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Job Analysis Using Conventional and Precast Methods on Jalan Konggoasa Kendari City

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ABSTRACT

Increasing population growth of Kendari City demands the development of infrastructure development that continues to grow so that there must be road arrangements and systems irrigation or drainage network to avoid overflowing puddles on road Konggoasa Kendari City. Drainage is an infrastructure that functions to drain surface water to water receiving bodies and or to artificial infiltration structures. In other words, drainage has the meaning of draining, throwing, or diverting water. The objectives of this study are: (1) to determine the cost comparison using the conventional method (cobblestone) and the precast method (u ditch). (2) to find out the comparison of time using the conventional method (cobblestone) and the precast method (u ditch). on the project implementation work on road Konggoasa Kendari City. The results of this study indicate that the work cost for the conventional method is IDR. 193.867.145 (One Hundred Ninety-Three Million Eight Hundred Sixty-Seven Thousand One Hundred Forty-Five Rupiah), and for the precast cost of IDR. 781.130.738 (Seven Hundred Eighty One Million One Hundred Thirty Thousand Seven Hundred Thirty Eight Rupiah), with the percentage of the cost of the conventional method being 75% cheaper than the precast method. And in terms of time for work using the conventional method for 66 days and for the precast method for 47 days with the percentage of time the precast method is 29% faster than the conventional method.

Keywords: *Drainage, Conventional, Precast*

I. INTRODUCTION

The increasing population growth of Kendari City demands the development of infrastructure development which is marked by the increase in housing, buildings, factories, irrigation networks, roads, bridges, docks and so on. The increasing number of construction projects should ideally be followed by an increase in the construction industry both in terms of quantity and quality.

Likewise with the arrangement of roads and irrigation or drainage network *systems* in Kendari City. Developments in the business world and offices in Kendari City are increasingly rapidly making the Kendari City government carry out road repairs and widening, including a more efficient irrigation system for the long term in the future. to drain water from roads as well as from residents' housing and business areas.

The current method of implementing a construction has developed rapidly. Developments are sought to reduce costs so that they can compete by reducing implementation time, number of workers and experts. At this time construction planning has developed, including the existence of a method of implementing concrete work using the *precast* method.

In the process of constructing a drainage channel, the majority of contractor companies currently still use conventional methods. The conventional method is a method of work carried out directly at the project site or *cast in situ.* However, there are several drawbacks to this method, such as it takes a long time because it uses ordinary reinforcement, poor quality control, and requires a lot of formwork. More effective alternative methods are urgently needed to minimize execution time and labor requirements. Therefore, companies that provide products or services compete to find alternative construction methods to build drainage channels. One alternative is the channel of *U ditch* precast concrete or the so-called precast method.

This precast method is basically the same as ordinary reinforced concrete, but the production process is carried out in a special place for precast production. Then it is transported or delivered to the project site so that it is arranged into a unified whole structure. The most basic difference between the conventional method and the precast method is the manufacturing method and the execution method. The manufacture and implementation of the conventional method is carried out directly in the field, while for the precast method, the manufacture is carried out in a manufacturing manner, the implementation is arranged into a unified whole structure, and does not require too much

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formwork because it has been replaced with precast which also functions as formwork. This precast method was adopted as the basis for this final project with the scope of field studies on drainage works for a road periodical maintenance project located on Jalan Konggoasa, Kandai Village, Kendari District, Kendari City, Southeast Sulawesi.

II. LITERATURE REVIEW

2.1 Drainage

According to the Regulation of the Minister of Public Works No. 12 of 2014 concerning the Implementation *of* Urban Drainage *Systems*, Drainage is an infrastructure that functions to drain surface water to water receiving bodies and or to artificial infiltration buildings. In other words, drainage has the meaning of draining, throwing, or diverting water.

According to Laksono (2007) the project is a series of work that aims to achieve the objectives of a project in accordance with the requirements that have been set at the beginning of the project such as quality, time, and cost requirements. Meanwhile, According to Fairizi (2015) The drainage system is a series of activities that make up the efforts to drain the water, both from surface water (runoff / *run-off)*, and ground water (underground *water)* from an area or region. According to Firdausi (2021) drainage has a function to drain, drain, dispose, or divert water, and can also be inteIDRreted as an effort to control groundwater quality in relation to salinity.

2.2 Conventional Method Channel

Conventional channel is a construction method in which all building components are carried out at the project site. The conventional concrete work process begins with mixing, transportation, pouring, compaction, and formwork. Stone masonry is an infrastructure that functions to drain excess water from an area to a receiving water body (Pratama, 2020).

The advantages of conventional channels are:

- Easy and common in his work.
- The materials needed are easier to obtain, so the price is cheaper.
- Easy to shape in various sections.
- Calculations are relatively easy and general.

The drawbacks are:

- Required quite a lot of labor (relatively expensive).
- The use of formwork is relatively more.
- Work in construction requires a longer process because sequential jobs are interdependent with other jobs.
- Affected by the weather, when it rains, concrete work cannot be done.

2.3 Precast/Precast Method Channel

According to Falah (2019), the precast method is a method of implementing a structure that does not do the casting at the site of the project to be built, but is carried out at the manufacturing site. Structural components such as *U ditch* and *covers are* printed or manufactured first before being placed, then assembled and assembled in the field or at the project site". Precast concrete was first developed on the European continent, in 1850 a man named Joseph Monier had the idea to develop reinforced concrete. Then reinforced concrete was introduced by a German company, Wayss and Freytag in Hamburg and began to be used in 1906. In 1912, John E. Conzelmann used the *Precast* method in the form of components, such as walls, columns and floors in several high-rise buildings. In 1981 for the first time the precast beam method was first used for the construction of the Casino, in Biarritz, France by the contractor Coignet.

Along with the development of the era that continues to occur, currently many *precast* products are starting to be produced and sought after, namely *Precast u-ditch*, *U-ditch* is reinforced concrete from one of the precast concrete innovations that is benefited as a channel, both for drainage channels and irrigation canals (Wagola et al.., 2017).

The advantages of Precest *U-ditch* Concrete are:

- Speed in the implementation of its development.
- Not affected by weather factors.
- Good quality.

The disadvantages of *U-ditch* precast concrete are:

- The shipping process from the factory to the field must be careful so that no cracks occur.
- Requires adequate means of transportation.
- Using heavy equipment for his work.
- Requires experienced workers for the installation process.

2.4 Budget plan

According to Prihantara (2018), the cost budget plan is a cost calculation method that can assist site *managers*, project management, directors and supervisory consultants in monitoring the progress of a project. According to a general understanding, the budget plan is an estimate of the costs, other things needed to construct a building. This is needed as a development guideline so that the development process runs efficiently and effectively.

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The data needed in making the budget plan include:

- Work Plan and Terms (RKS)
  Work plans and requirements are regulations, requirements, and specifications for the implementation of a building work, which are binding and described in such a way, so that they are clear and easy to understand, and are used to determine material specifications and technical requirements that have been determined.
- Building drawings that explain the shape, size and specifications of the materials used.
- Data on material prices and labor wages at the location and time of construction.
- Coefficient of building unit price analysis.
- The volume of each job.

2.5 Value Engineering (RN)

Value engineering is an application of a number of techniques to identify and reduce unnecessary costs. Value engineering is used to find alternatives that aim to produce lower costs than the previously planned price with functional limitations and quality of work.

2.6 Execution time

According to Hidayah (2015) project scheduling is one of the construction methods that aims to determine the time for the completion of a construction activity from when the activity begins until the completion of the construction activity, which in general consists of planning time, materials, equipment, labor, and finance.

The time dimension referred to in terms of productivity in the construction sector is planning in the preparation of a network that can show the fastest completion time accompanied by a float tolerance that identifies delay settings without disturbing the overall project schedule.

From this understanding, the time dimension will focus more on:

- Preparation of a project implementation schedule at a relatively economical cost.
- Scheduling with limited resources.
- Preparation of a schedule that can even out the combination or use of resources.

III. RESEARCH METHODS

3.1 Method of collecting data

3.1.1 Location and Time of Implementation

This research was carried out on Konggoasa Street, Kandai Village, Kendari District, Kendari City, Southeast Sulawesi. and for more details can be seen in Figure 1 below.

Picture 1. Location Of Konggoasa Road Kendari City

3.1.2 Data Types and Sources

The types and sources of data to be used in this study are presented in table 1 as follows:

Table 1 Types and sources of data

No	Data Type	Data source
1	Primary data	
	1. Number of workers	Field
	2. Tool type and coefficient	Field
2	Secondary Data	
	1 Details *u dich*	PUPR Kendari City
	2. Unit length	PUPR Kendari City
	3. Unit price of resources	PUPR Kendari City
	4. Resource coefficient	AHSP No. 26 Year 2016

Source: Research Design 2021.

3.1.3 Research variable

The indicators of this research variable can be seen in table 2

Table 2 Research Variable Indicators.

No	Review Elements	Indicator
1	Implementation cost	1. Calculation of work volume 2, Unit price analysis of workers, tools, materials
2	Execution time	1. Volume of work 2. Number of workers 3. Labor coefficient

Source: Research Design 2021.

IV. RESULTS AND DISCUSSION

4.1 General review

The length of the drainage building work is 450 meters. The length of the building is divided into two between the building on the north side of 225 meters and the building on the south side of 225 meters. drainage works are carried out using conventional methods or *cast in situ* where the work is a masonry drainage work and the precast method uses the *U Ditch precast* model.

4.2 Budget Plan Conventional Method and Precast Method

According to Kurniawan (2017). "The cost budget plan (RAB) is a calculation of how much costs must be used for materials and wages, as well as other costs related to the implementation of the building or project".

1. Conventional Method Cost Budget Plan

The following is a recapitulation of the budget plan using the conventional method with a drainage length of 225 meters, which can be seen in table 3 below:

Table 3 Budget Recapitulation Conventional Method

No	Description	Unit	Volume	Unit price (IDR)	Total price (IDR)
1	2	3	4	5	4 x 5
I	**Earthwork**				
1	Ordinary Digging Deep > 1 m to 2 m	m^3	292	IDR 82,417,50	IDR 24,066,322.09
2	Backfilling of Excavated Earth	m^3	70	IDR 61.050.00	IDR 4,244,501.25
				Amount	IDR 28,310,823.34
II	**Drainage Structure Works**				
1	Backfill Sand Urug	m^3	11	IDR 258,610.00	IDR 2,792,988.00
2	Stone Blank Installation (an stamping)	m^3	22	IDR 629,508.00	IDR 13,597,372.80
4	S Type Mortar Pair	m^3	82	IDR 896,782.81	IDR 73,244,736.01
5	Plastering 1SP: 1PP	m^2	545	IDR 93,837.92	IDR 51,094,747.44
3	Installation of Acian	m^2	545	IDR 45,595.00	IDR 24,826,477,50
				Amount	IDR 165,556,321.75
Total Cost of Couple Channel					IDR 193.867.145.08

Source: Data Analysis Results, 2021

Based on table 3, it is found that drainage work using conventional methods requires a budget of IDR. 193,867,145 (One Hundred Ninety-Three Million Eight Hundred Sixty-Seven Thousand One Hundred Forty-Five Rupiah).

2. Precast Method Budget Plan

The following is a recapitulation of the budget plan using the precast method with a drainage length of 225 meters which can be seen in table 4 below:

Table 4 Precast Method Budget Recapitulation

No	Description	Unit	Volume	Unit price (IDR)	Total price (IDR)
1	2	3	4	5	4 x 5
I	**Earthwork**				
1	Ordinary Soil Excavations Depth < 1 m	m³	264	IDR 68,742.30	IDR 18.124.251.11
2	Backfill excavation	m³	63	IDR 61.050.00	IDR 3,832,413.75
				Amount	IDR 21,956,664.86
II	**Drainage Structure Works**				
1	Concrete K 100 (f'c = 7.4 Mpa) For Floor Work	m³	11	IDR 1,078,280,41	IDR 11,645,428,40
2	U Ditch Precast Mount 80 x 80 cm L = 100 cm t = 08 cm (with cover)	fruit	188	IDR 3,986,819.44	IDR 747,528,644.28
				Amount	IDR 759,174,072.68
Total Cost of *U Ditch* Channel					IDR 781.130.737.54

Source: Data Analysis Results, 2021

Based on table 4, it is found that drainage work using the precast method requires a budget of IDR 781,130,738 (Seven Hundred Eighty-One Million One Hundred Thirty Thousand Seven Hundred Thirty-Eight Rupiah).

3. Discussion of Implementation Costs

Based on table 3, and table 4, the results of the drainage work using the conventional method require a budget of IDR. 193,867,145 (One Hundred Ninety Three Million Eight Hundred Sixty Seven Thousand One Hundred Forty Five Rupiah) while for drainage work using the precast method requires a budget. amounting to IDR 781,130,738 (Seven Hundred Eighty-One Million One Hundred Thirty Thousand Seven Hundred Thirty-Eight Rupiah).

For the price of work per meter length of the two methods are:

Conventional method = $\frac{\text{RAB Conventional method}}{\text{Total Lenght}}$

= $\frac{\text{IDR 193.867.145}}{225}$

= IDR. 861,632

Precast method = $\frac{\text{RAB Precast method}}{\text{Total Length}}$

= $\frac{\text{IDR 781.130.738}}{225}$

= IDR. 3,471,692

The difference between the costs of the two jobs is

Cost difference = *U Ditch* precast method – Conventional method

= IDR 3,471,692 – IDR 861,632

= IDR 2,610,060

Cost comparison presentation

= $\frac{\text{Cost Dufference}}{\text{precast method}}\ x\ 100\ \%$

= $\frac{\text{IDR 2.610.060}}{\text{IDR 3.471.692}}\ x\ 100\ \%$

= 75%

From the results of the above calculations, the budget for the conventional method is 75% lower than the precast method.

C. Comparison of Drainage Channel Work Time

1. Work Time Plan Conventional Method

The following is a recapitulation of the work time plan using the conventional method with a drainage length of 225 meters, which can be seen in table 4.3 below:

Table 5 Recapitulation of Conventional Method Work Time

No	Description	Unit	Volume	The number of workers (person)	Total Time (day)
1	2	3	4	5	6
I	**Earthwork**				
1	Ordinary Digging Deep > 1 m to 2 m	m³	292	8	37
2	Backfilling of Excavated Earth	m³	70	6	12
				Amount	49
II	**Drainage Structure Works**				
1	Sand Dumpling	m³	11	3	4
2	Empty Stone (an *stamping)*	m³	22	6	4
3	S Type Mortar Pair	m³	82	6	14
4	Plastering 1 m², 1SP : 1PP 15 mm	m²	545	15	36
6	Acian	m²	545	15	36
				Amount	94
Total Working Time of Couple Channel					143

Source: Data Analysis Results, 2021

Based on table 5, it was obtained for drainage work using the conventional method the total work was 143 days and when the calculation was carried out using the scheduling method using a bar chart, it was obtained for the work time with the conventional method for 66 days.

2. Precast Method Work Time Plan

The following is a recapitulation of the work time plan using the precast method with a drainage length of 225 meters, which can be seen in table 4.4 below:

Table 6 Precast Method Job Time Recapitulation

No	Description	Unit	Volume	The number of workers (person)	Total Time (day)
1	2	3	4	5	6
I	**Earthwork**				
1	Ordinary Soil Excavations Depth < 1 m	m³	264	7	38
2	Backfill excavation	m³	63	6	10
				Amount	48
II	**Drainage Structure Works**				
1	Concrete K 100 (f'c = 7.4 Mpa) For Floor Work	m³	11	5	2
2	U Ditch Precast Mount 80 x 80 cm L = 100 cm t = 08 cm (with cover)	fruit	188	5	38
				Amount	40
Total Channel Time *U Ditch*					88

Source: Data Analysis Results, 2021

Based on table 6, it is obtained for drainage work using the precast method, the total work is 88 days and when it is calculated using the scheduling method using a bar chart, it is obtained for the work time with the conventional method for 47 days.

3. Discussion of Implementation Time

The result of the implementation time for the conventional method is 66 days, while the implementation time for the precast method is 47 days.

The time difference between the two methods is:

Difference = Conventional Method - Precast Method
= 66 – 47
= 19 Days

Time comparison percentage

$$= \frac{Time\ Difference}{\text{Conventional Method}}\ x\ 100\ \%$$
$$= \frac{19}{66}\ x\ 100\ \%$$
$$= 29\%$$

From the results of the above calculations, it was found that the time for the execution of the work with the precast method was 19 days faster when compared to using the conventional method, so that the time difference between the two methods was 29%.

V. CONCLUSIONS AND SUGGESTIONS

5.1 Conclusion

From the results of the comparative discussion of implementation methods, the cost and time analysis obtained a conclusion that can be the difference between conventional masonry drainage and U Ditch precast drainage as follows:

1. The conventional drainage method costs IDR 193,867,145 (One Hundred Ninety-Three Million Eight Hundred Sixty-Seven Thousand One Hundred Forty-Five Rupiah), with work per meter of IDR 861,632 (Eight Hundred Sixty-One Thousand Six Hundred Thirty-two rupees). And for the method of implementing precast drainage, it costs IDR. 781.130.738 (Seven Hundred Eighty-One Million One Hundred Thirty Thousand Seven Hundred Thirty-Eight Rupiah), with a work per meter of IDR. 3,471,692 (Three Million Four Hundred Seventy-One Thousand). Six Hundred Ninety-Two). So that the conventional method is 75% better or cheaper when compared to using the precast method.
2. The conventional drainage method requires 66 days of work and the precast drainage method requires 47 days of work, the precast method is 19 days faster than the conventional method, so the precast method is 29% better or faster when compared to using conventional methods.

5.2 Suggestion

Based on the results of comparative research on the implementation of conventional methods with precast methods that have been carried out based on cost and time analysis, several suggestions can be proposed as follows:

1. For further research, a comparison of channel maintenance costs can be added between the conventional masonry method and the u-ditch precast method, so that the maintenance costs of the two methods can be known.
2. For further research, you can make changes to materials such as box culvert precast concrete and so on, so you can choose a more efficient alternative.

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