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Cost comparison analysis of slab structure using concrete beam and steel beam

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Abstract

Cost planning is an important phase on construction project planning to give illustration to the owner how much cost they should spend to execute that project. The slab is an element of the structure that has a large amount of the quantity so that affects the cost of the whole project. Then the cost comparison of slab structure has to be analyzed to know the most optimum design between conventional shuttering with the concrete beam on the initial design, first alternative options design, and metal deck shuttering with steel beam on second alternative design. The calculation of the slab structure cost analysis were based on Indonesia's standard (PermenPUPR and SNI). The result is the first alternative options design that using concrete beam were cheaper 10.24% than the initial design that using concrete beam too while the second alternative options design that using steel beam were more expensive 27.14% than the initial design.

Keywords: Cost Planning, Slab Structure, Concrete Beam, Steel Beam, Metal Deck, Conventional Shuttering.

1. Introduction

Along with the increasing number of construction projects at this time, the development of construction technology has also experienced rapid progress, marked by the presence of various types of modern materials and equipment, so as to produce many selections of work methods that can be applied.

A construction project goes through many stages that are interdependent with each other. One of them is the planning phase. One of the most important factors in this phase is cost planning, which is able to provide a description of the costs to be incurred by building owners to carry out construction projects.

Sinarmas Tower is one of the high rise building projects which are currently in the planning phase. In this phase, there are many design changes made by the planner to accommodate the demands of the owner as well as to optimize costs that must be incurred during the construction period. One of designs that underwent several changes was the work of typical upper structure floor (floors 4-23).

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In the initial design, the structural planner planned a typical floor structure using concrete and conventional shuttering. After that, in order to provide a cost comparison option for work, structural planner provide two alternative options. The first alternative option are the same as the initial design, using concrete beam structure and conventional shuttering, but there are some changes in dimensions and beam placement. Then the second alternative is using steel beam structure and metal deck shuttering. The cost comparison of the three designs is very important to be used as a reference for building owners to choose the most optimum design.

Cost estimation is an important thing in the world of construction industry. Inaccuracies in estimations have a negative effect on the entire construction process and all parties involved. The accuracy in cost estimation depends on the expertise and craftsman of the estimator in following the entire work process and in accordance with the latest information [1].

The calculation of the cost plan for a construction includes two most important variables, specifically the amount of the works and also the unit charge analysis coefficient. Unit charge analysis coefficients are numbers of the quantity of fabric and labor needed to do a job in one precise unit. The coefficient of evaluation of constructing unit costs is considered one of the critical additives because the coefficient of fee evaluation is the key to calculating the budget plan that is good and more precise. The value of the coefficient of evaluation of the charge of building devices has a exclusive fee - exclusive in each region, it is due to differences in market charges of substances and fees or labor prices that apply in every region. The other thing of budget plan compilation is the extent that's a calculation of a work quantity, as an instance the quantity of casting work or the quantity of formwork paintings and so on [2].

Based at the Minister of Public Works and Public Housing Regulation No. 28/PRT/M/2016, the Price of the Work Unit consists of direct costs and indirect cost. Direct cost encompass wages, gadget and materials. Indirect costs encompass general cost and benefits. Each direct cost is determined as the primary unit price (HSD) for every well known unit of measurement, so that the outcomes of the analysis formulation obtained replicate the actual price in the subject. Indirect costs can be decided in accordance with applicable regulations. The price of the primary unit must be in accordance with the idea of actual implementation / supply (according to field conditions) and take into local prices [3].

One part of the work on the upper structure of the building is the slab work. The large amount of work on the slab structure makes its structure has large amount of cost, time process, waste. However, these elements can still be optimized in the expenditure of costs resulting from material needs and the length of time in the process by choosing other alternatives in the process. The application of value engineering on slab structure is done by replacing conventional rebar works using wire mesh and bond plates. Therefore we need a value engineering analysis regarding the use of wire mesh and floordeck / metal deck as a substitute for the use of slab structure in the conventional way [4].

The use of floordeck as slab structure shuttering generally has more advantages than using the conventional one. Floordeck installation is relatively fast because floordeck functions as a permanent shuttering that does not need to be removed and positive rebar in one direction (tensile reinforcement) and the use of wire mesh as its reinforcement. Whereas conventional plates need to use shuttering and wait 28 days until the concrete maintenance period is complete and requires a lot of wire to assemble the reinforcement. The use of floordeck can save the use of scaffolding compared to conventional plates. Floordeck can also save time and materials used. From the various reviews above, it can be concluded that the reason why floordeck are now widely used in various developments [5].

Gross Floor Area (GFA) is the sum of the Fully Enclosed Cover Area (FECA) value and the Unenclosed Covered Area (UCA) value where the unit commonly used is square meter. Fully Enclosed Cover Area (FECA) is the total area of the building that is fully covered, including the basement area, covered roof area, garage, penthouse, and others. Whereas the Unenclosed Covered Area (UCA) is the total area of all buildings that have a roof but are not completely covered, including the balcony, porch, veranda, gallery area that is not entirely covered and others. (Australian Institute of Quantity Surveyors, 2014) [6].

2. Methodology

The first sequence to comparing the cost of slab structure using concrete beam and steel beam is processing the bill of quantity of each slab structure design. Then the Gross Floor Area is calculated to get the area which will later be the basis of the cost per square meter of a design. The next stage is to analyze the unit price of each job. This calculation is based on existing secondary data, namely SNI, PermenPUPR 2016 and previous research journals. After that, the analysis of the quantity and price of the work unit is recapitulated so that the planned budget of each design is obtained. The value of the cost budget plan is then divided by the value of the Gross Floor Area to get the value of the cost plan per square meter. The value of the floor structure budget plan uses concrete beam design (initial design), concrete beam design that changes its dimensions and placement (alternative design 1) and steel beam design (alternative design 2) then recapitulated in the form of tables so that a comparison of the cost of each work is obtained - each design.

3. Result and Analysis

3.1. Unit Price of Material, Equipment and Labor

Table 1. Material and Equipment Unit Price

No.	Material	Unit	Price (Rp)
1	Readymix Concrete Fc'40	M3	962,500.00
2	Readymix Concrete Fc'35	M3	929,500.00
3	Readymix Concrete Fc'30	M3	858,000.00
4	Readymix Concrete Fc'25	M3	841,500.00
5	Concrete Pump	Day – Rent	560,000.00
6	Tower Crane	Day – Rent	4,666,667.00
7	Bar Cutter & Bending	Day – Rent	333,333.00
8	Steel Rebar	Kg	7,755.00
9	Concrete Wire	Kg	28,000.00
10	Wiremesh M7	Kg	9,088.00
11	Wood Class III (Albasia)	M3	7,200,000.00
12	Wood Class II (Borneo)	M3	9,600,000.00
13	Multiplex 9mm thick	Sheet	203,000.00
14	Dolken Wood 8/10 (Length : 4m)	log	36,000.00
15	Nails 5cm - 12cm	Kg	29,500.00
16	Formwork Oil	Liter	65,000.00
17	Floordeck	M2	131,600.00
18	Roofbattens Wood 5/7	M3	2,950,000.00
19	Wood 8/12	M3	2,950,000.00
20	Wide Flange Steel	Kg	11,110.00
21	Honeycomb Steel	Kg	13,888.00
22	Steel Plate	Kg	10,500.00

Source : Supplier Offering Price and DKI Jakarta Price Journal, 2019

Table 2. Labor Unit Price

No.	Type of Labor	Unit	Price (Rp)
1	Labor	Man-Day	138.077,00
2	Carpenter	Man-Day	158.789,00
3	Chief Carpenter	Man-Day	173.978,00
4	Farrier	Man-Day	158.789,00
5	Chief Farrier	Man-Day	173.978,00
6	Chief Profile Farrier	Man-Day	173.978,00
7	Bricklayer	Man-Day	158.789,00
8	Chief Bircklayer	Man-Day	173.978,00
9	Foreman	Man-Day	185.023,00

Source : DKI Jakarta Price Journal, 2019

3.2. Gross Floor Area

Gross Floor Area is a total amount of Fully Enclosed Covered Area (FECA) and Unenclosed Covered Area (UCA). The area which includes FECA is all areas that are fully covered in all sides whereas area which includes UCA is all areas that are not covered in all parts. In this typical floor structure, the area included in the UCA area is only the elevator shaft and other ME shafts, while the rest of the area is classified as FECA because the area is completely closed. The typical FECA floor structure (Floor 4-23) is 1,861.30 square meters and UCA is 18.90 square meters, so a GFA value of 1,880.20 square meters is obtained.

3.3. The Budget Plan

The budget plan is the result of multiplying the quantity of work (Bill of Quantities) and analyzing the price of the work unit. The analysis of the calculation of the quantity of work is carried out based on the initial plan design drawings, alternative option one and alternative option two while the unit price analysis is carried out based on the Ministerial Regulation of Ministry of Public Works and Public Housing in 2016. The following is the budget plan of each design.

Table 3. Cost Budget Plan of Initial Design Slab Structure (Using Fc'40 Concrete)

No	Work Items	Unit	Volume	Unit Price (Rp)	Cost (Rp)
1	Beam Concrete	m3	338.78	1,301,721.00	440,991,352.00
2	Slab Concrete	m3	206.65	1,301,721.00	268,994,657.00
3	Beam Shuttering	m2	1,603.92	482,130.00	773,298,580.00
4	Slab Shuttering	m2	1,818.65	539,730.00	981,577,698.00
5	Beam Rebar	kg	94,857.18	10,857.00	1,029,864,365.00
6	Slab Rebar	kg	25,830.68	10,857.00	280,443,638.00
TOTAL COST (Rp)					**3,775,170,290.00**

Source : Calculation Analysis Results, 2019

Table 4. Cost Budget Plan of Alternative Option 1 Slab Structure (Using Fc'40 Concrete)

No	Work Items	Unit	Volume	Unit Price (Rp)	Cost (Rp)
1	Beam Concrete	m3	294.77	1,301,721.00	383,703,579.52
2	Slab Concrete	m3	206.65	1,301,721.00	268,994,656.73
3	Beam Shuttering	m2	1,193.88	482,130.00	575,603,036.98
4	Slab Shuttering	m2	1,818.65	539,730.00	981,577,697.63
5	Beam Rebar	kg	82,534.58	10,857.00	896,077,987.22
6	Slab Rebar	kg	25,830.68	10,857.00	280,443,638.48
TOTAL COST (Rp)					**3,386,400,596.56**

Source : Calculation Analysis Results, 2019

Table 5. Cost Budget Plan of Alternative Option 2 Slab Structure (Using Fc'40 Concrete)

No	Work Items	Unit	Volume	Unit Price (Rp)	Cost (Rp)
1	Beam Concrete	m3	21.87	1,301,721.00	28,466,686.00
2	Conventional Slab Concrete	m3	19.11	1,301,721.00	24,880,575.00
3	Floordeck Slab Concrete	m3	133.41	1,301,721.00	173,667,136.00
4	Beam Conventional Shuttering	m2	116.92	482,130.00	56,371,604.00
5	Slab Conventional Shuttering	m2	208.94	539,730.00	112,771,888.00
6	Slab Floordeck Shuttering	m2	1,593.13	184,291.00	293,599,521.00
7	Beam Rebar	kg	2,733.56	10,857.00	29,678,288.00
8	Slab Rebar	kg	2,389.20	10,857.00	25,939,544.00
9	Wiremesh M7	kg	5,020.14	11,168.00	56,064,900.00
10	Wide Flange Beam	kg	76,221.35	32,414.00	2,470,638,888.00
11	Honeycomb Beam	kg	32,064.45	35,626.00	1,142,328,096.00
12	Base Plate and Stiffener	kg	11,980.21	30,744.00	368,319,450.00
TOTAL BIAYA					**4,782,726,576.00**

Source : Calculation Analysis Results, 2019

Table 6. Staff Cost of Slab Works Using Concrete Beam

No.	**Staff**	**Unit Price (Rp)**	**Quantity (Man)**	**Duration (Month)**	**Total**
1	Site Manager	10,000,000.00	1.00	5.00	50,000,000.00
2	Supervisor	7,000,000.00	2.00	5.00	70,000,000.00
3	Surveyor	5,000,000.00	2.00	5.00	50,000,000.00
4	Engineering	6,000,000.00	2.00	5.00	60,000,000.00
5	Logistics	4,000,000.00	2.00	5.00	40,000,000.00
6	Administraion	4,000,000.00	1.00	5.00	20,000,000.00
TOTAL					**290,000,000.00**

Source: Calculation Analysis Results, 2019

Assuming the work of slab structures using concrete beams has a duration of 7 days per casting cycle, then the total duration of the work of slab structures using concrete beams is 7 days x 20 floors = 140 days = 4.7 months ≈ 5 months. While the slab structure work using steel beams has a duration of 5 days per casting cycle, then the total duration of the floor structure work using steel beams is 5 days x 20 floors = 100 days = 3.3 months ≈ 4 months. The following is the result of indirect cost calculation using concrete and steel beam.

Table 7. General Cost of Slab Works Using Concrete Beam

No.	Item	Unit Price (Rp)	Unit	Quantity	Total
1	Temporary Office	20,000,000.00	Ls	1.00	20,000,000.00
2	Office Stuffs	30,000,000.00	Ls	1.00	30,000,000.00
3	Stationary	1,000,000.00	Month	5.00	5,000,000.00
4	Project Security	3,000,000.00	Month	5.00	15,000,000.00
5	Safety Equipment	40,000,000.00	Ls	1.00	40,000,000.00
6	Material Test	5,000,000.00	Ls	1.00	5,000,000.00
7	Electrity	15,000,000.00	Month	5.00	75,000,000.00
8	Water	10,000,000.00	Month	5.00	50,000,000.00
9	Site Meeting	1,000,000.00	Month	5.00	5,000,000.00
TOTAL					**245,000,000.00**

Source : Calculation Analysis Results, 2019

Based on table 6 and table 7, indirect costs total of slab works using concrete beam during 5 months is Rp 290.000.000 + Rp 245.000.000 = **Rp 535.000.000**

Table 8. Staf Cost of Slab Works Using Steel Beam

No.	Staff	Unit Price (Rp)	Quantity (Man)	Duration (Month)	Total
1	Site Manager	10,000,000.00	1.00	4.00	40,000,000.00
2	Supervisor	7,000,000.00	2.00	4.00	56,000,000.00
3	Surveyor	5,000,000.00	2.00	4.00	40,000,000.00
4	Engineering	6,000,000.00	2.00	4.00	48,000,000.00
5	Logistics	4,000,000.00	2.00	4.00	32,000,000.00
6	Administraion	4,000,000.00	1.00	4.00	16,000,000.00
TOTAL					**232,000,000.00**

Source : Calculation Analysis Results, 2019

Based on table 8 and table 9, indirect costs total of slab works using steel beam during 4 months is Rp 232.000.000 + Rp 215.000.000 = **Rp 447.000.000.** The following is a comparison of the value of the cost plan of the three typical slab structure designs.

Table 9. General Cost of Slab Works Using Steel Beam

No.	Item	Unit Price (Rp)	Unit	Quantity	Total
1	Temporary Office	20,000,000.00	Ls	1.00	20,000,000.00
2	Office Stuffs	30,000,000.00	Ls	1.00	30,000,000.00
3	Stationary	1,000,000.00	Month	4.00	4,000,000.00
4	Project Security	3,000,000.00	Month	4.00	12,000,000.00
5	Safety Equipment	40,000,000.00	Ls	1.00	40,000,000.00
6	Material Test	5,000,000.00	Ls	1.00	5,000,000.00
7	Electrity	15,000,000.00	Month	4.00	60,000,000.00
8	Water	10,000,000.00	Month	4.00	40,000,000.00
9	Site Meeting	1,000,000.00	Month	4.00	4,000,000.00
TOTAL					**215,000,000.00**

Source : Calculation Analysis Results, 2019

Table 10. Cost Comparison of Three Slab Structure Design

Floor	Total Cost (Rp)		
	Initial Design	Alternative Option 1	Alternative Option 2
4	3,775,170,290.00	3,386,400,597.00	4,782,726,576.00
5	3,775,170,290.00	3,386,400,597.00	4,782,726,576.00
6	3,775,170,290.00	3,386,400,597.00	4,782,726,576.00
7	3,775,170,290.00	3,386,400,597.00	4,782,726,576.00
8	3,756,811,419.00	3,369,523,076.00	4,776,856,420.00
9	3,756,811,419.00	3,369,523,076.00	4,776,856,420.00
10	3,756,811,419.00	3,369,523,076.00	4,776,856,420.00
11	3,756,811,419.00	3,369,523,076.00	4,776,856,420.00
12	3,756,811,419.00	3,369,523,076.00	4,776,856,420.00
13	3,756,811,419.00	3,369,523,076.00	4,776,856,420.00
14	3,756,811,419.00	3,369,523,076.00	4,776,856,420.00
15	3,756,811,419.00	3,369,523,076.00	4,776,856,420.00
16	3,756,811,419.00	3,369,523,076.00	4,776,856,420.00
17	3,717,033,863.00	3,332,955,116.00	4,764,137,749.00
18	3,717,033,863.00	3,332,955,116.00	4,764,137,749.00
19	3,717,033,863.00	3,332,955,116.00	4,764,137,749.00
20	3,717,033,863.00	3,332,955,116.00	4,764,137,749.00
21	3,717,033,863.00	3,332,955,116.00	4,764,137,749.00
22	3,717,033,863.00	3,332,955,116.00	4,764,137,749.00
23	3,717,033,863.00	3,332,955,116.00	4,764,137,749.00
Direct Cost	**74,931,220,972.00**	**67,201,995,884.00**	**95,471,578,327.00**
Indirect Cost	**522,000,000.00**	**522,000,000.00**	**460,000,000.00**
Tax 3%	2,263,596,629.00	2,031,719,877.00	2,877,947,350.00
Margin 10%	7,545,322,097.00	6,772,399,588.00	9,593,157,833.00
TOTAL COST	**85,262,139,698.00**	**76,528,115,349.00**	**108,402,683,510.00**

Source : Calculation Analysis Results, 2019

Based on the table above, the design that has the largest cost plan is the alternative design of two total slab structure work costs of Rp 108,202,683,510, followed by the initial plan design with a total cost of slab structure work of Rp 85,262,139,698 and a design that has the lowest total cost of slab structure work. is alternative one design option of Rp. 76,528,115,349.

3.4. The Cost Optimization

There are two cost optimizations that will be discussed, namely the optimization of the cost of typical slab structure work using concrete beam design that has dimensional changes and placement (Alternative Option One) when compared to the slab structure that uses the initial plan design and the cost optimization of typical slab structure work using steel beam designs (Alternative Option Two) when compared to slab structure that uses the initial design plan.

Table 11. Design Alternative Option 1 Optimization Costs

Cost	**Initial Design Cost**	**Alternative Option 1 Cost**	**Difference**
a	**b**	**c**	**d = c - b**
Direct Cost	74,931,220,972.00	67,201,995,884.00	- 7,729,225,088.00
Indirect Cost	522,000,000.00	522,000,000.00	-
Tax 3% + Margin 10%	9,808,918,726.00	8,804,119,465.00	- 1,004,799,261.00
Total	**85,262,139,698.00**	**76,528,115,349.00**	**- 8,734,024,349.00**

Source : Calculation Analysis Results, 2019

Based on the table above, the total cost optimization of alternative one option design when compared to the initial design plan is Rp 8,734,024,349. So the total cost of a typical slab structure using alternative one design is 89.76% of the cost of using the initial design plan, resulting in a cost optimization of 10.24%. This optimization occurs due to changes in the dimensions and placement of concrete beams, the volume of concrete work, shuttering and reinforcement bar of beams in the alternative one less design compared to the design plan. Whereas these two slab structure design has the same volume of work. Thus **alternative option one is more feasible than the initial plan design because of 10.24% optimization cost.**

Table 12. Design AlternativeOption 2 Optimization Costs

Cost	**Initial Design Cost**	**Alternative Option 1 Cost**	**Difference**
a	**b**	**c**	**d = c - b**
Direct Cost	74,931,220,972.00	95,471,578,327.00	20,540,357,355.00
Indirect Cost	522,000,000.00	460,000,000.00	- 62,000,000.00
Tax 3% + Margin 10%	9,808,918,726.00	12,471,105,183.00	2,662,186,457.00
Total	**85,262,139,698.00**	**108,402,683,510.00**	**23,140,543,812.00**

Source : Calculation Analysis Results, 2019

Based on the table above the difference in the total cost of a typical slab structure design alternative two option when compared with the initial design plan is Rp. 23,140,543,812. So the total cost of typical slab structure work using alternative design two options is 127.14% cost of using the initial design plan so that the cost optimization is -27.14%. Although the volume of the alternative two alternative design floor plate designs savings of 23.87% due to the use of metal deck shuttering and also the price of the M7 metal deck and wiremesh formwork unit is cheaper than

the unit price of conventional shuttering and conventional slab reinforcement bar but overall **the cost of the slab structure design alternative option two is 27.14% more expensive than the initial design plan**.

3.5. Slab Structure Cost per m²

Typical floor area based on GFA calculation is 1,880.20 m², if multiplied by 20 typical floors then the overall floor area of a typical structure is 37,604 m². Following is a summary of typical floor structure work costs per m².

Table 13. Summary of Slab Structure Cost per m²

Cost	Initial Design	Alternative Option 1	Alternative Option 2
Total Cost (Rp)	85,262,139,698.00	76,528,115,349.00	108,402,683,510.00
Cost per m2 (Rp)	2,267,369.00	2,035,106.00	2,882,743.00

Source : Calculation Analysis Results, 2019

Based on table 13 the most optimum design is alternative option 1 that cost Rp 2.035.106 per m², then the initial design that cost Rp 2.267.369 per m² and the most expensive is alternative option 2 that cost Rp 2.882.743 per m².

4. Conclusion

From the results of the previous analysis the following conclusions can be drawn:

1. Total cost of the slab structure work based on alternative option one is Rp 67,201,995,884. While the total cost of slab structure work based on the initial plan amounted to Rp 74,931,220,972, therefore with the difference in cost of Rp 8,734,024,349, the alternative option one design when compared with the initial plan design had a **cost optimization of 10.24%**. Thus alternative option one is more feasible than the initial plan design.
2. Total cost of the slab structure work based on alternative option two is Rp 108,402,683,510. While the total cost of the slab structure work based on the initial plan is Rp. 85,262,139,698, therefore with the difference in cost of Rp. 23,140,543,812, it is more expensive, so the alternative option two design when compared with the initial plan design have a **cost optimization of -27.14%** . Thus the initial plan design is more feasible than the alternative option 2.
3. With a total typical floor area of 37,604 m², the most optimum typical slab structure work cost is alternative one design option, which is Rp 2,035,106 per m², then the initial design plan is Rp 2,267,369 per m² and a design that has the highest cost is alternative two with a cost of Rp 2,882,743 per m².

References

[1] Messah, Yunita (2013). Jurnal Teknik Sipil, Vol.II No.1, April 2013. Analisa Indeks Biaya untuk Pekerjaan Beton Bertulang dengan Menggunakan Metode SNI 7394-2008 dan Lapangan (Studi Kasus pada Proyek Pembangunan Asrama STIKES SHMK Tahap III.

[2] Sholehah, Siti (2017). Perbandingan Biaya Pelaksanaan Pelat Beton Bondek dengan Pelat Konvensional pada Gedung Hotel Bhayangkara Yogyakarta.

[3] Kementrian Pekerjaan Umum dan Perumahan Rakyat (2016). PermenPUPR No. 28/PRT/M/2016.

[4] Prian, Diolana (2017), Jurnal Karya Teknik Sipil , Vol.6 No.3 Tahun 2017, 69-80. Analisis Perbandingan Waktu, Biaya dan Direct Waste Penggunaan Tulangan Konvensional, Wiremesh dan Floordeck Pada Pekerjaan Lantai.

[5] Gursal, Arya (2018). Jurnal Tekno Vol.16, No.17, 2018. Analisis Efisiensi Biaya dan Waktu Pelat Lantai Beton Bertulang Konvensional Terhadap Pelat Lantai Bondek.

[6] Australian Institute of Quantity Surveyors (2014): Book Of Areas.