

Comparison Analysis of Conventional Method Floor Slabs With Half Slab Method Against Cost and Time of XYZ Project

Novika Candra Fertilia, Muhammad Fadhiil Dwi Sukmana
Faculty Of Engineering, Mercu Buana University, Jakarta, Indonesia
novikacandraf@yahoo.com , fadilds98@gmail.com

Abstract

Development in the infrastructure and construction sector in Indonesia has been growing from year to year both in terms of design and the system used. Some of these systems include conventional and precast (Half Slab) systems. Implementation of the conventional system is casting on site or it can be called Cast in situ, while the precast for the implementation of the production process is carried out in a special place, then taken to the project site (transportation) to be compiled into one intact structure. In the implementation of the conventional system there are several shortcomings, namely it takes a long time, is of poor quality and requires a lot of formwork and workers, resulting in a long implementation time. But behind these many shortcomings, of course, there are advantages, namely low implementation costs. In this research, the writer will compare the conventional floor slab system with the half slab floor plate on the bridge project as the object of this final project to compare the effect between the conventional system and the half slab on the project implementation cost requirements and the implementation period and the implementation method. The comparative analysis of the conventional method floor slab and the half slab method floor plate has obtained results. For the conventional method floor plate costs Rp. 2,353,749,140 with an implementation time of 67 days. While the half slab floor plate costs Rp. 2,598,711,750 with an implementation time of 49 days. So conventional floor plate work is cheaper by Rp. 244,962.

Keywords:

Conventional, Cost, Floor Slabs, Half Slab, Time.

1. Preliminary

At this time, the method of superstructure work such as beams, columns and floor slabs was developed so that time could be controlled precisely. One of the construction methods developed to produce time efficiency in construction work is the precast concrete structure system. Precast concrete is widely used as an alternative to conventional concrete systems (Syamsuddin, Warastuti, and Arini 2019).

The choice of a method is very important in the implementation of a construction project because the right method of implementation can provide maximum results, especially when viewed from a cost and time perspective. One of the efforts made by the project manager is to replace conventional methods to be more modern, namely by applying precast concrete (Najoan, Tjakra, and Pratahis 2016)

According to Affandi (2004) there are several differences between conventional and precast systems. The disadvantages in conventional are that it requires a longer construction time, because each interdependent structural element must be done sequentially, the quality is not guaranteed, especially the concrete surface is not as smooth as precast concrete, requires a lot of formwork and workers, depending on the weather, it really depends on the expertise of the implementer. The advantages of the precast system compared to conventional systems are that it has the advantage of being more economical in the use of formwork, more guaranteed quality because it is done in a factory with good supervision, is less affected by weather conditions and higher productivity. The definition of conventional concrete is concrete that is cast directly at the location of the planned structural elements or (cast in-situ). While the definition of Half Slab Concrete is precast concrete or precast concrete that is cast and treated (Curing) in another location, for example a workshop or factory (not where the concrete structural elements are installed) but requires Overtopping at the location of the planned structural elements.

The Half Slab and Conventional methods themselves have their own advantages and disadvantages. In general, the Half Slab method has the advantage of being fast and does not require a lot of workers. So that in order to determine which method is more effective, efficient, and economical in this xyz project, the conventional method and the Half Slab method need to be researched, especially in terms of cost and time.

2. Methodology

Research methodology is the argumentative background that makes a study used in a research activity. In a study, it is necessary to have a method used in carrying out the research. Well-designed and structured methods will produce data that meets the research objectives.

In this research, the comparison used is the conventional method with the half slab method, to find a more efficient cost and time for both methods. This research was conducted on the xyz project in the Soekarno-Hatta International Airport area (Perimeter Area).



Figure 1. Flowchart
Source: Author, 2020

The sequence of stages used for research is as follows:

1. Literature Study of Data Collection: Calculation of floor slab structure conversion, regulations or SNI related to floor slab work, implementation method, project unit price.
2. Calculation of material using conventional method and half slab method.
3. Calculation of work costs analyzed from the Project BoQ, Project Unit Price Analysis.
4. Calculation of time and number of workers based on the labor coefficient of SNI (2008).

Table 1. Material Prices and Equipment Rental in Conventional Methods

No.	Bahan/Alat	Satuan	Harga Satuan
A Bahan			
1	Multiplex Poly Film	lbr	Rp 275.000
2	Balok 8cmx12cm P=4m	m ³	Rp 2.779.500
3	Kaso 5cmx7cm P=4m	m ³	Rp 2.796.000
4	Minyak Bekisting	lir	Rp 7.100
5	Paku	kg	Rp 16.700
6	Besi D16 - BJTD 40	kg	Rp 9.030
7	Besi D22 - BJTD 40	kg	Rp 9.030
8	Beton Ready Mix K-350 T=12 cm	m ³	Rp 784.750
B Alat (Sewa per Bulan)			
1	Concrete Pump	Unit	Rp 59.040.000
2	Concrete Vibrator	Unit	Rp 47.232.000
3	Air Compressor	Unit	Rp 88.560.000
C Upah			
1	Pekerja	OH	Rp 135.500
2	Tukang	OH	Rp 155.800
3	Kepala Tukang	OH	Rp 170.000
4	Mandor	OH	Rp 170.500
5	Pasang + Bongkar Bekisting Pelat	m ²	Rp 41.000

Source: Project Unit Price Analysis xyz project

Table 2. Material Prices and Equipment Rental Half Slab Method

No.	Bahan/Alat	Satuan	Harga Satuan
A Bahan			
1	Beton Precast T=60mm	m ²	Rp 382.295
2	Besi D22 - BJTD 40	kg	Rp 9.030
3	Beton Ready Mix K-350 T=60mm	m ³	Rp 784.750
B Alat (Sewa per Bulan)			
1	Concrete Pump	Unit	Rp 59.040.000
2	Concrete Vibrator	Unit	Rp 47.232.000
3	Air Compressor	Unit	Rp 88.560.000
4	Crane 25 ton	Unit	Rp 280.440.000
C Upah			
1	Pekerja	OH	Rp 135.500
2	Tukang	OH	Rp 155.800
3	Kepala Tukang	OH	Rp 170.000
4	Mandor	OH	Rp 170.500

Source: Project Unit Price Analysis xyz project

Place and Time

Place : This research was conducted in the XYZ Project in the Soekarno-Hatta International Airport area (Perimeter Area). This project is a bridge project (Fly Over).

Time : The time of this study lasted approximately 1 month, which was divided into two stages. The first stage is conducting observations and interviews at the XYZ project location. Furthermore, the second stage is the implementation stage which includes data processing.

3. Results and Discussion

3.1. Results of Cost Analysis of Conventional Methods

The following are the results of the conventional method cost analysis of Rp. 2,353,749,140

Table 3. The Results Of The Conventional Method Cost Analysis

No.	Uraian Pekerjaan	Satuan	Volume	Harga Satuan	Jumlah
A Pelat Lantai					
1	Multiplex Poly Film	lbr	338,54	Rp 275.000	Rp 93.098.500
2	Balok 8cmx12cm P=4m	m ³	39	Rp 2.779.500	Rp 108.400.500
3	Kaso 5cmx7cm P=4m	m ³	78	Rp 2.796.000	Rp 218.088.000
4	Minyak Bekisting	lir	585	Rp 7.100	Rp 4.153.500
5	Paku	kg	1170	Rp 16.700	Rp 19.539.000
6	Besi D16 - BJTD 40	kg	46218	Rp 9.030	Rp 417.348.540
7	Besi D22 - BJTD 40	kg	87175	Rp 9.030	Rp 787.190.250
8	Beton Ready Mix K-350 T=12 cm	m ³	351	Rp 784.750	Rp 275.447.250
SUB TOTAL :					Rp 1.923.265.540
B Alat Ringan					
1	Concrete Vibrator	Unit	1	Rp 47.232.000	Rp 47.232.000
2	Air Compressor	Unit	1	Rp 88.560.000	Rp 88.560.000
SUB TOTAL :					Rp 135.792.000

Table 4. The Results Of The Conventional Method Cost Analysis

No.	Uraian Pekerjaan	Satuan	Volume	Harga Satuan	Jumlah
C Alat Berat					
1	Concrete Pump	Unit	1	Rp 59.040.000	Rp 59.040.000
D Upah					
1	Pekerja	OH	453	Rp 135.500	Rp 61.381.500
2	Tukang	OH	292	Rp 155.800	Rp 45.493.600
3	Kepala Tukang	OH	29	Rp 170.000	Rp 4.930.000
4	Mandor	OH	23	Rp 170.500	Rp 3.921.500
5	Pasang + Bongkar Bekisting Pelat	m ²	2925	Rp 41.000	Rp 119.925.000
TOTAL :					Rp 2.353.749.140

Source: Results of Analysis & BoQ Project xyz project

3.2. Results of the Half Slab Method Cost Analysis

Here are the results of the analysis of the half slab method cost of Rp. 2,598,711,750, -

Table 5. The Results Of The Conventional Method Cost Analysis

No.	Uraian Pekerjaan	Satuan	Volume	Harga Satuan	Jumlah
A Pelat Lantai					
1	Beton Precast T=60mm	m ²	2925	Rp 382.295	Rp 1.118.212.875
2	Besi D22 - BJTD 40	kg	87175	Rp 9.030	Rp 787.190.250
3	Beton Ready Mix K-350 T=60 mm	m ³	175,5	Rp 784.750	Rp 137.723.625
SUB TOTAL :					Rp 2.043.126.750
B Alat Ringan					
1	Concrete Vibrator	Unit	1	Rp 47.232.000	Rp 47.232.000
2	Air Compressor	Unit	1	Rp 88.560.000	Rp 88.560.000
SUB TOTAL :					Rp 135.792.000
C Alat Berat					
1	Concrete Pump	Unit	1	Rp 59.040.000	Rp 59.040.000
2	Crane 25 Ton	Unit	1	Rp 280.440.000	Rp 280.440.000
D Upah					
1	Pekerja	kg	280	Rp 135.500	Rp 37.940.000
2	Tukang	kg	225	Rp 155.800	Rp 35.055.000
3	Kepala Tukang	kg	27	Rp 170.000	Rp 4.590.000
4	Mandor	kg	16	Rp 170.500	Rp 2.728.000
TOTAL :					Rp 2.598.711.750

Source: Results of Analysis & BoQ xyz project

3.3. Results of Time Analysis with Conventional Methods

Following are the results of the time analysis of the conventional method obtained for 67 days.

Table 6. The Results Of The Time Analysis Of The Conventional Method

No.	Uratan	Volume (m ³)	Satuan	Koefisien	Produktivitas 1 group/hari	Kebutuhan Tenaga Kerja	Durasi (hari)	Kebutuhan tenaga kerja jika pekerjaan di selesaikan oleh 6 Group	Kebutuhan waktu jika pekerjaan diselesaikan oleh 6 group (hari)
	a	b	c	d	e=1/d	f=(b/c)*d	g=b/(f*d)	h	i=b/(h*d)
1	Pekerjaan Bekisting	2925							
	Pekerja		OH	0,66	3,03	637	3	106	18
	Tukang Kayu		OH	0,33		319	3	53	18
	Kepala Tukang		OH	0,033		32	3	5	18
	Mandor		OH	0,033		32	3	5	18
SUB TOTAL :								170	18

No.	Uratan	Volume (Kg)	Satuan	Koefisien	Produktivitas 1 group/hari	Kebutuhan Tenaga Kerja	Durasi (hari)	Kebutuhan tenaga kerja jika pekerjaan di selesaikan oleh 3 Group	Kebutuhan waktu jika pekerjaan diselesaikan oleh 3 group (hari)
	a	b	c	d	e=1/d	f=(b/c)*d	g=b/(f*d)	h	i=b/(h*d)
2	Pekerjaan Pembesian	133393							
	Pekerja		OH	0,07	14,28	654	14	218	43
	Tukang Besi		OH	0,07		654	14	218	43
	Kepala Tukang		OH	0,007		65	14	22	43
	Mandor		OH	0,004		37	14	12	43
SUB TOTAL :								470	43

Source: Analysis Results & (SNI 2008)

Table 7. The Results Of The Time Analysis Of The Conventional Method

No.	Uratan	Volume (m ³)	Satuan	Koefisien	Produktivitas 1 group/hari	Kebutuhan Tenaga Kerja	Durasi (hari)	Kebutuhan Tenaga Kerja Jika Pekerjaan di selesaikan oleh 2 Group	Kebutuhan waktu jika pekerjaan diselesaikan oleh 2 group (hari)
	a	b	c	d	e=1/d	f=(b/c)*d	g=b/(f*d)	h	i=b/(h*d)
3	Pekerjaan Pengocoran	351							
	Pekerja		OH	2,1	2,86	258	3	129	6
	Tukang Kayu		OH	0,35		43	3	21	6
	Kepala Tukang		OH	0,035		4	3	2	6
	Mandor		OH	0,105		13	3	6	6
SUB TOTAL :								159	6
TOTAL :								799	67

Source: Analysis Results & (SNI 2008)

3.4. Results of Time Analysis with Half Slab Method

Following are the results of the time analysis using the half slab method obtained for 49 days.

Table 8. The Results Of The Time Analysis Using The Half Slab Method

No.	Uratan	Volume (bh)	Satuan	Koefisien	Produktivitas 1 group/hari	Kebutuhan Tenaga Kerja	Durasi (hari)	Kebutuhan Tenaga Kerja Jika Pekerjaan di selesaikan oleh 2 Group	Kebutuhan waktu jika pekerjaan diselesaikan oleh 2 group (hari)
	a	b	c	d	e=1/d	f=(b/c)*d	g=b/(f*d)	h	i=b/(h*d)
1	Pemasangan Beton Precast	609							
	Pekerja		OH	0,067	7,46	5	7	3	15
	Tukang Kayu		OH	0,038		3	7	2	15
	Kepala Tukang		OH	0,134		11	7	5	15
	Mandor		OH	0,019		2	7	1	15
SUB TOTAL :								11	15

No.	Uratan	Volume (kg)	Satuan	Koefisien	Produktivitas 1 group/hari	Kebutuhan Tenaga Kerja	Durasi (hari)	Kebutuhan tenaga kerja jika pekerjaan di selesaikan oleh 2 Group	Kebutuhan waktu jika pekerjaan diselesaikan oleh 2 group (hari)
	a	b	c	d	e=1/d	f=(b/c)*d	g=b/(f*d)	h	i=b/(h*d)
2	Pekerjaan Besi	87175							
	Pekerja		OH	0,07	14,28	427	14	214	29
	Tukang Besi		OH	0,07		427	14	214	29
	Kepala Tukang		OH	0,007		43	14	21	29
	Mandor		OH	0,004		24	14	12	29
SUB TOTAL :								461	29

Table. 9 The Results Of The Time Analysis Using The Half Slab Method

No.	Uraian	Volume (m ³)	Satuan	Koefisien	Produktivitas 1 group/hari	Kebutuhan Tenaga Kerja	Durasi (hari)	Kebutuhan Tenaga Kerja Jika Pekerjaan di selesaikan oleh 2 Group	Kebutuhan waktu jika pekerjaan diselesaikan oleh 2 group (hari)
	a	b	c	d	e=1/d	f=(b/c)*d	g=b/(fd)	h	i=b/(h/d)
3	Pekerjaan Pengecoran	175,5			2,86				
	Pekerja		OH	2,1		129	3	64	6
	Tukang Kayu		OH	0,35		21	3	11	6
	Kepala Tukang		OH	0,035		2	3	1	6
	Mandor		OH	0,105		6	3	3	6
SUB TOTAL :								79	6
TOTAL :								551	49

Source: Analysis Results & (SNI 2008)

From the results of the analysis of the conventional method and the half slab method above, it can be concluded that the two methods of implementation can each be compared using the graph below:


 Figure 2. Perbandingan Biaya
 Source: Author, 2020

It can be seen from the graph above that the conventional method is cheaper than the half slab method. The conventional method is Rp.2,353,749,140 while the half slab method is Rp. 2,598,711,750. The difference between these two methods is Rp. 244,962,610 with an efficiency of 9.42% cheaper conventional methods.


 Figure 3. Perbandingan Waktu
 Source: Author, 2020

The graph above shows the comparison of time to days and total labor between the two methods. It can be seen that the half slab method is faster than the conventional method. The processing time for the half slab method is 49 days, while the conventional method takes 67 days. The difference between these two methods is 18 days with an efficiency of 26.86% faster half slab method work.

4. Conclusion

1. The cost of implementing the conventional method is Rp. 2,353,749,140 and the cost of implementing the half slab method is Rp. 2,598,711,750. So that the work of the floor slabs using conventional methods is cheaper Rp. 244,962,610 with an efficiency of 9.42% compared to the half slab method.
2. The time required in conventional method floor slab planning during 67 days while the time needed in floor slab planning half slab method for 49 days. So that the slab work using the half slab method is faster 18 days with an efficiency of 26.86% than conventional methods.

References

- Affandi. 2004. Pengaruh Pemupukan Beberapa Paket N, P Dan K Terhadap Pertumbuhan Dan Produksi Segar Rumput Gajah (*Pennisetum Purpureum*)Cv. Taiwan Pematangan Pertama Pada Tanah Podzolik Merah Kuning (Pmk). Padang: Fakultas Peternakan. Universitas Andalas.
- Najoan, Candy Happy, Jermias Tjakra, And Pingkan A. K. Pratisis. 2016. "Analisis Metode Pelaksanaan Plat Precast Dengan Plat Konvensional Ditinjau Dari Waktu Dan Biaya (Studi Kasus : Markas Komando Daerah Militer Manado)." *Jurnal Sipil Statik* 4(5):319–27.
- Sni, 7394:2008. 2008. Concerning The Procedure For Calculating Concrete Work Unit Prices For Building And Housing Construction. Bandung: National Standardization Agency.
- Syamsuddin, Joryans, Niken Warastuti, And Resti Nur Arini. 2019. "Analisis Perbandingan Pelat Lantai Konvensional Dan Pracetak Ditinjau Dari Aspek Biaya Dan Waktu Pada Dermaga 006 Terminal Operasi 1 Pelabuhan Tanjung Priok, Jakarta Utara." *Jurnal Infrastruktur* 4(2):127–34. Doi: 10.35814/Infrastruktur.V4i2.702.

Biography

Muhammad Fadhiil Dwi Sukmana is a student from Mercubuana University Bekasi with a Civil Engineering Study program. Before majoring in civil engineering, at the previous level, namely SMA Bina Bangsa Mandiri, majoring in Science, the author graduated from high school in 2016 and then immediately continued studying at Mercu Buana University majoring in Civil Engineering in 2016, during college the author was active in academic and non-academic organizations. During college, the author attended a seminar event as a security division, a friendly event as an entertainment division. With this research, the writer hopes that the research can become something of learning and hope that further research can be developed properly.