

Analysing the Cost Benefits of Value Engineering in Construction Project by Replacing Material

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Abstract— Value engineering is a proven management technique using a systematized approach to seek out the best functional balance between the cost, reliability, and performance of a product or project. The aim of Value engineering is mainly the reduction of cost without affection basic function and improve the performance of the project. VE is easy identification of unnecessary cost on project and major benefits is gaining from that. In the present trend of construction field major losses and loss of profitability in project its effective tools to the reduction of cost of the project without affecting function.

Keywords: Value Engineering, PPP Projects

I. INTRODUCTION

Value engineering is one of the sequential process to improve value without affecting function. Saving money and at the same time, providing better value, is a concept that everyone can support.

Three basic elements provide a measure of value to the user: function, quality, and cost. These elements can be interpreted by the following relationship:

$$\text{Value} = \text{Function} + \text{Quality} / \text{Cost}$$

A. History behind VE:

VE starting from General Electric Co. during World War II because shortages of skilled labour, raw materials, and component parts. Lawrence Miles and Harry Erlicher at G.E. looked for acceptable substitutes. Then, Lawrence D. Miles, a staff engineer for General Electric, led this effort. Miles combined number of ideas and techniques to develop a successful methodological approach for ensuring value in a product. After that In 1957, the Navy's Bureau of Ships became the first DoD organization to establish a formal VE program.

B. Reason for Unnecessary Cost:

Shortage the information, Deficiency ideas, Instantaneous situations, Truthful incorrect politics, Variations idea of the user, organization or owner, Shortage of co-ordination, outdated standards and specifications.

C. Benefits of Value Engineering:

People are interested in saving money. Everyone is looking for a sound investment with a high rate of return for their investment money. The benefits of spreading our investment dollar, building more for less money, increasing efficiency and cutting down our dependency on energy-intensive buildings (high energy cost) and plant facilities need to be recognized today and pursued in the future. Value engineering is a proven management technique using a systematized approach to seek out the best functional balance between the cost, reliability and performance of a product or project. The program seeks to improve the management

capability of people and to promote progressive change identifying and removing unnecessary cost.

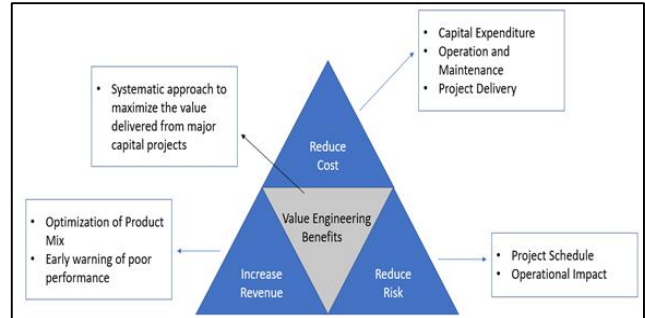


Fig. 1: Benefits of Value Engineering

D. A Case Study of Value Engineering

Depending on this parameter varies types of examples is consider which actually applying of VE in construction Industry.

1) VE: Waste Water Treatment Plant

Location: Near Oklahoma City, USA

Item: Elimination Outfall Line

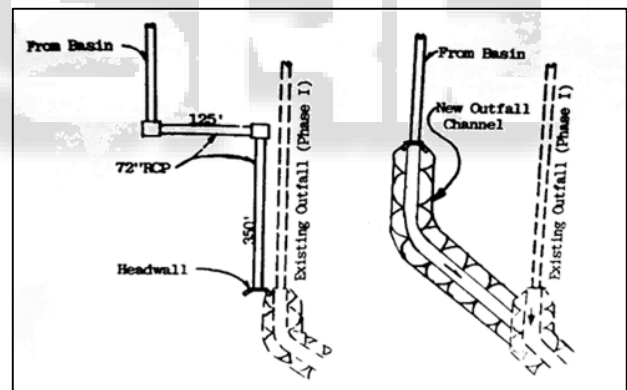


Fig. 2: Sketch of original Outfall Design and Proposed Design

The original outfall from the chlorine contact basin is contained in a 72" Diameter pipeline before discharging into an open channel.

a) Proposed Change:

It is proposed that the length of the enclosed pipe be reduced and 450 linear feet of open channel be constructed in its place. Improvement: In that, Reduction of cost is 10% due to reduce enclosed pipe and directly connected open channel.

2) VE: Engineering Management Building

Location: Norfolk Naval Shipyard US Navy

Item: Reduce Access Roads and parking Islands

The originally parking area and Pennock Street is perimeter in project and large landscape are cover in parking.

Proposed Change: Reorient and redesign parking area to eliminate two access roads and much green area. Pennock Street would be used for main traffic route and for heavy vehicular traffic.

Improvement: In that, Elimination of two components to effect in cost is 5% and properly fulfil purpose of parking and street.

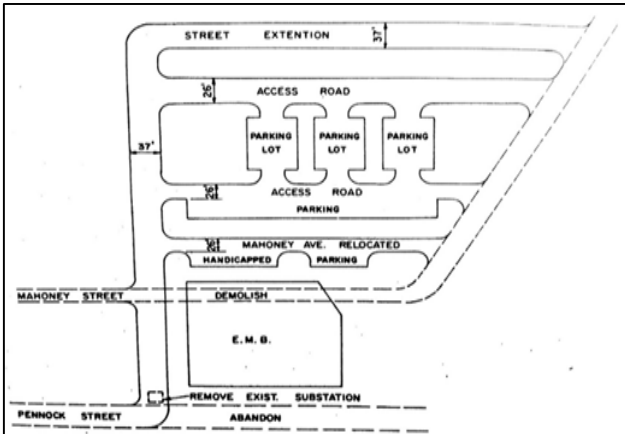


Fig. 3: Engineering Management Building-Original Plan

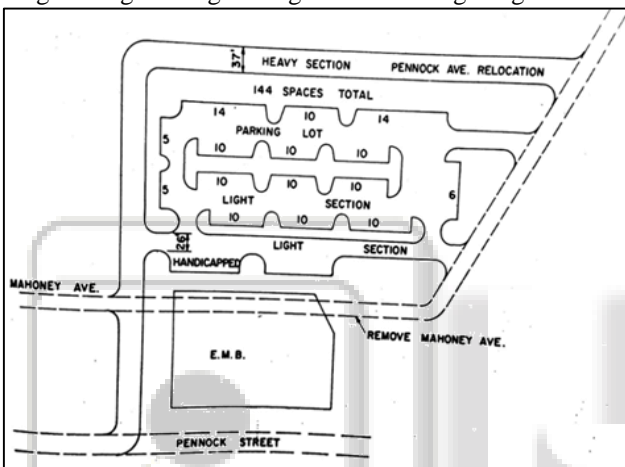


Fig. 4: Sketch of Proposed Parking Lot Redesign

E. Research Aim

Analysing the cost benefits of value engineering concept in residential construction project: Case study on Residential Project in Ahmedabad.

F. Research Objectives

The following are the objectives of report, to achieve the aim as stated above:

- 1) To Study value engineering concepts and achieve consumer need which expected and provide quality work on their cost.
- 2) To study case studies on value engineering implementation in construction.
- 3) To implement VE in any construction project and analyse cost effect on that.

G. Scope of Work

In that, Reduce project cost with different techniques, Materials and method of working. Check out which alternatives is used in project is worth or not. What type of quality effect on that and main goal to increases value with decrees cost. Following work of scope is to be considered in that:

- Due to cost overrun and Time overrun excess budget of project mainly seen in residential project.

- The replaced materials will be full fill the requirement and it is applicable only for the project cost.
- The study is limited to the construction phase only. Also selected only Gujarat region residential project.

II. LITERATURE REVIEW- TO STUDY VALUE ENGINEERING CONCEPTS

A. Value Engineering in Construction Industry

Study: In this research paper author work on using VE phases and analyzing tools for that also getting ideas and how to use different alternatives. Value engineering can improve decision-making that leads to the optimal expenditure of owner funds while meeting the required function and quality level. The success of the VE process is due to its ability to identify opportunities to remove unnecessary costs while assuring quality, reliability, performance, and other critical factors that meet or exceed customer's expectation.

B. Value Engineering in Construction Projects

Study: In that, when to applied Value engineering for major benefits also understand how to use in industry. This research paper is clearly suggested to how can helping VE in an employee for work smoothly, creates cost and quality consciousness, reduces the cost of the product, it is because of special attention which is paid for simplification, standardization and improved method of production.

C. Value engineering in Construction Industry

Study: Value engineering is essentially a process which uses function analysis, teamwork and creativity to improve value. Value Engineering can be applied during any stage of a project's design development cycle. VE may be applied more than once during the life of the project. Early application of VE helps to get the project started in the direction, and repeated application helps to filter the project's direction based on new or changing information.

D. Value Engineering Tool for Sustainability in Construction Projects

Study: Value engineering is the best tool for achieve of sustainable construction. VE uses multidisciplinary teams to analyse product design or construction approach. Sustainable construction is having valuable contribution to construction industry in the form of sustainability development. Sustainable construction is related to social, economic and environmental impacts of project. So, for environmental protection, cost optimization and social improvement VE provides powerful tools and techniques to achieve sustainability in construction. This paper discussed conceptual linkage between value engineering and sustainable construction which can be helpful for further research.

E. Value engineering in Residential House Construction

Study: In this paper the author's first objective was collection of information for where to applied value engineering. Information like Data estimation, Material price in the market, Basic building and site data, Owner's requirement, Activity involved, drawing of projects, Problem interface, etc.

III. LITERATURE REVIEW- TO STUDY CASE STUDIES ON VALUE ENGINEERING IMPLEMENTATION IN CONSTRUCTION

A. Cost Reduction on Government Project by Implementing Value Engineering at the Construction Stage

Study: This paper correct application of alternatives material used, also in that perfect reduction of cost of projects also without affecting function. Five alternatives used for reduction of project cost and 7-8% project cost down due to applying value engineering. Also, perfect give future scope to changing the design of the project to reduce unnecessary cost.

B. Value Engineering (VE) Application in Infrastructure Projects by Public- Private Partnerships (PPPs)

Study: VE is too important in infrastructure (PPP) projects to achieve better services at reasonable cost by eliminating unnecessary costs in the different project's phases, (VE) is not only decreasing the overall cost of the project but also improving the value, quality of the project, and reducing the time to complete the project. Determine the actual need of the target group of the project is the success key for implementation of (VE) because that identifies the basic function of the project. Application of (VE) in O&M phase is too important because it ensures the success and safe transfer for the project to the government (public sector). Finally (VE) can achieve public-private (win-win) solution.

C. Value engineering for canal tail Irrigation water problem

Study: In this research paper author using different three alternatives first is replacing canal lining with high consumptive use crops with low consumptive use types data was collected and analyzed based on result conclusion was prepared. Second is using a modern irrigation system, third is separate pipes to irrigate canal tail-end land and using plastic pipes for field canals to provide water. So that can also improve value and applied value engineering.

D. Possibility of Using Value Engineering in Highway Projects

Study: In this research paper the main objective of the author is to find out factor influencing equipment productivity and their impact on productivity. Author prepare questionnaire and base on that questionnaire data were collected and analyzed then result was generated. All the factors affecting productivity is listed and discuss then the conclusion is preparing. The paper summarizes the benefits and effectiveness of the value engineering methodology along with recommendations

E. Implementation of Value Engineering – A Case study

Study: In that, Author focus on Value engineering job plan for the successful application of the technique. A case study has been discussed and analysis has been carried out by this process to achieve the product optimization. Various tools are used for the analysis of the product while evaluating the product at different phases. In the end, the results obtained after the implementation of this technique are discussed.

IV. CONCLUSION

Studying all this research, Value engineering concepts understand also how and where to apply for reducing

unnecessary cost without affecting function. Planning of different alternatives used in projects. Also, in future collecting data of time overrun, budget overrun and selection of the residential project. Also depending and implementation of the method which actually performed on site. Collect information on various materials, methods, resources etc. and given alternatives on that. In preliminary phase is information phase work is carried out.

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