The Value Analysis Of Bca Branch Office Project In Malang

Hernawan Budisampurno, Kustamar, Tiong Iskandar

Abstract: The object of research is on concrete structure , new 6 story branch office in Malang on 2695 square metre area, owned by Bank Central Asia . The aim of this research are namely: 1) to analyze the type of right structure on the object in accordance with the reviewed aspects, 2) to determine the amount of cost saving and its percentage after value engineering to be applied. This research examines how to obtain optimal structure alternatives by apllying Value engineering, in an effort to obtain chosen effective , stabil and optimal type of structure but it is still in good quality. On the preparation before researching is to collect or even to search data in relevance with project, both from owner and consultant as well. After that to survey and observe the location of project to obtain the general condition on site.

Index Terms: Concrete structure, Branch Office , Project

1 INTRODUCTION

In order to face the challenge of ASEAN Economic community which was proclaimed 2 years ago, some other national bank vying to expand abroad by opening new office. [1]. However, PT. Bank Central Asia, Tbk (to be abbreviated to BCA) choose another method namely to strengthen the domestic market among other thing is to build new branch office in Malang, beside to recruit more human resources and to add more infrastructure such both automated teller machine (ATM) also cash deposit machine and to strengthen mobile and internet banking as well [2]. This new building is on 2695 square metre in Malang and is designed 6-story reinforced concrete structure. From the development of Bill of Quantity, the labour wages is obtained from the project and the price of material is obtained on building stores in Malang and in website store on internet until the total cost of project is Rp. 25.679.098.797,-. Meanwhile the allocation cost of structure is Rp. 14.991.885.338,- or 58% of total cost of project, which is the most amount portion of all project. This fact emerges the creativity so there are questions, such what type right stucture in accordance with reviewed aspect on this project. After, the right structure is founded , still there is question how much the right dimention both coloumn and beam can sustain the functional load but still consider workability and quality of this building, [3]. The purpose of this research is to apply value engineering both theoretical and practical to find the right structure which is more saving but still can sustains the functional load both gravitational and lateral load.

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Meanwhile the aim of this research are namely: 1) to analyze the type of right structure on the object in accordance with the reviewed aspects, 2) to determine the amount of cost saving and its percentage after value engineering to be applied.

2 RESEARCH METHOD

This research examines how to get the more optimum alternative by applying the Value Engineering especially in concrete work and determines the saving cost on it in an effort to get effective , efficient, and stabil structure, but it is still in good quality. [4;5;6]

3 RESULT AND DISCUSSION

3.1 The Calculation of Cost Estimation Before VE to be applied

The calculation of Cost Estimation Before VE to be applied, is taken from Budget Plan of BCA Branch Office Building Project in Malang. It includes the calculation of unit price:

Table 1. *Unit price 1m3 Concrete work Grade 25 according to Budget Plan*

Description	Unit	Coefficient	Unit Price (Rp.)	Total (Rp.)
Material :				
Portland Cement	Kg	413	1,300	536,900
Sand	M3	0.681	200,000	136,600
Gravel size 2/3 cm	M3	0.704	235,000	165,440
Water	Liter	215	10	2,150
Wages of labour :				
Unskilled labour	Manday	1.650	60,000	99,000
Skilled labour	Manday	0.275	75,000	20,625
Senior skilled labour	Manday	0.028	85,000	2,380
Foreman	Manday	0.083	100,000	8,300
Total Unit Price (Rp.)				970,995

Table 2. *The Unit Price of 1 kg Re-Bar according to Budget Plan.*

Description	Unit	Coefficient	Unit Price (Rp.)	Total Unit Price (Rp.)
Material :				
Re-Bar FY 40	Kg	1.050	9,500	9,975
Re-Bar Tie Wire	Kg	0.015	15,000	225
Wages of labour :				
Unskilled labour	Manday	0.007	60,000	420
Skilled Labour	Manday	0.007	75,000	525
Senior skilled labour	Manday	0.0007	85,000	60
Foreman	Manday	0.0004	100,000	40
Total Unit Price (Rp.)				11,245

Table 3. *Unit price 1m2 form work of beam according to Budget Plan*

Description	Unit	Coefficient	Unit Price (Rp.)	Total Unit Price(Rp.)
Material:				
Meranti Timber size 5/7 cm	M3	0.040	3,700,000	148,000
Nail 2"-5"	Kg	0.400	15,000	6,000
Lubricant of Formwork	Liter	0.200	17,000	3,400
Meranti Timber size 8/12	M3	0.018	3,700,000	66,600
Triplex 4'x8' thick. 9 mm	Sheet	0.035	95,000	33,250
Dolken timber ϕ 8/400 cm	Piece	2.000	25,000	50,000
Total Unit Price for 3 x usage				307,2
Total Unit Price for 1 x usage				102,416
The wages of Labour :				
Unskilled Labour	Manday	0.660	60,000	39,600
Skilled Labour/Carpenter	Manday	0.330	80,000	26,400
Senior skilled labour	Manday	0.033	90,000	2,970
Foreman	Manday	0.033	100,000	3,300
Total Unit Price				148,286

Table 4. *The Volume of All Beam according to Budget Plan*

	Concrete (kg)	Re-Bar (m²)	Form work (m²)
Basement	35.94	4,878.14	179.71
Ground Floor	253.25	47,887.04	1675.10
First Floor	110.79	23,065.37	711.30
Second Floor	123.65	26,790.10	790.45
Third Floor	102.95	19,491.52	673.12
Fourth Floor	102.95	19,491.52	673.12
Fifth Floor	102.95	19,491.52	673.12
Sixth Floor/ Roof	94.16	16,478.71	607.75
Total volume	**926.64**	**177,573.92**	**5,983.67**

Table 5. *The Total Cost of Installed Beam before VE to be applied:*

Description Of Beam	Unit	Volume	Unit Price (Rp.)	Total (Rp.)
Concrete Grade 25	M3	926.64	1,045,490	968,792,853
Re-Bar	Kg	177,573.92	11,245	1,996,818,730
Form Work	M2	5983.67	126,506	756,970,157
Total Cost of Installed Beam				3,722,581,740

3.2 The choice of Beam Concrete based on Alternative 1 : Reinforced Concrete Structure

Table 6. *Volume of Concrete*

Floor		Dimention (m)		Length of Beam	Quantity of Beam	Volume Of Concrete
		width	height			
Basement	X Axis Direction	0.3	0.7	9.25	5	9.71
		0.3	0.7	10.85	5	11.39
		0.3	0.7	7.0	2	2.94
		0.3	0.7	9.4	5	9.87
	Y Axis Direction	0.3	0.7	10.0	15	31.50
		0.3	0.7	9.0	10	18.90
		0.3	0.7	5.0	5	5.25
Ground Floor	X Axis Direction	0.3	0.7	7.0	10	14.70
		0.3	0.7	9.4	4	7.896
	Y Axis Direction	0.3	0.7	10.0	15	31.50
		0.3	0.7	9.0	3	5.67
		0.3	0.7	5.0	4	4.20
First Floor	X Axis Direction	0.3	0.7	7.0	12	17.64
		0.3	0.7	9.4	6	11.844
	Y Axis Direction	0.3	0.7	10.0	15	31.50
		0.3	0.7	9.0	8	15.12
		0.3	0.7	5.0	4	4.20
Second Floor	X Axis Direction	0.3	0.7	7.0	13	19.11
		0.3	0.7	9.4	6	11.844
	Y Axis Direction	0.3	0.7	10.0	15	31.50
		0.3	0.7	9.0	8	15.12
		0.3	0.7	5.0	4	4.20
Third Floor	X Axis Direction	0.3	0.7	7.0	11	16.17
		0.3	0.7	9.4	5	9.87
	Y Axis Direction	0.3	0.7	10.0	15	31.50
		0.3	0.7	9.0	8	15.12
		0.3	0.7	5.0	4	4.20
Fourth Floor	X Axis Direction	0.3	0.7	7.0	10	14.70
		0.3	0.7	9.4	5	9.87
	Y Axis Direction	0.3	0.7	10.0	15	31.50
		0.3	0.7	9.0	8	15.12
		0.3	0.7	5.0	5	9.87
Fifth Floor	X Axis Direction	0.3	0.7	7.0	11	16.17
		0.3	0.7	9.4	5	9.87
	Y Axis Direction	0.3	0.7	10.0	15	31.50
		0.3	0.7	9.0	8	15.12
		0.3	0.7	5.0	4	4.20
Sixth Floor/ Roof	X Axis Direction	0.3	0.7	7.0	11	16.17
		0.3	0.7	9.4	6	11.844
	Y Axis Direction	0.3	0.7	10.0	15	31.50
		0.3	0.7	9.0	8	15.12
		0.3	0.7	5.0	4	4.20
Total Volume of Concrete (m3)						704.61

The Volume of Beam (Basement Floor)
Line A, B, C and line 1,2,3,4 =(2x0.3 x 0.7 x 28) + (2x0.3 x 0.7 x 25.6)+(4 x 15 x 0.3 x 0.7)= 11.76 + 10.75 + 12.60 = 35.11 m³. Line I and line 1,2,3,4 = (4 x 0,3 x 0.7 x 18.65) + (0.3 x 0.7 x 10.85) + (0.3 x 0.7 x 6 x 8) = 15.67 + 2.28 + 10.08 = 28.03 m³

The Volume of Beam(Ground Floor)
Line A,B,C and line 1,2,3,4 = (3x0.3x0.7x28) +(12x5x0.25x0.5) + (8x0.3x0.7x 5.35) + (7x3.5x0.3x0.5)= 17.64 + 7.5 + 8.99 = 34.13 m³. Line I and line 1,2,3,4 = (4 x 0.3 x 0.7 x 18.65) + (0.3 x 0.7 x 10.85) + (0.3 x 0.7 x 6 x 8) = 15.67 + 2.28 + 10.08 = 28.03 m³

The Volume of Beam (Drop Off Floor)
Line B , C dan line 3 , 4 = (2 x 21.7 x 0.3 x 0.7) + {(6.7+5.595) x (0.3 x 0.7)}+ (4 x 6 x 0.3 x 0.5) = 9.11 + 2.58 + 3.6 = 15.29 m³. Total volume of Beam after VE to be applied = 704.61 + 35.11 + 28.03 + 34.13 + 28.03 + 15.29 = 845.2 m³. The calculation of structure Bending Moment is aided by Program SAP2000, determines that required area of Re-Bar A= 9.509 cm² (for span L = 7,0 m), then To apply Re-Bar 3D25 = 3 x 4.906 = 14.718 cm²> A While for span L= 9,4 m Arequired=13.014 cm², then To apply Re-Bar 4D25=19.624 cm²> Arequired.

Table 7. *Volume of Re-Bar*

Floor		Diameter (m)	Area of Re-Bar	The Length of Re-Bar	Beam (Nos)	Re-Bar (Nos)	Volume Of Re-Bar (kg)
Basement	X Axis Direction	0.025	0.0004906	9.25	5	4	712.47
		0.025	0.0004906	10.85	5	4	835.71
		0.025	0.0004906	7.0	2	3	161.75
		0.025	0.0004906	9.4	5	4	724.03
	Y Axis Direction	0.025	0.0004906	10.0	15	4	2310.73
		0.025	0.0004906	9.0	10	4	1386.44
		0.025	0.0004906	5.0	5	3	288.84
Ground Floor	X Axis Direction	0.025	0.0004906	7.0	10	3	808.75
		0.025	0.0004906	9.4	4	4	579.22
	Y Axis Direction	0.025	0.0004906	10.0	15	4	2310.74
		0.025	0.0004906	9.0	3	4	415.93
		0.025	0.0004906	5.0	4	3	231.07
First Floor	X Axis Direction	0.025	0.0004906	7.0	12	3	970.50
		0.025	0.0004906	9.4	6	4	868.83
	Y Axis Direction	0.025	0.0004906	10.0	15	4	2310.73
		0.025	0.0004906	9.0	8	4	1109.15
		0.025	0.0004906	5.0	4	3	231.07
Second Floor	X Axis Direction	0.025	0.0004906	7.0	13	3	1051.38
		0.025	0.0004906	9.4	6	4	868.83
	Y Axis Direction	0.025	0.0004906	10.0	15	4	2310.73
		0.025	0.0004906	9.0	8	4	1109.15
		0.025	0,0004906	5.0	4	3	231.07
Third Floor	X Axis Direction	0.025	0.0004906	7.0	11	3	889.63
		0.025	0.0004906	9.4	5	4	724.03
	Y Axis Direction	0.025	0.0004906	10.0	15	4	2310.73
		0.025	0.0004906	9.0	8	4	1109.15
		0.025	0.0004906	5.0	4	3	231.07
Fourth Floor	X Axis Direction	0.025	0.0004906	7.0	10	3	808.75
		0.025	0.0004906	9.4	5	4	724.03
	Y Axis Direction	0.025	0.0004906	10.0	15	4	2310.73
		0.025	0.0004906	9.0	8	4	1109.15
		0.025	0.0004906	5.0	5	3	288.84
Fifth Floor	X Axis Direction	0.025	0.0004906	7.0	11	3	889.63
		0.025	0.0004906	9.4	5	4	724.03
	Y Axis Direction	0.025	0.0004906	10.0	15	4	2310.73
		0.025	0.0004906	9.0	8	4	1109.15
		0.025	0.0004906	5.0	4	3	231.07
Sixth Floor/Roof	Arah x	0.025	0.0004906	7.0	11	3	889.63
		0.025	0.0004906	9.4	6	4	868.83
	Arah y	0.025	0.0004906	10.0	15	4	2310.73
		0.025	0,0004906	9,0	8	4	1109.15
		0.025	0.0004906	5.0	4	3	231.07
Total Volume of Re-Bar (kg)							43007.23

Table 8. *Volume of Re-Bar (Compressive Area)*

Floor		Diame-ter (m)	Area of Re-Bar	The Length of Re-Bar	Quantity of Beam (Nos)	Re-Bar (Nos)	Volume Of Re-Bar (kg)
Basement	X Axis Direction	0.025	0.0004906	9.25	5	2+1	534.36
		0.025	0.0004906	10.85	5	2+1	626.78
		0.025	0.0004906	7.0	2	2+1	161.75
		0.025	0,0004906	9.4	5	2+3	905.03
	Y Axis Direction	0.025	0.0004906	10.0	15	2+3	2888.41
		0.025	0,0004906	9.0	10	2+3	1733.04
		0.025	0.0004906	5.0	5	2	192.56
Ground Floor	X Axis Direction	0.025	0.0004906	7.0	10	2+1	808.75
		0.025	0.0004906	9.4	4	2+3	724.03
	Y Axis Direction	0.025	0.0004906	10.0	15	2+3	2888.41
		0.025	0.0004906	9.0	3	2+3	519.91
		0.025	0.0004906	5.0	4	2	154.05
First Floor	X Axis Direction	0.025	0.0004906	7.0	12	2+1	970.50
		0.025	0.0004906	9.4	6	2+3	1086.04
	Y Axis Direction	0.025	0.0004906	10.0	15	2+3	2888.41
		0.025	0.0004906	9.0	8	2+3	1386.44
		0.025	0.0004906	5.0	4	2	154.05
Second Floor	X Axis Direction	0.025	0.0004906	7.0	13	2+1	1051.38
		0.025	0.0004906	9.4	6	2+3	1086.04
	Y Axis	0.025	0.0004906	10.0	15	2+3	2888.41

	Direction	0.025 0.025	0.0004906 0.0004906	9.0 5.0	8 4	2+3 2	1386.44 154.05
Third Floor	X Axis Direction	0.025 0.025	0.0004906 0.0004906	7.0 9.4	11 5	2+1 2+3	88.,63 905.03
	Arah y	0.025 0.025 0.025	0.0004906 0.0004906 0.0004906	10.0 9.0 5.0	15 8 4	2+3 2+3 2	2888.41 1386.44 154.05
Fourth Floor	X Axis Direction	0.025 0.025	0.0004906 0.0004906	7.0 9.4	10 5	2+1 2+3	808.75 905.03
	Y Axis Direction	0.025 0.025 0.025	0.0004906 0.0004906 0.0004906	10.0 9.0 5.0	15 8 5	2+3 2+3 2	2888.41 1386.44 192.56
Fifth Floor	X Axis Direction	0.025 0.025	0.0004906 0.0004906	7.0 9.4	11 5	2+1 2+3	889.63 905.03
	Y Axis Direction	0.025 0.025 0.025	0.0004906 0.0004906 0.0004906	10.0 9.0 5.0	15 8 4	2+3 2+3 2	2888.41 1386.44 154.05
Sixth Floor/Roof	X Axis Direction	0.025 0.025	0.0004906 0.0004906	7.0 9.4	11 6	2 2+2	593.09 868.83
	Y Axis Direction	0.025 0.025 0.025	0.0004906 0.0004906 0.0004906	10.0 9.0 5.0	15 8 4	2+2 2+2 2	2310.73 1109.15 154.05
Total Volume of Re-Bar (kg)							4,8852.98

Since Stirrup D13-200 is installed along beam (30/70) cm per linier meter, so the weight is 1.85 m x 5 x 1.01 kg = 9.34 kg/m'. In case, total length of beam is 343.3 m, so total weight of stirrup is 343.3 x 9.34 = 3,206 kg. The support face of reinforcement D13 per linier meter is 2 x 0.0001290 x 7850 = 2.02 kg/m'. The total length of beam is 343.3 m, so the total weight is = 343.3 x 2.02 = 693.47 kg.

Volume of Concrete (Basement)

Line A, B, C and line 1,2,3,4 =(2x0.3 x 0.7 x 28) + (2x0.3 x 0.7 x 25.6)+(4 x 15 x 0.3 x 0.7)= 11.76 + 10.75 + 12.60 = 35.11 m³. Line I dan line 1,2,3,4 = (4 x 0.3 x 0.7 x 18.65) + (0.3 x 0.7 x 10.85) + (0.3 x 0.7 x 6 x 8) = 15.67 + 2.28 + 10.08 = 28.03 m³

Volume of Concrete (Ground Floor)

Line A,B,C and line 1,2,3,4 = (3x0.3x0.7x28) + (12x5x0.25x0.5) + (8x0.3x0.7x5.35)+(7x3.5x0.3x0.5)= 17.64 + 7.5 + 8.99 = 34.13 m³. Line I dan line 1,2,3,4 = (4 x 0.3 x 0.7 x 18.65) + (0.3 x 0.7 x 10.85) + (0.3 x 0.7 x 6 x 8) = 15.67 + 2.28 + 10.08 = 28.03 m³

Volume of Concrete (Drop off Floor)

Line B , C and line 3 , 4 = (2 x 21.7 x 0.3 x 0.7) + {(6.7+5.595) x (0.3 x 0.7)}+ (4 x 6 x 0.3 x 0.5) = 9.11 + 2.58 + 3.6 = 15.29 m³. Total volume of Concrete after VE to be applied = 704.61 + 35.11 + 28.03 + 34.13 + 28.03 + 15.29 = 845.2 m³. Total weight of Re-Bar after VE to be applied = 43007.23 + 48852.98 + 3206 + 639.47 = 95705.68 kg.

Table 9. *Volume of Form Work of Beam*

Floor		Dimention (m) b width	Dimention (m) h height	The length of Beam	Beam (Nos)	Volume of Form Work (m²)
Basement	X Axis Direction	0.3 0.3 0.3 0.3	0.7 0.7 0.7 0.7	9.25 10.85 7.0 9.0	5 5 2 5	5x(10.73+2.78)=67.55 5x(12.59+3.26)=79.25 2x(8.12+2.1) =20.44 5x(10.44+2.7) =65.7
	Y Axis Direction	0.3 0.3 0.3	0.7 0.7 0.7	10.0 9.0 5.0	15 10 5	15x(11.6+3)=219 10x(10.44+2.7)=131.4 5x(5.8+1.5)=14.6
Ground Floor	X Axis Direction	0.3 0.3 0.3	0.7 0.7 0.7	7.0 9.4 10.0	10 4 15	10x(8.12+2.1)=102.2 4x(5.45+2.82)=33.08 15x(11.6+3)=219
	Arah y	0.3 0.3	0.7 0.7	9.0 5.0	3 4	3x(10.44+2.7)=39.42 4x(5.8+1.5)=29.2
First Floor	X Axis Direction Y Axis	0.3 0.3 0.3 0.3 0.3	0.7 0.7 0.7 0.7 0.7	7.0 9.4 10.0 9.0 5.0	12 6 15 8 4	12x(8.12+2.1)=242.64 6x(10.9+2.82)=82.32 15x(11.6+3)=219 8x(10.44+2.7)=105.12 4x(5.8+1.5)=29.2
Second Floor	X Axis Direction Y Axis Direction	0.3 0.3 0.3 0.3 0.3	0.7 0.7 0.7 0.7 0.7	7.0 9.4 10.0 9.0 5.0	13 6 15 8 4	13x(8.12+2.1)=132.86 6x(10.9+2.82)=82.32 15x(11.6+3)=219 8x(10.44+2.7)=105.12 4x(5.8+1.5)=29.2
Third Floor	X Axis Direction Y Axis Direction	0.3 0.3 0.3 0.3	0.7 0.7 0.7 0.7	7.0 9.4 10.0 9.0	11 5 15 8	15x(8.12+2.1)=153.3 5x(10.9+2.82)=68.6 15x(11.6+3)=219 8x(10.44+2.7)=105.12

		0.3	0.7	5.0	4	4x(5.8+1.5)=29.2
Fourth Floor	X Axis Direction	0.3	0.7	7.0	10	10x(8.12+2.1)=102.2
		0.3	0.7	9.4	5	5x(10.9+2.82)=68.6
	Y Axis Direction	0.3	0.7	10.0	15	15x(11.6+3)=219
		0.3	0.7	9.0	8	8x(10.44+2.7)=105.12
		0.3	0.7	5.0	5	5x(5.8+1.5)=36.5
Fifth Floor	X Axis Direction	0.3	0.7	7.0	11	15x(8.12+2.1)=153.3
		0.3	0.7	9.4	5	5x(10.9+2.82)=68.6
	Y Axis Direction	0.3	0.7	10.0	15	15x(11.6+3)=219
		0.3	0.7	9.0	8	8x(10.44+2.7)=105.12
		0.3	0.7	5.0	4	4x(5.8+1.5)=29.2
Sixth Floor/Roof	X Axis Direction	0.3	0.7	7.0	11	15x(8.12+2.1)=153.3
		0.3	0.7	9.4	6	6x(10.9+2.82)=82.32
	Y Axis Direction	0.3	0.7	10.0	15	15x(11.6+3)=219
		0.3	0.7	9.0	8	8x(10.44+2.7)=105.12
		0.3	0.7	5.0	4	4x(5.8+1.5)=29.2
Total Volume of Form Work (m2)						4538.42

3.3 Cost Estimation of Coloumn before VE to be applied

Cost Estimation of Coloumn before VE to be applied is according to Budgetting of BCA Branch Office Project in Malang as below:

Table 10. *The unit price 1m3 concrete Grade G-25*

Description	Unit	Coefficient	Unit Price (Rp.)	Total Unit Price (Rp.)
Material :				
Portland Cement	Kg	413	1,300	536,900
Sand	M3	0.681	200,000	136,200
Gravel size 2/3 cm	M3	0.704	235,000	165,440
Water	Liter	215	10	2,150
Labour-wages:				
Unskilled Labour	Manday	1.650	60,000	99,000
Skilled labour	Manday	0.275	75,000	20,625
Senior skilled labour	Manday	0.028	85,000	2,380
Foreman	Manday	0.083	100,000	8,300
Total Unit Price				970,995

Table 11. *The Unit price of Re-Bar*

Description	Unit	Coefficient	Unit Price (Rp.)	Total Unit Price (Rp.)
Material :				
Re-Bar	Kg	1.050	9,500	9,975
Re-Bar Tie Wire	Kg	0.015	15,000	225
Labour-wages :				
Unskilled labour	Manday	0.007	60,000	420
Skilled labour	Manday	0.007	75,000	525
Senior skilled labour	Manday	0.001	85,000	60
Foreman	Manday	0.0004	80,000	40
Total Unit Price				11,245

Table 12. *The unit price of Form-work*

Description	Unit	Coefficient	Unit Price (Rp.)	Total Unit Price (Rp.)
Material :				
Timber size 5/7 cm	M3	0.040	3,700,000	148,000
Nail size 5 – 7 cm	Kg	0.400	15,000	6,000
Lubricant oil	Liter	0.200	17,000	3,400
Timber size 8/12 cm	M3	0.015	3,700,000	55,500
Triplex 4x8 ft 9mm	Sheet	0.035	95,000	33,250
Timber Ø 8-10/400 cm	Piece	2.000	25,000	50,000
Total unit price 1x usage				368,420
3 x usage				122,807
Labour wages :				
Unskilled labour	Manday	0.660	60,000	39,600
Skilled labour	Manday	0.330	80,000	26,400
Senior skilled labour	Manday	0.033	90,000	2,970
Foreman	Manday	0.033	100,000	3,300
Total Unit Price				195,007

Table 13. *Volume of Form-work of coloumn*

	Concrete (kg)	Re-Bar (m²)	Form-work (m²)
Basement	59.47	21334.27	457.88
Ground Floor	39.94	12726.08	264.27
First floor	52.78	13188.14	365.15
Second Floor	45.17	10230.1	299.15
Third Floor	44.63	10096.64	293.75
Fourth Floor	44.63	10096.64	293.75
Fifth floor	44.63	10096.64	293.75
Sixth floor/ Roof	1.32	330	40.04
Total volume	332.57	88098.51	2307.74

Table 14. *The Total Cost of Coloumn*

Description	Unit	Volume	Unit Price (Rp.)	Total (Rp.)
Concrete Grade 25	M3	332.57	970,995	322,923,807
Re-Bar	Kg	88098.51	11,245	990,667,745
Form-work	M2	2307.74	195,007	450,025,454
Total Cost of Coloumn				1,763,617,006

3.4 The Chosen coloumn based on Alternative 1 after VE to be applied: Conrete Structure

Table 15. *The Volume of Coloumn concrete size 60/60 cm after VE to be applied*

Floor	Dimention (m)		The length of Coloumn (m)	Quantity Of Coloumn (Nos)	Volume of concrete (m3)
	b width	h height			
Basement	0.60	0.60	3.6	20	25.92
	0.40	0.40	3.6	28	16.13
Ground Floor	0.60	0.60	3.6	20	25.92
	0,40	0,40	3,6	28	16,13
First Floor	0.60	0.60	5.0	20	36
Second Floor	0.60	0.60	4.5	20	32.4
Third Floor	0.60	0.60	4.5	20	32.4
Fourth Floor	0.60	0.60	4.5	20	32.4
Fifth Floor	0.50	0.50	4.5	20	22.5
Total Volume of Concrete (m3)					239.80

Table 16. *Volume of Re-Bar of Coloumn, still used D25 but less quantity*

Floor	Diam. D25 (m)	Area of Re-Bar (cm2)	The length of Re-bar (m)	Quantity of Coloumn (Nos)	Quantity of Re-Bar (Nos)	Volume of Re-Bar (kg)
Basement	0.025	0.000490625	3.6	20	8	2,218.30
Ground Floor	0.025	0.000490625	3.6	20	8	2,218.30
First Floor	0.025	0.000490625	5.0	20	8	3,080.97
Second Floor	0.025	0.000490625	4.5	20	8	2,772.87
Third Floor	0.025	0.000490625	4.5	20	8	2,772.87
Fourth Floor	0.025	0.000490625	4.5	20	8	2,772.87
Fifth Floor	0.025	0.000490625	4.5	20	8	2,772.87
Total Volume of Re-Bar (kg)						18,609.04

Table 17. *The Volume of Form-work of Coloumn*

Floor	Dimention (m)		The length of coloumn (m)	Quantity of coloumn (Nos)	Volume of Form-work (m²)
	b width	h height			
Basement	0.60	0.60	3.6	20	172.8
Ground Floor	0.60	0.60	3.6	20	172.8
First Floor	0.60	0.60	5	20	240
Second Floor	0.60	0.60	4.5	20	216
Third Floor	0.60	0.60	4.5	20	216
Fourth Floor	0.60	0.60	4.5	20	216
Fifth Floor	0.50	0.50	4.5	20	216
Total Volume of form-work (m2)					1,449.60

3.5 The step of Development

This step is to calculate the cost of the chosen alternative structure both coloumn and beam as well. Then to compare the cost before VE to be applied to the one after VE to be apllied, as following table below :

Table 18. *The Cost of Beam after VE to be applied*

Description	Unit	Volume	Unit Price (Rp.)	Total Cost (Rp.)
Concrete Grade 25	M3	845.2	1,045,490	883,648,148
Re-Bar	Kg	95,705.68	11,245	1,076,210,372
Form Work	M2	4,538.42	126,506	574,137,360
Total Cost of Beam after VE to be applied				2,533,995,880

Tabel 19. *The Comparasion of Cost of All Beam, Before and After Value Engineering to be applied*

Item Of Work	Cost of All Beam Before VE	Cost of All Beam After VE	Cost Saving (Rp.)	Percentage %
All Beam	3,722,581,740	2,533,995,880	1,188,585,860	31.93

Table 20. *The cost of coloumn after VE to be apllied*

Description	Unit	Volume	Unit Price (Rp.)	Total Cost (Rp.)
Concrete Grade 25	M3	239.80	970,995	232,844,601
Re-Bar	Kg	18609.04	11,245	209,258,655
Form work	M2	1449.60	195,007	282,682,147
Total Cost of coloumn after VE to be applied				724,785,403

Table 21. *The comparation of cost of Coloumn before and after Value Engineering to be applied:*

Item 0f Work	Cost of Coloumn Before VE	Cost of Coloumn After VE	Saving Cost (Rp.)	In percentage (%)
Coloumn	1,763,617,006	724,785,403	1,038,831,603	58.9

3.6 The Step of Recommendation.

This step is the final step process of Value Engineering, contains of preparation and presentation of conclusion of Value Engineering to whom it may concern. The report only explains facts and information to support argumentation. All various technical aspects and cost before to be compared to after Value Engineering to be applied, is described clearly. Thus, the final report contains as follow:

a. Identiy of Project.
b. The explanation of respectively component and the whole component before and after Value Engineering to be applied.
c. The proposed changed design.
d. The alteration of Cost
e. Total of Cost Saving will be obtained.

Table 22. *The Proposal of Primary Beam*

Project : BCA Branch Office Building Location : Jl. Terusan Borobudur 30 , Malang Item of Work: Beam	
The Planning : The Primary Beam : L : 7.0 m dimention 40/80 cm L : 9.4 m dimention 40/80 cm L : 7.0 m dimention 40/80 cm The Secondary Beam : L : 10.0 m dimention 40/80 cm Concrete Grade G-25 Diameter of Re-Bar : D25 Re-Bar FY 40	The Proposal : The Primary Beam : L : 7.0 m dimention 30/70 cm L : 9.4 m dimention 30/70 cm L : 7.0 m dimention 30/70 cm The secondary beam : L : 10.0 m dimention 30/70 cm Concrete Grade G-25 Diameter of Re-Bar : D25 Re-Bar FY 40
Reason : - To form Reinforced Concrete is easy as almost any desired shape. Both To obtain the materials itself and to maintain concrete is easy as well. Resistant to hot temperature is high. And, it can sustain compressive strength highly. Cost : Cost before VE to be applied : Rp. 3,722,581,740 Cost after VE to be applied : Rp 2,533,995,880 Cost Saving : Rp. 1,188,585,860 Persentage of cost saving is as follow : = (Cost Saving/Cost before VE to be applied) x 100 % = (Rp. 1,188,585,860/ Rp3,722,581,740) x 100 % = 31.93 %	

Table 23. *The Proposal of Coloumn*

Project : BCA Branch Office Building **Lokasi : Jl. Terusan Borobudur 30, Malang** **Item : Pekerjaan Struktur Kolom**	
Rencana Awal : Kolom : L : 3,60 m dimensi 70/70 L : 5,0 m dimensi 70/70 L : 4,5 m dimensi 70/70 L : 4,5 m dimensi 70/70 (Atap) Concrete Grade 25 Diameter of Re-Bar : D25	Usulan : Kolom : L : 3,6 m dimensi 60/60 L : 5,0 m dimensi 60/60 L : 4,5 m dimensi 60/60 L : 4,5 m dimensi 50/50 (Atap) Concrete Grade 25 Diameter of Re-Bar : D25
Reason : - To form Reinforced Concrete is easy as almost any desired shape. Both To obtain the materials itself and to maintain concrete is easy as well. Resistant to hot temperature is high. And, it can sustain compressive strength highly. Biaya : Cost Before VE : Rp. 1,763,617,006 Cost After VE : Rp. 724,785,403 Cost Saving : Rp. 1,038,831,603 Persentage saving is : = (Cost Saving/Cost Before VE) x 100 % = (Rp. 1,038,831,603 / Rp. 1,763,617,006) x 100 % = 59.8 %	

Source : Calculation Sheet

5. CONCLUSION

After applying Value Engineering (VE) on BCA Branch Office Construction Building Project obtains the conclusion as follow below : The beam and coloumn structure are still same as before namely reinforced concrete but the dimentions are altered as follow below:

Primary Beam

Planning :	After VE :
Primary Beam :	Primary Beam :
L : 7.0 m dimention 40/80 cm	L : 7.0 m dimention 30/70 cm
L : 9.4 m dimention 40/80 cm	L : 9.4 m dimention 30/70 cm
L : 7.0 m dimention 40/80 cm	L : 7.0 m dimention 30/70 cm
Secondary Beam :	Secondary Beam :
L : 10.0 m dimention 40/80	L : 10.0 m dimention 30/70
Concrete Grade 25	Concrete Grade 25
Diameter of Re-Bar : D25	Diameter of Rebar : D25
Re-Bar FY 40	Re-Bar FY 40

Coloumn :

Planning :	After VE :
L : 3.6 m dimention 70/70 cm	L : 3.6 m dimention 60/60 cm
L : 5.0 m dimention 70/70 cm	L : 5.0 m dimention 60/60 cm
L : 4.5 m dimention 70/70 cm	L : 4.5 m dimention 60/60 cm
L : 4.5 m dimention 70/70 cm (Roof)	L : 4.5 m dimention 50/50 cm (Roof)
Concrete Grade G-25	Concrete Grade G-25
Diameter of Re-Bar : D25	Diameter of Re-Bar : D25
Re-Bar FY 40	Re-Bar FY 40

After the alteration of coloumn and beam dimention, the cost saving be obtained :
Primary Beam
Cost Before VE : Rp. 3,722,581,740,-
Cost After VE : Rp. 2,533,995,880,-
Cost Saving : Rp. 1,188,585,860,-

Percentage of saving :
= (Cost Saving/Before VE) x 100 %
= (Rp. 1,188,585,860/ Rp. 3,722,581,740) x 100 %
= 31.93 %
Coloumn
Cost Before VE : Rp. 1,763,617,006,-
Cost After VE : Rp. 724,785,403,-
Cost saving : Rp. 1,038,831,603,-
Persentage saving is :
= (Cost Saving /Cost Before VE) x 100 %
= (Rp. 1,038,831,603/ Rp. 1,763,617,006) x 100 %
= 59.8 %

6. SUGGESTION

For next researcher, the application of Value Engineering can be done on foundation , since the weight of building after Value Engineering to be applied is lighter than before.

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