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Implementation of Fast Track Method in Bore Pile Foundation Construction for Regional General Hospital Development Projects

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ABSTRACT

In a project, running work will require a good planning, scheduling and control, and are influenced by factors such as good resources, material availability, equipment availability, and performance. Natural conditions and other factors affect project progress and can also be the cause of delays in project completion, resulting in the planned time to exceed the previous specified time. With the implementation of the Fast Track method on Bore Pile's work, it can be seen how quickly it will take for the work to be continued and the development project of the Regional Hospital to be completed. This research will focus on the analysis of time and cost acceleration in order to determine the comparison of time obtained with the scheduling start time and also on the analysis of cost outcomes required for acceleration, It is also a matter of consideration for contractors and for project owners and can also be a medium of learning especially in construction management. From the analysis of this study, the result was that the time obtained from the acceleration of activities was 20 days from the initial duration of 110 days to 90 days with the required cost of Rp 9,466,975,861.54, and the cost difference between normal cost and Fast Track method was Rp 238,218,404,57.

Keywords: *Fast Track; Acceleration; Bore Pile; Construction; Hospital Building*

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INTRODUCTION

Contractors typically seek expedited project completion to enhance profitability through labor costs. Among the three methodologies, projects managed by State-Owned Enterprises (BUMN) or government entities frequently employ the Traditional method. However, this approach possesses inherent drawbacks, particularly its inflexible scheduling; subsequent tasks must await the completion of preceding ones. Consequently, any delays in earlier phases result in cumulative setbacks in overall project completion, despite the potential for concurrent execution that could reduce total implementation time[1].

During the implementation of a construction project, it can affect the time or delay of the construction project. Delays in any task can be mitigated by expediting the postponed elements; similarly[2], the deficiencies of this traditional method can be addressed or reduced through acceleration, one such approach being the Fast Track method. In the implementation of construction projects require a control system that can signal in case of irregularities in what is planned so that a way is sought to anticipate it [3]. The fast track approach is employed to expedite development by executing processes concurrently, resulting in reduced implementation periods and enhanced cost efficiency[4]. This fast track approach will evaluate the critical path in work scheduling by expediting the duration on the critical path.

In addition, the fast track method can reduce implementation time and lower project costs compared to traditional methods that depend on a fixed sequence of activities. The fast track technique enables project implementation to be finished on schedule or even ahead of time. Prior to implementation, numerous factors must be taken into account, specifically the planning must be systematic and effective; logistics management should employ the just-in-time method to prevent delays in material availability. Labor utilization must maintain stable productivity, and labor grouping should align with individual capabilities. Coordination among site managers, field supervisors, and project-related elements must be maintained throughout the implementation period to promptly identify potential issues[5].

The project has been a delay of approximately 40% in the planned duration due to various factors impeding progress. The implementation of the Fast Track method, combined with the Critical Path Method (CPM), is deemed appropriate for this project, which has substantial financial implications. This approach facilitates straightforward calculations and presents a work network that clearly delineates all activities related to the Bore Pile work, enabling an assessment of the expedited timeline for project continuation and the eventual completion of the Kembangan Regional Hospital development project.

METHOD

Research methods are systematic approaches employed to acquire data for defined objectives and applications and in generally categorized into two types: qualitative and quantitative. Qualitative research methods can be interpreted as research methods based on post-positivism philosophy [6] while quantitative research possesses distinct qualities, specifically in calculations, numerical data, and quantities. This quantitative research methodology employs numerical data, commencing with data collection, followed by data estimation and the presentation of findings. This form of quantitative research necessitates that a researcher elucidate the influence of one variable on others [7]. The research on the Kembangan Regional Hospital development project will employ quantitative research methods.

The case study in this research is the Kembangan Regional General Hospital Development Project in West Jakarta and the procedures in the research that will be carried out as follows:

a. Determining the idea or concept of the research to be carried out.
b. Formulating research problems and determining research objectives.
c. Determining concepts and exploring literature.
d. Surveying to see if the project meets the requirements to be used as a research location.
e. Collecting the necessary data by means of direct observation and requesting related data.
f. Processing the data that has been collected according to the needs of data analysis, so that it can facilitate the process of analyzing research data.
g. Analyzing the research data obtained by calculating the acceleration and its impact on other work factors.

Direct observation is conducted to gather data on the amount of job execution, specifically on the bore pile operations in lower construction, emphasizing material production or procurement and the workforce involved during the process. Interviews are conducted to acquire intangible data and corroborate the accuracy of the information gathered from observation.

Primary data from this project activity include general project information such as the sequence of work during implementation, information on the number of workers, and the tools used. Secondary data obtained in this study are the cost budget plan (RAB), project unit price analysis, material and wage costs, and weekly reports. The project cost is essential and crucial

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for controlling a building activity. In a building project, finance can be categorized into two types: direct costs and indirect costs [8].

Data processing and analysis are carried out using the fast track method. What is done after knowing the sequence of project work items, it is necessary to input data into Microsoft Project software to create network planning. Network Planning is a project control and planning that describes the relationship of dependency between one activity and another which is stated in the form of a network diagram [9].

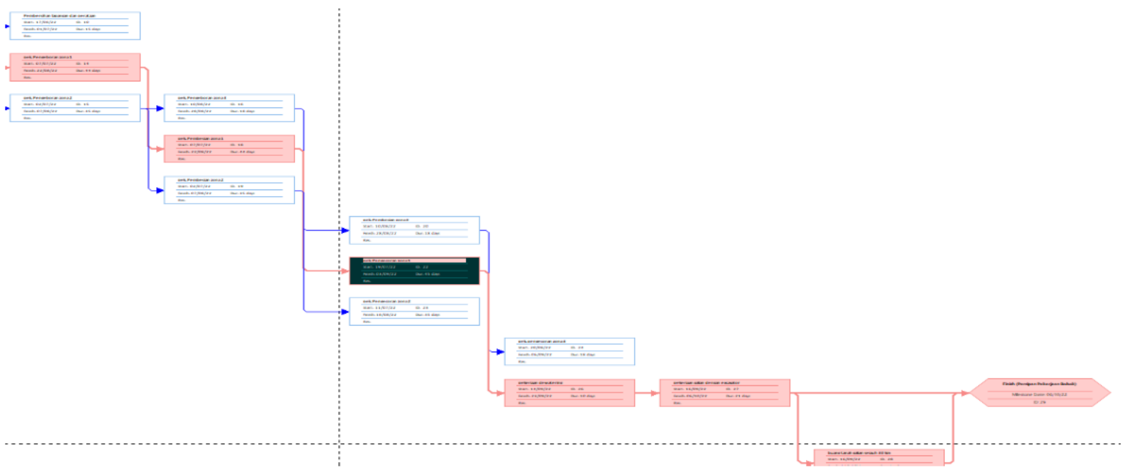

Figure 1. Network Diagram in the Form of Activity on Node

After establishing a network, it can be evaluated to identify critical and non-critical paths. Microsoft Project software will automatically highlight activities within the critical path in red, while those not included in the critical path remain unmarked. The activities in the critical route are those that will be expedited by the project. The findings of this survey will thereafter be corroborated by specialists to acquire additional feedback and insights concerning the issues identified in the research.

Fast Track Steps

The steps to do fast track as follows [10]:

a. Implement logical scheduling that aligns one task with another.
b. Implement fast tracking just on actions within the critical path.
c. The criterion for employing the fast track technique is that the minimum duration is ≥ 2 days.
d. The activity on the critical path that can be fast tracked have the following relationships:
    - If duration i < duration j, then activity j is accelerated after activity i ≥ 1 day and activity i must be completed first or simultaneously.
    - If duration j < duration i, if the remaining duration of activity i < 1 day of activity j then activity j can be started. Both activities should be able to be completed simultaneously.
e. Conduct a float check on activities on the non-critical path, whether a new critical path appears or not.
f. Acceleration is carried out < 50% of the normal duration.

RESULTS AND DISCUSSION

Data on foundation work in the Kembangan Regional Public Hospital Development Project, West Jakarta is divided into three zones with details as in Table 1 and as seen in Figure 2.

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Table 1. Foundation Work Data

No	**Area**		**Total (Points)**	
			Bore Pile	**Soldier Pile**
1	Zona 1	Zona 1.1	3	55
		Zona 1.2	-	109
2	Zona 2	Zona 2.1	-	76
		Zona 2.2	36	
3	Zona 3	Zona 3	11	47
Total			354	

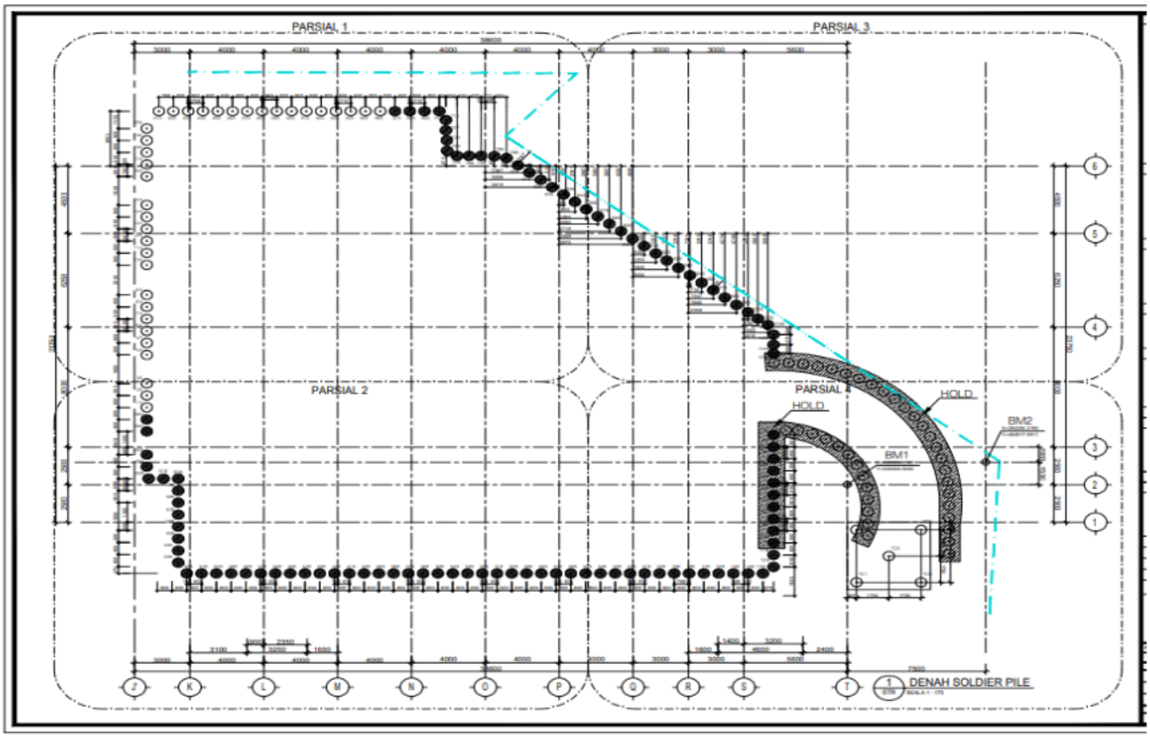

Figure 2. Shop Drawing of Work Area

Scheduling Analysis with Critical Path Method

The Critical Path Method (CPM) is employed for its advantages pertinent to the analyzed project, including its suitability for high-value projects, straightforward calculations, and a visual representation as a work network that facilitates easier comprehension of all activities involved. Several stages must be undertaken in performing a scheduling analysis. The procedures for executing the analysis are as follows:

a. Work Arrangement

All acquired activity data will be organized into a table to enhance analysis. The table will be examined to ascertain the entire length of the activity, as seen in Table 2. The work arrangement pertains to the planning document, whereas the length is derived from direct observational results. This procedure additionally functions as a preliminary reference for assembling a professional network.

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Table 2. Description of Work

No	Description	Symbol		Duration	Activity	
					Predecessor	Successor
	Preparatory Work					
1	Development of project nameplates	A		1		B
2	Temporary fence construction	B		2	A	C
3	Temporary director kit construction, worker barracks, warehouse and guard post construction	C		2	B	D
4	Equipment mobilization	D		3	C	E
5	Tower crane equipment	E		6	D	F
6	Measurement and bowplank	F		2	E	G
7	Temporary electricity and water connection and monthly for workers	G		1	F	H
8	Field clearing and leveling	H		15	A	I
	Substructure Work					
	Foundation Work					
	Drilling Work					
9	Drilling work zone 1	I		44	H	L
10	Drilling work zone 2	J		35	I	M
11	Drilling work zone 3	K		18	J	N
	Ironing Work					
12	Ironing work zone 1	L		44	H	O
13	Ironing work zone 2	M		35	I	P
14	Ironing work zone 3	N		18	J	Q
	Foundry Work					
15	Foundry work zone 1	O		45	H	R
16	Foundry work zone 2	P		35	I	R
17	Foundry work zone 3	Q		18	J	R
	Excavation Work					
18	Dewatering work	R		10	O;P;Q	S
19	Excavation work	S		21	R	U
20	Disposal of excavated soil as far as 30 km	T		21	R	U
21	Finish (Preparation of demolition work)	U			S;T	
TOTAL				110 days		

b. Generate Network Diagrams

The subsequent stage following the acquisition of work data is to construct a work network; in this study, the author utilizes the Microsoft Project program to get well-organized work network outcomes. All activities will be interconnected as outlined in Table 2, which was previously established. Once a network is established that interlinks various tasks, it will be analyzed to determine the time that yields a critical path. The translation of data into the

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Microsoft Project application can be represented as a bar chart and a Network Diagram, which serve to identify the critical and non-critical lines of operations in building project work [11]. Acquired as follows:

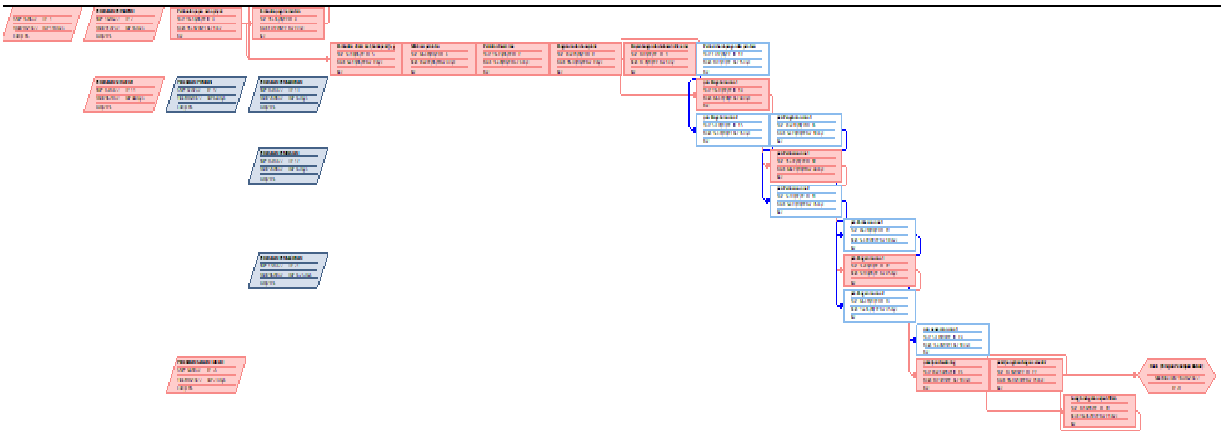

Figure 3. Project Network Diagram

c. Determination of Critical Path

After establishing a work network, it can be evaluated to identify critical and non-critical paths. The Microsoft Project software will automatically highlight activities within the critical path in red, while those not classified as critical will remain unmarked. The activities in the critical route are those that will be expedited by the project. The critical path activities, encompassing a total work period of 103 days, are summarized in Table 3 as follows:

Table 3. Activity in Critical Path

No	Activity	Duration	Information
Preparatory Work			
1	Development of project nameplates	1 day	
2	Temporary fence construction	2 days	Together with no.1
3	Temporary director kit construction, worker barracks, warehouse and guard post construction	2 days	
4	Equipment mobilization	3 days	
5	Tower crane equipment	6 days	
6	Measurement and bowplank	2 days	
7	Temporary electricity and water connection and monthly for workers	1 day	
Substructure Work			
Foundation Work			
Drilling Work			
8	Drilling Work Zone 1	44 Days	
Ironing Work			
9	Ironing Work Zone 1	44 Days	Together With No.8
Foundry Work			
10	Foundry Work Zone 1	45 Days	Done After No. 9 Is 25% Complete (Started After 11 Days Of No. 9)

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No	Activity	Duration	Information
Excavation Work			
11	Dewatering work	10 days	
12	Excavation work	21 days	
13	Disposal of excavated soil as far as 30 km	21 days	Together with no.12
TOTAL		103 days	

Fast Tracking Method

After obtaining the results of which activities are included in the critical path from the scheduling analysis using the Critical Path Method (CPM), the analysis will be continued to accelerate the duration of the work in this study using the Fast Track method. Using the Fast Track acceleration method in this study is done in the following ways;

a. Implementation of Activities According to Plan

By looking at the activities from the duration and start time in this work, it will be found that there are several activities that are not in accordance with the plan, starting from the duration of the work that is not in accordance (increased) and the start time that is delayed due to several things such as weather disturbances, equipment damage and so on, so a list of activities that are not in accordance with the plan is made.

Table 4. Initial Activities Versus Planning

No	Description	Duration	
		Initial	**Planning**
Preparatory Work			
1	Development Of Project Nameplates	1	1
2	Temporary Fence Construction	2	2
3	Temporary Director Kit Construction, Worker Barracks, Warehouse And Guard Post Construction	2	2
4	Equipment Mobilization	3	2
5	Tower Crane Equipment	6	5
6	Measurement And Bowplank	2	2
7	Temporary Electricity And Water Connection And Monthly For Workers	1	1
8	Field Clearing And Leveling	15	15
Substructure Work			
Foundation Work			
Drilling Work			
9	Drilling Work Zone 1	44	43
10	Drilling Work Zone 2	35	30
11	Drilling Work Zone 3	18	16
Ironing Work			
12	Ironing Work Zone 1	44	43
13	Ironing Work Zone 2	35	30
14	Ironing Work Zone 3	18	16
Foundry Work			
15	Foundry Work Zone 1	45	43

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No	Description	Duration	
16	Foundry Work Zone 2	35	30
17	Foundry Work Zone 3	18	16
Excavation Work			
18	Dewatering Work	10	5
19	Excavation Work	21	21
20	Disposal Of Excavated Soil As Far As 30 Km	21	21
21	Finish (Preparation Of Demolition Work)		

Several activities deviate from the established plan, notably the drilling operations in zone 1, which were intended to span 43 days but extended to 44 days due to a decline in work efficiency from the initial daily target of 4 points to 3 points. Additionally, the commencement was delayed by 5 days because access to the work area was obstructed by concurrent activities in drilling zone 2. Consequently, to align with the planned drilling operations in zone 1, the approach was altered, ensuring adherence to the daily target. The second example pertains to dewatering operations, which exhibit a significant reduction in duration from the initial 10 days to 5 days through the simultaneous utilization of two tools. It is noteworthy that the contractor has equipped two tools, each capable of completing work at one point in 2 days, across a total of 5 points. However, one tool remains unused for unspecified reasons, as it is designated for use only if the primary tool fails. After consultation with the Site Operational Manager, it has been determined that the tool can indeed be utilized with information from the related party. It can be inferred that both tools operate in conjunction with equivalent work efficacy and do not incur additional costs, as the tool has been developed alongside other tools. The simultaneous utilization of both techniques at two distinct junctures can diminish the time to merely 5 days.

b. Execution of Concurrent Activities

Subsequent to adjusting the duration of various jobs that deviate from the schedule, the next step involves analyzing and identifying which activities can be executed concurrently. This entails allowing tasks on the critical path to proceed simultaneously with other jobs, thereby eliminating the necessity for waiting for the completion of other tasks before initiating critical path activities, ultimately resulting in a reduction of the overall project duration.

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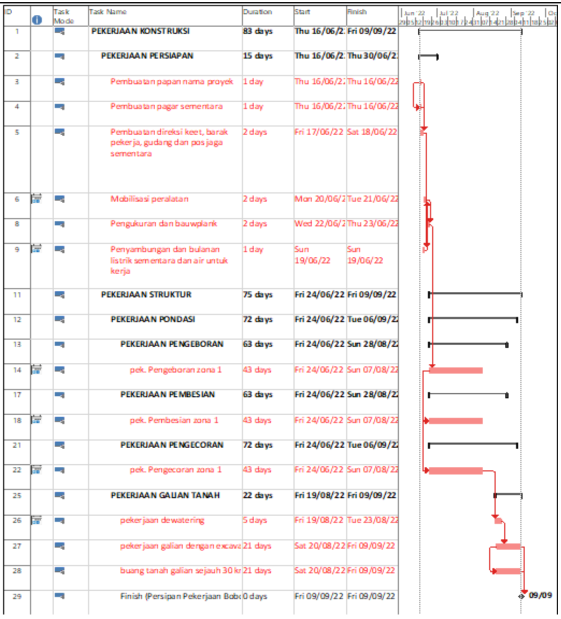

Figure 4. Implementation of Overlapping Work

c. Scheduling Activities After Acceleration

The schedule is presented in Figure 5, which elucidates the outcomes of the acceleration performed on important route activities with the Fast Tracking approach, revealing that critical tasks can be accomplished in 83 days.

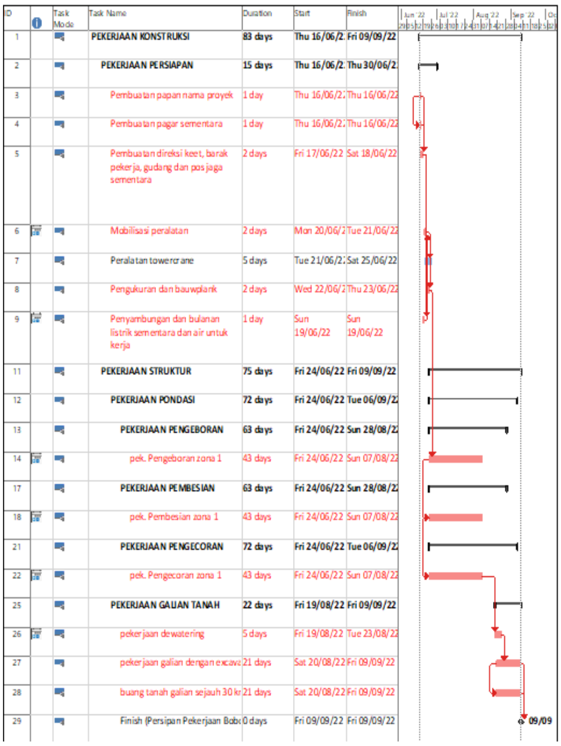

Figure 5. Scheduling after Fast Track is done

Duration and Cost Calculation

a. Duration Calculation

The application of the Fast Track technique revealed that crucial work can be accomplished in 83 days, reduced from the prior duration of 103 days. Consequently:

1) Initial project duration = 110 days (Table 2)

2) Critical Duration = 103 days (Refer to Table 3)

3) Non-Critical Duration = Normal Duration – Critical Work Duration
= 110 - 103
= 7 days

4) Critical Work Duration Fast Tracking Method = 83 days

Consequently:
5) Fast Tracking Duration
= Non-Critical Duration (3) + Critical Duration (4)
= 7 days + 83 days
= 90 days or 3 months

The disparity between the original duration and the rescheduled duration is 20 days.

b. Cost Calculation

Cost analysis is conducted to estimate the expenses associated with executing a task based on available resources and specific implementation techniques. To perform a cost analysis, it is essential to understand the specifications utilized in the building planning [12]. The following is a summary of the bill of quantities data for foundation work derived from the unit price analysis as presented in Table 5.

Table 5. Summary Foundation Work

Foundation Work for the Development of Kembangan Regional Hospital		
Description	**Cost**	
Preparatory Work	Rp	3.176.430.000,00
Foundation Work	Rp	4.336.225.757,76
Excavation Work	Rp	1.230.762.500,00
Total	Rp	8.743.418.257,76
Tax 11%	Rp	961.776.008,35
Grand Total	**Rp**	**9.705.194.266,11**
Unforeseen Expenses	**Rp**	**970.519.426,61**

The outcomes of the tasks on the essential route have been expedited to achieve a length of 90 working days, resulting in a decrease in indirect costs. The cost reductions are detailed as follows:

6) Indirect Cost = Rp 970,519,426.61

7) Indirect Cost per Day
= (Indirect Cost) / Normal Duration
= (Rp 970,519,426.61) / 110
= Rp 8,822,903.88

8) Direct Cost
= Total Planned Cost – Indirect Cost
= Rp 9,705,194,266.11 - Rp 970,519,426.61

= Rp 8,734,674,839.50

Following the implementation of the fast track, which resulted in a 20-day reduction in duration, the indirect costs are as follows:

9) Indirect Cost
= Duration After FT x Indirect Cost/Day
= 83 days x Rp 8,822,903.88
= Rp 732,301,022.04

10) Total Project Cost (FT)
= Direct Cost + Indirect Cost (FT)
= Rp 8,734,674,839.5 + Rp 732,301,022.04
= Rp 9,466,975,861.54

11) Difference
= Planned Cost – Cost After Fast Track
= Rp9,705,194,266.11 - Rp9,466,975,861.5
= Rp238,218,404.57

CONCLUSION

Through a rescheduling study utilizing the CPM approach and a cost analysis employing the Fast Track method on the foundation work of the Kembangan Regional Hospital development project, the subsequent conclusions were attained:

1. The overall work time determined after doing a rescheduling study of the foundation work for the Kembangan Regional Hospital development project in West Jakarta is 90 days, reduced from the previous 110 days, resulting in a difference of 20 days.
2. Employing the Fast Tracking method, the expenditure for the project amounted to Rp 9,466,975,861.54, whereas under standard conditions, the cost for the foundation work of the Kembangan Regional Hospital development project in West Jakarta was Rp 9,705,194,266.11. The resultant cost differential from utilizing the Fast Tracking method was Rp 238,218,404.57.

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