Cost Comparison Analysis of Fence Work Between Conventional Walls and Pracest Concrete (Case Study of West Java Petrochemical Complex Project) at PT Pertamina International

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***Abstract*— The fence is one of the important components in a building which functions as an area barrier, protects privatization, protects security (safety), art and beauty of the building being fenced, generally fences are made of concrete, brick, steel, stainless steel, live plants, wood / planks and river stones. The fence work was carried out using two work methods, namely using the precast concrete method and the hebel or light brick wall method. This research aims to determine the price of work and the duration of work on fences between precast concrete using two different grades of concrete using conventional methods (light brick wall installation) as well as the methods recommended in terms of cost and time The construction period of precast wall installation is shorter than that of conventional wall installation. A precast wall project takes three months. While conventional walls take an average of four months. Precast walls feature practical modular installation methods as well as fabrication of Similar panel components. Conventional wall work (masonry) takes longer to perform compared to prefabricated walls.. (Abstract)**

Keywords—Conventional, Concrete Fence, Cost Comparison, Precast (key words)

I. INTRODUCTION (*HEADING 1*)

A construction project is a series of activities that are only carried out once and generally have a short term. In construction, a project timeline is a schedule that shows the sequence of events in completing a building project. A project timeline helps managers plan the project and organize everything efficiently by knowing the deadlines for each task. Thus, project managers can manage resources effectively, including personnel, budget , and equipment, thus ensuring that everything is completed on time and the project can be successful. Creating a project timeline is very important to ensure that all aspects of the project can be completed on time and within budget. A series of activities in a construction project can be divided into 2 types, namely activities routine and project activities. "Routine activities are a series of continuous activities that are repeated and last a long time, while project activities are a series of activities that are only carried out once and generally within a short period of time."[1]

The world of construction is an inseparable part of human life. With the increasing population inhabiting this earth, construction services will be increasingly needed. Currently, the development of the world of construction is increasingly rapid. Various breakthrough methods in terms of planning and implementing construction work continue to be developed. In Indonesia, there are hundreds of companies operating in the construction services sector. Competition between these companies is increasingly fierce. To get a project, companies are required to be able to compete in terms of quality, time, cost and technology. Companies must be able to build an efficient planning system, namely at the minimum possible cost, in the shortest possible time without ignoring user comfort and safety. Thus, companies that do not have the ability to compete will sooner or later be eliminated. A building construction project activity has various activities that are related to each other, from planning to implementation and maintenance. The success or success of a project can only be known after the project has been completed and carried out. This can be known by looking at the total costs incurred, the time required to complete the project and the quality of the resulting building. Therefore, before starting a building construction project, you must really have a plan and strategy on how to carry out and deal with various kinds of obstacles and risks that may arise. In the world of construction today, especially concrete construction, there are two types of implementation methods, namely concrete work using conventional methods and concrete work using precast methods. The conventional method is a method that is currently commonly used, while the precast concrete method for concreting is currently rarely used. Thus, an analysis is needed to determine the level of efficiency and effectiveness between conventional methods and precast methods when viewed in terms of the strength of the building structure, time and costs required. Projects generally have a deadline, meaning that the project must be completed before or on time. which has been specified. In connection with this problem, success in implementing a

U. S. Saputri and M. A. S. Yudono (eds.), *Proceedings of the International Conference on Consumer Technology and Engineering Innovation (ICONTENTION 2023)*, Advances in Engineering Research 233,
https://doi.org/10.2991/978-94-6463-406-8_20

project on time is an important goal for project owners and contractors. [2].

Several forms of project planning are Cost Budget Plan (RAB) and scheduling or Time Schedule (TS). The cost budget plan for a building or project is a calculation of the costs required for materials and wages, as well as other costs related to the implementation of the building or project. "The cost budget is the price of building materials that is calculated carefully, carefully and meets the requirements." The cost budget for the same building will vary in each region, due to differences in material prices and labor wages" [3].

The implementation method for each project can be different according to the social conditions of the community and nature. The type of construction material technology used will affect the serviceability of the building and also affect the budget and project implementation time. In construction, it is known that there are two concrete work methods used, namely the conventional method and the precast method. "The conventional method is a construction system in which all building components are cast in the field or at the project site (cast in situ). Meanwhile, precast production can be done on site or in the factory. If it is in the field, printing or casting area is needed, but if it is done in a factory, it does not require land but requires transportation. "For precast construction, implementation is faster than conventional construction because the production process can be carried out simultaneously with the construction of the structure" [4].

The existence of conventional and precast concrete methods certainly influences the method of casting work carried out, the effectiveness of the size of a part of a building structure, the art and beauty of the form of a part of a building structure and even the costs incurred and the number of workers needed for a concrete job, in this case The researcher will explain the construction of the West Java Petrochemical Complex Project Fence at PT Kilang Pertamina Internasional.

In Indonesia, the construction of structures using precast concrete for the construction of residential houses, multi-storey buildings, apartments, offices and so on is growing very rapidly. Precast concrete has advantages such as better and guaranteed product quality, more durability and environmental friendliness. This is due to stricter supervision in the fabrication process. In its physical implementation, installation of precast concrete is quicker to complete compared to conventional concrete. However, there are several factors that are taken into consideration by project contractors to continue using conventional methods compared to precast concrete, such as the cost of transportation and installation because precast concrete is made in a different place from the construction site. [5]

Thus, an analysis is needed to determine the level of efficiency and effectiveness between conventional methods and precast methods when viewed in terms of cost and time required for fence work, as a reference for consideration and input for companies in making decisions related to project implementation methods. . The research object used is the West Java Petrochemical Complex Project at PT Kilang Pertamina Internasional.

II. RESEARCH BASIS

A. Profile of the Research Place Institution

The company where the author carries out research activities is one of the companies whose main business is processing crude oil into BBM (Fuel Oil), Non-BBM and Petrochemical products called PT Pertamina (Persero) Refinery Unit (RU) VI Balongan which is a refinery the sixth of the seven refineries of the Processing Directorate of PT Pertamina (Persero) can be seen in figure 2.1. RU VI Balongan began operating in 1994. This refinery is located in Indramayu (West Java) approximately ±200 km east of Jakarta, with operational areas in Balongan, Mundu and Salam Darma.

The existence of RU VI Balongan is very strategic for Pertamina's business and national interests. As a relatively new refinery and has implemented the latest technology, Pertamina RU VI has high economic value. With superior products such as Premium, Pertamax, Pertamax Plus, Solar, Pertamina DEX, LPG, Propylene, Pertamina RU VI has a large contribution in generating income for both PT Pertamina and the country. Apart from that, RU VI Balongan has strategic value in maintaining the stability of fuel supplies to DKI Jakarta, Banten, parts of West Java and surrounding areas which are the business and government centers of Indonesia; [7]

B. Research Contribution

Regarding the Scientific Field

Understand the financial aspects of projects, including project budget management, costing, and financial planning. This is important for managing the project's financial system and ensuring that there is enough money for payments.

Against Institutions / Nations

Understand the terms and conditions of payment plans in construction projects. This includes determining payment methods, payment methods, and performance verification and confirmation processes for payments.

Understand the basic concepts of project management, including planning, organizing, implementing and controlling the project as a whole. This includes strategic planning, cost control and risk management.

C. Theoretical basis

Conventional wall fence construction refers to the traditional method of building a fence using materials such as brick, stone, or wood. In conventional wall fence construction, these materials are installed in stages using cement mortar, sand, and perhaps other additions such as concrete iron or wooden fences. This process usually involves intensive handwork and takes quite a long time to complete the project. According to the Big Indonesian Dictionary (KBBI). A fence is something that is used to limit (surround, divide) yards, land, houses, gardens, and so on. The function of a fence in general is to delimit the ownership of an area which aims to protect or secure what is in the area surrounded by the fence, from everything that is outside the area where the fence is erected. The function of the fence in this research case can be used for fencing industrial areas, residential areas, plantation areas, private land boundaries, yard land, road boundaries and so on. [8]

The choice between conventional wall fence construction and precast concrete fence construction depends on the needs, budget and project requirements. Factors such as cost, time, quality, and design can influence the decision in selecting the most appropriate construction method. [9].

In analyzing the comparison of fence work costs between conventional walls and precast concrete with two different concrete qualities, several relevant theoretical bases need to be considered. The following are several theoretical foundations that can be the basis for this analysis: [10].

In conventional walls, the main materials used are bricks or concrete blocks. However, there are also several other materials that can be used for walls, such as gypsum, bamboo, boards/multiplex. Lightweight concrete can also be used as a substitute for conventional red brick in making walls.

Precast concrete uses concrete panels that have been previously produced in a factory and installed at the project site. Precast concrete panels offer several advantages over traditional on-site concrete construction, including faster installation, higher quality control, and reduced labor costs. The cost of precast concrete panels can vary depending on the size, shape and complexity of the panels, as well as the location and availability of the precast plant. In general, precast concrete panels are more expensive than traditional on-site concrete construction, but the higher initial costs can be offset by labor and time savings.

Precast concrete is generally more efficient in terms of construction time because the concrete panels have been manufactured beforehand and can be installed quickly at the project site. Precast concrete is a construction product produced by casting concrete in reusable molds or "forms" that are then cured in a controlled environment. The advantage of using precast concrete is that it is generally more efficient in terms of construction time because the panels are pre-produced and can be installed quickly at the project site. This eliminates the need to purchase and prepare materials, such as channels and reinforcement, and simplifies the construction process. Precast components are also ready for immediate use. at the time of delivery, while cast-in-place concrete requires additional time to install the cardboard forms, bend and position the reinforcement, pour and vibrate the concrete, and wait for the concrete to dry. Precast concrete is produced in a factory-controlled environment, which allows for better quality control and consistency in the production process.

In precast concrete with two different concrete grades, it is necessary to consider the difference in concrete strength required for the fence. When using precast concrete with two different concrete strengths for a fence, it is necessary to consider the difference in concrete strength required. Precast concrete is a type of concrete that is made in a factory or special location separate from the construction site. Precast concrete has several advantages over conventional concrete, including better quality and consistent strength. The quality of precast concrete can be adjusted to meet the required strength standards. When using precast concrete for a fence, it is important to consider the purpose for which the fence will be used and the strength of the concrete required. The strength of the concrete must be selected based on the load that the fence will withstand. Higher grades of concrete may require more expensive ingredients, such as hardening additives or additional concrete hardeners. When using higher concrete strengths for precast concrete, more expensive materials such as concrete hardening additives or additional concrete hardeners may be required. This additive is used to strengthen and speed up the drying process of concrete, resulting in higher quality and longer lasting concrete. It is important to consider a cost-benefit analysis when determining concrete strength and the use of additives for precast concrete fences.[11]

Labor costs must also be calculated based on the number of workers, working hours, and worker wage rates. In general, the labor market is influenced by two main things, namely the cost of living and living index. When calculating labor costs, there are two factors that need to be considered. The first is money or prices related to daily or hourly wages, additional benefits, and safety 18 insurance. The second factor is productivity, namely the amount of work that can be carried out by a worker in a specified time period (per day or hour). Therefore, labor costs are differentiated into: [12]

III. RESEARCH METHODOLOGY

When the research was carried out from July to August 2023, the research was carried out starting from data collection, namely drawing work plans to determine the length of the area to be fenced and conducting field surveys to obtain more accurate data. The research location is in Kesambi Village, Balongan District, Indramayu Regency, West Java Province

The research method used is a quantitative method, where quantitative research methods are a method used to answer research problems related to data in the form of numbers and statistical programs [14].

The data obtained for this research is primary data and secondary data. Primary data is data collected directly through a series of existing manual test activities [15]. Primary data is obtained by coming directly to the field and conducting a survey of the fence work being carried out to find out the area being worked on. Meanwhile, secondary data is supporting data such as work drawing data and unit price analysis of work.

IV. RESULTS AND DISCUSSIONU

A. Research results

The results of the analysis of this research are to study the cost budget plan (RAB) and construction schedule of concrete fences using precast and conventional methods. The analysis was conducted to determine the price and schedule comparison between the precast concrete guardrail method vs. the conventional concrete guardrail method. Legal

a. Cost budget plan

To find out the costs required in the fencing work between conventional and precast walls, a cost analysis is needed which includes technical and non-technical cost analysis and the costs required. This calculation is useful for knowing the bidding limits that will be issued by the owner and the bidding limits that will be issued by the contractor (service provider). The calculation of this cost budget plan can be divided into several stages, namely:

1. Draw the fence work plan

2. Calculation of workload for conventional walls and prefabricated walls
3. Find the unit price list of wages and materials
4. Prepare unit price analysis for traditional wall and prefabricated wall projects
5. Overview of Prefabricated and Conventional Fence Project Budget Preparation (RAB)

b. Cost Budget Plan of conventional and precast wall works

The analysis shows that precast walls may be more expensive than conventional walls but take less time to build.

1. Budget plan for conventional wall

No	Uraian	Sat	Harga Satuan	Volume	Jumlah Harga
1	Pemasangan 1m² Pondasi Batu Kali	m3	Rp 625.185,00	537,500	Rp 336.036.937,50
2	Pembuatan 1m² Beton Mutu f'c = 21,7 Mpa (K250) Untuk Sloof	m3	Rp 705.232,00	96,029	Rp 67.722.371,11
3	Pembuatan 1m² Beton Mutu f'c = 21,7 Mpa (K250) Untuk Pondasi	m3	Rp 705.232,00	679,470	Rp 479.183.987,04
4	Pembuatan 1m² Beton Mutu f'c = 21,7 Mpa (K250) Untuk Kolom	m3	Rp 705.232,00	2.657,220	Rp 1.873.956.575,04
5	Pembuatan 1m² Beton Mutu f'c = 21,7 Mpa (K250) Untuk Balok	m3	Rp 705.232,00	94,394	Rp 66.569.493,10
6	Pemasangan 1 m² Bekisting untuk Sloof Beton Bangunan Gedung	m2	Rp 149.564,25	347,434	Rp 51.963.645,81
7	Pemasangan 1 m² Bekisting untuk Kolom Beton Bangunan Gedung	m2	Rp 227.997,00	4.345,000	Rp 990.646.965,00
8	Pemasangan 1 m² Bekisting untuk Balok Beton Bangunan Gedung	m2	Rp 388.379,75	347,434	Rp 134.936.174,71
9	Pemasangan 1 m² Dinding Bata Ringan Tebal 10 cm dengan Mortar Siap Pakai	m2	Rp 108.009,00	2.606,340	Rp 281.508.177,06
10	Pemasangan 1 m² Barepan 1 SP : 5 PP Tebal 15 mm	m2	Rp 31.753,92	5.207,412	Rp 165.355.744,06
11	Pemasangan Finishing 1 m² Dinding Sisir pasangan Bata	m2	Rp 120.818,20	35.628,000	Rp 4.304.510.829,60
12	Pekerjaan Pembesian Sloof, Kolom dan Balok < 12 mm Htungan Per 100 kg	kg	Rp 1.197.460,00	262,994	Rp 314.925.034,73
	Jumlah Total Harga				Rp 9.067.315.934,76

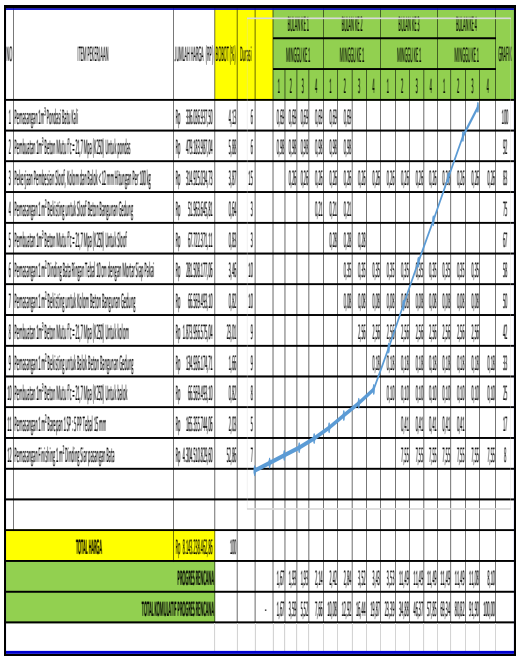
2. Precast wall cost budget plan

No	Uraian	Sat	Harga Satuan	Volume	Jumlah Harga
1	Pemasangan 1m² Pondasi Batu Kali	m3	Rp 625.185,00	537,500	Rp 336.036.937,50
2	Pembuatan 1m2 Bekisting Untuk Beton Pracetak Komponen Modular Gedung (5 Kali Pakai)	m2	Rp 143.759,39	1.501,920	Rp 215.915.100,91
3	Pembuatan 1 m² Bekisting Untuk Kolom Beton Pracetak (10 -12 kali Pakai)	m3	Rp 137.520,02	93,960	Rp 12.921.381,08
4	Pemasangan dan Membuka Cetakan 1 Buah Komponen Pelat Beton Pracetak	Unit	Rp 6.996,00	5.214,000	Rp 36.477.144,00
5	Pemasangan dan Membuka Cetakan 1 Buah Komponen Kolom Beton Pracetak	Unit	Rp 9.174,00	869,000	Rp 7.972.206,00
6	Penuangan / Menebar Beton 1m3 untuk Pelat Beton Pracetak	m3	Rp 53.988,00	5.214,000	Rp 281.493.432,00
7	Penuangan / Menebar Beton 1 m3 untuk Kolom Beton Pracetak	m3	Rp 50.171,00	869,000	Rp 43.598.599,00
8	Pemasangan 1 Buah Komponen untuk Pelat Beton Pracetak	Unit	Rp 82.577,00	5.214,000	Rp 430.556.478,00
9	Pemasangan 1 m² Bekisting untuk Sloof Beton Bangunan Gedung	Unit	Rp 66.027,50	1.647,060	Rp 108.751.254,15
10	Pembuatan 1m² Beton Mutu f'c = 21,7 Mpa (K250) Untuk Sloof	m3	Rp 702.064,00	135,781	Rp 95.326.951,98
11	Pembuatan 1m² Beton Mutu f'c = 30 Mpa (K250) Untuk Beton Pracetak	m3	Rp 747.417,00	799,697	Rp 597.707.319,50
12	Pembuatan 1m² Beton Mutu f'c = 21,7 Mpa (K250) Untuk Pondasi Beton	m3	Rp 702.064,00	168,286	Rp 118.147.717,82
13	Pengangkutan Beton Pracetak dari Workshop ke Proyek	kg	Rp 8.759.520,00	1,000	Rp 8.759.520,00
	Jumlah Total Harga				Rp 2.293.664.050,95

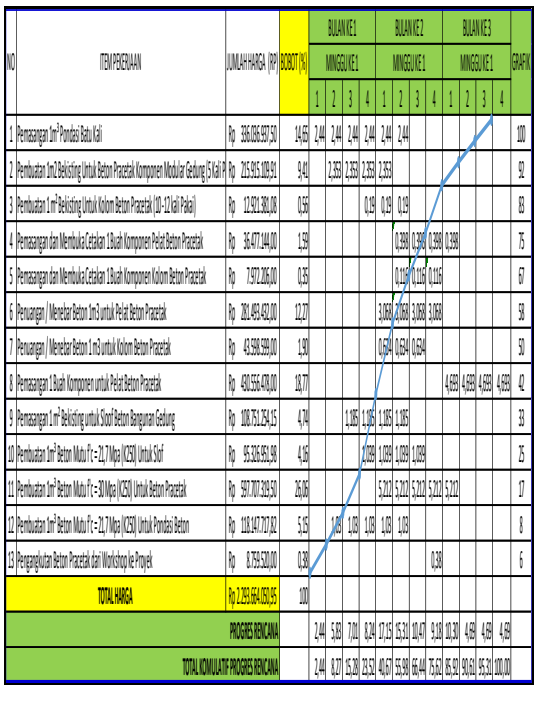
c. Work duration of conventional wall and precast wall

The duration of prexast wall installation is generally shorter than conventional wall installation. The prexast wall work takes 3 months. While the wall work takes an average of 4 months. Prexast walls have a practical modular installation method and also the fabrication of similar wall panel components. The execution time of conventional wall works (masonry) is longer than that of prexast walls.)

1. Duration of conventional walling work



2. Duration of precast wall work



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