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Value Engineering in Drainage & Non Asphalt Pavement Construction of Penderian Jalan Cabe 2, Cabe 2 Terusan & K.H. Salem, Pamulang District - South Tangerang City (Case Study: In Non-Asphalt Drainage & Pavement Work)

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Abstract: ***At this time construction service companies are required to make breakthroughs in an effort to reduce production costs (Cost Reduction) and maintain project profitability by maintaining performance, quality, time and cost. Use of cost reduction to obtain efficiency in construction costs by conducting value engineering studies. Value engineering is a systematic method for increasing value through function analysis. The application of value engineering is expected to produce optimum value both in terms of quality, technology, efficiency and innovation of the project. This research was conducted to determine alternative architectural materials and determine the value of saving costs obtained. On non-asphalt drainage & pavement work. From the results of these studies, it can be obtained that the saving cost of the drainage work is Rp. 3,395,006,872 (61%) and non asphalt pavement work Rp. 687,949,835, - (35%). So it can be concluded that the use / selection of materials is very dominant to get saving costs. The objectives of value engineering are implementation, work plan (process of increasing value, efficiency and function analysis) and value engineering team which is the critical success factor in applying value engineering studies.***

Keywords: Costs, Stages & Efficiency / Saving.

1. Introduction

At this time consumers have realized that to get a good value for money spent, it is necessary to conduct an investigation or search for value for the product, for producers, to be able to continue to compete must market products that provide good value for consumers and companies. The benefits are very dependent on the ability of the producer to make quality products at low cost, offer competitive prices and are ready to be marketed. If this goal can be achieved, it will also get good value from the availability of human resources, money, materials and equipment and provide good value for consumers. This proves that profits are very related and cannot be separated from values.

Value Engineering or Value Engineering is a technique for controlling costs that has considerable potential for success, using a value analysis approach to its function.

In the Road Pedestrian Construction Project in the Pamulang District area, South Tangerang City is an attempt by the Regional Government to find a solution to meet people's needs for convenience, security and comfort. The existence of items - work items that need to be reviewed to be analyzed again in order to get a cost savings that can produce better costs / efficiency.

2. Theoretical Basis

Value Engineering Definition

Value Engineering Definition of Value Analysis or Value Engineering is an organized and creative approach that aims to identify unnecessary costs. This unnecessary cost is a cost that does not provide quality, usability, something that revives, a good appearance or the nature desired by consumers (Barrie, 1987).

Value Engineering (VE) is an application of value methodology on a project or service that has been planned or conceptualized to achieve an increase in value. This methodology is a systematic process that is used by a discipline to increase the value of an entire project through analysis of its functions (stabd SAVE, 2007).

Objectives and Benefits of Value Engineering Implementation

1) For the purpose of applying Value Engineering are: to provide support for decision making, to reduce costs, to generate new and creative ideas.
2) Benefits of the Value Engineering method in its application to construction projects especially at the beginning of construction activities. In carrying out a value engineering process, it should be done at the planning stage so that we can know in advance the cost elements that we can optimize. This is done because if we

carry out a value engineering analysis when the construction process takes place it will certainly take up work time, additional consultation costs, so that many losses occur when carried out during the construction / construction phase. This understanding can be illustrated as follows. There are several reasons why the value engineering concept (VE) is deemed necessary and important to be applied in a construction project

3) The benefits of applying Value Engineering are: Reduced project costs, increased project performance, improved project quality, customer / project owner satisfaction, better communication between parties involved, the creation of many creative ideas and innovations, increased efficiency, more project value good productivity. (Berawi, 2014).

Value Engineering Techniques

Value Engineering achieves its objectives, it is necessary to use special techniques. These techniques are based on the understanding that Value Engineering is closely related to human attitudes and behavior as the culprit, the problem of decision making and problem solving. These techniques are used primarily for design engineering work at the beginning of the project, the most important techniques are as follows: 1. Work on a specific basis 2. Get information from the best sources 3. Relations between humans 4. Teamwork 5. Overcoming obstacles (Suharto 1999).

Value Engineering Process

In the procedure / process Value Engineering is carried out in a systematic framework so that the final results are achieved according to the planned objectives, in the following manner:

- Identification of problems by gathering information and data from existing planning and project planning documents that are being handled. Then, the problem formulation is carried out based on the facts obtained from problem identification.
- Assessing objects where Value Engineering is intended to be carried out with reference to the function of the fixed installation, even if it can increase. Then, alternative costs are calculated as a result of the study of the function of the object.
- Analyze costs versus functions against several alternatives to get the best solution in terms of costs, functions and performance of the installation / object.
- After getting the selected solution, the Value Engineering results are developed and verified against the applicable standards and other experiences that have been done before.
- Value Engineering costs are determined by additional balance of technical balance.
- Final Value Engineering is documented and presented to the project owner for approval.

The research refers to the SAVE phase in 2007. Figure 1 illustrates the SAVE study process flow diagram. Each phase of the work plan must be carried out in the order in which each phase provides understanding and information that is indispensable for the successful implementation of the next phase:

Draw Steps in the VE Process

Value Engineering Work Plan

To get maximum results, value engineering is done by a team consisting of various scientific disciplines. This team collaborates systematically to follow the value engineering work plan. The work plan is used because it is proven to be able to reduce the cost of making products and can provide maximum effectiveness.

In value engineering, there are five stages of the work plan, namely:

a) Information Stages
b) Stages of Analysis
c) Creative Stages
d) Development Stages
e) Stages of Presentation / Recommendations

a) Information Stages

According to Zimmermasn (1982) the stages of information from value engineering (VE) are shown to obtain optimal information from the design stages of a project (Afandi, 2010). The information includes background that provides information that leads to project design, assumptions used, and sensitivity of the costs needed in development. According to SAVE 2007.

b) Stages of Function Analysis

After gathering information, a function analysis is carried out. The stages of function analysis are the most important stage in value engineering (analysis of this function that distinguishes value engineering (VE) from other cost-saving techniques. At this stage the function analysis will be carried out so that the lowest cost is needed to carry out the main functions, supporting functions, and identify costs that can be reduced or eliminated without affecting the performance or quality of the product.

Functional mentors contain an understanding of the description, study, and analysis that will be carried out on the project will refer to the functional aspects of the project. According to Hario Sabrang (1998) the function of something is the role of something that surrounds it (Afandi, 2010). The role or activity that occurs in the project is to support the achievement of the system objectives that surround it.

c) Creative Stage

This phase is a phase to develop a quantity of ideas that are related to other ways of performing functions. According to Hutabrata (1995), the creative stage is the stage of developing as many alternatives as possible which can fulfill the primary or primary function (Ustoyo, 2007).

d) Development Phase

This phase is a continuation analysis phase and develops a short list of ideas and development by considering alternative alternatives. The general activities for this phase are as follows:

1) Compare study conclusions with terms of success during the information phase and function analysis phase.
2) Prepare a paper on the alternative values for each idea chosen for further development.

3) Assess and allocate risks and costs appropriately.
4) Conduct a cost-benefit analysis.
5) Developing the sketches and information needed to convey the concept.
6) Refer to an alternative that will be developed later.
7) Ending the initial alternative development.

Develop an action plan to define implementation steps for each value alternative.

e) Stages of Recommendation or Presentation

This stage is the final stage in the Value Engineering work plan whose purpose is to convince decision makers about what has been fully developed by the study team and recommended at this stage of development or the purpose is to offer or provide reports on all previous stages in the Value Engineering plan to the management or assignor to decide whether the chosen design is capable and good to do. (Chandra, 2014).

3. Research Methodology

The research methodology is the steps and plans of the process of thinking and solving problems, starting from preliminary research, finding problems, observing, collecting data from both written references and direct observation in the field. Processing data until drawing conclusions on the problem under study. The research methodology was carried out a direct review on the project site by collecting data needed to calculate the Value Engineering review on

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In calculating Value Engineering, there must be supporting data in the form of a project cost budget plan, analysis of unit prices and the appropriate project images listed in the contract. And from these data, it is calculated to get more economical costs. The stages applied in the Value Engineering analysis, Construction of the Penderian Jalan Cabe 2, Chili 2 Canal and K.H. Salem Wilayah Pamulang - Kota Tangerang Selatan are:

a) Data collection and stages in calculations (information, creative, analysis, recommendations, and presentation).
b) Data processing.
c) Design analysis of the use of materials, dimensions, and costs without changing the quality and appearance of a project.
d) Value Engineering analysis to find out how much saving costs occur (cost saving).

Steps and things that need to be done in the research process, including:

1) Preparation Stages

Before carrying out the research process researchers must conduct the preparation stage, including collecting or searching project data. After obtaining the project data, the researcher conducted a survey to the project location to get an overview of the field conditions. In addition, researchers also conduct literature studies through library books, the internet, and other materials that can be used as reference materials and additional knowledge.

2) Research data

The data used in the study are grouped into 2, namely:

a) Primary data

Primary data is the source of data obtained directly from the original source (from the project) / main data used in conducting Value Engineering analysis. Primary data in the form of data generated through interviews and direct surveys on the project.

b) Secondary data

Secondary data is supporting data that can be used as input and reference in conducting Value Engineering analysis. Secondary data, including data on unit price lists and worker analysis, data on materials or building materials used, labor data, and other data that can be used as a reference in analyzing Value Engineering.

3) Data collection method

Data collection can be done by:

a) The primary data collection method is the method by conducting a direct survey of the consultant and executor handling the project. In addition, researchers also conducted direct observations to the location of the project.
b) Secondary data retrieval method. Namely the method by conducting a direct survey of agencies or companies that are considered interested. The company can include building materials companies, consultants, contractors, contractor workers, agencies that deal with services and construction issues and other companies that can be used as reference material.

4) Analysis of document From the document that has been collected, Value Engineering analysis is conducted to produce a cost savings or saving cost. Value Engineering Analysis is carried out in five stages, namely:
   a) Information stage
   b) Creative stage
   c) Analysis phase
   d) Development phase
   e) Recommendation / Presentation Stage

4. Results and Discussion

The things that must be considered in preparing the plan for applying Value Engineering analysis in the implementation of construction projects are as follows:

a) Explanation and purpose of the scope of the Value Engineering analysis work in detail to ensure optimum results are achieved. Determination of target savings and realistic project study costs.
b) The preparation of the team and the time provided by each member in carrying out Value Engineering studies, as well as determining the discipline of the members involved in it.

c) The time limit for applying Value Engineering analysis to the project.

The process of applying VALUE ENGINEERING IN DRAINAGE & NON ASPHALT PAVEMENT. Construction of Penderian Jalan Cabe 2, Cabe 2 Terusan & K.H. Salem, Pamulang District - South Tangerang City (Case Study: On Non Asphalt Drainage & Pavement Work).

The steps taken to facilitate this Value Engineering study are:

1) Hold field observations to get as many inputs as possible.
2) Determine the possibility of applying Value Engineering to a work item with significant savings.
3) In applying Value Engineering, it is guided by the provisions in contract documents and applicable regulations.
4) The main problems in the work of VALUE ENGINEERING IN DRAINAGE & NON ASPHALT PAVEMENT WORK. Construction of Penderian Jalan Cabe 2, Cabe 2 Terusan & K.H. Salem, Pamulang District - South Tangerang City (Case Study: On Non-Asphalt Drainage & Pavement Work).
5) is how to look for other alternatives in planning the project to get cheaper material in order to save the budget.

As for considerations in an effort to conduct Value Engineering, namely:

1) Make lighter materials without sacrificing value and function.
2) Replacing material that should be unnecessary is used because of substitute material that has the same function and strength but is seen in terms of cost and time more efficiently.
3) Expected cost factors can be minimized without reducing the quality, quality and safety aspects, so as not to cause a lack of planning costs which are a small part of the project but greatly affect the total cost of the entire project.
4) Efficient time so that implementation is faster. Job Items That Will Be in Value Engineering
   - Drainage Structural Work
   - Non Asphalt Pavement Work

Application of VALUE ENGINEERING IN DRAINAGE & NON ASPHALT PAVEMENT. Construction of Penderian Jalan Cabe 2, Cabe 2 Terusan & K.H. Salem, Pamulang District - South Tangerang City (Case Study: On Non Asphalt Drainage & Pavement Work). Will be done by filling in the Value Engineering workbook on this project, as follows:

1. Information stage

At this information stage, a lot of complete and complete information is sought. All data are then sorted and processed according to the needs at the next stage. General information needed includes:

a) Project Name: Construction of Penderian Jalan Cabe 2, Cabe Terusan and Jalan KH Salem Kecamatan Pamulang, Kota Tangerang Selatan.
b) Project Location: Pamulang, South Tangerang City.
c) Project Owner: South Tangerang City Public Works Agency.
d) Building Function: Pendestrian
e) Value of Fee + VAT: Rp. 10,325,819,108

2. Creative Stage

This stage aims to develop alternatives to achieve basic functions, by using several material choices, using components, simplifying, and / or modifying while maintaining the main function of an object. After the analysis is done, a number of possible alternatives for value engineering (VE) can be obtained, as below, consisting of:

Division 2: Drainage work is proposed 5 alternatives as a basis for Original measurement, namely:

a) Alternative 1. Original in accordance with RKS / Specifications & Contracts
b) Alternative 2 Drainage with BOX Culvert
   Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.
c) Alternative 3 Soil drainage
   Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.
d) Alternative 4 Stone Drainage times
   Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.
e) Alternative 5 Concrete Drainage
   Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.
f) Alternative 6 Drainage culverts
   Then one alternative was chosen, namely the Kali Kali Drainage Work which was assessed as being able to be carried out by value engineering while the land drainage was in accordance with appendix 11 of the regulation of the public works minister no. 12 / PRT / M / 2014 does not qualify as urban drainage. see the calculation table below.

Table 4.14: Alternative maintenance of drainage works

No.	Keterangan	Alternatif	Item Pekerjaan yang di VE	Biaya Kontruksi		Total Intial Cost Saving	Saving Cost	%	Rangking
				Sebelum VE	Sesudah VE				
				1	2	3=1-2	4 = 3	5=3/1	6
1	Drainase Tanah	2	Drainase	5,528,537,152	157,806,484	5,370,730,667	5,370,730,667	97%	1
4	Drainase Beton	4	Drainase	5,528,537,152	2,981,523,155	2,547,013,997	2,547,013,997	46%	2
2	Drainase Batu Kali	3	Drainase	5,528,537,152	3,395,006,872	2,133,530,280	2,133,530,280	39%	3
3	Drainase Buis Goron	5	Drainase	5,528,537,152	3,432,349,664	2,096,187,487	2,096,187,487	38%	4
5	Box Culvert	1	Drainase	5,528,537,152	4,709,858,885	818,678,267	818,678,267	15%	5

Division 5: Non-asphalt Pavement work proposed 4 alternatives as the basis for Original measurement, namely:
Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.

1) Alternative 1 Paving Blocks
   Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.
2) Alternative 2 Kramik Tiles: Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.

3) Alternative 3 Concrete Motives
Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.

4) Alternative 4 Granito
Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.

Then 1 alternative was chosen, namely the Kramik Tile Work which was assessed as being able to do value engineering see the calculation table below.

Table 4.15 alternative maintenance of non-asphalt pavement work

No.	Keterangan	Alternatif	Item Pekerjaan yang di VE	Biaya Kontruksi		Total Intial Cost	Saving Cost	%	Rangking
				Sebelum VE	Sesudah VE	Saving			
				1	2	3=1-2	4 = 3	5=3/1	6
1	Ubin Kramik	2	Perkerasan Non Aspal	1,977,180,677	1,289,230,842	687,949,835	687,949,835	35%	1
2	Paving Blok	1	Perkerasan Non Aspal	1,913,765,669	1,382,497,092	531,268,577	531,268,577	28%	2
3	Granito Essenza	4	Perkerasan Non Aspal	1,977,180,677	1,678,050,592	299,130,085	299,130,085	15%	3
4	Beton Motif	3	Perkerasan Non Aspal	1,977,180,677	4,643,169,342	(2,665,988,665)	(2,665,988,665)	-135%	4

After establishing selected alternatives, each group I. Division 2 Drainage work as many as 1 (one) alternative, & group II Division 5 Non-asphalt Pavement work as much as 1 (one) alternative it is necessary to know how much influence the change in construction value over Modification changes that result from alternatives that have been chosen by the author, namely
1) Drainage of Kali Stone
2) Non Aspaid Pavement using crisp ceremonial tiles.

Table 4.16. Comparison of costs arising from Division 2, namely alternatives 1 (original) Drainage U-Dicth & culverts with alternative estimation 2 (Drainage of Kali Stone) can be seen in the table as follows:

Table 4.16: Comparison of the cost of original Drainage with Stone times

No.	Pekerjaan	Original	Alternatif 2	Hemat	%
		Total Biaya	Total Biaya	Total Biaya	
		1	2	3=1-2	
1	Saluran Terbuka & Tutup	4,612,433,415	1,859,448,550	2,752,984,865	60%
2	Gorong - Gorong	916,103,737	274,081,730	642,022,007	70%
	Total	5,528,537,152	2,133,530,280	3,395,006,872	61%

Alternative Benefits & Weaknesses 2 Stone Kali Drainage:
- Advantages:

1) Price

For the price problem, the stone channel is easier and the material or material used. limited budget, you should choose river stone channels.

2) Deficiency

1. Processing Time (Manufacture)

The processing time for the river stone channel will require a longer time in the process because everything must be done manually.

2. Basically river stone channels will require land or a wider area. This is because generally the stone channel thickness is at least 30 cm

In Table 4.17. Comparison of costs that arise in Group II. Division 5: Non-asphalt Pavement with 4 alternative estimates (Crack tiles) can be seen in the table as follows:

No.	Pekerjaan	Original	Alternatif 2	Hemat	%
		Total Biaya	Total Biaya	Total Biaya	
1	Perkerasan Non Aspal	1,977,180,677	1,289,230,842	687,949,836	35%
	Total	1,977,180,677	1,289,230,842	687,949,836	35%

Deficiency

- Uneven layer thickness as a result of technological violations when placing tiles with your own hands.
- Risk of high trauma in winter. With the onset of the track ice tiles can be very slippery.

From the results of the cost comparison, the estimated savings between the original with the alternative are in Division 2 Drainage & Division 5 Non-asphalt Pavement respectively in Division 2: there are alternatives 2 Drainage of Batu Kali and Division 5: Non-asphalt Pavement There are Alternative 4 Non-Asphalt Pavement Kramik Tiles based on Development using equivalent materials as specified in the RKS / Specifications and contracts with lower prices or significant price differences

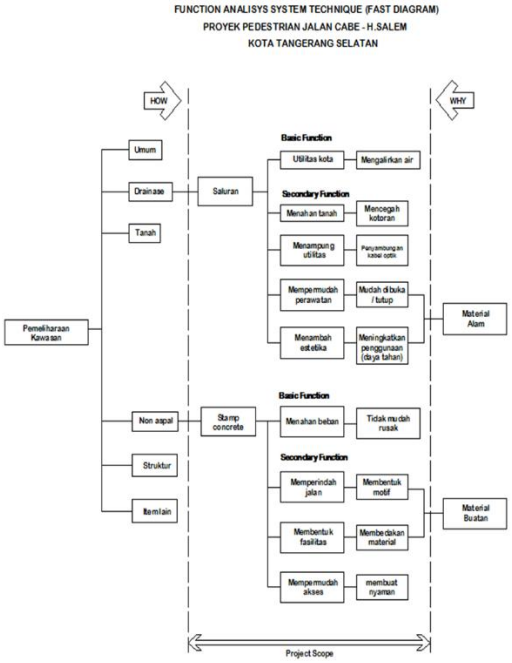
1. Function Analysis

Function analysis is done using the FAST (Function Analysis System Technique) diagram. FAST is a method for analyzing, organizing and recording functions of a system that is structured in the form of a diagram. From the results of the analysis contained in the form of this diagram will be able to describe the functions of each element of the work structure and the relationship of each function and the boundaries of the problems analyzed. The term used in mentioning functions in the FAST diagram is to use verbs (verb) and nouns (noun).

Analisa Fungsi
Proyek : Pendestrian jalan Cabe 2 , Cabe 2 terusan & KH Salem
Lokasi : Tangerang Selatan

No.	Perkerjaan	Kata Benda	Kata Fungsi	Jenis
1	Drainase	Utilitas	Kota	Primer
		Menahan	Tanah	Sekunder
		Menampung	Utilitas	Sekunder
		Mempermudah	Perawatan	Sekunder
		Menambah	Estetika	Sekunder
		Mengalirkan	Air	Primer
		Mencegah	Kotoran	Sekunder
		Tempat	Instalasi	Sekunder
		Mudah	Buka/Tutup	Sekunder
		Tidak Cepat	Rusak	Sekunder
2	Stamp Concrete	Menahan	Beban	Primer
		Merperindah	Jalan	Sekunder
		Membentuk	Fasilitas	Sekunder
		Mempermudah	Akses	Sekunder
		Tidak Mudah	Rusak	Primer
		Membentuk	Motif	Sekunder
		Membedakan	Material	Sekunder
		Membuat	Nyaman	sekunder

To obtain an understanding of the function of Drainage work, FAST Diagram is used so that Drainage work can be carried out in detail and clearly



2. Evaluation Phase

The analysis phase is a stage to develop alternative choices in achieving basic function elements. This alternative choice contains the use of material types. From the acquisition of data, used from each Drainage Division there are 5 alternatives & Division 5 Non-asphalt Pavement there are 4 alternative uses of Non-asphalt drainage & pavement materials as an alternative. The results of the analysis are obtained as possible for Value Engineering to be carried out as follows:

I. Division 2: Drainage work with 2 alternatives, namely:

1. Alternative 1 Original Drainage in accordance with RKS / Specification & Contract

2. Alternative 2 Stone Drainage times

Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.

II. Division 5: Non-asphalt Pavement Work

Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.

1. Alternative 3 Original Non-Asphalt Pavement

Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.

2. Alternative 4 Kramik Tiles

Development by using the equivalent material contained in the RKS / Specifications and Contracts at a lower price.

4. Development Phase

Stages of analysis at the development stage proposed alternative 2 for material use in the Batu Kali Drainage structure work at a cost of Rp. 2,133,530,280, - or (39%) in the initial use of the material using U-Dith & Gorong - drainage obtained is Rp. 5,528,537,152 .- or (100%) There is a difference in the cost of efficiency / savings as an alternative 2 that is equal to Rp. 3,395,006,872, - or (61%). Stages of analysis at the development stage proposed 4 alternatives for the use of materials in the Kramik Tile structure work at a cost of Rp. 1,289,230,842, - (65%) in the initial use of material using Non-Asphalt Pavement at a cost of Rp. 1,977,180,677 .- or (100%) There is a difference in the cost of efficiency / savings as an alternative 2 which is Rp. 687,949,836, - or (35%)

5. Recommendation / Presentation Stage

Results Recommendations from cost savings on Non-Asphalt Pavement and Drainage Work jobs are as follows:

1) The cost of saving the Drainage Structure obtained is Rp. 3,395,006,872, - or 61%.
2) Non-Asphalt Pavement savings costs obtained are Rp. 687,949,836, - or 65%.
3) Total overall savings costs of Rp. 4,082,956,708, - or 43%

5. Conclusions and Recommendations

Conclusion

From the results of the research that has been carried out, some conclusions are obtained as below:

1) The cost model provides 2 alternatives, namely alternative river rock drainage and alternative Kramik tiles.
2) The value of construction costs from Value Engineering is:
   - Alternative Stone River Drainage against the original design (Drainage U-Dith), experienced a decrease in construction costs (construction cost) of Rp. 3,395,006,872, - or 61%.
   - Alternative Kramik Tiles for the original design (Non Asphalt Pavement), has decreased the construction cost (construction cost) by Rp. 687,949,836, - or 65%.
   - Alternative Stone River Drainage against the original design (Drainage U-Dith), experienced a decrease in construction costs (construction cost) of Rp. 3,395,006,872, - or 61%.
   - Alternative Kramik Tiles for the original design (Non Asphalt Pavement), has decreased the construction cost (construction cost) by Rp. 687,949,836, - or 65%.
   - with the Joint Alternative 2 & 4 Joint Velue Engineering, namely the reference of the price of Kali Stone Drainage & non-asphalt pavement (including installed costs). In obtaining calculation of efficiency / savings of Rp. 4,082,956,706, - or (43%).
3) The value of the Life Cycle Cost (LCC) of Value Engineering is:
   - Alternative Stone River Drainage for the original design (U-Dith Drainage), decreased the Life Cycle Cost (LCC) costs by Rp2,550,928,760, -or by 39%.
   - Alternative Kramik Tiles for the original design (Non Asphalt Pavement), experienced a decrease in the Life Cycle Cost (LCC) costs of Rp. Rp1,500,776,049, or 35%.
4) The results of this study can be concluded that the determination of the material is very dominant with the value of the cost / project cost, so that the research conducted on the City Road Pendestrian Development Work Project in the District of Pamulang - South Tangerang City, is using the option of Division 2 Drainage Structure there are 2 alternatives and Division

5: Non-smoke pavement structures there are 2 alternatives as a basis for conducting value engineering.

6. Suggestion

The suggestions that can be given by the author relating to this research are those relating to the implementation of value engineering as follows:

1) Conducted Value engineering is carried out before the implementation of the project in the market and provides space for the contractor to carry out maximum value engineering so that the results are truly maximal.
2) Where the Owner can provide clarity to consumers that in a project / project that is being built using material with an equal level of material, so that consumers will better understand this.
3) The Value Engineering is carried out both for the owner, the contractor wants to plan because to correct each other and fill in the shortcomings that will occur when the project is running.
4) For the implementation of value engineering, it is not feasible to do this due to the limited time given by the owner to the consultant and the contractor, so that most of the value engineering is carried out when the project takes place.

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