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Implementation of Fast Track Method to Accelerate Construction Project Scheduling

Suriati Abd. Muin [1,*,a], Watono Watono [1,b], Evi Gusmiarni Alimuddin[1], and Siti Huriyah Shatara Ridwan[1]
[1]Civil Engineering Study Program, Faculty of Engineering, Indonesian Muslim University
[*,a] suriati.abdmuin@umi.ac.id (Corresponding Author), [b]watono031@gmail.com

Abstract— In a project, the planning stage is the key to success because it determines the allocation, funding, time and quality to be achieved. In order for work efficiency and effectiveness to be fulfilled properly, project implementation is influenced by planning and scheduling factors. Construction project control is a systematic activity or effort to determine standards that are by the planning objectives, compare implementation with planning, and make necessary corrections so that costs, resources, and time can be used effectively and efficiently to achieve the desired construction project objectives. If there is an imbalance between the plan and the realization of the work, then the project may experience delays like what happened to the Naval Pier project of the Main Base of the Indonesian Navy VI Makassar. The project experienced several delays in work and required rescheduling, so a special method was needed that could speed up the project execution time. The purpose of this study is to accelerate the duration of work and reduce project costs after applying the fast track method. The results of the implementation of the fast track method can reduce the time by 64 days or experience a time acceleration of 20.9% from the initial duration of 306 days, the total project cost before acceleration is Rp50,365,788,654.89 After acceleration with the fast track method which affects the overhead cost to Rp49,312,386,539, the total cost reduced is Rp1,053,402,116 or a saving of 2.09% of the total cost.

Keywords—Fast Track, Cost, Time, Project

I. Introduction

A construction project is a work activity that has a starting point and an endpoint[1], [2]. The progress of the construction services industry depends heavily on the optimization of three main elements, namely cost, time, and quality. Each element has an important role and is interrelated with each other. In the current development of engineering technology, it is found that projects often experience delays in completion time. Delays in a project can come from delays in the delivery of materials, unavailability of labor, extreme weather, unavailability and breakdown of construction equipment that cause delays in the execution of work [3], [4]. If there is an imbalance between the plan and the realization of the work, then the project may experience delays like what happened to the Naval Pier project of the Main Base of the Indonesian Navy VI Makassar. The project experienced several delays in the 12th week and deviations in the 18th week of 5.91%, so it needed to be rescheduled and required a special method that could accelerate the project implementation time. The project also does not use special methods and does not use programs that can make it easier to control the project in the event of delays. Based on this, it is necessary to accelerate the implementation time of development which aims to overcome the delay in the implementation of work.

If there is an imbalance between the plan and the realization of the work, then the project may experience delays like what happened to the Naval Pier project of the Main Base of the Indonesian Navy VI Makassar. The project also does not use *special* methods and does not use programs that can make it easier to control the project in the event of delays [5], [6]. The purpose of this study is to accelerate the duration of work and get the usual number of projects after applying the fast track method. The fast track method is a method of accelerating development by carrying out activities in parallel with faster implementation times and more efficient costs. Acceleration is carried out by implementing different and innovative strategies and effective implementation times of all normal project activities based on work items that are on a critical trajectory [7].

The fast track method in project execution provides many advantages, namely with a faster project completion

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time, and improves the reputation of the owner to offer further opportunities in a competitive market. The acceleration of this method is carried out by making a withdrawal on the longest critical track. The steps or provisions that must be taken in the application of the fast track method to activities on critical tracks [8] are Scheduling must be logical between one activity and another so that it is realistic enough to be carried out (including labor, productivity of materials, tools, technical, and funds), Doing fast track only on activities on critical tracks, especially on activities that have a long duration, The shortest time that can be done on a fast track ≥ 2 days, the relationship between critical activities that will be fast-tracked.

Check the float present on non-critical activities, whether they are still qualified and non-critical after the fast track is done, If, after the initial stage of the fast track, the critical track shifts, take the same steps for the activities on the new critical track and acceleration should be carried out no more than 50% of the normal time [9].

II. Research Methodology

The location of this research was carried out at the Lantamal VI Makassar Naval Pier Construction Project on Jalan Yos Sudarso no. 308, Tamalabba, Ujung Tanah District, Makassar with a project cost of Rp50.365.788.654,89,-. The research sites are as follows:

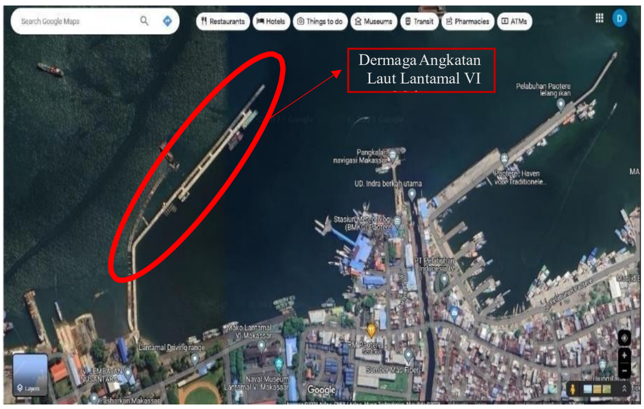

Figure 1. Research sites

Advantages of the Fast Track Method:

1. Accelerating the function of the infrastructure concerned.
2. Providing financial benefits from the use of this infrastructure.
3. Reduce scheduling.
4. Accelerate project execution duration/time.

Analysis Methods

In this study, the analysis of the Fast track Method was carried out, and a sequence of activities and logical relationships between activities. The steps to implement the fast track method are Collecting cost budget plans (RAB) and time schedules that have been planned, identifying work that has not been carried out after a delay, creating a cognate grouping of job types and equalizing the volume of work based on the unit price, determine the number of labor groups used in completing the existing volume of work, Scheduling logically according to one job to another, Determine critical trajectories with the help of Microsoft Project programs, Creating the most realistic sequence of interrelated work (activity logic), if it is not precise, then it must be improved, Accelerate with fast track on critical tracks and have a long duration. The steps of fast track analysis
For project cost and project time efficiency as per the following formula:

1) Cost Efficiency:
$$= \frac{Normal\ Cost - Acceleration\ Cost}{Normal\ Cost} \times 100\%$$
2) Time Efficiency:
$$= \frac{Normal\ Time - Acceleration\ Time}{Normal\ Time} \times 100\%$$

III. Results and Discussion

Networking and Critical Path Determination Using Microsoft Project

In this study, the work carried out accelerated was only on structural work that was on a critical trajectory. The data used in this study are Cost Budget Plan data and schedule. The following is a Gantt chart display using Microsoft project software based on the schedule for the implementation of the construction of the naval pier.

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Occasionally, the sequence of a network can be adjusted to enable critical activities to be performed simultaneously rather than sequentially [10], [11]. One of the most common methods in rearranging the relationship between these activities is to change *the finish-to-start* relationship to a *start-to-start* relationship [12]

The data required to compile the network is the schedule. The work arrangement is known from the schedule and then entered as data input in the Microsoft Project 2019 program. It should be noted that in project financing with the application of *the fast track* method, what is calculated is the financing of the implementation of activities on critical tracks and activities on non-critical tracks as well as in normal financing. There is no increase in the amount of labor and costs in each activity both on the critical track and on the non-critical activity [13]

In the precedent chart, you will be able to see that critical activities are marked in red while non-critical activities are marked in blue. As shown in the following image:

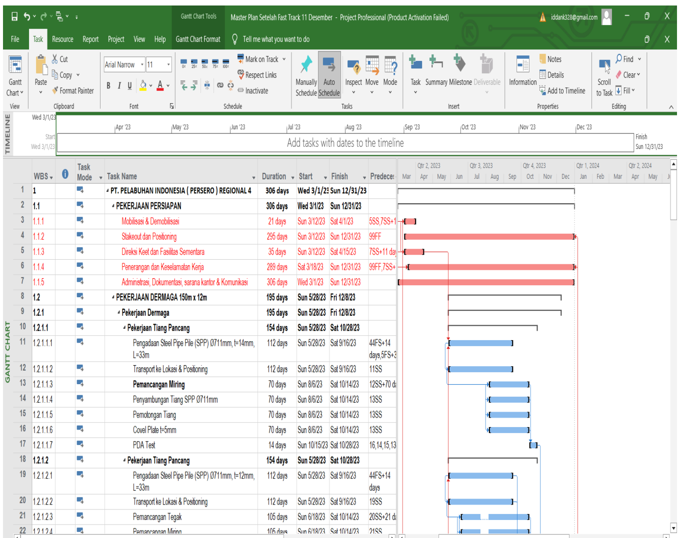

Figure 2. View of the schedule for the construction of the main naval base pier using Ms. Project

Here is a list of work items that are on a critical trajectory.

Table 1. Work items that are on a critical trajectory

WBS	Task Name	Duration	Predecessors
1	**PT. PORT OF INDONESIA (PERSERO) REGIONAL 4**	**306 days**	
1.1	**PREPARATORY WORK**	**306 days**	
1.1.1	Mobilization & Demobilization	21 days	5SS,7SS+11 days
1.1.3	Keet Board of Directors and Temporary Facilities	35 days	7SS+11 days
1.1.5	Administration, Documentation, Office Facilities & Communications	306 days	
1.3	**TRESTLE WORK**	**196.25 days**	
1.3.1	**Trestle Jobs**	**196.25 days**	
1.3.1.1	**Piling Work (Axis 1 to Axis 13)**	**77 days**	
1.3.1.1.1	Procurement of Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=32m following Transport to Location & Positioning	56 days	3SS+7 days
1.3.1.2	**Piling Work (Axis 14 to Axis 37)**	**147 days**	
1.3.1.2.1	Procurement of Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=31m and Transport to Location & Positioning	56 days	44SS
1.3.1.2.2	Upright Hoisting	56 days	51FS-7 days
1.3.1.3	Preboring Support Crane Work Ø600mm	62 days	51SS,52FF
1.3.1.5	**Insitu Reinforced Concrete Work**	**182 days**	
1.3.1.5.1	Concrete Filler Columns	112 days	58SS+7 days
1.3.1.5.2	Pilecap	154 days	68SS+7 days
1.3.1.5.3	Abutment	28 days	69SS
1.3.1.5.4	Diaphragm Beam	56 days	70FS+28 days
1.3.1.5.5	Slab & Kanstin	98 days	71SS+21 days
1.3.1.6	**Cable Tray Structure Work (Include accessories)**	**105 days**	
1.3.1.6.1	UC.75.40.5.7	98 days	72SS
1.3.1.7	Procurement and Installation of Dilatation	98 days	74SS,71SS+21 days
1.4	**WALKWAY WORK**	**245 days**	
1.4.1	**Walkway Jobs**	**245 days**	
1.4.1.1	**Pile Work**	**140 days**	
1.4.1.1.1	Procurement of Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=33m	84 days	68SS-5 days

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Table 1. Continued

WBS	Task Name	Duration	Predecessors
1.4.1.1.2	Transport to Location & Positioning	84 days	82SS
1.4.1.1.	Upright Hoisting	49 days	83FF,76SS-2 days
1.4.1.2	**Insitu Reinforced Concrete Work**	**133 days**	
1.4.1.2.1	Concrete Filler Columns	42 days	84SS+21 days
1.4.1.2.2	Pilecap	42 days	90SS
1.4.1.2.3	Slab & Kanstin	56 days	91FS+21 days,90FS+21 days
1.4.1.2.4	Diaphragm Beam	56 days	91FS+21 days,90FS+ 1.
1.4.1.3	**Walkway Structure Works (Include accessories)**	**35 days**	
1.4.1.3.1	Ø2" Pipe Handrail	35 days	93SS+14 days,92SS+14 days
1.5	**MECHANICAL WORK**	**90 days**	
1.5.1	**CLEAN WATER**	**90 days**	
1.5.1.1	Procurement & Installation of HDPE PE 100 (PN-10), he. 4" (100 mm)	90 days	95SS-7 days
1.5.1.2	Procurement & Installation of HDPE PE 100 (PN-10), Elbow 90° dia. 4" (100 mm)	90 days	99SS
1.5.1.3	Procurement & Installation of Clean Water Outlets	90 days	99SS
1.5.2	***HYDRANT***	***90 days***	
1.5.2.1	Procurement & Installation of HDPE PE 100 (PN-20), he. 6" (160 mm)	90 days	95SS-7 days
1.5.2.2	Procurement & Installation of HDPE PE 100 (PN-20), Elbow 90° dia. 6" (160 mm)	90 days	103SS
1.5.2.3	Procurement & Installation of HDPE PE 100 (PN-20), Elbow 90° dia. 6" (160 mm)	90 days	103SS

For items that are on a critical trajectory, it is not allowed to experience delays because these activities can affect the project completion time. Therefore, on these critical tracks, acceleration can be carried out to ensure that the project is completed early or on time.

Direct Cost and Indirect Cost Analysis

Indirect costs here consist of overhead costs. Then we will look for overhead costs and profits, overhead costs and profits themselves are indirect costs such as profits, salaries, electricity costs, operations, and others. Based on Presidential Decree 70/2012 the profit of providing services is 0-15%. Because profit and overhead costs are indirect costs, in this study a profit value of 4% of the total project cost and overhead costs of 6% of the total project cost were taken. Normal costs are weighted 90% of direct costs and indirect costs are weighted 10%. From the description above, the value of profit and overhead costs can be found in the following way:

Cost Budget Plan = Rp. 50.365.788.654.89,-

1. *Overhead Costs* = Total Project Cost × 6%
   = Rp. 50.365.788.654,89 × 6%
   = Rp. 3.021.947.319,20,-
2. *Profit* = Total Project Cost × 4%
   = Rp. 50.365.788.654,89 × 4%
   = Rp. 2.014.631.546-
3. *Daily Overhead* $= \frac{Overhead\ Costs}{Normal\ Duration}$

$$= \frac{Rp. 3.021.947.319,20}{306}$$

= Rp. 9.875.645,-

Once you have the value of the profit and overhead costs, then you can calculate the direct costs and indirect costs.

1. Direct Cost = 90% × Total Project Cost
   = 90% × Rp. 50.365.788.654.89
   = Rp. 45.329.209.789,-
2. Indirect Cost = Overhead Costs + Profit
   = Rp. 3.021.947.319,20,- + Rp. 2.014.631.546,-
   = Rp. 5.036.578.654,-

Total Project Cost = Direct Cost + Indirect Cost
= Rp. 45,329,209,789,- + Rp. 5,036,578,654,-
= Rp. 50.365.788.654,89,-

Analysis with Fast Track Method

The implementation of the fast track method can be seen in the following table.

Table 2 Examples of Critical Activities to Perform *Fast Track*

WBS	Task Name	Duration	Predecessors
1	**PT. PORT OF INDONESIA (PERSERO) REGIONAL 4**	**306 days**	
1.1	**PREPARATORY WORK**	**306 days**	
1.1.1	Mobilization & Demobilization (e)	21 days	5SS,7SS+11 days
1.1.3	Keet Board of Directors and Temporary Facilities (f)	35 days	7SS+11 days

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e = 21 Days	f = 35 Days

a. In the provisions of *the Fast Track Method*, only those work items are seen on critical trajectories.
b. The accelerated duration should be less than 50% [14], therefore to facilitate the calculation, it is assumed that the acceleration of the duration is 50%.

e = 50% x 21 Days = 11 Days

c. After that, the acceleration carried out is only allowed for 10 days because it must be less than 50% of the initial work duration.
d. From the calculation above, it can be interpreted that the work has reached 11 days before work (f) can begin.
e. Therefore, work f begins after work e lasts 11 days The implementation of time acceleration in activities on critical tracks is then tabled as follows.

Table 3 Analysis of Work Acceleration with Fast Track Method

WBS	Task Name	Duration	Predecessors	Fast Track
1	**PT. PORT OF INDONESIA (PERSERO) REGIONAL 4**	**242 days**		
1.1	**GENERAL PREPARATION**	**242 days**		
1.1.1	Mobilization & Demobilization	21 days	5SS,7SS	**11 Day**
1.1.3	Keet Board of Directors and Temporary Facilities	35 days	7SS	**7 Day**
1.1.5	Administration, Documentation, Office Facilities & Communications	306 days		**7 Day**
1.3	**TRESTLE WORK**	**196days**		
1.3.1	**Trestle Jobs**	**196 days**		
1.3.1.1	**Piling Work (Axis 1 to Axis 13)**	**77 days**		
1.3.1.1.1	Procurement of Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=32m following Transport to Location & Positioning	56 days	3SS+4 days	**3 Day**
1.3.1.2	**Piling Work (Axis 14 to Axis 37)**	**147 days**		
1.3.1.2.1	Procurement of Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=31m and Transport to Location & Positioning	56 days	44SS	
1.3.1.2.2	Upright Hoisting	56 days	51FS-28 days	**21 Day**
1.3.1.3	Preboring Support Crane Work Ø600mm	62 days	51SS,52FF	**21 Day**
1.3.1.4	**Precast Reinforced Concrete Work**	**91 days**		
1.3.1.4.1	**Beam**	**91 days**		
1.3.1.5	**Insitu Reinforced Concrete Work**	**182 days**		
1.3.1.5.1	Concrete Filler Columns	112 days	58SS+7 days	**14 Day**
1.3.1.5.2	Pilecap	154 days	68SS+7 days	**14 Day**
1.3.1.5.3	Abutment	28 days	69SS	**21 Day**
1.3.1.5.4	Diaphragm Beam	56 days	70FS+7 days	**21 Day**
1.3.1.5.5	Slab & Kanstin	98 days	71SS+7 days	**14 Day**
1.3.1.6	**Cable Tray Structure Work (Include accessories)**	**105 days**		
1.3.1.6.1	UC.75.40.5.7	98 days	72SS	**14 Day**
1.3.1.7	Procurement and Installation of Dilatation	98 days	74SS,71SS+21 days	**35 Day**
1.4	**WALKWAY CONSTRUCTION WORK**	**245 days**		
1.4.1	**Walkway Jobs**	**245 days**		
1.4.1.1	**PILE FOUNDATION WORK**	**140 days**		
1.4.1.1.1	Procurement of Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=33m	84 days	68SS-5 days	**14 Day**
1.4.1.1.2	Transport to Location & Positioning	84 days	82SS	**14 Day**
1.4.1.1.3	Upright Hoisting	49 days	76SS	**2 Day**
1.4.1.2	**Insitu Reinforced Concrete Work**	**133 days**		
1.4.1.2.1	Concrete Filler Columns	42 days	84SS+14 days	**7 Day**
1.4.1.2.2	Pilecap	42 days	90SS	**7 Day**
1.4.1.2.3	Slab & Kanstin	56 days	91,90	**21 Day**
1.4.1.2.4	Diaphragm Beam	56 days	91,90	**21 Day**

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Table 4. Comparison of Predecessors before and after fast implementation of the fast track method

WBS	Task Name	Duration	Predecessors	Duration (Fast Track)	Predecessors
1	**PT. PORT OF INDONESIA (PERSERO) REGIONAL 4**	**306 days**		**242 days**	
1,1	**PREPARATORY WORK**	**306 days**		**242 days**	
1.1.1	Stakeout dan Positioning	21 days	5SS,7SS+11 days	21 days	5SS,7SS
1.1.2	Stakeout dan Positioning	295 days		242 days	3SS
1.1.3	Site Office and Temporary Facilities	35 days	7SS+11 days	35 days	7SS
1.1.4	Lighting and Occupational Safety	289 days	7SS+7 days	235 days	7SS+7 days
1.1.5	Administration, Documentation, Office Facilities & Communications	306 days		242 days	
1,2	**DOCK WORKS 150m x 12m**	**188 days**		**175 days**	
1.2.1	**Dock Works**	**188 days**		**175 days**	
1.2.1.1	**Pile Work**	**154 days**		**154 days**	
1.2.1.1.1	Procurement of Steel Pipe Pile (SPP) Ø711mm, t=14mm, L=33m	112 days	44FS+7 days	112 days	44FS+7 days
1.2.1.1.2	Transport ke Lokasi & Positioning	112 days	11SS	112 days	11SS
1.2.1.1.3	**Tilt Hoisting**	70 days	12SS+70 days	70 days	12SS+70 days
1.2.1.1.4	SPP Pole Splicing Ø711mm	70 days	13SS	70 days	13SS
1.2.1.1.5	PPole Cutting	70 days	13SS	70 days	13SS
1.2.1.1.6	Covel Plate t=5mm	70 days	13SS	70 days	13SS
1.2.1.1.7	PDA Test	14 days	16,14,15,13	14 days	16,14,15,13
1.2.1.2	**Pile Work**	**154 days**		**154 days**	
1.2.1.2.1	Procurement of Steel Pipe Pile (SPP) Ø711mm, t=12mm, L=33m	112 days	44FS+7 days	112 days	44FS+7 days
1.2.1.2.2	Transport to Location & Positioning	112 days	19SS	119 days	19SS
1.2.1.2.3	Upright Hoisting	105 days	20SS+21 days	105 days	20SS+21 days
1.2.1.2.4	Tilt Hoisting	105 days	21SS	105 days	21SS
1.2.1.2.5	SPP Pole Splicing Ø711mm	105 days	21SS	105 days	21SS
1.2.1.2.6	Ray Cuttingng	105 days	21SS	105 days	21SS
1.2.1.2.7	Covel Plate t=5mm	105 days	21SS	105 days	21SS
1.2.1.2.8	PDA Test	14 days	25,17FF,21,22,23, 24	14 days	25,17FF,21,22,2 3,24
1.2.1.3	**Precast Reinforced Concrete Work**	**63 days**		**63 days**	
1.2.1.3.1	Long Beam (LB.1)	63 days	19	63 days	19
1.2.1.3.2	Cross Beam (CB.3)	63 days	28SS	63 days	28SS
1.2.1.4	**Cast-In-Place Reinforced Concrete Work**	**125 days**		**125 days**	
1.2.1.4.1	Concrete Filler Columns	112 days	56	112 days	56
1.2.1.4.2	Pilecap	112 days	31SS	112 days	31SS
1.2.1.4.3	Long Beam	77 days	31SS+35 days	77 days	31SS+35 days
1.2.1.4.4	Cross Beam	77 days	33SS	77 days	33SS
1.2.1.4.5	Slab & Kanstin	77 days	33SS	77 days	33SS
1.2.1.5	Procurement and Installation of 50 Ton Bollards (along with accessories)	42 days	31FS-7 days	42 days	31FS-7 days
1.2.1.6	Procurement and Installation of V Fender 2000 H (with accessories)	42 days	36SS	42 days	36SS
1.2.1.7	Procurement and Installation of Pier Front Side Corner Guard	42 days	36SS	42 days	36SS
1.2.1.8	Procurement and Installation of Dilatation	42 days	36SS	42 days	36SS

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Table 4. Continued

WBS	Task Name	Duration	Predecessors	Duration (Fast Track)	Predecessors
1.2.1.9	Procurement and Installation of Gratings	42 days	36SS	42 days	36SS
1,3	**TRESTLE WORK**	**196.25 days**		**175.25 days**	
1.3.1	**Trestle Jobs**	**196.25 days**		**175.25 days**	
1.3.1.1	**Piling Work (Axis 1 to Axis 13)**	**77 days**		**77 days**	
1.3.1.1.1	Procurement of Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=32m and Transport to Lokasi & Positioning	56 days	3SS+7 days	56 days	3SS+4 days
1.3.1.1.2	Upright Hoisting	56 days	44SS+14 days	56 days	44SS+14 days
1.3.1.1.3	CSP Pole Splicing Ø600mm	56 days	45SS	56 days	45SS
1.3.1.1.4	Pole Cutting	56 days	45SS	56 days	45SS
1.3.1.1.5	Plywood t=12mm	56 days	45SS	56 days	45SS
1.3.1.1.6	PDA Test	14 days	48FS-7 days	14 days	48FS-7 days
1.3.1.2	**Piling Work (Axis 14 to Axis 37)**	**147 days**		**126 days**	
1.3.1.2.1	Procurement of Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=31m and Transport to Location & Positioning	56 days	44SS	56 days	44SS
1.3.1.2.2	Upright Hoisting	56 days	51FS-7 days	56 days	51FS-28 days
1.3.1.2.3	Tilt Hoisting	35 days	52SS+7 days	35 days	52SS+7 days
1.3.1.2.4	CSP Pole Splicing Ø600mm	35 days	53SS	35 days	53SS
1.3.1.2.5	Pole Cutting	35 days	53SS	35 days	53SS
1.3.1.2.6	Plywood t=12mm	35 days	53SS	35 days	53SS
1.3.1.2.7	PDA Test	49 days	56SS+42 days,61FF	49 days	56SS+42 days,61FF
1.3.1.3	Preboring Support Crane Work Ø600mm	62 days	51SS,52FF	62 days	51SS,52FF
1.3.1.4	**Precast Reinforced Concrete Work**	**91 days**		**91 days**	
1.3.1.4.1	**Beam**	**91 days**		**91 days**	
1.3.1.4.1.1	Beam (B.1)	91 days	53SS,68SS-14 days	91 days	53SS,68SS-14 days
1.3.1.4.1.2	Beam (B.1A)	91 days	61SS,68SS-14 days	91 days	61SS,68SS-14 days
1.3.1.4.1.3	Beam (B.19)	91 days	61SS,68SS-14 days	91 days	61SS,68SS-14 days
1.3.1.4.2	**Slab**	**56 days**		**56 days**	
1.3.1.4.2.1	Slab (PS.1)	56 days	63SS+35 days,68SS-21 days	56 days	63SS+35 days,68SS-21 days
1.3.1.4.2.2	Slab (PS.1A)	56 days	65SS,68SS-21 days	56 days	65SS,68SS-21 days
1.3.1.5	**Insitu Reinforced Concrete Work**	**182 days**		**168 days**	
1.3.1.5.1	Concrete Filler Columns	112 days	58SS+7 days	112 days	58SS+7 days
1.3.1.5.2	Pilecap	154 days	68SS+7 days	154 days	68SS+7 days
1.3.1.5.3	Abutment	28 days	69SS	28 days	69SS
1.3.1.5.4	Diaphragm Beam	56 days	70FS+28 days	56 days	70FS+7 days
1.3.1.5.5	Slab & Kanstin	98 days	71SS+21 days	98 days	71SS+7 days
1.3.1.6	**Cable Tray Structure Work (Include accessories)**	**105 days**		**105 days**	
1.3.1.6.1	UC.75.40.5.7	98 days	72SS	98 days	72SS
1.3.1.6.2	Anchor Bolt M16	98 days	74SS	98 days	74SS
1.3.1.7	Procurement and Installation of Dilatation	98 days	74SS,71SS+21 days	98 days	74SS,71SS+21 days
1.3.1.8	Procurement and Installation of Bearing Pads	98 days	74SS,71SS+21 days	98 days	74SS,71SS+21 days

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Table 4. Continued

1.3.1.9	Cable Tray Procurement and Installation	98 days	74SS,71SS+21 days	98 days	74SS,71SS+21 days
1,4	**WALKWAY WORK**	**245 days**		**194 days**	
1.4.1	**Walkway Jobs**	**245 days**		**194 days**	
1.4.1.1	**Pile Work**	**140 days**		**140 days**	
1.4.1.1.1	Procurement of Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=33m	84 days	68SS-5 days	84 days	68SS-5 days
1.4.1.1.2	Transport to Location & Positioning	84 days	82SS	84 days	82SS
1.4.1.1.3	Upright Hoisting	49 days	83FF,76SS-2 days	49 days	76SS
1.4.1.1.4	CSP Pole Splicing Ø600mm	49 days	83FF,76SS-2 days	49 days	83FF,76SS-2 days
1.4.1.1.5	Pole Cutting	49 days	83FF,76SS-2 days	49 days	83FF,76SS-2 days
1.4.1.1.6	Plywood t=12mm	49 days	83FF	49 days	83FF
1.4.1.1.7	PDA Test	14 days	83FF	14 days	83FF
1.4.1.2	**Concrete Filler Columns**	**133 days**		**112 days**	
1.4.1.2.1	Concrete Filler columns	42 days	84SS+21 days	42 days	84SS+14 days
1.4.1.2.2	Pilecap	42 days	90SS	42 days	90SS
1.4.1.2.3	Slab & Kanstin	56 days	91FS+21 days,90FS+21 days	56 days	91,90
1.4.1.2.4	Diaphragm Beam	56 days	91FS+21 days,90FS+21 days	56 days	91,90
1.4.1.3	**Walkway Structure Works (Include accessories)**	**35 days**		**35 days**	
1.4.1.3.1	Ø2" Pipe Handrail	35 days	93SS+14 days,92SS+14 days	35 days	93SS+14 days,92SS+14 days
1.4.1.3.2	Postrail Pipe Ø3"	35 days	95SS	35 days	95SS
1,5	**MECHANICAL WORK**	**90 days**		**90 days**	
1.5.1	**CLEAN WATER**	**90 days**		**90 days**	
1.5.1.1	Procurement & HDPE PE 100 (PN-10) installation, he. 4" (100 mm)	90 days	95SS-7 days	90 days	95SS-7 days
1.5.1.2	Procurement & Installation of HDPE PE 100 (PN-10), Elbow 90° dia. 4" (100 mm)	90 days	99SS	90 days	99SS
1.5.1.3	Procurement & Installation of Clean Water Outlet	90 days	99SS	90 days	99SS
1.5.2	***HYDRANT***	***90 days***		***90 days***	
1.5.2.1	Procurement & Installation of HDPE PE 100 (PN-20), he. 6" (160 mm)	90 days	95SS-7 days	90 days	95SS-7 days
1.5.2.2	Procurement & Installation of HDPE PE 100 (PN-20), Elbow 90° dia. 6" (160 mm)	90 days	103SS	90 days	103SS
1.5.2.3	Procurement & Installation of HDPE PE 100 (PN-20), Elbow 90° dia. 6" (160 mm)	90 days	103SS	90 days	103SS
1,6	**ELECTRICAL WORK**	**92 days**		**92 days**	
1.6.1	**STREET LIGHTING WORKS**	**92 days**		**92 days**	
1.6.1.1	**Distribution Panel Jobs**	**92 days**		**92 days**	
1.6.1.1.1	Procurement & Installation of LP - SL Panels	92 days	82SS	92 days	82SS
1.6.1.2	**Cable Work**	**92 days**		**92 days**	
1.6.1.2.1	From LP-SL To SL group (R, S, T)	92 days	109SS	92 days	109SS
1.6.1.2.2	NYY Procurement & Installation 4C x 16mm2	92 days	109SS	92 days	109SS
1.6.1.3	**Street Lighting Jobs**	**92 days**		**92 days**	
1.6.1.3.1	Street Light Poles complete with Anchor Bolts and Nuts	92 days	109SS	92 days	109SS
1.6.1.4	**Cable Line Work**	**92 days**		**92 days**	

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Table 4. Continued

1.6.1.4.1	**Testing & Commissioning Jobs**	92 days	109SS	92 days	109SS
1.6.1.5	**Testing & Commissioning Work**	**92 days**		**92 days**	
1.6.1.5.1	Testing & Commissioning Jobs	92 days	109SS	92 days	109SS
1,7	**NEW ITEM WORK**	**140 days**		**89 days**	
1.7.1	**TRESTLE WORK**	**21 days**		**21 days**	
1.7.1.1	**Piling Work (Axis 1 to Axis 13)**	**21 days**		**21 days**	
1.7.1.1.1	Pengadaan Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=15m berikut Transport ke Lokasi & Positioning	21 days	82FS-14 days,118FS+7 days	21 days	82FS-14 days,118FS+7 days
1.7.1.2	**Piling Work (Axis 14 to Axis 37)**	**21 days**		**21 days**	
1.7.1.2.1	Pengadaan Concrete Spun Pile (CSP) Ø600mm, t=100mm, L=15m following Transport to Location & Positioning	21 days	122SS,109FS+7 days	21 days	122SS,109FS+7 days
1.7.1.3	**Reinforced Concrete In-Situ Work**	**21 days**		**21 days**	
1.7.1.3.1	Concrete Filler Columns	21 days	122SS	21 days	122SS
1.7.1.3.2	Pilecap	21 days	122SS	21 days	122SS
1.7.1.3.3	Abutment	21 days	122SS	21 days	122SS
1.7.1.3.4	Diaphragm Beam	21 days	122SS	21 days	122SS
1.7.1.3.5	Slab & Kanstin	21 days	122SS	21 days	122SS
1.7.2	**WALKWAY WORK**	**42 days**		**42 days**	
1.7.2.1	**Precast Reinforced Concrete Work**	**42 days**		**42 days**	
1.7.2.1.1	**Beam**	**42 days**		**42 days**	
1.7.2.1.1.1	Beam (B.1)	42 days	105SS	42 days	105SS
1.7.2.1.2	**Slab**	**42 days**		**42 days**	
1.7.2.1.2.1	Slab (PS.1)	42 days	134SS	42 days	134SS
1.7.2.1.2.2	Slab (PS.1A)	42 days	134SS	42 days	134SS
1.7.2.1.2.3	Slab (PS.2)	42 days	134SS	42 days	134SS
1.7.3	**BOX CULVERT WORK**	**42 days**		**42 days**	
1.7.3.1	Quarry	42 days	138FS-14 days,137FS-14 days,136FS-14 days	42 days	138FS-14 days,137FS-14 days,136FS-14 days
1.7.3.2	Concrete Demolition	42 days	140SS	42 days	140SS
1.7.3.3	Concrete Fc' 35 Mpa	42 days	140SS	42 days	140SS
1.7.3.4	Iron Concrete he. 13"	42 days	140SS	42 days	140SS
1,8	**ADDITIONAL WORK**	**21 days**		**21 days**	
1.8.1	Dredging Excavation	21 days	130SS,129FF	21 days	130SS,129FF
1.8.2	Expansion Joint	21 days	145SS	21 days	145SS
1.8.3	Seismic Anchor ø2,5" (Bowl)	21 days	145SS	21 days	145SS

From the table above, there is a difference in predecessors that causes a difference in the total duration of work, namely from the initial duration of 306 days to 242 days, so that the implementation of the fast track method can reduce the duration by 64 days or experience a time acceleration of 20.9% from the initial duration of 306 days.

Calculating Project Costs After the Implementation of the Fast Track Method

The calculation of project costs after the implementation of the Fast Track Method is the same as the calculation of conventional project costs [15], [16]. There is no increase in the amount of labor and costs for any critical or non-critical activities, the use of material and other cost standards is still based on what is determined by the contractor. However, the implementation of critical activities that are carried out in an overlapping manner to reduce 64 working days causes a reduction in costs in indirect costs after the implementation of the Fast Track Method. The indirect cost reductions are as follows:

Indirect Costs = (Normal Indirect Costs: Normal Duration) × New Duration
= (Rp. 50.365.788.654,89- : 306) × 242
= Rp. 3.983.176.749,-

Total Cost = Direct Costs + Indirect Costs

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= Rp. 45,329,209,789,- + Rp. 3,983,176,749,-
= Rp. 49,312,386,539,-

Cost Savings = Initial cost – the total cost after acceleration
=Rp. 50,365,788,654.89 – Rp 49,312,386,539
= Rp. 1,053,402,116

Cost Savings Percentage

$$= \frac{\text{Total Initial Project Cost} - \text{Total Cost After Acceleration}}{\text{Total Initial Project Cost}} \text{ x } 100\%$$

$$= \frac{\text{Rp. } 50.365.788.654{,}89 - \text{Rp. } 49.312.386.539}{\text{Rp. } 50.365.788.654{,}89} \text{ x } 100\%$$

$= 2{,}09\%$

The acceleration of using the fast track method has an impact on reducing costs from the total initial cost of the project which can reduce costs by Rp. 1.053.402.116,- or experienced a cost saving of 2.09% of the total cost.

IV. Conclusion

Based on the description of the results and discussion, it can be concluded that:

The duration of the completion of the construction of the main base pier of the Indonesian Navy VI Makassar by applying the fast track method can reduce the time with the application of the fast track method can reduce duration by 64 days or experience a time acceleration of 20.9% from the initial duration of 306 days and the total project cost before the acceleration is carried out is Rp. 50,365,788,654.89 After acceleration with the fast track method which affects the overhead cost to Rp. 49,312,386,539, the total cost reduced is Rp. 1,053,402,116 or a saving of 2.09% of the total cost.

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