# Comparative Study of the Fast Track Method with the Crash Program Method in Accelerating Time and Costs

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## Abstract

In many projects, delays are common, so it's important to make efforts to speed up the process and avoid them. This study investigates two methods of acceleration: the Fast Track method and the Crash Program method. The normal duration for this project is 180 days with a total cost of Rp. 14,666,588,288.29. The study uses MS Project to identify critical path activities that can be accelerated. The Fast Track method reduced the project time to 149 days at a cost of Rp. 14,287,701,424.18, while the Crash Program method reduced it to 144 days at a cost of Rp. 14,318,586,553.16. The study compares the time and cost outcomes of the two methods. The difference is due to the Fast Track method not incurring an increase in direct costs, only reducing indirect costs by changing predecessors. On the other hand, the Crash Program method resulted in additional direct costs but reduced indirect costs by adding 2 hours of overtime work.

Keywords: acceleration, fast track, crash program, time, cost.

#### 1. Introduction

The construction industry is growing rapidly, leading to an increased demand for engineering graduates. Successful construction projects rely on careful planning. According to Siti Hardayanti et al. (2022), a successful construction project meets quality requirements, is completed on time, and stays within the specified budget. Large construction projects need to be finished in a matter of months, requiring effective project management to plan, organize, and monitor available resources. Quality, time, and cost are the three primary components influencing project success, and optimizing one aspect may impact others, as noted by Gede Wira Hadinata (2013).

Contractors must manage construction projects systematically to ensure timely completion, turning costs into profits and avoiding fines resulting from delays. Failure to start construction on time could lead to fines or administrative sanctions as per Presidential Decree No. 12 of 2021 concerning Government Procurement of Goods and Services. Delays can also incur costs, reduce competitive value, and harm future project opportunities for contractors, ultimately impacting the project owner.

For example, the Simalas - Simalungun Regency boundary road improvement project, with a lane width of 4.5 m and a road length of 4,994 km, has a contract value of Rp. 16,279,913,000.00. This road connects Serdang Berdagai Regency and Simalungun Regency. To avoid delays and associated fines, accelerating construction projects' time and costs is crucial.

When scheduling construction projects, the fast track and crash program methods are essential to expedite project completion. The fast track method employs overlapping or parallel activities to shorten the project duration, while the crash program utilizes additional labor, changing shifts, and increased working time to expedite completion.

The primary objective is to determine the time and cost acceleration using the crash program and fast track methods and to compare the results for efficiency in completing the project with the shortest duration and optimal costs.

#### 2. Material and Methods

## 2.1 Crash Program

One way to accelerate project completion is through a scheduling method called a crash program. The critical path of a project can be determined using the Critical Path Method (CPM), which helps identify activities that can be expedited. Employing a crash program will escalate direct costs and

resources on the critical path. There are several parameters to consider when determining how to accelerate project time.

a.	Daily Productivity	
	Volume	(1)
	Normal Duration	(1)
b.	Hourly Productivity	
	Daily Productivity	(2)
	8 hours of work	(2)
c.	Daily Productivity After Crash	

= (8 hours of work x Hourly Productivity) + (a x c x Hourly Productivity) (3)

Table 1 Coefficient of reduction in work productivity									
Overtime Hours	Productivity Index	Performance (%)							
(a)	Decrease Coefficient								
		(c)							
	(b)								
1 jam	0,1	90							
i juiii	0,1	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,							
2 jam	0,2	80							
3 jam	0,3	70							
		<u> </u>							
4 jam	0.4	60							

Source: (Soeharto, 1997)

## Where :

a = Length of additional working hours

b = Coefficient of decrease in productivity by increasing working hours

d.	Crash Duration = Volume	(4)
	Daily productivity after the crash	(.)
e.	Crash Cost Total	
	Normal Cost a hour	
	= Hourly productivity x (Unit price of labor + Unit price of equipment)	(5)
	➢ Normal Cost of Workers a day	
	= 7 hours x Normal Cost of workers a hour	(6)
	➢ Worker overtime costs a day	
	= (first hour of overtime work $x1.5 x$ normal hourly wagel) + (next overtime hours $x 2$	x normal
	hourly wage)	(7)
	Crash Cost of Workers a day	
	= Normal worker costs a day + overtime costs a day	(8)
	<ul> <li>Crash Cost Total</li> </ul>	
	= Crash Cost of workers per day x crash duration) + (Unit price of material x volume)	(9)
f.	Slope	
	Crash Cost - Normal Cost	(10)
	Normal Duration - Crash Duration	(10)

## 2.2 Fast Track

In construction projects, a fast track is an effort to complete a project faster than normal time by implementing an overlapping (parallel) strategy or starting work earlier than planned. The main principles of implementing fast track in project scheduling planning include the following (Tjaturono, 2014):

- 1. The principle of parallel systems is used to perform logical activities on critical paths. They can also complete one activity after another according to the start-to-start principle.
- 2. Logical relationships between activities must be logical, empirical, and utilize real productivity.
- 3. Consider the number, timing, resources, and productivity of critical path activities.
- 4. Fast track the critical path.

- 5. Acceleration should be no more than 50% of normal time.
- 6. Speed up time, particularly for activities with the longest duration and those with the shortest duration, which is at least one day.

## 3. Results and Discussion

# 3.1 Critical Path Determination Results

According to the analysis, the connection between jobs (predecessor and successor) in the schedule varies based on the start and end times of the work. After arranging the job relationships using Microsoft

Jadwalan Pekerjaan Ruas in Simalas Mutur Mobilisasi Demobilisasi Manajemen den Keselamatan Lalu Lintas Keselamatan dan kesehatar kerja <b>CEKERJAAN DRAINASE</b> Galiaru nutuk Selokan Drainase dan Saluran Air Pasangan Batu dengan Mor	180 days 180 days 33 days 7 days 180 days 180 days 28 days	Wed 05/04/	Sun 01/10/23 /:Sun 01/10/2 /2Sun 07/05/2 /2Sun 01/10/23 Sun 01/10/23 Sun 01/10/23	51	دی دی دی دی	26	Mar Apr May Jun Jul Aug Sep Oct Mobilisasi[Rp32.114.516,02] Demobilis manajeme keselamat
Mobilisasi Demobilisasi Manajemen dan Keselamatan lalu Lintas Keselamatan dan kesehatar kerja PEKERJAAN DRAINASE Galiam untuk Selokan Drainase dan Saluran Air	33 days 7 days 180 days 180 days	Wed 05/04/ Mon 25/09/ Wed 05/04/23 Wed 05/04/23	/2 Sun 07/05/2 /2 Sun 01/10/2 Sun 01/10/23 Sun	1 1 1	LS LS	26	Demobilis manajeme
Demobilisasi Manajemen dan Keselamatan Lalu Lintas Keselamatan dan kesehatar kerja <b>TEKERJAAN DRAINASE</b> Galian untuk Salokan Drainase dan Saluran Air	7 days 180 days 180 days	Mon 25/09/ Wed 05/04/23 Wed 05/04/23	/2 Sun 01/10/2 Sun 01/10/23 Sun	1 1	LS LS	26	Demobilis manajeme
Manajemen dan Keselamatan Lalu Lintas Keselamatan dan kesehatar kerja <b>FEKERJAAN DRAINASE</b> Galian untuk Selokan Drainase dan Saluran Air	180 days 180 days	Wed 05/04/23 Wed 05/04/23	Sun 01/10/23 Sun	1	LS	26	manajeme
Keselamatan Lalu Lintas Keselamatan dan kesehatar kerja YEKERJAAN DRAINASE Galian untuk Selokan Drainase dan Saluran Air	180 days	05/04/23 Wed 05/04/23	01/10/23 Sun	-			
kerja <b>'EKERJAAN DRAINASE</b> Galian untuk Selokan Drainase dan Saluran Air		05/04/23		1	LS		keselamat
Galian untuk Selokan Drainase dan Saluran Air	28 days	Mon					
Drainase dan Saluran Air	28 days	Mon					
Pasangan Batu dengan Mor		01/05/23	Sun 28/05/23	2.891,63	M3	14	Dump Truck[Rp130.784.636,86];excavator[Rp15.962.665,08];Pekerja
	t 84 days	Mon 15/05/	/2 Sun 06/08/2	1.892,70	M3	10FS-7 days	Pekerja[Rp145.920.072,37];Tukang
Gorong-gorong Kotak Beton Bertulang, uk. dalam 80 x 80 cm		Mon 08/05/23	Sun 21/05/23	54,00	м	8FS-21 days	Pekerja[Rp642.004,92];Mandor[Rp106.526,88];Tukang[Rp83.252,88];Bo
Gorong-gorong Kotak Beton Bertulang, uk. dalam 100 x 100 cm	7 days	Man 22/05/23	Sun 28/05/23	17,00	м	10	Tekerja[Rp250.897,22];Tukang[Rp32.535,45];Mandor[Rp41.630,96];
EKERJAAN TANAH &							
Timbunan Pilihan dari sumber galian	42 days	Mon 01/05/23	Sun 11/06/23	1.296,96	M3	14	Pekerja[Rp525.165,04];Mandor[Rp217.850,37];Bahan pilihan[
Penylapan Badan Jalan	21 days		/2 Sun 30/04/2	25.420,00	M2		Pekerja[Rp915.628,40];Mandor[Rp759.549,60];MOTOR GRADER > 100 HP[Rp17.9
ERK BERBUTIR & PERK							
Lapis Pondasi Agregat Kela	s 49 days	Man 12/06/	/2 Sun 30/07/2	4.942,00	M3	13	Pekerja[Rp8.314.964,42]; Mandor[Rp1.7
ERKERASAN ASPAL							
Lapis Resap Pengikat - Aspal Cair/Emulsi	28 days	Mon 31/07/23	Sun 27/08/23	22.239,00	Liter	16	Aspal Emulsi CSS-1 atau S
Laston Lapis Aus (AC-WC)	28 days	Mon 31/07/	/2 Sun 27/08/2	2.506,50	Ton	16	Pekerja[Rp9.783.930,29];1
Bahan anti pengelupasan	28 days	Mon 31/07/	/2 Sun 27/08/2	451,25	Kg	16	Anti Stripping Agent[458,
TRUKTUR							
Beton Struktur fc' 20 Mpa	56 days	Mon 17/07/	/2 Sun 10/09/2	67,00	M3	16FS-14 days;:	Pekerja(Rp3.421.920
Anyaman Kawat Yang Dilas (Welded Wire Mesh)	56 days	Mon 17/07/23	Sun 10/09/23	1.689,19	Kg	16FS-14 days;24FS+21	Pekerja[Rp5.470.88
Pasangan Batu	14 days	Mon 12/06/	/2 Sun 25/06/2	7,98	M3	13	Pekerja[Rp522.713,58];Tukang[Rp169.459,36];Mandor[
'EKERJAAN HARIAN DAN 'EKERJAAN LAIN-LAIN							
	14 days		inc at los la	24 m m m m	10000		Pekerja[Rp66
	Gorong-gorong Kotak Beton Bertulang, uk. dalam 100 x 100 cm EKERJAAN TANAH & EOSINTETIK Timbunan Pilihan dari sumber galian Penyapan Badan Jalan ERK BERBUTIR & PERK ETON SEMEN Lapis Pondasi Agregat Kelat ERKERASAN ASPAL Lapis Resap Pengikat - Aspal CairEmulsi Laston Lapis Aus (AC-WC) Bahan anti pengelupasan TRUKTUR Beton Struktur fc' 20 Mpa Aryaman Kawat Yang Dilas (Walded Wire Mesh) Pasangan Batu EKERJAAN HARIAN DAN EKERJAAN LAIN-LAIN	Gorong-gorong Kotak Beton Bertulang, uk. dalam 100 x 100 cm     7 days Bertulang, uk. dalam 100 x 200 cm       EKERJAAN TANAH & GOSINTETIK     42 days sumber galian       Timbunan Pilihan dari sumber galian     21 days       EKK BERBUTIR A PERK ETON SEMEN     21 days       Lapis Pondasi Agregat Kelas 49 days     ERK BERBUTIR A PERK ETON SEMEN       Lapis Pondasi Agregat Kelas 49 days     ERKERASAN ASPAL       Lapis Pondasi Agregat Kelas 49 days     Edays       Bahan anti pengelupasan     28 days       Bahan anti pengelupasan     28 days       Anyaman Kawat Yang Dilas     56 days       Aryaman Bahu     14 days       EKERJAAN LAIN-LAIN     EKERJAAN LAIN-LAIN	Gorong-gorong Kotak Betol Bertulang, uk. dalam 100 x 100 cm         Yayas 22/05/23         Man 22/05/23           EKERJAAN TANAH 8 COSINTETIK         Imbunan Pilhan dari sumber galian         42 days         Mon 01/05/23           Penyiapan Badan Jalan         21 days         Mon 10/04/ EKK BERBUTIK 8 PERK ETON SEMEN         Mon 12/06/ 21 days           Lapis Pondasi Agregat Kelas 49 days         Mon 12/06/ 331/07/23         Mon 12/06/ 21 days         Mon 12/06/ 31/07/23           Lapis Robasi Agregat Kelas 49 days         Mon 12/06/ 331/07/23         Mon 12/06/ 21 days         Mon 12/06/ 31/07/23           Lapis Robasi Agregat Kelas 49 days         Mon 12/06/ 331/07/23         Mon 13/07/ 21 days         Mon 13/07/ 21 days           Bahan anti pengelupasan         28 days         Mon 13/07/ 73         Mon 11/07/ 74/79           Beton Struktur fc' 20 Mpa Aryuman Kawat Yang Dias         56 days         Mon 11/07/72           Pasangan Batu         14 days         Mon 12/06/ EKERJAAN HARIAN DA EKERJAAN HARIAN DA	Gorong-gorong Kotak Beton Bertulang, uk. dalam 100 x         7 days 22(05/23)         Man 22(05/23)         Sun 22(05/23)           EKERJAAN TANAH & GOSINTETIK         2	Gorong-gorong Kotak Beton Bertulang, uk. dalam 100 x 100 cm         Man 22/05/23         Sun 22/05/23         17,00           EKERJAAN TANAH & COSINTETIK         Imbunan Pilhan dari sumber galian         42 days         Mon 01/05/23         Sun 11/05/23         1.296,96           Penylapan Badan Jalan         21 days         Mon 10/04/2 Sun 30/04/21 25.420,00         EK ERK BERBUTK & PERK ETON SEMEN         Imbunan Pilhan dari 01/05/23         1.296,96           Lapis Pondasi Agregat Kelas 49 days         Mon 12/06/2 Sun 30/07/22 4.942,00         EK ERKERASAN ASPAL         Sun 31/07/23         2.23,900           Lapis Pondasi Agregat Kelas 49 days         Mon 31/07/2 Sun 27/08/22 1.506,50         Mon 31/07/23         Sun 21/08/22 1.506,50           Bahan anti pengelupasan         28 days         Mon 31/07/25 un 27/08/22 1.506,50         Mon 31/07/23         Sun 21/08/22 1.506,50           Bahan anti pengelupasan         26 days         Mon 13/07/25 un 27/08/22 1.506,50         Mon 31/07/23         Sun 1.889,19           Vivided Wive Mesh)         56 days         Mon 17/07/25 un 10/09/23         Ste9,19         Ste9,19           Pasangan Batu         14 days         Mon 12/06/2 Sun 25/06/23 7.98         SteRayan HARIAN LAN	Gorong-gorong Kotak Beton         7 days         Mon         Sun         17,00         M           Bertulang, uk. dalam 100 x         22/05/23         28/05/23         100         M           EKERJAAN TANAH 8         22/05/23         28/05/23         11/06/23         M           EKERJAAN TANAH 8         01/05/23         11/06/23         M         M         M           EKERJAAN TANAH 8         01/05/23         11/06/23         M	Gorong-gorong Kotak Betion 7 Bertulang, uk. dalam 100 x 100 cm         Yange 22/05/23         Sun 28/05/23         17,00         M         10           EKERJAAN TANAH 8 EOSINTETIK         2         28/05/23         12/06/23         12/06         M3         14           Timbunan Pilihan dari sumber galian         42 days         Mon 01/05/23         Sun 11/06/23         1.296,96         M3         14           Penyapan Badan Jalan         21 days         Mon 10/04/2 Sun 30/04/21 25 A20,00         M2         EKE ERK DERUTIR & PERK ETON SEMEN         Man 12/06/23 Sun 30/07/22 4.542,000         M3         13           Lapis Pondasi Agregat Kelas 49 days         Mon 12/06/25 un 30/07/22 4.542,000         M3         13           ERKERASAN ASPAL         28 days         Mon 31/07/25 un 27/08/22 .506,50         Ton 16         16           Bahan anti pengelapiasan         28 days         Mon 31/07/2 Sun 27/08/22 .506,50         Ton 16         16           Bahan anti pengelapiasan         28 days         Mon 12/06/25 un 27/08/22 .506,50         M3         16F5-14 days; Aryaman Kawat Yang Dias         56 days         Mon 12/06/25 un 25/06/22 .7,98         M3         16F5-14 days; Aryayan Kawat Yang Dias         16 f55-14 days; 21/07/23         10/09/21 67,00         M3         16F5-14 days; Aryayan Kawat Yang Dias         18         16 f55-14 days; 21/02/21 10/09/21 67,98

Figure 1 Job Relatedness

From the results of predecessors which have been prepared using the Microsoft project program, it is found that work is on a critical path, which can be seen in Table 2 as follows: Table 2 Jobs that are on the critical path

No	Job Name	Duration	Volume	Unit
1	Selected Stockpiles from Excavated Sources	42 days	1.296,96	M <sup>3</sup>
2	Road Body Preparation	21 days	25.420	M <sup>2</sup>
3	Class A Aggregate Foundation Layer	49 days	4.942	M <sup>3</sup>
4	Structural Concrete fc'20 MPa	28 days	67	M <sup>3</sup>
5	Welded Wire Mesh	28 days	1.689,2	M <sup>3</sup>
6	Install Stones	14 days	7,89	M <sup>3</sup>
7	Thermoplastic Road Markings	14 days	358,57	M <sup>2</sup>

## 3.2 Fast Track method analysis results

The results of scheduling using the Microsoft Project program show a critical path that can be completed more quickly. The accelerated completion time is 31 days, leading to a reduction in indirect costs of Rp. 378,886,864.11. You can see the acceleration results in Figure 2 below.

0	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Successors	Mar	Qtr 1, 2024 Apr	May	Jun	Qtr 2, 2024 Jul	Aug	Sep	Qtr 3, 2024 Oct	Nov
1	*	Penjadwalan Pekerjaan Ruas Jalan Simalas	180 days	Wed 05/04/	Sun 01/10/2				-							
2	*	UMUM	180 days	Wed 05/04/	Sun 01/10/2										- i	
3	*	Mobilisasi	33 days	Wed 05/04/	2 Sun 07/05/2	8									1	
4	*	Demobilisasi	7 days	Fri 25/08/23	Thu 31/08/2	26										
5	*	Manajemen dan Keselamatan Lalu Linta			2Thu 31/08/2											
6	*	Keselamatan dan kesehatan kerja	149 days		2Thu 31/08/2								_			
7	-	PEKERJAAN DRAINASE	98 days		Sun 06/08/2								-			
8		Galian untuk Selokan Drainase dan	28 days	Mon		14	10FS-21 days		1 1				· .			
•	1	Saluran Air	20 dayo	01/05/23	28/05/23	14	10r3-21 udys			1						
9	*	Pasangan Batu dengan Mortar	84 days		2 Sun 06/08/2	10FS-7 days				A						
10	-	Gorong-gorong Kotak Beton Bertulang,		Mon	Sun	8FS-21 days	9FS-7 days;11									
		uk. dalam 80 x 80 cm		08/05/23	21/05/23		515-7 0035,11									
11	*	Gorong-gorong Kotak Beton Bertulang, uk. dalam 100 x 100 cm	/ days	Mon 22/05/23	Sun 28/05/23	10										
12	*?	PEKERJAAN TANAH & GEOSINTETIK														
13	*	Timbunan Pilihan dari sumber galian	42 days	Fri 21/04/23	Thu 01/06/2	14SS+11 days	24SS+21 days;16	SS+21		-	1					
14	*	Penyiapan Badan Jalan	21 days		2Sun 30/04/2		13SS+11 days;8		4	al l						
15	-	PERK BERBUTIR & PERK BETON SEM	E49 days		Thu 29/06/2					<u> </u>	_	1				
16	*	Lapis Pondasi Agregat Kelas A	49 days			13SS+21 days	19;20;18;22FS-14	4 days		H	_	6				
17	*	PERKERASAN ASPAL		11122/03/20	1110 2070072		15,20,20,2210 1	, ady.								
18	*	Lapis Resap Pengikat - Aspal Cair/Emu	28 days	Eri 20/06/22	Thu 27/07/2	16						*				
19	-	Laston Lapis Aus (AC-WC)	28 days		Thu 27/07/2							-				
20	-	Bahan anti pengelupasan	28 days									*				
20	*	STRUKTUR	20 days	FI 50/06/25	Thu 27/07/2	:10										
22	*?	Beton Struktur fc' 20 Mpa	28 days							3						
22	*	•	28 days			24FS+21 days;16FS-14 d										
		Wire Mesh)		Fri 16/06/23	10/08/23	24FS+21 days;16FS-14 days	26				7					
24	*	Pasangan Batu	14 days	Fri 12/05/23	Thu 25/05/2	13SS+21 days	22FS+21 days;23	FS+21								
25	*?	PEKERJAAN HARIAN DAN PEKERJAAN LAIN-LAIN											-			
26	*	Marka Jalan Termoplastik	14 days	Fri 11/08/23	Thu 24/08/2	323:22	4						T I			
		Task	Inactiv	e Task		Manual Summary Rollup	E	xternal Milestone	\$		Manual Pr	rogress				
		Split	Inactiv	e Milestone	0	Manual Summary		Deadline	+							
		ast track cp Milestone 🔷		e Summary				ritical								
					-		-									
oject: pe ate: Fri 24	4/05/24	Summan	Manu	Tack		Finish-only	7 7	ritical Solit								
	4/05/24	Summary Project Summary	Manua	al Task		Finish-only External Tasks		Critical Split								

Figure 2 Analysis Results using the Fast Track Method

## 3.3 Results of Program Crash Method Analysis

In order to avoid project delays, we applied the crash program method to minimize problems caused by various factors. By scheduling with the Microsoft Project program, we identified critical paths for work that could be completed more quickly by utilizing the Crash program method to optimize costs. The results showed an acceleration of the project by 36 days and a cost reduction of Rp. 348,000,753.13, which can be seen in Table 3 below.

Job description	Normal Duration	Crash 2 Hours	Acceleration
1. Earthfill Work	42	34	8
2.Road Body Preparation	21	18	3
3. Foundation Layer	49	40	9
4. Stone Pair	14	11	3
5. Structural Concrete fc' 20 Mpa	28	23	5
6. Welded Wire Woven	28	23	5
7. Thermoplastic Road Markings	14	11	3
Total Crash Duration	•		36

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The Crash program calculations have determined that the project to improve the road section on the Simalas - Simalungun Regency border can be completed in an accelerated duration of 36 days. This can be achieved by adding 2 hours of overtime work per day. As a result, the total duration for the completion of the Simalas - Simalungun Regency border road section improvement project would be reduced to 144 days. However, it's important to note that the acceleration in the project timeline will lead to an increase in direct costs due to the additional 2 hours of overtime work per day. Details of the increased direct costs can be found in the table below.

No	Job description	Normal Fees	Crash Cost	Slope
1	Earthfill Work	Rp763.510.249,09	Rp909.747.412,50	Rp18.279.645,43
2	Road Body Preparation	Rp61.708.943,79	Rp81.166.241,57	Rp6.485.765,93
3	Foundation Layer	Rp4.079.622.131,72	Rp4.659.985.784,62	Rp64.484.850,32
4	Stone Pair	Rp10.791.006,12	Rp11.298.208,47	Rp169.067,45
5	Structural Concrete fc' 20 Mpa	Rp177.574.256,78	Rp181.623.617,87	Rp809.872,22
6	Welded Wire Woven	Rp37.623.114,34	Rp40.659.346,25	Rp607.246,38
7	Thermoplastic Road Markings	Rp61.664.984,49	Rp63.565.432,72	Rp633.482,74
Tota	l Slope			Rp91.469.930,74

# Table 4 Results of Additional Costs of 2 Hours of Overtime Work

The reduction in indirect costs from acceleration using the crash program method from the total project duration of 180 days to 144 days. The indirect cost reductions from the crash program method are as follows:

Indirect Cost	= 15% x total cost
	= 15 % x Rp. 14.666.588.288,29
	= Rp. 2.199.988.243,24
Indirect Cost	Indirect cost
	Duration
	Rp. 2.199.988.243,24
	=
	= Rp.12.222.156,91
Reduced costs	= <i>indirect cost a day</i> x acceleration duration
	= Rp. 12.222.156,91 x 36
	= Rp. 439.997.648.65
Total <i>indirect cost crash</i>	= indirect cost - reduced costs
	= Rp. 2.199.988.243,24 - Rp. 439.997.648.65
	= Rp.1.759.990.594,59
	-

total cost after crash

= direct cos t+ slope + indirect cost after crash

= Rp12.466.600.045,05 + Rp.91.469.930,74 + Rp.1.759.990.594,59

= Rp.14.318.060.570,11

#### 3.4 Comparison of the Fast Track Method with the Crash Program Method

In this research, two acceleration methods are considered: the fast track method and the crash program method. The fast track method shortens the time from 180 days to 149 days and costs Rp 14,287,701,424.18, resulting in a cost reduction of Rp 378,886,864.11. On the other hand, the crash program method reduces the time from 180 days to 144 days with a cost of Rp 14,287,701,424.18. These details can be found in Table 5 below.

Condition	Normal			Fast Tı	ack	Crash Program			
Condition		Normai	Result		Difference		Result	Difference	
Budget (Rp)	Rp	14,666,588,288.00	Rp	14,287,701,424.00	Rp 378,886,864.00	Rp	14,318,586,553.00	Rp 348,000,753.00	
Duration		180		149	31		144	36	

Table 5 Co	mparison	Results	of Two	Methods

## 4. Conclusion

The research analysis concluded the following results:

- 1. This study employed two methods to reduce time and costs. The fast track method and the crash program method each resulted in a time reduction of 149 days with a total cost of 14,287,701,424.18. Meanwhile, the crash program method achieved a time reduction of 144 days with a total cost of 14,318,586,553.16.
- 2. The fast track method yielded a time reduction of 31 days with a budget decrease of Rp. 378,886,864.11. On the other hand, the crash program method led to a time reduction of 36 days with a cost decrease of Rp. 348,527,718.18.

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