Comparison Of Estimated Cost Of Estimation With Detailed Cost Estimation In Building Projects

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Abstract: There are two terms in cost estimation, namely estimated cost estimation with detailed cost estimation. Estimated cost estimates are made to obtain an approximate budget picture, while detailed cost estimates are made for contracts. The study was conducted on a 19-story building, starting with the estimated cost estimates calculated based on concrete ratios m3 / m2, iron kg / m3, m2 / m3 formwork, while detailed cost estimates were calculated based on detailed drawings and technical specifications. Making estimated cost estimates in three forms or types namely Block Plan Cost Estimate, Elemental Cost Estimate and Detailed Elemental Cost Estimate on detailed cost estimates. The results showed the contract value of the estimated detailed costs of Rp. 72 billion with a price per m2 of Rp. 1.507.506.76 / m2. The level of approach or accuracy of the estimated cost plan Block Estimate of the estimated cost of detail by 24%, Elemental Cost Estimate of the estimated cost of detail by 15%, Detailed Elemental Cost Estimate of the estimated cost of 4.4%.

Index Terms: estimated cost estimation, detailed cost estimates, cost estimates

1 INTRODUCTION

Costs are expenses to achieve the goals or benefits received. Cost is also the most important element when an initial idea or concept of a project starts to be assessed. For the project owner the cost will determine once whether a project can be implemented or not, while for contractors the success to get a project is determined one of them by the cost factor. Project costs are grouped into direct costs and indirect costs. Direct costs consist of materials, wages and equipment. Whereas indirect costs consist of overhead, unexpected costs and profits. Estimation is the process of predicting / estimating the cost and time to complete various deveriable projects. In the estimation of material, labor, equipment, time, money and others can be classified in two terms, namely estimated cost estimates and detailed cost estimates. Estimated cost estimates are generally made by project owners, developers and consultants with the aim of obtaining an approximate budget picture, while detailed cost estimates are made by contractors, subcontractors, suppliers for contractual purposes. Detailed cost estimates are also made by project owners, developers and consultants as a reference and guide for conducting tender evaluations (evaluating bid prices submitted by bidders). There is a difference between estimated cost estimates and detailed cost estimates. Estimated cost estimates begin to be prepared when the ideas and concepts of a project have been put forward by the project owner or developer. These detailed cost estimates will go through a phasing process during the design stage with an always updated estimate, while detailed cost estimates are made when the tender stage has begun and bill of quantities documents have been prepared. Detailed Cost Estimate is prepared or made based on a bill of quantities that has been equipped with a unit price and the total price of each piece of work. This research was conducted on a 19-story lecture building construction project in Jakarta with a total gross floor area of 47,787.58 m2 which has one semi-basement for parking, 1 floor for a public area, 18 floors for class, 1 floor for sports facilities.

This research is focused on:

1. The location used as research is the 19-story lecture building construction project at.
2. The work under study is structural work (concrete, iron, and formwork).
3. Calculation methods used are from Building Cost Consultants.
4. The aspects studied are in terms of cost estimates.

5. Analysis of the estimated unit price used in this study is the price that has been adjusted to the price prevailing at the time the project is in progress. Analysis of contract unit prices used in this study, namely the prices listed in the contract.

2 LITERATURE REVIEW

The project is a temporary activity that takes place in a limited period of time, with the allocation of certain resources with the aim of achieving goals. In managing a project, especially in the construction industry, the main target is the fulfillment of Time, Quality and Cost targets. Time or time is influenced by technical factors where technical factors are determined by how far the readiness is in the planning (design) and implementation (construction) stages, while non-technical factors are determined for example natural conditions, weather and soil geology which are sometimes difficult to predict (unpredictable). If this time is not in accordance with the planned time frame, it will have an impact on costs. The quality factor is not only determined by how good the quality and specifications of the materials, materials and equipment used, but also determined by the workmanship. Although good quality materials, materials and equipment are used, but if the implementation does not meet the specified requirements, the quality results will not be good and of course this will also affect the cost. In implementing a project, it is necessary to consider a risk factor, because this risk factor is something that cannot be avoided and will always be faced in implementing a project. One risk factor that is often encountered in implementing a project is cost or cost (cost plan). If this risk is not anticipated beforehand, it can result in losses and uneconomics in a project. Glenn M. Hardie from the British Columbia Institute of Tecnology in his book "Construction Estimating Technicques" provides the following definition of estimating: "The formation of approximate judgment or opinion regarding the value, amount, size, or weight of something. In construction parlance, an estimate is an expression of opinion or the prediction of the probable future cost of certain construction activities, usually based on some data having an acceptable degree of reliability ".

3 RESEARCH METHODOLOGY

Data related to the calculation method is the data obtained from the Building Cost Consultant. Secondary data collection: Project image of lower and upper structure work, quantity calculation methods, provisions of structural work ratios (concrete, steel and formwork), cost estimation format, unit price analysis analysis used in this study, namely prices that have been adjusted to the price prevailing at the time of the project, the analysis of the contract unit price used in this study is the price listed in the contract. After all the data is complete, then analyzed so that the results are obtained.

4 ANALYSIS AND DISCUSSION

1. Building Data

Table 1. *Gross Area Calculation.*

No.	Uraian	Parkir & podium	Tower (kelas)	Total
		m2	m2	m2
1	Lantai semi basement	6.769,68		6.769,68
2	Lantai 1	6.428,04		6.428,04
3	Lantai 2	2.206,68		2.206,68
4	Lantai 3		2.104,68	2.104,68
5	Lantai 4		2.173,22	2.173,22
6	Lantai 5		2.136,21	2.136,21
7	Lantai 6		2.136,56	2.136,56
8	Lantai 7		2.173,34	2.173,34
9	Lantai 8		2.102,99	2.102,99
10	Lantai 9		2.069,59	2.069,59
11	Lantai 10		2.073,40	2.073,40
12	Lantai 11		1.970,81	1.970,81
13	Lantai 12		1.905,85	1.905,85
14	Lantai 13		1.879,72	1.879,72
15	Lantai 14		1.747,61	1.747,61
16	Lantai 15		1.655,00	1.655,00
17	Lantai 16		1.602,93	1.602,93
18	Lantai 17		1.446,92	1.446,92
19	Lantai 18		1.332,49	1.332,49
20	Lantai 19		1.301,25	1.301,25
21	Lantai Atap		570,61	570,61
	TOTAL	**15.404,40**	**32.383,18**	**47.787,58**

2. Calculation of estimated cost

Block Plan Cost Estimate

Preparation is done when the idea or concept of a project has been put forward by the project owner (concept design stage). To get the total cost of a building, the unit price is multiplied by the total gross floor area (TGFA).

Table 2. *Volume calculation (BPCE).*

BLOCK PLAN COST ESTIMATE

Revisi : 0

No.	Uraian	Luas gross (TGFA)
		(m2)
1	Pekerjaan Struktur	47.787,58

Elemental Cost Estimate

Elemental Cost Estimate is still approximate. Generally in Elemental Cost Estimate, it has been stated for some parts of the work in general.

Table 3*. Volume Calculation (ECE) Retaining Wall Work.*

ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.1	STRUKTUR BAWAH			
	RETAINING WALL			
1	Beton fc 25 Mpa	Tebal 30 cm	m3	90,00
2	Besi beton (BJTP 24 & BJTD 40)	200 kg/m3	kg	1.800,00
3	Bekisting biasa		m2	600,00

Table 4. *Volume Calculation (ECE) Works of Pile cap and Tie beam.*

ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.1	STRUKTUR BAWAH			
	PILE CAP			
1	Beton fc 25 Mpa	0,035 m3/m2	m3	1.672,57
2	Besi beton (BJTP 24 & BJTD 40)	100 kg/m3	kg	167.257,00
3	Bekisting batako	0,90 m2/m3	m2	1.505,31
	TIE BEAM			
1	Beton fc 25 Mpa	0,007 m3/m2	m3	334,51
2	Besi beton (BJTP 24 & BJTD 40)	150 kg/m3	kg	50.176,50
3	Bekisting batako	5,50 m2/m3	m2	1.839,81

Table 5. *Volume Calculation (ECE) Basement slab work.*

ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.1	STRUKTUR BAWAH			
	PELAT BASEMENT			
1	Beton fc 25 Mpa	Tebal 25 cm	m3	1.692,42
2	Besi beton (BJTP 24 & BJTD 40)	110 kg/m3	kg	186.166,20
3	Bekisting biasa	Kell 329 m	m2	82,25

Table 6. *Volume Calculation (ECE) Earthwork.*

ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.1	STRUKTUR BAWAH			
	PEKERJAAN TANAH			
1	Galian tanah menggunkan alat termasuk buang tanah ke luar lokasi	s/d elv dibawah plat + pasir urug + lt kerja	m3	7.108,17
	Galian tanah menggunkan tenaga orang termasuk buang tanah ke luar lokasi	Pile cap dan tie beam	m3	2.007,08
2	Potong kepala tiang pancang	733 titik	bh	733,00
3	Anti rayap	dibawah plat + 1.000 mm kell	m2	7.098,69
4	Pasir urug	Tebal 100 mm	m3	676,97
5	Lantai kerja	Tebal 50 mm	m3	338,48
6	Waterproofing integral	Pelat dan dinding basement, pile cap, tie beam	m3	3.789,50

Table 7. *Volume Calculation (ECE) Upper Structure Work.*

ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.2	STRUKTUR ATAS			
	Beton fc 40 Mpa	0,36 m3/m2	m3	14.766,44
	Besi beton (BJTP 24 & BJTD 40)	160 kg/m3	kg	2.362.630,40
	Bekisting biasa	7,50 m2/m3	m2	110.748,30

Table 8. *Volume Calculation (DECE) Retaining Wall Work.*

DETAILED ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.1	STRUKTUR BAWAH			
	RETAINING WALL			
1	Beton fc 30 Mpa	Tebal 30 cm	m3	90,00
2	Besi beton (BJTP 24 & BJTD 40)	200 kg/m3	kg	18.000,00
3	Bekisting biasa		m2	600,00

Detailed Elemental Cost Estimate

Detailed Elemental Cost Estimate is made during schematic design. In the concept can be known TGFA, plan and elevation, section including outline specifications. In this cost estimate system the calculation is more accurate than the Estimate Cost Plan Block.

Table 9. *Volume Calculation (DECE) Pile cap and tie beam Work.*

DETAILED ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.1	STRUKTUR BAWAH			
	PILE CAP			
1	Beton fc 30 Mpa	0,035 m3/m2	m3	1.672,57
2	Besi beton (BJTP 24 & BJTD 40)	100 kg/m3	kg	167.257,00
3	Bekisting batako	0,9 m2/m3	m2	1.505,31
	TIE BEAM (PODIUM)			
1	Beton fc 25 Mpa	0,007 m3/m2	m3	107,83
2	Besi beton (BJTP 24 & BJTD 40)	150 kg/m3	kg	16.174,50
3	Bekisting batako	5,5 m2/m3	m2	593,07
	TIE BEAM (TOWER)			
1	Beton fc 40 Mpa	0,007 m3/m2	m3	226,68
2	Besi beton (BJTP 24 & BJTD 40)	150 kg/m3	kg	34.002,00
3	Bekisting batako	5,5 m2/m3	m2	1.246,74

Table 10. *Volume Calculation (DECE) Basement slab work.*

DETAILED ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.1	STRUKTUR BAWAH			
	PELAT BASEMENT (PODIUM)			
1	Beton fc 25 Mpa	Tebal 25 cm	m3	1.140,75
2	Besi beton (BJTP 24 & BJTD 40)	110 kg/m3	kg	125.482,50
3	Bekisting biasa	kell 329 m	m2	82,25
	PELAT BASEMENT (TOWER)			
1	Beton fc 40 Mpa	Tebal 25 cm	m3	551,67
2	Besi beton (BJTP 24 & BJTD 40)	110 kg/m3	kg	60.683,70
3	Bekisting biasa	kell 329 m	m2	Masuk podium

Table 11. *Volume Calculation (DECE) Earthwork.*

DETAILED ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.1	STRUKTUR BAWAH			
	PEKERJAAN TANAH			
1	Galian tanah menggunkan alat termasuk buang tanah ke luar lokasi	s/d elv dibawah plat + pasir urug + lt kerja	m3	7.108,17
	Galian tanah menggunkan tenaga orang termasuk buang tanah ke luar lokasi	Pile cap dan tie beam	m3	2.007,08
2	Potong kepala tiang pancang	733 titik	bh	733,00
3	Anti rayap	dibawah plat + 1.000 mm kell	m2	7.098,69
4	Pasir urug	Tebal 100 mm	m3	676,97
5	Lantai kerja	Tebal 50 mm	m3	338,48
6	Waterproofing integral	Pelat dan dinding basement, pile cap, tie beam	m3	3.789,50

Table 12. *Volume Calculation (DECE) Upper Structure Work (1).*

DETAILED ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.2	STRUKTUR ATAS			
1	Kolom (podium)			
	Beton fc 30 Mpa	0,04 m3/m2	m3	346,71
	Besi beton (BJTP 24 & BJTD 40)	270 kg/m3	kg	93.611,70
	Bekisting biasa	5,5 m2/m3	m2	1.906,91
2	Kolom (tower)			
	Beton fc 50 Mpa	0,04 m3/m2	m3	526,03
	Besi beton (BJTP 24 & BJTD 40)	270 kg/m3	kg	142.028,10
	Bekisting biasa	5,5 m2/m3	m2	2.893,17
	Beton fc 40 Mpa	0,04 m3/m2	m3	501,07
	Besi beton (BJTP 24 & BJTD 40)	270 kg/m3	kg	135.288,90
	Bekisting biasa	5,5 m2/m3	m2	2.755,89
	Beton fc 30 Mpa	0,04 m3/m2	m3	537,70
	Besi beton (BJTP 24 & BJTD 40)	270 kg/m3	kg	145.179,00
	Bekisting biasa	5,5 m2/m3	m2	2.957,35
3	Core wall (tower)			
	Beton fc 50 Mpa	0,05 m3/m2	m3	1.090,93
	Besi beton (BJTP 24 & BJTD 40)	210 kg/m3	kg	229.095,30
	Bekisting biasa	4,8 m2/m3	m2	5.236,46
	Beton fc 40 Mpa	0,05 m3/m2	m3	626,33
	Besi beton (BJTP 24 & BJTD 40)	210 kg/m3	kg	131.529,30
	Bekisting biasa	4,8 m2/m3	m2	3.006,38
	Beton fc 30 Mpa	0,05 m3/m2	m3	672,12
	Besi beton (BJTP 24 & BJTD 40)	210 kg/m3	kg	141.145,20
	Bekisting biasa	4,8 m2/m3	m2	3.226,18

Table 13. *Volume Calculation (DECE) Upper Structure Work (2).*

DETAILED ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.2	STRUKTUR ATAS			
4	Balok (podium)			
	Beton fc 25 Mpa	0,09 m3/m2	m3	562,34
	Besi beton (BJTP 24 & BJTD 40)	200 kg/m3	kg	112.468,00
	Bekisting biasa	6,5 m2/m3	m2	3.655,21
5	Balok (tower)			
	Beton fc 40 Mpa	0,09 m3/m2	m3	984,34
	Besi beton (BJTP 24 & BJTD 40)	200 kg/m3	kg	196.868,00
	Bekisting biasa	6,5 m2/m3	m2	6.398,21
	Beton fc 30 Mpa	0,09 m3/m2	m3	1.106,64
	Besi beton (BJTP 24 & BJTD 40)	200 kg/m3	kg	221.328,00
	Bekisting biasa	6,5 m2/m3	m2	7.193,16
	Beton fc 25 Mpa	0,09 m3/m2	m3	1.038,29
	Besi beton (BJTP 24 & BJTD 40)	200 kg/m3	kg	207.658,00
	Bekisting biasa	6,5 m2/m3	m2	6.748,89
6	Pelat (podium)			
	Beton fc 25 Mpa	0,14 m3/m2	m3	901,13
	Besi beton (BJTP 24 & BJTD 40)	80 kg/m3	kg	72.090,40
	Bekisting biasa	8,00 m2/m3	m2	7.209,04
7	Pelat (tower)			
	Beton fc 40 Mpa	0,14 m3/m2	m3	1.504,82
	Besi beton (BJTP 24 & BJTD 40)	80 kg/m3	kg	120.385,60
	Bekisting biasa	8,00 m2/m3	m2	12.038,56
	Beton fc 30 Mpa	0,14 m3/m2	m3	1.721,44
	Besi beton (BJTP 24 & BJTD 40)	80 kg/m3	kg	137.715,20
	Bekisting biasa	8,00 m2/m3	m2	13.771,52

Table 14. *Volume Calculation (DECE) Upper Structure Work (3).*

DETAILED ELEMENTAL COST ESTIMATE
Revisi : 0

No.	Uraian	Ket.	Sat.	Volume
A.2	STRUKTUR ATAS			
	Beton fc 25 Mpa	0.14 m3/m2	m3	1.615,11
	Besi beton (BJTP 24 & BJTD 40)	80 kg/m3	kg	129.208,80
	Bekisting biasa	8.00 m2/m3	m2	12.920,88
8	Tangga			
	Beton fc 30 Mpa	0.005 m3/m2	m3	238,94
	Besi beton (BJTP 24 & BJTD 40)	80 kg/m3	kg	19.115,20
	Bekisting biasa	5,5 m2/m3	m2	1.314,17
9	Balok&kolom separator			
	Beton fc 30 Mpa	0.0003 m3/m2	m3	14,34
	Besi beton (BJTP 24 & BJTD 40)	130 kg/m3	kg	1.864,20
	Bekisting biasa	15 m2/m3	m2	215,10

2. Calculation of detailed cost estimates

Detailed cost estimates are made at the tender documentation stage, calculated and compiled based on working drawings which are categorized as tender drawings and based on technical specifications. From the contractor's offer by referring to the bill of quantitias (BoQ) made by the quantity surveyor (QS) consultant, the volume is agreed after a clarification meeting (joint calculation) of volume calculation between the Project Owner, QS Consultant and Contractor. Hereinafter referred to as a list of job descriptions and bills or quantities of BoQ

3. Unit Price Analysis (Estimated)

a. Block Plan Cost Estimate

Unit price of the Plan Cost Estimate is based on references from several similar projects.

Table 15. *Estimated Unit Price Analysis (BPCE).*

Kode	Uraian	Sat.	Koefisien	Harga Satuan (Rp)	Jumlah (Rp)
1-BPCE	Pekerjaan struktur per m2				
	- Struktur	Ls	1,00	1.700.000,00	1.700.000,00
				Total Rp	1.700.000,00

b. Elemental Cost Estimate and detailed cost estimates

This unit price is obtained from the supplier / vendor offer, while for wages from the standard QS consultant price.

Table 16. *Estimated Unit Price Analysis (ECE dan DECE) (1).*

Kode	Uraian	Sat.	Koefisien	Harga Satuan (Rp)	Jumlah (Rp)
1-DECE	Galian tanah dengan alat (m^3)				
	- Peralatan	Ls	1,00	30.000,00	30.000,00
	- Alat Bantu dan pekerja	Ls	1,00	10.000,00	10.000,00
				Total Rp	40.000,00
2-DECE	Galian tanah manual (m^3)				
	- Pekerja	Ls	1,00	38.500,00	38.500,00
	- Alat Bantu dan peralatan	Ls	1,00	16.500,00	16.500,00
				Total Rp	55.000,00
3-DECE	Buang tanah keluar proyek (m^3)				
	- Peralatan	Ls	1,00	20.000,00	20.000,00
	- Alat Bantu dan pekerja	Ls	1,00	7.500,00	7.500,00
				Total Rp	27.500,00
4-DECE	Potong kepala tiang ukuran dia. 45 cm (titik)				
	- Pekerja	Ls	1,00	100.000,00	100.000,00
	- Alat Bantu dan peralatan	Ls	1,00	25.000,00	25.000,00
				Total Rp	125.000,00
5-DECE	Anti rayap (m^2)				
	- Bahan kimia	Ls	1,00	13.000,00	13.000,00
	- Alat Bantu dan peralatan	Ls	1,00	7.500,00	7.500,00
				Total Rp	20.500,00

Table 17. *Estimated Unit Price Analysis (ECE dan DECE) (2).*

Kode	Uraian	Sat.	Koefisien	Harga Satuan (Rp)	Jumlah (Rp)
6-DECE	Pasir urug (m^3)				
	- Pasir urug	Ls	1,05	270.000,00	283.500,00
	- Pekerja	Ls	1,00	26.500,00	26.500,00
	- Alat Bantu dan peralatan	Ls	1,00	11.000,00	11.000,00
				Total Rp	321.000,00
7-DECE	Beton B0 (m^3)				
	- Beton	Ls	1,05	661.000,00	694.050,00
	- Alat Bantu dan pekerja	Ls	1,00	200.000,00	200.000,00
				Total Rp	894.050,00
8-DECE	Beton Fc'25 Mpa (m^3)				
	- Beton	Ls	1,05	615.000,00	645.750,00
	- Alat Bantu dan pekerja	Ls	1,00	180.000,00	180.000,00
				Total Rp	825.750,00
9-DECE	Beton Fc'30 Mpa (m^3)				
	- Beton	Ls	1,05	640.000,00	672.000,00
	- Alat Bantu dan pekerja	Ls	1,00	180.000,00	180.000,00
				Total Rp	852.000,00
10-DECE	Beton Fc'40 Mpa (m^3)				
	- Beton	Ls	1,05	725.000,00	761.250,00
	- Alat Bantu dan pekerja	Ls	1,00	180.000,00	180.000,00
				Total Rp	941.250,00
11-DECE	Beton Fc'50 Mpa (m^3)				
	- Beton	Ls	1,05	905.000,00	950.250,00
	- Alat Bantu dan pekerja	Ls	1,00	180.000,00	180.000,00
				Total Rp	1.130.250,00

Table 18. *Estimated Unit Price Analysis (ECE dan DECE) (3).*

Kode	Uraian	Sat.	Koefisien	Harga Satuan (Rp)	Jumlah (Rp)
12-DECE	Besi beton BJTP 24 & BJTP 40 (kg)				
	- Besi	Ls	1,05	5.400,00	5.670,00
	- Kawat beton	kg	0,01	20.000,00	200,00
	- Alat Bantu dan pekerja	Ls	1,00	2.000,00	2.000,00
				Total Rp	7.870,00
13-DECE	Bekisting batako (m^2)				
	- Batako	Ls	1,00	38.000,00	38.000,00
	- Alat Bantu dan pekerja	Ls	1,00	33.000,00	33.000,00
				Total Rp	71.000,00
14-DECE	Bekisting biasa (m^2)				
	- Mutiplex 12 mm	Lb	0,13	170.000,00	21.250,00
	- Rangka kayu	m3	0,02	2.100.000,00	42.000,00
	- Scaffilding	Lt	1,00	17.000,00	17.000,00
	- Mould oill	Ltr	0,30	7.500,00	2.250,00
	- Upah pasang + bongkar	Ls	1,00	77.500,00	77.500,00
				Total Rp	160.000,00
15-DECE	Waterproofing integral (m^3)				
	- Bahan kimia	Ls	1,00	108.500,00	108.500,00
	- Alat Bantu dan pekerja	Ls	1,00	46.500,00	46.500,00
				Total Rp	155.000,00

Unit Price Analysis (Contract)

The unit price is obtained from the final negotiation of the contractor or contract offer. For preliminaries work, the value has been determined through a bidding process followed by negotiations until agreed upon preliminary value of 15% of the total value of structural work.

Table 19. *Contract Unit Price Analysis (1).*

No	Uraian	Sat.	Koefisien	Harga Satuan (Rp)	Jumlah (Rp)
1-DCE	Galian tanah dengan alat (m^3)				
	- Peralatan	Ls	1,00	34.000,00	34.000,00
	- Alat Bantu dan pekerja	Ls	1,00	11.000,00	11.000,00
				Total Rp	45.000,00
2-DCE	Galian tanah manual (m^3)				
	- Pekerja	Ls	1,00	38.500,00	38.500,00
	- Alat Bantu dan peralatan	Ls	1,00	16.500,00	16.500,00
				Total Rp	55.000,00
3-DCE	Buang tanah keluar proyek (m^3)				
	- Peralatan	Ls	1,00	20.000,00	20.000,00
	- Alat Bantu dan pekerja	Ls	1,00	7.500,00	7.500,00
				Total Rp	27.500,00
4-DCE	Potong kepala tiang ukuran dia. 45 cm (titik)				
	- Pekerja	Ls	1,00	140.000,00	140.000,00
	- Alat Bantu dan peralatan	Ls	1,00	35.000,00	35.000,00
				Total Rp	175.000,00
5-DCE	Anti rayap (m^2)				
	- Bahan kimia	Ls	1,00	23.000,00	23.000,00
	- Alat Bantu dan peralatan	Ls	1,00	2.000,00	2.000,00
				Total Rp	25.000,00

Table 20. *Contract Unit Price Analysis (2).*

No	Uraian	Sat.	Koefisien	Harga Satuan (Rp)	Jumlah (Rp)
6-DCE	Pasir urug (m^3)				
	- Pasir urug	Ls	1,05	270.000,00	283.500,00
	- Pekerja	Ls	1,00	30.500,00	30.500,00
	- Alat Bantu dan peralatan	Ls	1,00	11.000,00	11.000,00
				Total Rp	325.000,00
7-DCE	Beton B0 (m^3)				
	- Beton	Ls	1,05	631.000,00	662.550,00
	- Alat Bantu dan pekerja	Ls	1,00	250.400,00	250.400,00
				Total Rp	912.950,00
8-DCE	Beton Fc'25 Mpa (m^3)				
	- Beton	Ls	1,05	615.000,00	645.750,00
	- Alat Bantu dan pekerja	Ls	1,00	217.500,00	217.500,00
				Total Rp	863.250,00
9-DCE	Beton Fc'30 Mpa (m^3)				
	- Beton	Ls	1,05	640.000,00	672.000,00
	- Alat Bantu dan pekerja	Ls	1,00	217.500,00	217.500,00
				Total Rp	889.500,00
10-DCE	Beton Fc'40 Mpa (m^3)				
	- Beton	Ls	1,05	725.000,00	761.250,00
	- Alat Bantu dan pekerja	Ls	1,00	217.500,00	217.500,00
				Total Rp	978.750,00
11-DCE	Beton Fc'50 Mpa (m^3)				
	- Beton	Ls	1,05	905.000,00	950.250,00
	- Alat Bantu dan pekerja	Ls	1,00	217.500,00	217.500,00
				Total Rp	1.167.750,00

Table 21. *Contract Unit Price Analysis (3).*

No	Uraian	Sat.	Koefisien	Harga Satuan (Rp)	Jumlah (Rp)
12-DCE	Besi beton BJTP 24 & BJTP 40 (kg)				
	- Besi	Ls	1,05	5.400,00	5.670,00
	- Kawat beton	kg	0,01	20.000,00	200,00
	- Alat Bantu dan pekerja	Ls	1,00	2.225,00	2.225,00
				Total Rp	8.095,00
13-DCE	Bekisting batako (m^2)				
	- Batako	Ls	1,00	38.000,00	38.000,00
	- Alat Bantu dan pekerja	Ls	1,00	33.650,00	33.650,00
				Total Rp	71.650,00
14-DCE	Bekisting biasa (m^2)				
	- Mutiplex 12 mm	Lb	0,13	170.000,00	21.250,00
	- Rangka kayu	m3	0,02	2.100.000,00	42.000,00
	- Scaflding	Lt	1,00	17.000,00	17.000,00
	- Mould oill	Ltr	0,30	7.500,00	2.250,00
	- Upah pasang + bongkar	Ls	1,00	85.500,00	85.500,00
				Total Rp	168.000,00
15-DCE	Waterproofing integral (m^3)				
	- Bahan kimia	Ls	1,00	108.500,00	108.500,00
	- Alat Bantu dan pekerja	Ls	1,00	91.500,00	91.500,00
				Total Rp	200.000,00

Cost Calculation

This cost calculation is obtained from the Tables above, namely volume x unit price.

a. Block Plan Cost Estimate

Table 22. *Block Plan Cost Estimate (BPCE).*

BLOCK PLAN COST ESTIMATE

Revisi : 0

No.	Uraian	Luas gross (TGFA) (m2)	Harga satuan (Rp)	Total (Rp)
1	Pekerjaan Struktur	47.787,58	1.700.000,00	81.238.886.000,00
	(1-BPCE)			
	SUB TOTAL			**81.238.886.000,00**
	PPN 10%			**8.123.888.600,00**
	GRAND TOTAL			**89.362.774.600,00**
	DIBULATKAN			**89.362.800.000,00**

b. Elemental Cost Estimate

Table 23. *Elemental Cost Estimate (ECE).*

ELEMENTAL COST ESTIMATE

Revisi : 0

No.	Uraian	Ket.	Sat.	Volume	Harga satuan (Rp)	Total (Rp)
	PENJUMLAHAN					
A.1	PEKERJAAN STRUKTUR BAWAH					9.214.040.310,75
A.2	PEKERJAAN STRUKTUR ATAS					50.212.540.898,00
					SUB TOTAL 1	**59.426.581.208,75**
					JASA PEMBORONG 10%	**5.942.658.120,88**
					SUB TOTAL 2	**65.369.239.329,63**
					PRELIMINARIES 15%	**9.805.385.899,44**
					TOTAL	**75.174.625.229,07**
					PPN 10%	**7.517.462.522,91**
					GRAND TOTAL	**82.692.087.751,98**
					PEMBULATAN	**82.692.100.000,00**

c. Detailed Elemental Cost Estimate

***Table 24**. Detailed Elemental Cost Estimate (DECE).*

DETAILED ELEMENTAL COST ESTIMATE
Revisi : 0

No.	Uraian	Ket.	Sat.	Volume	Harga satuan (Rp)	Total (Rp)
	PENJUMLAHAN					
A.1	PEKERJAAN STRUKTUR BAWAH					8.919.831.163,50
A.2	PEKERJAAN STRUKTUR ATAS					45.136.050.005,50
					SUB TOTAL 1	**54.055.881.169,00**
					JASA PEMBORONG 10%	**5.405.588.116,90**
					SUB TOTAL 2	**59.461.469.285,90**
					PRELIMINARIES 15%	**8.919.220.392,89**
					TOTAL	**68.380.689.678,79**
					PPN 10%	**6.838.068.967,88**
					GRAND TOTAL	**75.218.758.646,66**
					PEMBULATAN	**75.218.800.000,00**

d. Budget plan

***Table 25**. Cost Recapitulation (RAB).*

DAFTAR URAIAN PEKERJAAN (BILL OF QUANTITIES)
PENJUMLAHAN TOTAL
HALAMAN : 1 REVISI : 0

No.	Uraian	Sat.	Volume	Harga Satuan (Rp)	Total (Rp)
	PENJUMLAHAN				
1	**PRELIMINARIES**				7.610.175.405,48
2	**PEKERJAAN STRUKTUR BAWAH**				7.016.491.042,55
3	**PEKERJAAN STRUKTUR ATAS**				43.718.011.660,68
				SUB TOTAL 1	**58.344.678.108,71**
				JASA PEMBORONG 10%	**5.834.467.810,87**
				SUB TOTAL 2	**64.179.145.919,59**
				PPN 10%	**6.417.914.591,96**
				GRAND TOTAL	**70.597.060.511,54**
				PEMBULATAN	**70.597.100.000,00**

PAKET : PEKERJAAN STRUKTUR

d. Detailed Cost Estimate

***Table 26.** Detailed Cost Estimate (DCE).*

DAFTAR URAIAN PEKERJAAN (BILL OF QUANTITIES)
PENJUMLAHAN TOTAL
HALAMAN : 1 REVISI : 0

No.	Uraian	Sat.	Volume	Harga Satuan (Rp)	Total (Rp)
	PENJUMLAHAN				
1	**PRELIMINARIES**				7.909.545.748,68
2	**PEKERJAAN STRUKTUR BAWAH**				8.193.880.040,90
3	**PEKERJAAN STRUKTUR ATAS**				44.536.424.950,30
				SUB TOTAL 1	**60.639.850.739,88**
				JASA PEMBORONG 8%	**4.851.188.059,19**
				SUB TOTAL 2	**65.491.038.799,07**
				PPN 10%	**6.549.103.879,91**
				GRAND TOTAL	**72.040.142.678,98**
				PEMBULATAN	**72.040.100.000,00**

PAKET : PEKERJAAN STRUKTUR

5 DISCUSSION RESULT

From the discussion and analysis above, the following results are obtained:

1. In terms of calculation methods.
Estimated cost estimates are calculated based on concrete ratios m3 / m2, iron kg / m3, m2 / m3 formwork, while detailed cost estimates are calculated based on detailed drawings and technical specifications.

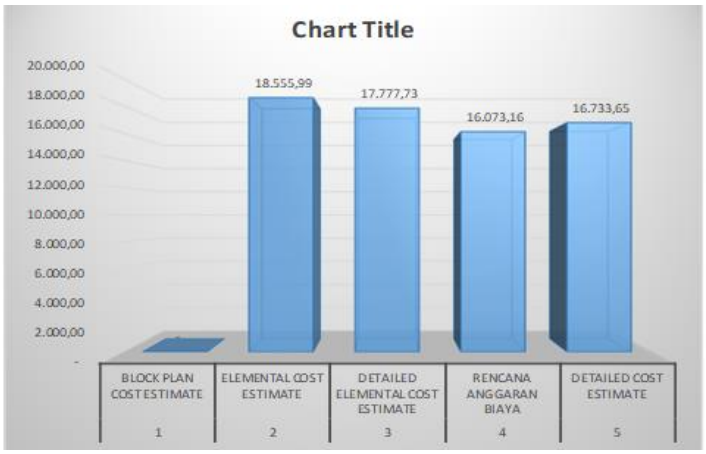

***Figure 1.** Concrete Volume Comparison Chart.*

***Figure 2.** Iron Volume Comparison Chart.*

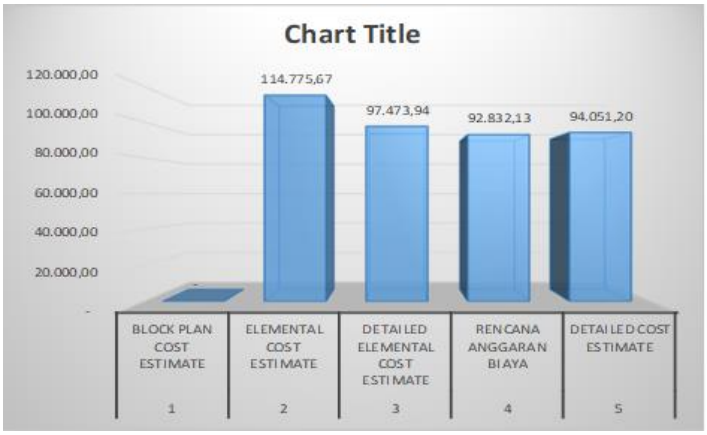

Figure 3. *Formwork Volume Comparison Chart.*

In terms of cost estimates.

a. Analysis of the total value of the Plan Cost Estimate (BPCE) of Rp. 89,362,800,000 (including 10% VAT) at a price per m2 of Rp. 1,870,000,53 / m2.
b. Analysis of the total value of Elemental Cost Estimate (ECE) of Rp. 82,692,100,000 (including 10% VAT) at a price per m2 of Rp. 1,730,409.87 / m2.
c. Analysis of the total Detailed Elemental Cost Estimate (DECE) value of Rp. 75,218,800,000 (including 10% VAT) at a price per m2 of Rp. 1,574,024.05 / m2.
d. Analysis of the total value of the Budget Plan (RAB) of Rp. 70,597,100,000 (including 10% VAT) at a price per m2 of Rp. 1,477,310,63 / m2.
e. Analysis of the total Detailed Cost Estimate (DCE) value of Rp. 72,040,100,000 (including 10% VAT) at a price per m2 of Rp. 1.507.506.76 / m2.

Figure 4. *Cost Comparison Chart.*

6 CONCLUSION

The level of approach or accuracy of the estimated cost plan Block Estimate against Detailed Cost Estimate (contract) is 24%, Elemental Cost Estimate against Detailed Cost Estimate (contract) is 15%, Detailed Elemental Cost Estimate against Detailed Cost Estimate (contract) is 4.4%, shows that the purpose of doing Cost Estimating in parallel with the design stage has been achieved, i.e.:

1. A realistic budget is reached.
2. Obtain a decent and profitable budget.
3. Get an economical and efficient design.
4. Design and budget can be controlled and adjusted.
5. Design according to the allocated budget.

7 REFERENCES

[1] Atmakusuma Djuhanda, “Cost Planning dan Cost Estimating”, PT. Rekagriya Menarabuana – Jakarta Indonesia Edisi : 1 Maret 2011.
[2] Atmakusuma Djuhanda, “Pedoman Penyusunan Daftar Uraian dan Kuantitas Pekerjaan (Bill of Quantities)”, PT. Rekagriya Menarabuana – Jakarta Indonesia Edisi : 1 Maret 2011.
[3] Clifford F. Gray, ‘Manajemen proyek proses manajerial”, Penerbit Andi – Jogyakarta
[4] Fatonah Kurnia dan Wulansari Novi Dwi, “Estimasi Anggaran Biaya Struktur Proyek Pembangunan Hotel Quad Makassar Menggunakan Metode SNI”, Jurnal Kajian Teknik Sipil Vol.2 No.2, Fakultas Teknik Universitas 17 Agustus 1945 Jakarta.
[5] Herwansyah Diyan, “Estimasi Anggaran Biaya Konstruksi Dan Rencana Penjadwalan Tahap Desain Pada Pembangunan Kampus Bsi Margonda – Depok”, Fakultas Teknik Universitas Gunadarma.
[6] Hansen Seng, “Quantity Surveying – Pengantar Manajemen Biaya dan Kontrak Konstruksi”, Penerbit PT. Gramedia Pustaka Utama.
[7] Iman Soeharto, “ Manajemen Proyek dari konseptual sampai operasional”, Erlangga- Jakarta
[8] Mansyur, SE, M.Si ‘ Manajemen pembiayaan proyek”, Laksbang Pressindo – Jogyakarta.
[9] Mukomoko J.A., “Dasar Penyusunan Anggaran Biaya Bangunan”, Penerbit Gaya Media Pratama.Rekagiya Mitra Buana “Metode Pengukuran Kuantitas”, PT. Rekagriya Mitra buana – Jakarta Indonesia Edisi : 2016.