JOURNAL OF WORLD CONFERENCE
VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Comparative Analysis Methods Fullslab Precast Erection of Cost and Time

Irriene Indah Susanti and Dega Setyawan Hadi
Faculty of Engineering, University of Mercu Buana, Indonesia,
irrieneindahsusanti@gmail.com, degashadi@gmail.com

Abstract

The Indonesian government stepped up infrastructure projects in the country for logistical and economic equality equalization, infrastructure in the form of a Freeway. This study aimed to analyze and compare the costs, timing, and precise method in Fullslab Precast erection work on 1 module. The data used are primary and secondary. Using the method of removal/erection with heavy equipment cranes. For the calculation of comparative analysis is obtained by analysis of the cost and time analysis. Field observations, and direct cost analysis calculation, and not directly into the calculations that will be loaded to get the proper method to the cost and time of work. The results of the right method are method 1 Crawler Crane at Rp 206.598.086,00.
Keywords: Analysis, Erection, Fullslab Precast, Methods, Cost, Time.

1. Introduction

The Indonesian government to build infrastructure projects in the country for equalization logistical and economic equality. Infrastructure development in the form of motorway where each use is required to pay and can act as growth in the national economy and also local area income.

Development of the construction of the world is growing rapidly, it can be seen by the increasing number of development implemented in both the buildings, roads, bridges and the building needs of the community. In any construction process also needed sufficient time to complete from start to finish. Therefore, it needs careful thought to determine the most appropriate method of implementation and efficient in completing a construction project, also through good cooperation between the various parties involved, especially for large projects such as road tolls. It would also require the role of construction management that the utilization of existing resources can be maximized.

The main construction on highway projects using pile on slab method, which uses precast concrete slab construction (precast), which is based on the structure of the stake. On the field, of course, there are various obstacles. Precast slab production of sub-contractors has been delayed. With the delay affects the execution time of a job in the field. It is very influential in costs and time, as well as the area of land preparation work required before construction be carried out.

In the construction of this project Precast Erection Fullslab be the greatest work to complete the project Cibitung-Cilincing toll road that needs to be maximized Precast Fullslab work methods in order to avoid wastage of costs, time delays and have good quality.

On Construction erection Fullslab Precast using the heavy equipment 1 Crawler cranes, 1 mobile cranes, and 1 Crawler Crane with 1 Mobile cranes, so the authors are interested to analyze the comparison of methods erection Fullslab Precast against the cost and time (case study highway projects Cibitung-Cilncing section 3).

Based on the background that has been stated previously, the subject-matter of the study are:

1. What is the cost of the construction of precast Fullslab with method 1 Crawler Crane, 1 Mobile Crane and Crawler Crane 1 to 1 of Mobile Crane?
2. How much time is needed for the execution of construction Fullslab Precast erection?
3. The exact method to the cost and time to work Fullslab Precast erection?

The purpose of this research is:

1. Knowing the cost involved in the erection method Fullslab Precast.
2. Knowing the execution time required at Fullslab Precast erection method.
3. Knowing the proper methods to work Fullslab Precast erection method to the cost and time.

JWC JOURNAL OF WORLD CONFERENCE
VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

2. Literature Review

In terms of cost and time of use of precast cheaper and faster than using cast in situ. But the precast method emphasized that requires precision and expertise both in the production process and in the installation process. [1].

Crawler crane is a heavy equipment used to haul the load either horizontally or vertically, crawler cranes have the ability to rotate 360˚ to maneuver easily and practically. [2]

Thin structure made of reinforced concrete with a field whose direction is horizontal, and the load acting perpendicular to the field of the structure. The thickness of the field plate is relatively very small compared with the span / width fields. [3]

Precast Concrete (Precast Concrete) is concrete that is printed in multiple locations (both within the project as well as in factories), which in turn mounted in position by a connection system so that the circuit elements for the sake of precast concrete elements into a coherent whole as a structure (Plant cast Precast and Presetressed). And "Half Precast is a system of reinforced concrete slab that half of them printed off-site (precast) and half of them are printed on the spot (cast in situ)." [4]

2.1 Project management

Construction project management is planning, organizing leading, and controlling resources to achieve short-term goals have been determined.

In planning and implementing the project, there are three things that has always been a benchmark for the success of the project, all three measures are:

a. Great cost (budget) allocated
   That project should be completed at a cost that does not exceed the budget.
b. Project implementation schedule.
   Ie the time the project should correspond to the time period specified.
c. Quality products (output of the project)
   Namely the quality of the results of the project must meet the specifications defined and as expected until the period has been planned (the design life).

Project Management Functions

a. Planning / plan
   Planning /planning an act of decision-making data, information, assumptions or facts selected activities and will do in the future.
b. Organizing /organizing
   Organizing is an action to collect a human activity behrdasarkan their respective duties and are interconnected to one another by any particular procedure. Organization formed will succeed if each member is able to cooperate with the aim of achieving a common goal.
c. actuating /Implementation
   Implementation is an attempt to move the organisani accordance with the wishes and their efforts to achieve its goals and members are organized for each member also has personal goals
d. controlling / Control
   Control is tersistematis efforts of the company to achieve its objectives by comparing presstasi work with the plan and make the appropriate action to correct an important difference. Benefits of control is to minimize the possibility of errors occurring in terms of quality, quantity, cost and time.

2.2 Project Cost Management

Project cost management is a process or activity that is needed to ensure that the project will be completed within the budget approved.

2.2.1. Project Cost

Cost is the sacrifice of economic resources that are usually measured in terms of money, whether that has happened, is happening, or might happen for a particular purpose. Various things in our activities is also not free of charge, especially for a project in the company.

The calculation of the cost of the project is very important in controlling the available resources given the available resources are limited. To that end, the role of an engineer is twofold cost, estimate project costs and control (control) the realization of the cost in accordance with the restrictions that exist in the estimation. There are two types of project costs, namely:

VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

a. Direct Cost (Direct Cost)
Direct costs are costs associated with the implementation of the construction project work in the field. The direct costs of the construction project can be estimated by calculating the volume of work and the cost of the project based on the unit price of the work.

b. Indirect Costs (Indirect Cost)
Indirect costs (Indirect Cost) are all project costs that are not directly related to the construction field. Nevertheless, indirect costs must exist and can not be separated from the ongoing project. These indirect costs have not been explicitly calculated for each construction project but need to be estimated for the allocation of costs beyond construction work.

2.2.2. Project Cost Analysis

Calculation of the budget usually consists of five basic things:

a. *Manpower* ie calculating working hours required and the number of his charges.
b. *Material* which count the number of materials used and price.
c. *Machine* namely calculate type and amount of equipment used and the cost.
d. *Methode* ie calculate the costs and time based methods of work necessary to complete the project
e. *Money* calculate the percentage gain of the time, place and type of work.

2.3 Budget plan

Budget Plan (RAB) is the amount of expected costs in project work which is based on the volume of each work item in the picture or guidelines. RAB filed by the contractor at the time of bidding, in which the RAB is used benchmark for the contractor to submit a bid. This fee is in addition to depending on the volume, also heavily dependent on labor and employee wages, prices of material required and contracting services as well as taxes. [5]

2.4 Employment Analysis Unit price

Unit price is the amount of material prices and labor costs based on the calculation analysis. Material prices obtained on the market, collected in a list called list unit prices of materials. Labor wages earned in the location, collected and recorded in a list called list unit prices of materials. The unit price of materials and labor in each different region. So in calculating and preparing the budget of a building / project should be based on the unit price of materials and labor in the market and work locations.

2.5 Scheduling

Scheduling is a planning phase translates into a diagrams in the form of activities in accordance with the time scale in which each activity should be carried out so that the project is completed on time at economical cost. One example is the scheduling method PDM.[5]

2.6 Productivity

Factors that affect the productivity of which is a tower crane in field conditions, the condition of the tool, management factors and the ability of the operator. In this study, the condition of equipment and the operator's ability is considered normal and does not affect the data taken during the observation in the field. While field conditions in the form of tall buildings in the vicinity of the project, bad weather, material load in the lift, as well as management factors which include tower crane layout and placement of materials thought to affect the observed data in the field. [6]

2.7 Lifting Heavy Equipment Material Type

2.7.1. Tools Crawler Crane

Air is lifting material used in the construction project site with a range that is not too long. This type has a top that can move 360 degrees. With the wheels crawler cranes of this type can be engaged in the project site while doing his job. At the time of the crane will be used another projected then a crane lifted using lowbed trailer.

VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Figure 1. Tools Crawler Crane
(Source: Data Project Cibitung-Cilincing Section 3, 2019)

2.7.2. Tools Mobile Crane

Mobile cranes is one type of alternative heavy equipment tower crane when a project requires heavy equipment that includes a height with high mobility, and can also be used in construction, such as bridges, roads, dams and other development work. Mobile crane has a boom that is supported by the main structure (super structure plat form), this boom may be a frame (lattice) of steel (frame work) with the control cable as a means pengangkatnya on the mobile crane-type crawler, or may be a boom arranged with hydraulic control on the type of hydraulic mobile crane.

Figure 2. Tool Crawler Crane
(Source: Data Project Cibitung-Cilincing Section 3, 2019)

3. Research Methodology

The method used in this research iswhich analyzes the use of methods fullslab precast erection with heavy equipment Mobile Crane Crawler Crane and in terms of cost and time. The analytical method used is descriptive quantitative. A quantitative approach is research that focuses on hypothesis testing, data used should be measured, and produce conclusions that can be generalized. This approach uses a method (analyzer). To achieve the objectives, the necessary data to be used for processing in accordance with the theoretical basis acquired. The data itself is divided in two; primary data and secondary data. The primary data of the data obtained and collected through direct survey to the study site. Secondary data can be obtained by searching through the internet, coworker or go directly to the office or agency concerned. If the data obtained to continue the research has not met, then the required return for the collection of such data.

Criteria Expert:

a. Experts in the field of infrastructure, and / or representation in Government.
b. Minimum S1 or S2.
c. At least 25 years of experience to S1 and S2 at least 10 years for.

JOURNAL OF WORLD CONFERENCE
VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

To achieve the objectives of this research, the study is divided into several stages, including:

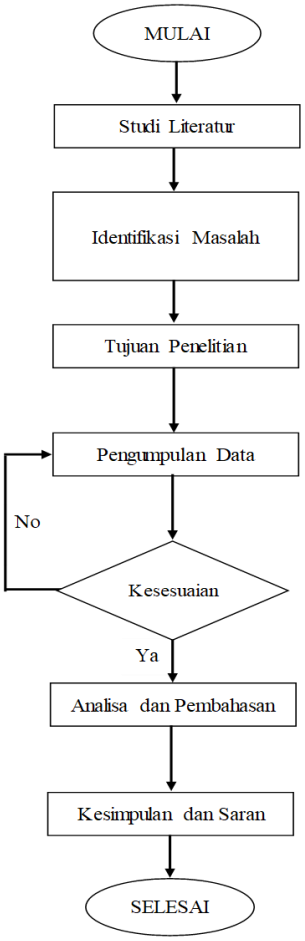

Figure 3. Flowchart Flow Research
Source: Processed Data Researcher, 2019

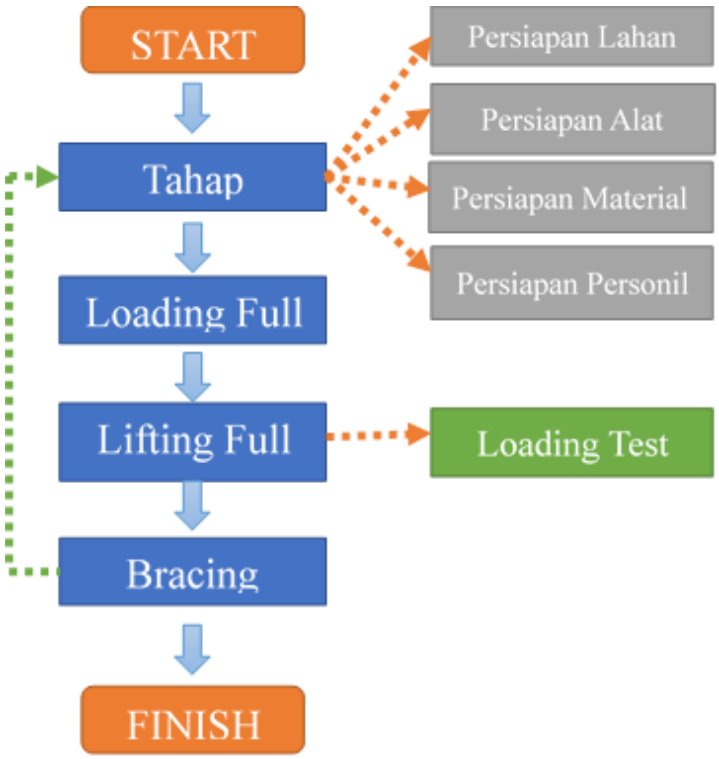

Figure 4. Flowchart working methods
Source: Data Project Cibitung-Cilincing section 3

4. Results and Discussion

4.1 Working methods

a. Method 1: 1 Crawler Crane (capacity 50 tons)
*setting Crane*Crawler crane will be set in the landscape in erection by considering the actual length Precast Full Slab, clearances, and all objects that can be annoying at the time of erection work. The land that would become the foundation of Crawler Crane must be ensured robust and stable, to avoid displacement crawler crane during the erection process which would jeopardize for the job.
*sling crane*in pairs at the point of handling / jacking contained in Fullslab. Used seat sling at the top which is then tightened. Once installed the crane slings ready removal.
Precast placement, after the precast walked slowly to the location of the installation, if necessary crawler cranes come to move towards the place of installation of the precast if not signed within arm's reach of the crane, and then Fullslab precast placed in position. Having ascertained the installation is done properly and correctly, crane sling off. Erction process is repeated on one line until all Fullslab attached.

b. Method 2: 1 Mobile Crane (capacity 55 tons)
setting Crane, Installation of Outriggers (foot Mobile Crane) will each pick-up load, outriggers should be installed or removed, the more distant landscape outriggers, the more stable and secure. To be safe again, each shoe tread outriggers still to be propped up with wooden beams or steel plate to prevent subsidence when lifting weights because of a decrease in side outriggers can be fatal and can result in the crane overturned.

JWC JOURNAL OF WORLD CONFERENCE
VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

*sling crane*in pairs at the point of handling / jacking contained in Fullslab. Used seat sling at the top which is then tightened. Once installed the crane slings ready removal. For the first appointment, Precast Fullslab lift height of 50 cm from the top sliper and do hanging over + - 5 minutes.

Erection process is repeated by moving heavy equipment to the place for desired and repeat the crane outriggers settings on the machine.

The prerequisite for this method is Fullslab should be on a truck trailer or the product was beside / near the machine. It takes the form of a truck trailer tools in order to facilitate the process of erection Fullslab sehinggan Fullslab product may be mobilized from the place of erection Fullslab stockyard.Precast placement, Having ascertained the installation is done properly and correctly, crane sling off. Back ketahap early and coordination with truck drivers to be able to perform kemabli Trailer initial step to any one grid attached Fullslab Precast main road.

c. Method 3: 1 Crawler Crane with 1 Mobile Crane

Appointment erection Fullslab Precast using this method maximizes tool Crawler Crane as the mobilization of very high to areas far away from the stockyard without the help of a truck trailer so Crawler crane must mobilization individually to each area, and with the help of Mobile Crane for locations that do not allow Crawler Crane can run smoothly as areas that have a very high undulating land that Outriggers of Mobile Crane can replace heavy equipment Crawler Crane. As the scheme will be undertaken, namely Tool Crawler Crane walking on bumpy areas that are not too high, and Tools Mobile Crane replace the high undulating land area. The following steps are used with method 1 Crawler Crane with 1 Mobile Crane

crawler Crane take*Precast Fullslab* from *stockyard*, while *Mobile Crane* take *Precast Fullslab*on Truck *trailer* which is already on the Mobile Crane radius.

crawler Crane do *swing* first to the location of placement *Precast slab* to 11, while *Mobile Crane* do *swing* first direct *erection* on *slab Precast* to 12 in *grid* adjacent to the lorry *trailer*,

crawler Crane do *Fullslab erection Precast* at locations to 11, while *Mobile Crane* do *swing* second and take back *Precast slab* on trucks *Trailer*.

crawler Crane head back *stockyard* take *Precast slab* then *swing* back to the location *precast slab* to 10, while *Mobile Crane* To do *swing* The third and *Precast Slab erection* on location *slab* the 12 th *grid* apart by truck *trailer*,

Crawler Crane put*Precast slab* the placement locations to 10, while *Mobile Crane* To do *swing* fourth to take *Precast slab* on trucks *trailer*,

crawler Crane perform steps 1 and 2, while the*Mobile Crane* To do *swing* fifth to *erection Precast slab*,

Crawler Crane repeat the previous steps until*Precast slab* composed 1 *grid* while *Mobile Crane* arrange *Precast slab* and begin to move *Khinematik*And then repeat the previous step.

This working method using a combination of Crawler Crane Mobile Crane as an alternative in the area / land a job that does not allow heavy equipment Crawler Crane passing through the area completely because the area has a ground elevation and the waves were very different.

d. Working Methods 20 Ton Truck Trailer

Truck trailers are used as tools necessary for the mobilization of special Precast Fullslab material for Method 1 and Method 1 Mobile crane Crawler Crane with 1 Mobile Crane can lift Precast Fullslab at the appointed place. Trailer trucks must wait until Fullslab Precast who brought fully installed.

4.2 Productivity analysis

Precast recapitulation obtained Fullslab size and productivity calculation of each method presented in the following table:

Table 1. Size and Type Precast Fullslab

No	Tipe	Panjang (m)	Lebar (m)	Tebal (m)	Luas (m2)
1	Type 1B - uk (7,125m x 2,580m x 0,35m)	7,125	2,58	0,35	18,3825
2	Type 2B - uk (6,800m x 2,580m x 0,35m)	6,8	2,58	0,35	17,544
3	Type 1B-1 - uk (7,125m x 2,580m x 0,35m)	7,125	1,65	0,35	11,75625
4	Type 2B-1 - uk (6,800 m x 1,65 m x 0,35m)	6,8	1,65	0,35	11,22
5	Type 1C - uk (7,125m x 1,65m x 0,35m)	7,125	1,65	0,35	11,75625
6	Type 2C - uk (6,800m x 1,65m x 0,35m)	6,8	1,65	0,35	11,22

Source: Processed Reseacher, 2019

VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Table 2. Summary of Productivity each method

metode	Khine matik	unit slab (unit)	CT (menit)	total waktu (menit)	total waktu (menit)	total waktu (jam)	produktivitas			
Crawler Crane	1	14	18,50	259,00	518	8,633	1,148	menit/ m2	3,243	slab/ jam
	1	14	18,50	259,00						
Mobile Crane	3	5	13,00	182,00	364	6,067	0,726	menit/ m2	4,615	slab/ jam
	3	5	13,00	182,00						
Crawler Crane dengan Mobile Crane	1	11	18,50	203,50	485	8,083	1,076	menit/ m2	3,464	slab/ jam
	1	11	18,50	203,50						
	1	6	13,00	78,00						

Source: Processed Reseacher, 2019

4.3 Cost Calculation Method Works

The value of direct costs and indirect costs of each - each method of implementation can be summed for each method of execution.

Table 3 Summary of Cost method 1 Crawler Crane

No	Deskripsi	1 Crawler Crane			
		volume	*satuan*	Harga Satuan	Harga
Biaya Langsung					
Alat					
1	Crawler Crane	43,17	jam	624.941	26.976.599
2	Mobile Crane				
3	Trailer				
Tenaga					
1	Pekerja	200	jam	17.260	3.451.925
Biaya Tidak Langsung					
1	Biaya Gaji Karyawan	1	Ls	36.000.000	36.000.000
2	Biaya Utilitas	1	Ls	1.350.000	1.350.000
3	Biaya Umum	1	Ls	47.360.000	47.360.000
4	Biaya Transportasi	1	Ls	6.840.000	6.840.000
5	Biaya Persiapan	1	Ls	12.316.000	12.316.000
6	Biaya Intensif	1	Ls	17.000.000	17.000.000
7	Biaya Mob Demob	1	Ls	40.000.000	40.000.000
Total					191.294.524
SCF (4,5%)					8.608.254
PPh (3%)					6.695.308
Jumlah Total					**206.598.086**

Source: Processed Researcher, 2019

JOURNAL OF WORLD CONFERENCE
VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Table 4. Summary of Cost method 1 Mobile Crane

No	Deskripsi	1 Mobile Crane			
		volume	*satuan*	Harga Satuan	Harga
Biaya Langsung					
Alat					
1	Crawler Crane				
2	Mobile Crane	30,33	jam	893.134	27.091.725
3	Trailer	30,33	jam	437.995	13.285.863
Tenaga					
1	Pekerja	200	jam	17.260	3.451.925
Biaya Tidak Langsung					
1	Biaya Gaji Karyawan	1	Ls	36.000.000	36.000.000
2	Biaya Utilitas	1	Ls	1.350.000	1.350.000
3	Biaya Umum	1	Ls	47.360.000	47.360.000
4	Biaya Transportasi	1	Ls	6.840.000	6.840.000
5	Biaya Persiapan	1	Ls	11.950.000	11.950.000
6	Biaya Intensif	1	Ls	17.000.000	17.000.000
7	Biaya Mob Demob	1	Ls	46.000.000	46.000.000
Total					210.329.514
SCF (4,5%)					9.464.828
PPh (3%)					7.361.533
Jumlah Total					**227.155.875**

Source: Processed Researcher, 2019

Table 5. Summary of Cost method 1 Crawler Crane with 1 mobile crane

No	Deskripsi	1 Crawler Crane dengan 1 Mobile Crane			
		volume	*satuan*	Harga Satuan	Harga
Biaya Langsung					
Alat					
1	Crawler Crane	33,92	jam	624.940,52	21.195.899
2	Mobile Crane	6,50	jam	893.133,80	5.805.370
3	Trailer	6,50	jam	437.995,49	2.846.971
Tenaga					
1	Pekerja	200	jam	17.260	3.451.925
Biaya Tidak Langsung					
1	Biaya Gaji Karyawan	1	Ls	36.000.000	36.000.000
2	Biaya Utilitas	1	Ls	1.350.000	1.350.000
3	Biaya Umum	1	Ls	47.360.000	47.360.000
4	Biaya Transportasi	1	Ls	6.840.000	6.840.000
5	Biaya Persiapan	1	Ls	16.816.000	16.816.000
6	Biaya Intensif	1	Ls	17.000.000	17.000.000
7	Biaya Mob Demob	1	Ls	86.000.000	86.000.000
Total					244.666.165
SCF (4,5%)					11.009.977
PPh (3%)					8.563.316
Jumlah Total					**264.239.458**

Source: Processed Researcher, 2019

JWC JOURNAL OF WORLD CONFERENCE
VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Table 6. The Summary price of each method

No	Metode	Total Biaya	Total Slab
1	1 Crawler Crane	Rp 206.598.086	140 unit
2	1 Mobile Crane	Rp 227.155.875	140 unit
3	1 Crawler Crane dengan 1 Mobile	Rp 264.239.458	140 unit

Source: Processed Researcher, 2019

4.4 Time Calculation Method Works

The fact the field tool of any of these methods operated for 8 hours a day, which means 480 minutes a day. Furthermore, it can be calculated Fullslab Precast erection process completion day.

Table 7. Summary of time each method

No	Metode	Jenis Alat	Total Waktu (menit)	Total Waktu (jam)	Total Waktu (hari)
1	metode 1	1 Crawler Crane	2590	43,17	5,4
2	metode 2	1 Mobile Crane 3 Truk Trailer	1820	30,33	3,8
3	metode 3	1 Crawler Crane 1 Mobile Crane 3 Truk Trailer	2425	40,42	5,1

Source: Processed Researcher, 2019

The time of each method *Fullslab erection Precast* until the end of the implementation of the work obtained from field observations and analysis of each of the methods of work *Precast Fullslab erection. Mobilization* heavy equipment on each of the methods for 1.5 days followed by preparation runway or assemble heavy equipment heavy equipment *crawler Crane* and *Mobile Crane*, Trial*Fullslab erection Precast* be required *Loading Test* as the first reference to the machine can operate.

Table 8. Data observation time Fullslab Precast Erection work

No	Metode	Mobilisasi (hari)	Perakitan Alat (hari)	Persiapan Landasan (hari)	Loading Test (hari)	*Erection* (hari)	Bongkar Alat (hari)
1	1 Crawler Crane	1,5	2,1	0,6	0,3	5,40	2
2	1 Mobile Crane	1,5	-	0,1	0,3	3,80	0,1
3	1 Crawler Crane dengan 1 Mobile Crane	1,5	2,1	0,7	0,5	4,30 0,90	2,1

Source: Processed Researcher, 2019

4.5 Discussion

The results of the comparison of cost and time obtained by the method 1 Crawler Crane has a more economical price but has a longer period of time compared to other methods. Method 2 with Mobile Crane has a shorter work time. Method 1 Mobile Crane can not Fullslab Precast erection if not assisted by a truck trailer. Method 3 (1 Crawler Crane with 1 Mobile Crane) has a large cost compared to other methods. The time gained is greater than the first method Mobile Crane but faster than the first Crawler Crane. Method 1 Crawler Crane with 1 Mobile Crane has the advantage in the work area of land that has a different ground elevation.

JWC JOURNAL OF WORLD CONFERENCE
VOLUME 2 | NUMBER 2 | MARCH 2020
Available online at http://proceedings.worldconference.id.
ISSN: 2656-1174 (online)

Table 9. Summary Cost and Time Fullslab Precast erection method

No	Metode	Jenis Alat	Jumlah Alat	Total Slab	Total Biaya	Total Waktu
1	metode 1	Crawler Crane	1	140 unit	Rp206.598.086	12 hari
		Truk Trailer	0			
2	metode 2	Mobile Crane	1	140 unit	Rp227.155.875	7 hari
		Truk Trailer	3			
3	metode 3	Crawler Crane	1	140 unit	Rp264.239.458	10 hari
		Mobile Crane	1			
		Truk Trailer	3			

Source: Processed Researcher, 2019

5. Conclusions and Recommendations

The analysis and discussion in the previous chapter and answer from the formulation of the problem, it can be concluded as follows:

1. Method 1 uses Crawler Crane at Fullslab erection Precast has a very low cost value of Rp. 206.598.086,00 / 1 module main road / 140 units Fullslab Precast. For the second method, namely Mobile Crane has a value of Rp 214.195.875,00 / 1 module main road / 140 units Fullslab Precast. Method 3 (1 Crawler Crane with 1 Mobile Crane has a value of Rp 251.279.458,00 / 1 module main road / 140 units Fullslab Precast.
2. Method 1 uses a Crawler Crane with a productivity of 18,5 minutes / Fullslab Precast gained time to complete one module Fullslab Precast is 12 days. Method 2 using Mobile Crane with a productivity of 13 minutes / Fullslab Precast obtained 7 day processing time. Method 3 using 1 Crawler Crane with 1 Mobile Crane with Crawler crane productivity of 18,5 minutes / Fullslab Precast minute and productivity Mobile Crane 13 minutes / Fullslab Precast so obtained 9 days.
3. The proper method to complete one module Fullslab Precast namely with method 1 that is 1 Crawler Crane because of the mobility of Crawler Crane can lift Fullslab Precast directly from the stockyard, with the price obtained from the research is more economical compared to other methods and does not require the help of a truck trailer.

Recomendation

1. *Precast Fullslab* who come should be implemented immediately because the work tool that rental prices have been running an hour and a unit will continue to run.
2. For areas that have a different elevation should use methods 2 or 3 for Mobile Crane outrigger can issue as a basic foundation on different surfaces.
3. If speed up completion of the work should use the method 2 because it has a faster productivity which is 13 minutes / Fullslab Precast compared to other methods.

References

[1] Purba, A. S. E. (2017). *Analisis Perbandingan Biaya Dan Waktu Metode Pelaksanaan Beton In Situ Dengan Pre Cast (Studi Kasus: Pekerjaan Abutmen Trestle Girder Proyek Terminal Multi Purpose Dermaga Kuala Tanjung).*

[2] Kurniawan, W., Nuryati, S., & Prihesnanto, F. (2019, July). *Analisa Perbandingan Metode Erection Girder Menggunakan Beam Launcher Dan Crawler Crane Dari Segi Waktu Dan Biaya Pada Proyek Jalan Bebas Hambatan Tanjung Priok Seksi E2. In Prosiding Seminar Nasional Energi & Teknologi (Sinergi) (Pp. 37-54).*

[3] Asroni, A. (2010). *Balok dan Pelat Beton Bertulang. Yogyakarta: Graha Ilmu.*

[4] PP, PT. (2015). *Metode Pelaksanaan Plat : BDE / GDG / STR / PLT / 2015 / 005. Jakarta*

[5] Ervianto, W. I. (2005). *Manajemen Proyek Konstruksi (Edisi Revisi). Yogyakata: Andi.*

[6] Citra, P. L. P., Sihkawekas, G., Hidayat, A., & Yuniarto, R. (2016). *Perbandingan Produktivitas Luffing Crane Dengan Hammer Head Crane Pada Proyek High Rise Building Studi Kasus: Menara Astra Project*, Jakarta. *JURNAL KARYA TEKNIK SIPIL*, *5*(2), 116-127.

[7] Adiasa, A. M., Prakoso, D. K., Hatmoko, J. U. D., & Santoso, T. D. (2014). *Evaluasi Penggunaan Beton Precast Di Proyek Konstruksi. Jurnal Karya Teknik Sipil, 4(1), 126-134.*

[8] Frederika, A., Wiranata, A. A., & Larasati, K. R. (2014). *Perbandingan Biaya Dan Waktu Pelaksanaan Pekerjaan Balok Struktur Beton Gedung Antara Metode Konvensional Dengan Precast (Studi Kasus: Grand Whiz Hotel, Gatot Subroto Barat). Jurnal Ilmiah Teknik Sipil.*
[9] Farizal Fani, dan I Putu Artama Wiguna, M.Arif Rohman (2012): "*Analisa Perbandingan Metode Pelaksanaan Cast in Situ Dengan Pracetak Terhadap Biaya dan Waktu Pada Proyek Dian Regency Apartemen*".
[10] Holla, R., Anant, S., Muhammad, M. A., Periwal, A., & Kapoor, A. (2016). *Time, Cost, Productivity And Quality Analysis Of Precast Concrete System. International Journal Of Innovative Science, Engineering And Technology, 3(5), 252-257.*
[11] Ibrahim, H. B. (2011). *Rencana Dan Estimate Real Of Cost, Bumi Askara.*
[12] Indonesia, S. N. (2008). *Tata cara perhitungan harga satuan pekerjaan tanah untuk konstruksi bangunan gedung dan perumahan.*
[13] Najafi, A., & Kong, R. T. L. (2016). *Productivity Analysis Of Precast Concrete Operations By Artificial Neural Networks.*
[14] Najoan, C. H., Tjakra, J., & Pratasis, P. A. (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).*
[15] Nasional, B. S. (2012). SNI 7833 2012 *Tata Cara Perancangan Beton Pracetak dan Beton Prategang untuk Gedung. Jakarta: Bwadan Standardisasi Nasional.*
[16] PERMEN PUPR NO.28/PRT/M/2016, (2016). *Pedoman Analisis Harga Satuan Pekerjaan Bidang Pekerjaan Umum. Peraturan Menteri Pekerjaan Umum, (11).*
[17] Rahmawati, R. (2017). *Biaya Dan Waktu Pekerjaan Girder Erection Dengan Metode Launcher Pada Bentang Tengah Proyek Pembangunan Jembatan Mastrip Surabaya (Doctoral Dissertation, Institut Teknologi Sepuluh Nopember).*
[18] R. Tito Hario Rahadi Tjitrosoma, Ir. Aman Subakti, MS. (2012) : "*Perancangan Modifikasi Struktur Gedung RSUD. Dr. Kanujoso Djatiwibowo Menggunakan Beton Pracetak (Precast) dan Metode Pelaksanaan*".
[19] SNI 6880:2016, *Spesifikasi beton struktural.*
[20] SNI 7832:2017, *Analisis harga satuan pekerjaan beton pracetak insitu untuk konstruksi bangunan gedung.*
[21] Suwito, M. F. *Perencanaan Percepatan Pembangunan Proyek Gedung Fakultas Hukum Universitas Jember Dengan Menggunakan Pelat Precast.*
[22] Wijaksono, O., Tistogondo, J., & Bagio, T. H. (2018). *Analisis Perbandingan Efisiensi Waktu Dan Biaya Antara Metode Konvensional Slab, Precast Half Slab Dan Precast Full Slab Pada Proyek Bangunan Hotel Bertingkat Di Surabaya. Prosiding Semnastek.*