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Research Paper

The Implementation of Time Acceleration Analysis to Project Construction of Labuan Banten Regional Hospital

Justino Dos Santos[1], Sutanto Hidayat[2], Lila Ayu Ratna Winada[3]
[1,2,3]*(Department of Civil Engineering, National Institute of Technology, Malang, Indonesia)*
Corresponding Author: Justino Dos Santos

ABSTRACT : *In the construction of Regional Hospital of Labuan Banten project, from the beginning of project work there has been one month delay due to design changes for the renovation building where the change made in the existing two-stories building that will be transformed into three-stories building. Moreover, the old column structure was not demolished but having a structure reinforcement for the column. A structural reinforcement was chosen to make the quality of building meets the existing standards also with consideration of more economical cost and shorter working time. Due to this delay, the researchers tried to accelerate by employing two methods namely Crashing method and Fast Track method, which essentially were applied to optimize the cost and time of project work. As the research results, the normal time duration for structure work implementation from Regional Hospital of Labuhan Banten Construction Project was 85 days and by the result from acceleration analysis on the structure work by employing the Crashing-Fast Track method, it was found the time duration was 71 days, so, the difference between normal time and optimized time by implementing Crashing-Fast Track methods on structure work resulted a time efficiency of 14 days.*
KEYWORDS: *Labuhan Banten, Time acceleration, Hospital Project, Crashing, Fast Track Method.*

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I. INTRODUCTION

In general, scheduling for a project is using definite duration estimation. However, there are many uncertainty factors to make duration of each activity cannot be determined in exact timing. The causal factors of duration uncertainty are including worker productivity, weather factor, supplies of tools/equipment's, and others. According to Body of Knowledge Project Management [1] there are several methods to condense the overall project schedule to speed up the work schedule so time duration can be optimized. One of many ways for contractor in preventing delays is by implementing fast-track method [2].

An improper and not systematic planning will cause delays in its implementation. It requires a right method for optimizing the existing resources and available facilities, such as a technical application computer program to make the project able to be completed on time, with the right quality and at the right cost. To overcome this problem, a time schedule that shows the time for each activity will take place should be considered, so that resources can be completed at the right time and the activity components can be started at the right time [3].

Time and cost are greatly influence the success or failure of a construction project. A benchmark for project success can be seen from the optimal completion time with a minimal cost and quality that meets the project standards. A systematic project management is required for ensuring the project implementation time is in accordance to the contract, or, when it possible, able to finish faster, so the costs incurred can provide benefits and able to avoid fines due to delays in the project completion. If there is a delay in the project, ways to do to make the project work continue to run well is accelerating the project implementation time. Acceleration of project implementation means to shorten the life of project implementation which can be attained by various ways to speed up the implementation of the project, including: (1) conducting work shifts, (2) extending working time (overtime), (3) using more productive tools, (4) increasing amount of works, (5) using material type that has a faster installation, and (6) employing other construction method that works more quickly. In certain circumstances, there is a difference between the estimated age of the project and the planned age of the project. The age/life of the project plan usually is shorter than estimated life of the project. The estimated life of a project is determined by the critical path that has the longest implementation time, where the implementation time is the sum of length of the estimated activities along with critical activities that form the path. Meanwhile, the life of project plan is determined based on management needs or other reasons [4].

The construction of Regional Hospital of Labuan Banten project has implementation time of 240 calendar days starting from February, 25 to October 22, and for weekly work progress in August has reached the week of 24th when the initial work experiencing halt or delay for one month due to a design change in the Regional Hospital of Labuan Banten renovation building, from the existing two-story floors that going to be transformed into three-story floors also the column structure which will not be demolished but will be strengthened (for its column structure) for the building project, due to the choice of method that selected to meet the quality standards and also maintain an economical cost and shorter work time. Therefore, it needs one month to choose the right method of structure reinforcement for the building project. Moreover, the authors wish to re-analyze work items that have been realized and the work items that experienced delays also the implementation time.

In relation to the background reasoning above, this research combines the Crashing Method with Fast Track method to optimize time and cost for the Regional Hospital of Labuan Banten project. By using these methods, it is expected to get an earlier completion time than the normal completion time and to get an efficient or economical cost as possible to complete the project implementation. Also, to find out how much of time duration can be accelerated with calculation of cost that can be saved (cost saving) by combining the Crashing-Fast Track methods.

II. LITERATURE REVIEW

2.1. The Project Scheduling Method

2.1.1. Critical Path Method (CPM)

1. Benefit of critical path method (CPM)

According to Dappa et.al [5], the Critical Path method is a series of activities within the project scope that do not have a float time, and activities occur in this path are called the critical activities. Kustamar, et.al [6] suggested the aim of Critical Path method is quickly identifying type of activities that have a high sensivity level to delay in any activity implementation within a project, so the activity that able to influence delay of activity completion can be controlled. By using the Critical Path method, activities are arranged in logical way with a relation of Finish to Start where it can show the activities along the critical path. In its operation, the Critical Path Method (CPM) is a method that uses arrow diagrams to determine the critical path, so, this method is called as the Critical Path Method.

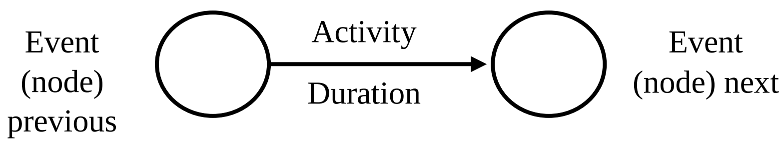

Figure 1: CPM Format [3]

2. The calculation of EET dan LET in critical path method

In critical path method (CPM) there are terms of 'Earliest Event Time' (EET) and 'Latest Event Time" (LET), total float and float interference. EET is the earliest event or the fastest time of the event, meanwhile LET is the latest event or the longest time of the event.

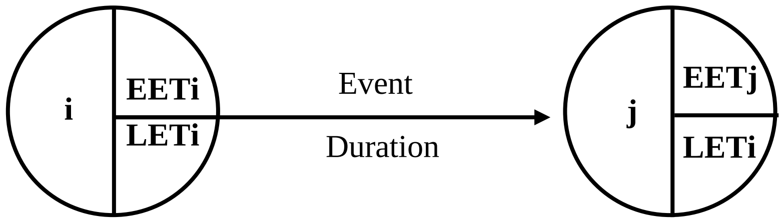

Figure 2: EET and LET of an Event [3]

3. The equation and calculation procedures

a. Earliest event time (EET)

A forward calculation to calculate the Earliest Event Time (EET)

$$\mathbf{EET = (EET + d)_{max}}$$

Procedures in calculating EET

- Determine the event number from the left to right, starting for event number 1 in a row until the maximum number.
- Determine the EET value for event number 1 (far left) equals to no.
- The next EET can be calculated by using the formula stated above.

b. Latest Event Time (LET)

A countdown calculation to calculate the Latest Event Time (LET)

$$\mathbf{LET = (LET + d)_{min}}$$

Procedures in calculating LET

- Determine the LET's latest event (far right) equals to the EET value of the last event.
- LET value can be calculated from right to left by using the formula stated above.
- If there are more than one event (including dummy), then LET minimum must be chosen.

4. EETj calculation model

a. A Forward Calculation to Calculate EETj

It starts from earliest event with EET = 0 to the last event, then, traced forward to the right for calculating the EET value of the next event as in the project.

Calculating in forward means the EETi situated at node I as the earliest start time of activity X, plus the duration of activity A (that will become EETj) as the fastest time to start activity after activity A. If there are more than two activities leading to an event, then = EETj of an activity always the largest value be taken.

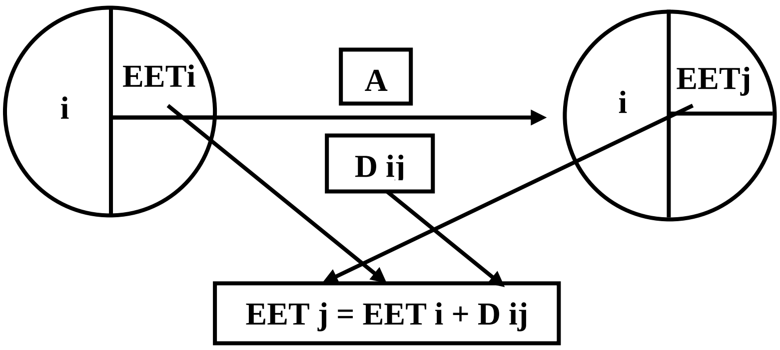

Figure 3: Calculating The EET of an Event [3]

b. A Countdown Calculation to Calculate the Latest Event Time (LET)

It starts from the latest event with LET=EET obtained from the forward calculation, then tracing backwards to the left to calculate the LET of the next event.

Counting down means the LETj situated at node j as the slowest completion time for activity A minus the time duration of activity A which becomes LTEi as the slowest time to start activity A and at the same time the slowest completion time for activities that precedes activity A. if there are more than two backward activities that leading to one event then = LETi of an activity always the smallest value than be taken as visible in the following picture.

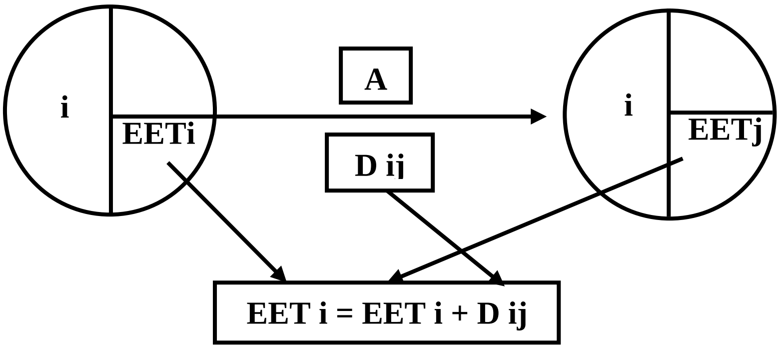

Figure 4: Calculating The LET of an Event [3]

2.1.2. The Bar Chart

Widiastuti in Wibowo and Rozy [7] defines a bar chart as a collection of activities placed in a vertical column, while the time is placed in a horizontal row. Start and finish of time for each activity along with their duration will be shown by placing a horizontal bar on the right side of each activity. Time estimation started from beginning to the end can be determined by the horizontal time scale at the top of the chart. Length of bar shows the activity duration and usually these activities are arranged according to the sequence or work chronology.

2.1.3. The S Curve

According to Hardianta and Effendy [8], the S curve is a graph of relationship between duration/time required to carry out work with the accumulation of work progress, in which the work progress becomes the representation of the work price. So, in preparing the S curve, it refers to the weighting of work price with the following equation: *Weight (in %) = cost of each work, total cost of work x 100%.* In a project with less activities (not too many activities) a bar chart method often used as a cost monitor and it called as S curve because its shape resembles the letter S. it happens because at the start of the project (preparatory activities) the cost incurred per unit of time tends to be low, then will increase rapidly in the middle of the project (when construction activities in progress) and decreases again at the end of the project (project completion).

2.2. Accelerate The Project’s Time Completion

According to Dimyati and Nurjaman [3], accelerating project completion time is an effort to complete the project earlier than the completion time under normal circumstances. By accelerating the time, there will be a reduction in the duration of many activities that will be held in a crash program. The maximum acceleration duration is limited by the size of the project or by work location, however, there are four factors which able to be optimized for carrying out acceleration within an activity. These factors are adding number of workers, scheduling overtime work, using heavy equipment and change the construction method in the field.

a. For each next overtime hour, the overtime wages must be paid twice time bigger than the hourly wage. Consultant
b. Then, for this matter can be formulated as follows: Sub-Contractor
c. Overtime cost per day = (first hour of overtime work x 1.5 x normal hour’s wage) + (next overtime hour x 2 normal hour’s wage) .... (1)

2.2.1. Fast Track Method

Fast track in project completion time can be made by implementing ‘parallel’ or ‘simultaneous’ or ‘overlapping’ work items to attain some time savings for the project work completion.

1. Several Principles Applied in Fast Track Analysis:
   a. Dependency logic among critical activities will be arranged in parallel or using a start-to-start principle.
   b. Dependency logic will consider the field condition and real productivity aspects.
   c. Careful consideration to the work volume, duration, resources, and productivity in critical activities.
   d. Acceleration will be conducted by looking at activities that have a long-time duration.
   e. The shortest activity time that chosen ≥ 2 days

2. Several Considerations
   a. Will not require additional workforce/labour
   b. Materials selected according to normal planning, including the material price, material types, and labor that must be ready in the construction field.
   c. The possibility of risk from inaccurate scheduling must be a concern (especially when there are many critical paths)
   d. The risk from overload of resources usage

Zuhriyah and Oetomo [9] stated a fast track is an effort to shorten the time duration of a project and its usage able to provide benefit of acceleration of project completion time by setting an effective and sequential system. Fast track method is executed by applying overlapping or parallel works on the critical path.

Furthermore, Zuhriyah and Oetomo [9] stated a fast track on a project is an important matter since there are various conditions and circumstances in the scheduling of a project. The fast track method is a process with one of the most important solutions within scheduling of a project. By using a fast track method, it can deal with possibility of delay and moreover, it can shorten the duration of completion of a project, although one activity is not completely finished, it is safe to start the next activity and these works can be completed together so the overall time duration able to be shortened.

Ballesteros-Perez in Wiharti, et.al. [10] stated the advantage of fast-track method to be applied to most projects is its economical aspect, although with a very limited time to do time acceleration, for example only between 10 % - 20 % of the initial work schedule, although this is one disadvantages of applying the fast-track method individually. In line with these definitions, the Fast-track method stages according to Stefanus, et.al [11] is stated as follows:

- Collecting project data of: cost budget plan (RAB), S curve, unit price of work, unit price of standard materials, unit price of analysis which had been planned at bidding time, also collect physical progress report on the project work every week as obtained from monitoring activity from the supervisory consultant during the project implementation.
- Create a logical sequence of activities and relationship between existing activities which quite realistic to be implemented.
- Determine the critical path with the help of Microsoft Project program.
- After the activities on the critical path able to be identified by Microsoft Project program, then a fast track scheduling will be carried out on activities on the critical path by applying the fast-track principles.
- The next step is determining the chosen time that will be accelerated, then carry out the desired acceleration to speed up the implementation time.
- After obtaining the accelerated time, then, a comparison of initial cost to the fast-track cost will be conducted.

2.2.2. The Procedures of Time Acceleration

Procedures of shortening time duration according to Soeharto [4] are as follow:

a. Calculate the project completion time.
b. Determine the normal work cost.
c. Determine the accelerated time cost for each of the activities.
d. Calculate the cost slope for each of the component activities.
e. Shorten the time duration of activity, started from critical activity with the lowest cost slope.
f. If within the acceleration time process is found/formed a new critical path, the way to overcome is by accelerating critical activities that have combination of the lowest slope cost.
g. Continue to accelerate the activity time until the point of shortened project time (TPD)
h. Create a tabulation of cost versus time, put this tabulation into graph format and normal point relationship (normal cost and normal time), formed point every time there is a shortening activity occurs up to the TPD point.
i. Calculate the direct cost and indirect cost to get the optimum time (time duration with the lowest cost for a project completion).

2.2.3. Crashing Method

Terminology of crashing process is a reduction of work which able to affect the completion time of a project. Crashing method is a deliberate, systemic, and analytic process by means of making test to all activities within a project, focusing on activities that are situated on the critical path. The crashing process is a way of estimating variable cost for determining the maximum and the most economical reduction of duration from an activity that still possible to conduct [12].

According to Mahendra in Dimyati and Nurjaman [3], there are two reasons to conduct crashing method:

a. The related project activities are expected to be completed soon because it has been decided and approved by the management division or the project owner for a certain reason.
b. There is a delay on the project implementation which exceeded certain tolerance limit and according to assessment by the management or the project owner, it is able to greatly affect the work progress and deadline time for the overall completion time of the related project.

III. RESEARCH METHOD

3.1. Data Collection Method

1. The research data obtained from the Regional Hospital of Labuan Banten project to be used within this study are as follow:
   a. Planning Drawings of the Project (Specification)
   b. S curve
   c. Monthly and Weekly Progress Reports of the project.
   d. Data of wage and material unit prices.
2. The required type of data for this study are:
   a. Primary Data, the data which researchers are obtained from the main source or taken in direct method
      - Engaging interview with project managers
   b. Secondary Data, the data which researchers taken by indirect method or from other related parties.
      - Contract Documents
      - Weekly Progress Reports.
      - Previous Research Journal Articles

3.2. Data Analysis Method

This is quantitative research because the data used in this study are in the form or numbers, such as the S-curve, budget plans, monthly and weekly progress reports of the project, also data on material and wage unit prices. These data will be used during the project runs until the project reach its completion time. Whereas the stages of planning analysis will be explained below.

1. Conduct analysis of project time under normal circumstances to find the project completion time by adjusting the data obtained from the project. The scheduling analysis is set by the help of MS-Excel for the resource analysis and MS-Project for the project scheduling analysis. The scheduling on normal condition will be used to see the final results from duration of schedule after it has been optimized. Normal schedule also needed to observe any irregularities in the existing schedule that may need more effective scheduling.
2. From the result of normal scheduling, the critical activities and critical paths for the project activities are attainable. Activities and critical paths indicate type of activities which cannot be late and vice versa, if these activities are accelerated, it will speed up the time completion of the overall project.
3. The critical activities are arranged into a table to analyze which activity can be accelerated according to the Fast Track and Crashing principles as mentioned in section II.
4. Based on the result of analysis to the activities and critical paths, an accelerated scheduling plan can be prepared with the same way as the analysis step in preparing the normal schedule.
5. The final stage is comparing the analysis result in normal time and analysis result after accelerating time in the project schedule then compiling these results into a conclusion.

3.2.1. Terminology in Critical Path According to Soeharto [4]

TE = E

The very beginning of an event (node) can occur or the earliest time occurrence which means the earliest time of an activity originating from that node can start, because according to the basic rules of net of works, a new activity can start when the previous activity has been completed.

TL = L

The very end of an event (node) can occur or the latest allowable event/occurrence time, which means the latest time which still allowed for an event to occur.

ES

The earliest start time of an activity or earliest start time, if the activity takes place and stated in time unit of hour then this time stated as the earliest hour when the activity starts.

EF

The earliest finish time for an activity or earliest finish time, if there is only one previous activity, then EF from the previous activity becomes the ES of the next activity.

LS

The very last time of an activity can start or latest allowable start time, the latest time of an activity can start without slowing down the entire work progress of the related project.

LF

The very last time for an activity can finishes or latest allowable finish time, without slowing down the project completion.

D

This is the time bracket for an activity. In general, it is stated by time units of day, week, month and others.

3.2.2. The Stages of Crashing Method

1. Collect the project data
2. Create a sequence of work activities
3. Determine the critical path
4. Conduct time acceleration analysis to activities on the critical path

3.2.3. The Stages of Fast Track Method

1. Collect the project data
2. Create a sequence and relationship between activities
3. Determine the critical path by employing Microsoft project and other software applications.
4. Fast Track Scheduling
5. Determine the time acceleration within the project implementation time.

IV. RESULT AND DISCUSSION

4.1. Acceleration Time Analysis of Regional Hospital of Labuan Banten Project

4.1.1. Crash Duration

After the critical activities according to the normal schedule have been obtained, then activities that able to be accelerated can be identified by the Crashing method (shortening the implementation time) in this discussion, will be done by assumption of adding overtime hours to construction workers for three working hours as the maximum allowable overtime hours according to the government regulation.

A. Method of daily productivity

The daily productivity calculation can be obtained by dividing the volume of a particular job by the time duration of the work performed. The following is an example of a calculation for one of many work items in Regional Hospital of Labuan Banten project.

Example of Analysis Calculation on Bouw plank Installation and Measurement Work

$$= \frac{Volume}{Normal\ Duration\ (ND)}$$

$$= \frac{178}{9{,}8}$$

$$= 20\ m^3/day$$

Manual soil excavation of 2 m depth

$$= \frac{Volume}{Normal\ Duration\ (ND)}$$

$$= \frac{224,11}{3,785}$$

$$= 59,211\ m^3/day$$

B. Calculating the productivity per hour

After the daily productivity has been calculated, the hourly productivity calculation can be analyzed based on the working time according to the interview data from the Regional Hospital of Labuan Banten project.

The example is from the hourly productivity analysis to the Bouw plank Installation and Measurement Work:

$$= \frac{Daily\ Productivity}{Normal\ Working\ Time}$$

$$= \frac{20}{7}$$

$$= 2,857\ m^3/hour$$

Example of Hourly Productivity analysis to manual soil excavation of 2 m depth

$$= \frac{Daily\ Productivity}{Normal\ Working\ Time}$$

$$= \frac{59,211}{7}$$

$$= 8,459\ m^3/hour$$

C. Calculating the daily productivity after crash method implementation

After the hourly productivity has been calculated, then calculation analysis for daily productivity after crash method being implemented according to the working hours obtained from the interview data on the Regional Hospital of Labuan Banten project can be conducted.

The calculation example from analysis of daily productivity after crash method implemented into the work of Bouw plank installation and measurement explains as:

= (normal time x hourly productivity) + (overtime hour x hourly productivity)
= (7 hours x 59,211) + (3 hours x 0,8 x 59,211)
= 26,857 m3/ day

The calculation example of daily productivity after crash method being implemented into manual soil excavation of 2 m depth.

= (normal time x hourly productivity) + (overtime hour x hourly productivity)
= (7 hours x 8,459) + (3 hours x 0,8 x 8,459)
= 79,511 m3/ day

D. Calculating the crash duration

After the calculation for daily productivity with crash method has been conducted, then, the crash duration can be analyzed according to the working hours obtained from the interview data on the Regional Hospital of Labuan Banten project.

The calculation example of crash duration analysis to Bouw plank installation and measurement work:

$$= \frac{Volume}{daily\ productivity\ after\ crash\ method\ implemented}$$

$$= \frac{178}{26,857} = 6,628\ m^3/day$$

The calculation example of crash duration analysis to manual soil excavation of 2 m depth.

$$= \frac{Volume}{daily\ productivity\ after\ crash\ method\ implemented}$$

$$= \frac{224{,}11}{79{,}511}$$

$$= 2{,}819\ m^3/day$$

Table 1. Tabulation of Crash Duration Result

Volume	Duration according to schedule (day)	Daily Productivity	Hourly Productivity	Productivity after Crash Implemented	Crash Duration
178	8,9	20	2,857	26,857	6,628
24,11	3,785	59,211	8,459	79,511	2,819
6,006	2,628	2285,714	326,531	3069,388	1,957
165,13	4,77	34,615	4,945	46,484	3,552
224,11	3,785	59,211	8,459	79,511	2,819
224,11	3,785	59,211	8,459	79,511	2,819
12,608	5,884	2142,857	306,122	2877,551	4,382
165,13	4,77	34,615	4,945	46,484	3,552
34,14	2,276	15	2,143	20,143	1,695
47,79	2,655	18,000	2,571	24,171	1,977
36,70	2,039	18,000	2,571	24,171	1,518
12.613,58	5,886	2142,857	306,122	2877,551	4,383
388,37	4,747	81,818	11,688	109,870	3,535
1.452,88	2,179	666,667	95,238	895,238	1,623
70,41	2,904	24,242	3,463	32,554	2,163
63,71	3,539	18,000	2,571	24,171	2,636
11.139,93	5,199	2142,857	306,122	2877,551	3,871
612,16	4,897	125,000	17,857	167,857	3,647
68,41	3,801	18,000	2,571	24,171	2,830
6.559,84	7,653	857,143	122,449	1151,020	5,699
285,80	3,493	81,818	11,688	109,870	2,601
41,36	2,954	14,000	2,000	18,800	2,200
6.718,24	3,135	2142,857	306,122	2877,551	2,335
389,11	7,78	50,000	7,143	67,143	5,795
975,40	2,05	476,190	68,027	639,456	1,525
65,50	2,402	27,273	3,896	36,623	1,788

4.2. Fast Track

After series of calculations have been completed and obtained an acceleration which allowed to be applied into a crashing project, then, the research will continue with analysis of the relationship between activities, to see which activities that implemented simultaneously able to be analyzed in fast track method. The complete results from type of works that able to be accelerated either by crashing method or by combining two methods of fast track-crashing is presented in table 2.

Table 2. The Tabulation of Accelerated Activities Result

No	Activity	Duration	Predecessors	Predecessors after fast track	FT/CR	Crash Duration
Section A.1.1 Dak Floor Preparatory Work (elv. +7.45)						
2	Bowplank measurement and Installation	9	-	-	CR	6,628
Section A.1.2. Foundation Structure Work						
Preparatory Work						
5	Manual soil excavation 2 m depth	4	2FS-3	2SS	FT+CR	2,819
6	Sand excavation	1	8	-		
7	Concrete floor work	1	5	-		
8	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250)	2	9	-		
9	Footplate reinforcing	3	10FF	10SS	FT+CR	1,957
10	Paired form work ½ concrete brick	5	7FS	7SS	CR	3,552
Work of Pit Lift						

12	Manual soil excavation 2 m depth	4	5SS		CR	2,819
13	Sand excavation	1	15			
14	Concrete floor work	1	12			
15	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250)	2	16			
16	Floor plate (*slab)* and wall reinforcing	1	18			
17	Foundation form work installation	2	14			
18	Wall form work installation	2	17;19			
19	Waterstop PVC l:20 cm installation	1	17FF			
Work of Sloof S1 and S2						
21	Manual soil excavation 2 m depth	4	13FS;6FS;5FS	13SS;6SS;5SS	FT+CR	2,819
22	Sand excavation	1	24			
23	Concrete floor work	1	21FF			
24	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250)	2	26			
25	Sloof reinforcing	6	23	23SS	FT+CR	4,382
26	Paired form work ½ concrete brick	5	25FF		CR	3,552
Section A.1.3. First Floor Structure Work						
Work of Structure Floor elv.-0.05						
42	Sand excavation	1	44			
43	Concrete floor work f'c 7.4 Mpa	3	37FS;22FS;29FS;33FS	37SS;22SS;29SS;33SS	FT+CR	1,695
44	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250)	3	45FS		CR	1,977
45	Steel Wire Mesh Reinforcing Wiremesh M8	2	43			
Work of Structure Column elv. - 0.05 s.d +3.45						
47	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250) with pump	3	42;49		CR	1,518
48	Column Reinforcing	6	45SS		CR	4,383
49	Column Form Work Installation	5	48FF	48SS	FT+CR	3,535
Work of Beam and Staircase Plate						
55	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250) with pump	1	57;47			
56	Beam and Staircase Plate Reinforcing	3	47SS;51		CR	1,623
57	Staircase Plate Form Work Installation	3	56FF	56SS	FT+CR	2,163
Section A.1.4. Second Floor Structure Work (elv. +3.45)						
Work of Structure Beam						
60	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250) with pump	4	62		CR	2,636
61	Beam Reinforcing	6	68		CR	3,871
62	Beam Form Work Installation	5	61FF	61SS	FT+CR	3,647
Work of Structure Floor Plate elv. +3.45						
64	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250) with pump	4	60FS;66FS		CR	2,830
Work of Structure Column elv. +3.45 s.d +7.45						
68	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250) with pump	2	70			
69	Column Reinforcing	8	55		CR	5,699
70	Column Form Work Installation	4	69FF	69SS	FT+CR	2,601
Section A.1.6. Dak Floor Structure Work (elv.+7.45)						
Work of Beam elv.+7.45						
81	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250) with pump	3	83FF	83SS	FT+CR	2,200
82	Beam Reinforcing	4	89	89SS	FT+CR	2,335
83	Beam Form Work Installation	8	82SS		CR	5,795
Work of Structure Column elv. +7.45 s.d +10.80						
89	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250) with pump	1	91			
90	Column Reinforcing	2	64			
91	Column Form Work Installation	1	90FF			
Section A.1.7. Roof Top Structure Work (elv. +10.80)						
Work of Ring Balk Elv.+ 10,80						
96	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250) with pump	1	98FF			
97	Beam Reinforcing	3	81;85;93		CR	1,525
98	Beam Form Work Installation	2	97FF			
Work of Dak Plate Elv.+ 17,75						

100	Ready Mix Concrete, quality fc' 21,7 Mpa (K-250) with pump	2	96;102			
101	Plate reinforcing	2	97SS			
102	Plate form work installation	3	101SS		CR	1,788

V. CONCLUSION

According to the result analysis on acceleration time applied to the construction of Regional Hospital of Labuan Banten project by employing the combined methods of crashing-fast track also with the help of Microsoft Project Assistance program, there are some results as conclusions of this study:

1. The normal time duration for structure work in the work implementation of Regional Hospital of Labuan Banten project according to the result analysis is 85 calendar days.
2. The accelerated time duration for structure work by employing crashing-fast track methods in the work implementation of Regional Hospital of Labuan Banten project according to the result analysis is 75 calendar days.
3. Therefore, the difference between the normal time and the accelerated time after having optimization by implementing combo method of crashing-fast track obtained a time efficiency of 14 calendar days.

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