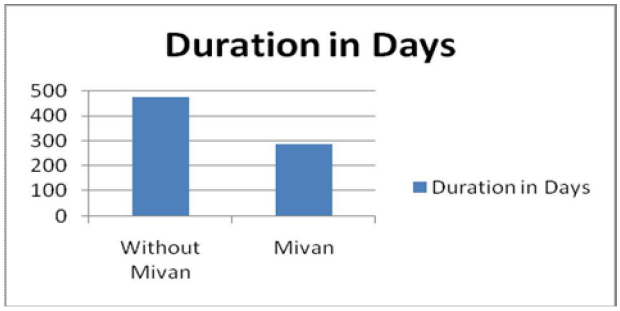
In Above the MSP Scheduling we have use Granite having Size 800 mm X 800 mm to reduce time of the project as compare to 2nd Project we use tile having size 600 x 600 It reduce cost but it take more time As compare to 1st project

4.2 DATA ANALYSIS OF CASE STUDY – 2

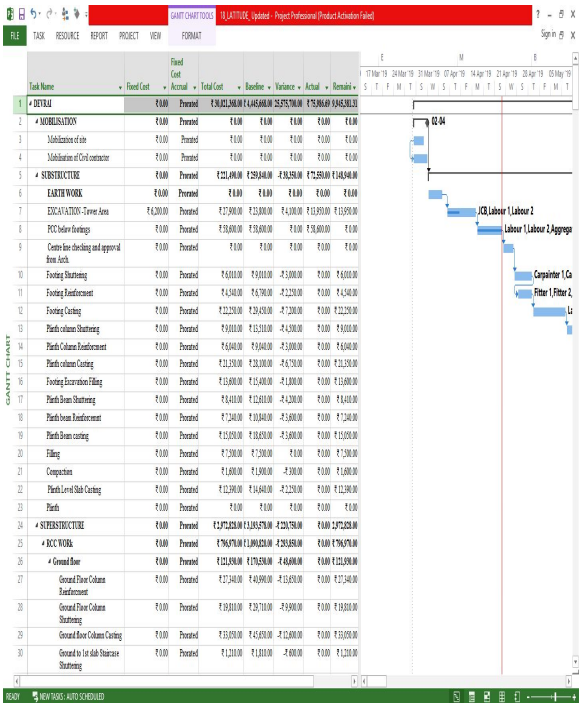


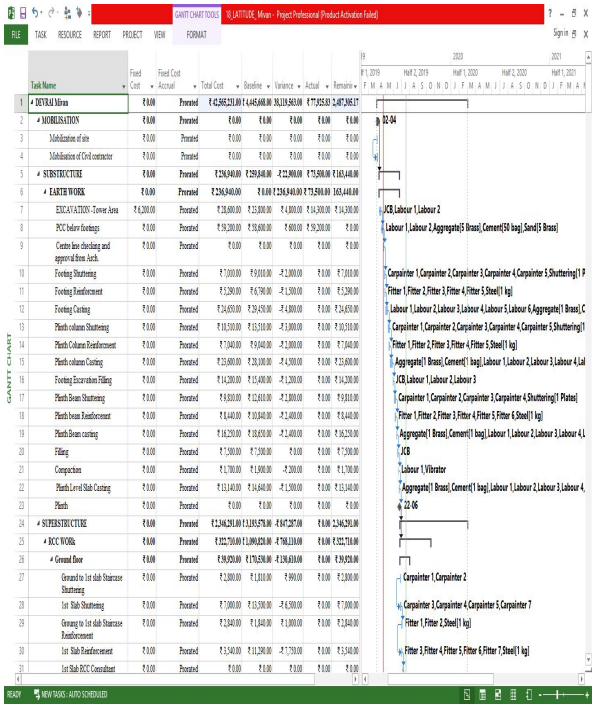


DEVRAI	Duration in Days
Without Mivan	475
Mivan	290

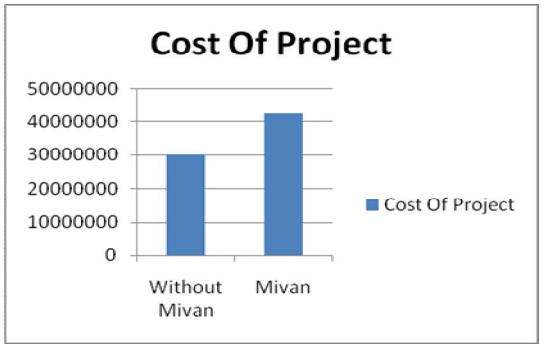


From the above graph it conclude that required duration of the project without mivan technology is more than the mivan technology





DEVRAI	Cost Of Project
Without Mivan	30021368
Mivan	42565231



V. CONCLUSION

- It was discussed that using value engineering methods by multidisciplinary team, value and economy are improved through study of alternative design concepts, material and construction methods without compromising functional requirement and quality.
- A second look at the design produced by architect and engineers gives the assurance that all reasonable alternatives have been explored. From study it is seen that different parameters of value engineering alternatives helps to find best solution.
- Thus, value engineering assures best value will be obtained over life cycle of the building or structure. Success of a project, deciding on where and how a project will be built, completion of the structure according to desired design and building quality, within determined time and cost limits, are all possible with good estimations and solution.
- Carrying out correct estimations is closely based on the knowledge level of the team. Value engineer assumes regulating and analyzing duties to increase the value of the project while preventing unnecessary costs.
- It is not possible to apply VE on each project a company produces. Much more successful value engineering studies can be carried out on complex and big projects which have high potential of restoring the investment.

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