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RESEARCH ARTICLE

VALUE ENGINEERING ANALYSIS OF BEAM STRUCTURE ON GOLD FACTORY DEVELOPMENT PROJECT.

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Abstract

High demand in construction building materials certainly calls for material energy savings in order to secure project efficiency. The research was identity ineffectiv cost in structural works in a gold plant construction project. To prevent such inefficiency, value engineering method was adopted to secure cost efficiency. In tehe adoption of the value engineering analysis applied to beam structural works in a gold plant construction project, the researcher observed i item of job leading to loss cost the most, i,e. :beem structural works.The value engineering analysis application adopted was zero one method to generate a recomendation for beam strucutural works, i,e. :alternative 1, saving as much as IDR 157,675,945 or 8.44% of the total costs of beam structural works with a saving percentage by 1.54% of the total project costs.

Introduction:-

Developments in the field of construction in Indonesia are things that need to be considered in its implementation, many obstacles are often found which might be detrimental to the service providers involved in a construction development. To prevent these losses, it is necessary to have an efficient budget plan to minimize unnecessary costs. One way that service providers can do to reduce unnecessary costs is by implementing value engineering analysis (VE).

Value Engineering is an organized and creative approach that aims to identify unnecessary costs (Miles, 1971). Unnecessary costs are costs that do not provide quality, usability, something that revives a good appearance or the nature desired by consumers.

Beam structure work is a typical work item, has a large cost. Need a creative idea to optimize the cost of building the project by replacing existing planning. The replacement of beam structure work with other alternatives will certainly have an effect in terms of cost and time of implementation, so that a method is needed in the form of engineering which aims to reduce unnecessary costs. The application of value engineering analysis techniques using the zero-one method is expected to reduce the risk of swelling the costs incurred.

Research on value engineering analysis of beam structure work was chosen because in this technique high value work will be directly proportional to the savings obtained. Thus, the value engineering applied to high-value jobs will have the potential to save costs on the PT. Damai Karunia Sejahtera Kenjeran.

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Methods:-

To solve the problems that occur, the author uses quantitative descriptive research by making descriptions of accurate images then calculated systematically and analyzed to bring out the best alternatives by conducting a case study on the Damai Karunia Sejahtera gold plant construction project.The research process is divided into 5 stages including the information stage, the creative stage, the analysis phase, the development stage and the recommendation stage.

Results and Discussion:-

Information stage;-

In the information stage, several ways are used to identify the work that value engineering will do, including breakdown of the model and analysis of functions. Cost models are work charts that are grouped according to the elements of each work.

From the recapitulation of the cost of the budget plan (RAB) breakdown is carried out on the structure work. For more details, see Table 1.

Table 1:-Breakdown Cost Model Proyek Pabrik Emas

WORK BASIC FLOOR S / D FLOOR 3	Cost	
1. Beam	Rp	1.868.786.728
2. Coloumn	Rp	916.210.083
3. Stairs	Rp	145.315.660
4. Pelat Lantai	Rp	1.814.899.839
5. Sloof	Rp	427.702.120

From the breakdown table, the above model can be seen that work items on the 1st to 3rd floor have the highest cost with a percentage of 67.69%, so that on the work item, value engineering analysis will be carried out to obtain potential savings.

The second stage in the information phase is the analysis of functions used to explain the basic functions and secondary functions of work items and to get a comparison between value of cost (cost) with value of benefit (worth). Analysis of the function of beam work can be seen in Table 2. Because both the cost / worth ratio shows a value of more than 1, then the potential beam work for value engineering is done.

The next step to get the priority feasibility of work items to do a value engineering, needs to be analyzed with a pareto graph which can be seen in figure 1

Table 2:-Analysis of Beam Function Functions

No	Component	Fungsi			Cost (Rp)	Worth (Rp)
		Verb	Noun	Kind		
1	Rebar	conduct	load	P	1.280.321.093	1.280.321.093
2	Beam	conduct	load	P	288.720.626	288.720.626
3	Formwork & Scaffolding	mold	beam	S	299.745.008	-
				Jumlah	1.868.786.728	1.569.041.719
	Jenis :			Ratio C/W	1,19	
	P= Basic function (Primer)					
	S= Supporting Functions (Secondary)					

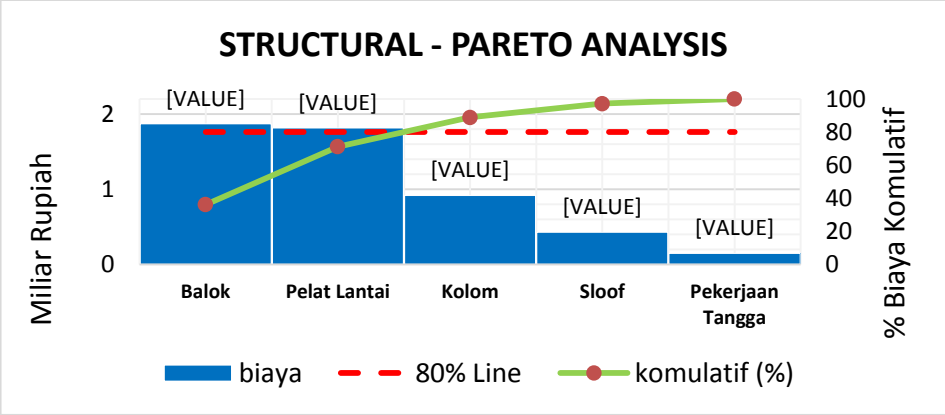

Figure 1:-Pareto Analysis Chart

Creative Stage:-

At this stage there are several alternative alternatives for beam structure work from brainstorming techniques, so that with the emergence of several alternatives this idea is expected to be cost savings. An alternative substitute for beam structure work can be seen in table 3.

Tabel 3:-Alternatif pelaksanaan struktur balok

Existing Beam	Implementation Using Scafolding Frame
Alternative Beams 1	Implementation Using Scafolding PCH
Alternative Beams 2	Implementation Using Scafolding Pipes
Alternative Beams 3	Implementation Using Bamboo Scafolding
Existing Beams	Implementation Using Scafolding Frame
Alternative Beams 1	Implementation Using Scafolding PCH
Alternative Beams 2	Implementation Using Scafolding Pipes
Alternative Beams 3	Implementation Using Bamboo Scafolding

Analysis Phase:-

Alternatives that have been raised are then analyzed by assessing the quality and calculating the costs of each alternative in order to determine the value of the best alternative. Profit and Loss Analysis can be seen in table 4.

Tabel 4:-Profit and Loss Analysis

No	Alternative	Profit	Loss
1	Implementation Using Scafolding PCH	- Scaffolding work is relatively easy compared to existing	- Scafolding PCH suppliers are still rare
2	Implementation Using Scafolding Pipes	- Scafolding rental prices are more economical	- Difficult to adjust to the conditions in the field because of the size of the pipe that is fixed
3	Implementation of Using Bamboo Scaffolding	- Bamboo material is easily available - The price of bamboo materials is cheaper - Scaffolding can reach 5m high	- Easy to weather - Implementation in the field is relatively long - Can not be used more than 2x - Only can be used within ± 4 months

Alternative Selection Analysis:-

Alternative selection in the ranking uses the Zero-One method so that poor alternatives will be eliminated automatically. For the determination of Zero-One looking for the weight of researchers using primary data in the form of interviews with site managers can be seen in table 5. For the zero-one method looking for an index can be seen in table 6-9. From the results of searching for weights and searching for indexes, an evaluation matrix can be made that functions as a ranking. The evaluation matrix can be seen in table 10.

Tabel 5:-Zero-One looking for weight method

No	Criteria	Criteria Number	1	2	3	4	Total	Ranking	Weight
1	Ease of Implementation	1	X	0	0	0	0	1	10,00
2	Financing	2	1	X	1	1	3	4	40,00
3	Time	3	1	0	X	1	2	3	30,00
4	Quality	4	0	0	1	X	1	2	20,00
							Total	10	100,00

Tabel 6:-The Zero-One Method Looks for the Ease of Implementation Criteria Index

Function	A	B	C	D	Total	Index
A	X	X	1	1	2	0,40
B	X	X	1	1	2	0,40
C	0	0	X	1	1	0,20
D	0	0	0	X	0	0,00
				Total	5	

Tabel 7:-The Zero-One Method Looking for a Financing Criteria

Function	A	B	C	D	Total	Index
A	X	0	0	1	1	0,17
B	1	X	1	1	3	0,50
C	1	0	X	1	2	0,33
D	0	0	0	X	0	0,00
				Total	6	

Tabel 8:- The Zero-One Method Searches for the Time Criteria Index

Function	A	B	C	D	Total	Index
A	X	0	1	1	2	0,33
B	1	X	1	1	3	0,50
C	0	0	X	1	1	0,17
D	0	0	0	X	0	0,00
				Total	6	

Tabel 9:- The Zero-One Method Looking for a Quality Criteria Index

Function	A	B	C	D	Total	Index
A	X	X	X	1	1	0,33
B	X	X	X	1	1	0,33
C	X	X	X	1	1	0,33
D	0	0	0	X	0	0,00
				Total	3	

Tabel 10:-Matriks Evaluasi

No	Fungtion		Criteria				Total
			1	2	3	4	
	Weight		10,00	40,00	30,00	20,00	
1	A	I =	0,33	0,00	0,20	0,00	9,33
		B x I =	3,33	0,00	6,00	0,00	
2	B	I =	0,33	0,33	0,60	0,00	34,67
		B x I =	3,33	13,33	18,00	0,00	
3	C	I =	0,33	0,50	0,20	0,00	29,33
		B x I =	3,33	20,00	6,00	0,00	
4	D	I =	0,00	0,17	0,00	0,00	6,67
		B x I =	0,00	6,67	0,00	0,00	

Development Phase:-
Because the work of the Beams has been planned to hold the load strong, it does not require operational and maintenance costs. For this reason, calculation is not carried out at this stage.

Recommendation Phase:-
The final stage in carrying out value engineering is to provide recommendations on the results of studies that have been conducted.

Preliminary Design:-
Beam Structure Work with Scafolding Frame

Recommended:-

Alternative Beam Structure Work 1 (Beam Work Implementation Using Scafolding PCH)
1. Requires a work fee of Rp. 1,711,1010,783, so that a cost savings of Rp. 157,675,945.
2. Uninstall Scafolding PCH faster because the support uses vertical support (which is more flexible than the scafolding frame)

Conclusions:-

From the value engineering analysis (VE) conducted on the Kenjeran gold plant construction project conclusions can be taken as follows:

The application of value engineering analysis on the beam produces 3 alternatives, namely the implementation of beam work using PCH scafolding, scafolding pipes and bamboo scaffolding. then obtained alternative work 1 (scafolding PCH) as the best alternative, because this alternative has a high total value in the evaluation matrix table of 34.67.

From the application of the value engineering analysis, the recommendations are in the form of replacing the existing beam structure work with alternative 1 which has a work cost of Rp. 1,711,110,783 so as to generate savings as much as Rp. 157,675,945 or as large as 8.44% of the total cost of the beam structure work and has a percentage of savings of 1.54% of the total project cost.

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