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PROJECT SCHEDULING HANDS-ON MANUAL

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PREFACE

This handbook is published with the purpose of developing the understanding and the application of JKR Scheduling tool i.e. Ms Project during execution of construction phase.

This handbook was initiated from the training classes and workshops conducted through the year 2011-2013 by Cawangan Pengurusan Projek Kompleks (PROKOM).

The application of the scheduling software in this handbook is based on the integration system identified through the **Scope**, **Time** and **Cost Management** planning processes. JKR as the leading role in project management must highlight its integrity, competency and professionalism in the construction industry.

The contribution and the effort of the JKR Scheduling trainers have resulted in the formulation of this handbook and it is hoped that it will be beneficial to all JKR staffs at all level.

As a precise handbook it is advisable that the readers will use this handbook as a manual in understanding and developing of the work program.

Ir Hj. Mohd Daud bin Harun Senior Director Cawangan Pengurusan Projek Kompleks (PROKOM)

October 2014

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CHAPTER 1

OVERVIEW

- 1.1 Key Planning Processes in Scheduling
- 1.2 The Default View of Ms Project: Gantt Chart With Timeline
- 1.3 Project Case

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1 OVERVIEW

This manual is prepared for the following purposes:

- i. Assist JKR project team understand the key planning processes involved in project scheduling using Ms Project.
- ii. Step by step guide to prepare, approve and monitor work program.

1.1 Overview of Project Scheduling

Scheduling involves planning, monitoring, and controlling the timely execution of the work in order to communicate more frequently and effectively with stakeholders.



1.2 Key Planning Processes in Scheduling

Figure 1.1 : Key Planning Processes For Scheduling

1.3 The Default View of Ms Project 2010: Gantt Chart With Timeline



Figure 1.2 : Default View of Gantt Chart

1.4 **Project Case**

The following sample project will be used as a project case throughout this manual.

1.4.1 Project Information

•	Project Title	: Projek Membina 2 Blok Bangunan (Blok A &
		Blok B) di Sintok, Kedah
•	Project Start Date	: 1 June 2013
•	Project Finish Date	: 30 October 2013
•	Project Duration	: 5 months
•	Cost Project	: RM 2,000,000.00
•	Calendar	: Friday & Saturday – non working days
•	Public Holiday	: To be identified

1.4.2 Resource Planning

Table 1.1. Resource Availability and Froductivity Rate								
Resource	Max. No.	Blok A	Blok B					
Earthwork Team	4	1000 m ³ /d/t	800 m ³ /d/t					
Structure Team	4	100 m ³ /d/t	100 m ³ /d/t					
Architecture Team	3	100 m²/d/t	150 m²/d/t					
M&E Team	3	40 nos/d/t	50 nos/d/t					

Pacauraa Availability and Productivity Pata

Where $m^3/d/t = unit$ measure / day / team

1.4.3 Resource and Work Information

	Resource Allocation	Quantity	Risk Consideration			
Blok A						
Earthwork	2 nos. Earthwork Team	100,000 m ³	+10%			
Structure Work	3 nos. Structure Team	9,000 m ³	Testing : 7 days			
Architect Work	3 nos. Architect Team	12,000 m ²	Delivery : 10 days			
M&E Work	2 nos. M&E Team	2,400 nos	Procurement : 5 days			
Blok B						
Earthwork	3 nos. Earthwork Team	120,000 m ³	+10%			
Structure Work	3 nos. Structure Team	12,000 m ³	Testing : 7 days Access : 5%			
Architect Work	2 nos. Architect Team	15,000 m ²	Delivery : 10 days			
M&E Work	2 nos. M&E Team	5,000 nos	Procurement : 5days			

Table 1.2 : Resource Allocation and Quantity of Works

1.4.4 Value of Works

Works	Cost (RM)
Preliminaries	
Performance Bond	10,000.00
Establish & Removal of Site Office	20,000.00
Maintenance of Site Office	15,000.00
Progress Report	5,000.00
Blok A	
Earthwork	200,000.00
Structure Work	400,000.00
Architect Work	250,000.00
M&E Work	200,000.00
Blok B	
Earthwork	180,000.00
Structure Work	290,000.00
Architect Work	200,000.00
M&E Work	230,000.00

1.4.5 Change Requests

- i. Land acquisition resolved on 1st July 2013.
- ii. Services relocation resolved 5 days after land acquisition.
- iii. Variation Order No. 1 for Kerja Tanah at Blok A duration 25 days, done by main contractor costing RM200,000.00.
- iv. Variation Order No. 2 for Kerja Tanah at Blok B duration 35 days, done by main contractor costing RM150,000.00.
- v. Work Omission Kerja Arkitek at Blok A New Value of Work is RM180,000.00.
- vi. Workers shortage, need to hire new workers for Kerja M&E at Blok A need additional 10 days.
- vii. Late delivery of materials for Kerja Arkitek 3 days
- viii. Additional Public Holiday (Cuti peristiwa Piala Malaysia at 24 September 2013)

CHAPTER 2

SCOPE MANAGEMENT

- 2.1 Scope Definition
- 2.2 Work Breakdown Structure (WBS)

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2 SCOPE MANAGEMENT

2.1 Scope Definition

Scope definition refers to the identification of scope, deliverables and activities of the project.

There are four (4) steps involved in creating a new project file in Ms Project:

- i. Open Ms Project to Enter Project Name
- ii. Identify scheduling pattern
- iii. Save project file (JKR File Naming Convention)
- iv. Create Project Properties

2.1.1 Open Ms Project and Enter Project Name

The project name used in the work program is referred to the **Contract Document**.

Steps to Open Ms Project and Enter Project Name:

1. Open Ms Project at default page (Gantt Chart)



Figure 2.1 : Locate Ms Project

2. Key in project name in **Task Name** column. This task is in "manually schedule" mode (default).

F	ile	Task Re	esource Project Vi	w	Format					
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		wanua								

Figure 2.2 : Inserting Project Name

2.1.2 Identify Scheduling Pattern

Ms Project offers two (2) options of scheduling patterns as shown in Figure 2.3 below. JKR projects normally use **Forward Scheduling** (ASAP) method.



Figure 2.3 : Scheduling Pattern

Steps to set scheduling pattern:

- 1. Click **Project** ribbon
- 2. Select Project Information in Properties group
- 3. Select project Start date from calendar in Project Information dialogue

box	1
P ↓ ♥ ★ ♥ ★ ↓ ↓	Gantt Chart Tools Project - Microsoft Project
File Task Resource Pro	Image: Construction for 'Project I' Status Date: Image: Construction for 'Project I'
E Wed 9/25/13 Task ~ Task Mode 1 \$\$ Med Bar Bar	Start gate: Sat 6/1/13 3 e: Wed 9/25/13 Oct 6/13 Oct 6/13 Pinish date: Wed June, 2013 Instruction of the second s
Gantt	Help Statistics OK Cancel

Figure 2.4 : Selection of Project Start Date

- 4. Select Project Start Date in Schedule from field
- 5. Click OK

1	nsert			roperties		Schedule		Status		Reports	Prootii
neline		St	, Today art	Project Informat	tion for 'Project1'	_		_	×	4:00 PM	5:00 PM Finish
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	1		Rei Bai	Schedule from:	Project Start Date	-	Calendar:	Standard	•		
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				Help	Statistics			ОК	Cancel		



2.1.3 Save Project File (JKR File Naming Convention)

Project file name should contain project type, project name, program status, baseline number and revised date for ease of documentation and search as shown in the format below:

Project type - Project Name - Program Status - Baseline – Creation Date e.g. : BGN - 2 Blok Bangunan JKR - Initial - 01 - YYYY-MM-DD

Whereby Program Status refers to the following definition:

- i. Initial work program submitted for approval
- ii. Accepted approved work program accepted as baseline
- iii. Updated monthly tracked work program
- iv. Recovery rescheduled work program to complete all works at original finish date

		JKR FILE NAM		NVENTION	FOR W	ORK P	ROG	RAM	
[BGN	/JLN] -	[PROJECT NAME] - [PR	OGRAM STA	TUS] -	[BASE	LINE]	- [DATE]	
Project Type	Separator	Project Name	Separator	Program Status	Separator	Baseline	Separator	r Date	
BGN		2 Blok Bangunan	-	Initial	-	01	-	2013-06-01	
BGN	For buildir	ng projects							
JLN	For road p	projects							
Other	For other	projects							
	-	use " - " as separator							
		2 Blok Bangunan	Project Nar	ne					
		-	-	use " - " as separat	or				
				Initial	Work prog	ram submit	ted for ap	oproval	
				Accepted	Approved	work progra	am accep	ted as baseline	
				Updated	Monthly tra	acked work	program		
				Recoverv	Reschedu	led work pro	ogram to	complete all works a	at original finish date
					_	use " - " a	as separ	ator	-
						01 E	Baseline N	Number	
						· · ·	-	use " - " as separa	ator
				Date work	nrogram w	as prepareo	l / tracker	d 2013-06-01	
				Date worr	program we	as properte	, tracitot	- 2010-00-01	

Figure 2.6 : JKR File Naming Convention

Steps to name and save project file:

- 1. Click File ribbon
- 2. Select Save As

1							
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Save & Send					Status Date	Today	
Help					Project Calendar Priority	Standard 500	
Doptions							
🔀 Exit							

Figure 2.7 : File Saving

- 3. Type in project file name, refer to JKR File Naming Convention (Figure 2.6)
- 4. Click Save

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		File name: BGN - Membina 2 Blok Bangunan - Save as type: Project ODBC	Initial - 01 - 2013-06-01
		Hide Folders	Tools Save Cancel



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			Bangunan															
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Figure 2.9 : Saved File Name

2.1.4 Create Project Properties

The project properties information will indicate the owner of the project.

Steps to create project properties:

- 1. Click File ribbon
- 2. From Info menu
- 3. Select Project Information
- 4. Select Advanced Properties



Figure 2.10 : Project Properties

- 5. From dialog box, type in project properties information
- 6. Click OK

Project1 Prope	rties ? X			
General Sun	nmary Statistics Contents Custom	I		
Title:	BGN - Membina 2 Blok Bangunan - Initia l- 01 - 2013-06		Ъ	
Subject:	Projek Bangunan			
Author:	prokom 14	I		
Manager:	Ir. Abd Rahman	I	5	Key in relevant project
Company:	PROKOM JKR	I	1	properties information
Category:		I	ľ	
Keywords:		I		
Comments:		I		
		I		
Hyperlink base:		I	J	
Template:		I		
Save pre	view picture 6	I		
	OK Cancel			

Figure 2.11 : Project Properties

Steps to view project properties information in project's report:

- 1. Click Project ribbon
- 2. Select Reports from Reports group



Figure 2.12 : Steps to Locate Project Reports

2014

- 3. Select Overview from Reports dialog box
- 4. Click **Select**

P. 1. 7	• 61 •	- -			Gantt Chart T	ools BGN -	Membina 2 Bl	ok Bangunan	- Initial - 0	1 - 2013-06-01
File	Task	Resource	Project	View	Format					
Subproject Insert	Pro Inform	ject Custonation Field	om Links Betwee ds Projects Propertie	en WBS	Change Working Time	Calculate S Project Base Scher	et Move line - Project dule	Status Date:	Update Project Statu	Sync to Protected Actua S
	0	Task 🗸 Mode	Task Name		- Durati	on 🖕 Start	🚽 Finis	ih 🝷	T F S	May 26, '13 S M T W 1
1		*?	Membina Bangunan	2 Blok						
Gantt Chart		Reports	erview	Gurre Utaal	ent ad	Costs Costs Custom	Clo	Sect	4]

Figure 2.13 : Selection of Type of Project Reports

- 5. Select **Project Summary** from **Overview Reports** dialog box
- 6. Click **select** (repeat step 5 and 6 to view other types of reports)





HANDS-ON MANUAL

	BGN - Membina 2 Blok Ban PRO Ir. Ab as of 5	gunan - Initia I- 01 - 2013-06-01 KOM JKR d Rahman Sat 6/1/13	
Dates			
Start:	Sat 6/1/13	Finish:	Sat 6/1/13
Baseline Start:	NA	Baseline Finish:	NA
Actual Start:	NA	Actual Finish:	NA
Start Variance:	0 days	Finish Variance:	0 days
Duration			
Scheduled:	0 days?	Remaining:	0 days?
Baseline:	0 days	Actual:	0 days
Variance:	0 days?	Percent Complete:	0%
Work			
Scheduled:	0 hrs	Remaining:	0 hrs
Baseline:	0 hrs	Actual:	0 hrs
Variance:	0 hrs	Percent Complete:	0%
Costs			
Scheduled:	\$0.00	Remaining:	\$0.00
Baseline:	\$0.00	Actual:	\$0.00
Variance:	\$0.00		
Task Status		Resource Status	
Tasks not yet started:	1	Work Resources:	0
Tasks in progress:	0	Overallocated Work Resources:	0
Tasks completed:	0	Material Resources:	0
Total Tasks:	1	Total Resources:	0

Figure 2.15 : Project Summary Report

2.2 Work Breakdown Structure (WBS)

WBS is the process of subdividing the major project deliverables and project work into smaller and manageable components. For JKR projects, WBS should be broken down to a minimum of Level 4 (task level).

Figure 2.16 shows the sample of WBS for a building project that will be used throughout this handbook. This WBS is related to project case in Chapter 1.

	WBS LIST												
1. Memb	oina 2 Blok Bangunan	1.5	Blok A										
1.1	Projek Mula		1.5.1 Kerja Tanah										
1.2	Preliminaries		1.5.2 Kerja Struktur										
	1.2.1 Performance		1.5.3 Kerja Arkitek										
	Bond/Insurance		1.5.4 Kerja M&E										
	1.2.2 Establish & Remove	1.6	Blok A										
	Site Office		1.6.1 Kerja Tanah										
	1.2.3 Maintain Site Office		1.6.2 Kerja Struktur										
	1.2.4 Progress Report		1.6.3 Kerja Arkitek										
1.3	Land Acquisition		1.6.4 Kerja M&E										
1.4	Service Relocation	1.7	Completion of Cable Lay										
			by TNB										
		1.8	T&C										
		1.9	Projek Siap										

Figure 2.16: WBS List from Sample Project

Steps to create WBS:

1. Key in all works components in Task Name column



Figure 2.17 : List of Works Components

- 2. Right click at Task Mode column
- 3. Select Insert Column to create WBS column

Sut	oproject	Project (Information	F Cal	m Links Batwaan	1	RS ()	nange ting Time	Calcu Proj	llate Set ect Baseline	Mi Tro	ove oject	Status Date	u P	pdate roject Pro	Sync to tected Ad) ctual:
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	5	*?	u.u	Insert Column		0	3									
	6	*?	ΨP	Hide Column												
	7	*?	Î.	<u>H</u> ac column		:										
	8	*	Α	<u>F</u> ont												
	9	1	A	Text Styles		on										
	10	*	1	<u>Field Settings</u>												
ť	11	*	1	Custom Fields												
cha	12	*		<u>D</u> ata Type	Þ											



4. Scroll down and select WBS

P F 9	- (° -	Ŧ	-		Gantt Chart To	ols BGN - N	1embina 2 Bl	ok Bangunan -	- Initial - ()1 - 2013-06-01
File	Task	Resource	Project	View	Format					
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Subproject	Proj	ect Custom	Links Betwee	een WBS	Change Working Time	Calculate Set	t Move		Update	Sync to Protected Actua
Insert	1110111		Properti	es	Working finite	Schedi	ule		Statu	IS
	0	W <mark>arning</mark> Ta Mo	sk 🖕 Ta ode	sk Name		Duration 🖕	Start	🚽 Finish	TF	May 26, '1
1		Warning WBS WBS Predecess	ors	4	Blok					
2		WBS Successor	s		а					
3		Work Contour								

Figure 2.19 : Inserting WBS Codes

5. The WBS codes will be shown in the **WBS** column

	File	Tas	k Reso	urce Pr	oject View Format					
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	2	2	2	*?	Projek Mula					
	3	3	3	*?	Preliminari					
	4	F -	4	*?	Performance Bond					
	5	5	5	*?	Est & remove S.O.					
	e	5	6	*?	Maintain S.O.					
	7	'	7	*?	Progress Report					
	8	3	8	*?	Land Acquiition					
	9)	9	*?	Service Relocation					
	1	0	10	*?	Blok A					
	1	1	11	*?	Kerja Tanah					
	1 g	2	12	*?	Kerja Struktur					
	၌ 1	3	13	*?	Kerja Arkitek					
	ting 1	4	14	*?	Kerja M&E					
	1	5	15	*?	Blok B					
	1	6	16	*?	Kerja Tanah					
	1	7	17	*?	Kerja Struktur					
	1	8	18	*?	Kerja Arkitek					
	1	9	19	*?	Kerja M&E					
	2	0	20	*	Completion of Cable Lay by TNB					
	2	1	21	*?	T&C					
	2	2	22	*?	Projek Siap					

Figure 2.20 : WBS Codes

- 6. Select all works components from ID 2 to ID 22 to create WBS level 2
- 7. Click Task ribbon
- 8. Click Indent icon in Schedule group



Figure 2.21 : Creating WBS Level 2

2014

WBS level 2 will be indented and corresponding codes will be as shown below.

	P	3	- (°'	- -				Gantt Ch	art Tools	BGN	- Membina 2	Blok Bangun	an - I
	Fi	le	Task	Resou	urce f	Project	View	For	mat				
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			0	WBS		- T	ask Name			•	Duration	🕳 Start	
	ovel	1	\succ	1		-	Membina	2 Blok B	angunan	1	0 days	Sat 6/1/1	.3
		<u> </u>	ן ו	1.1	*		Projek	Mula					
		3		1.2	*?		Prelim	inari					
		4		1.3	*?		Performance Bond						
		5		1.4	*?		Est & remove S.O.						
		6		1.5	*?		Maint	ain S.O.					
		7		1.6	*?		Progress Report						
		8		1.7	*?		Land A	cqusitio	n				
		9		1.8	*		Servic	e Reloca	tion				
1.17	evel	vel 2 🏱		1.9	*		Blok A						
		_		1.10	*		Kerja T	anah					
	art	12		1.11	*		Kerja S	truktur					
	۲. E	13		1.12	*		Kerja A	rkitek					
	ant	14		1.13	*		Kerja N	1&E					
		15		1.14	*		Blok B						
		16		1.15	*?		Kerja T	anah					
		17		1.16	*		Kerja S	truktur					
		18		1.17	*		Kerja A	rkitek					
		19		1.18	*		Kerja N	1&E					
		20		1.19	*?		Compl	etion of	Cable Lay	y by TNB			
		21		1.20	*?		T&C						
		22		1.21	*?		Projek	Siap					
			- T										

Figure 2.22 : WBS Level 2

 Repeat steps 6 to 8 to create WBS level 3 for Preliminaries, Blok A and Blok B



Figure 2.23 : WBS Level 3
2.2.1 Scheduling Task Mode (Manual/Auto)

By default, task scheduling in Ms Project is **manual** mode. Switching task scheduling from manual mode to **auto** mode is to allow Ms Project to calculate project duration automatically.

Steps to change task scheduling mode from manual to auto:

- 1. Select all works components
- 2. Click Auto Schedule in Tasks group



Figure 2.24 : Changing Scheduling Task Mode from Manual to Auto

Ensure all **new inserted** activities are converted to **auto schedule mode** by following the above steps.

Comparison between Manual and Auto Schedule Task Mode is as shown below.



Figure 2.25 : Manual to Auto Schedule Task Mode

2.2.2 Basic Symbols



Figure 2.26 : Basic Symbols in Ms Project

- Tasks
 Works to be completed within a specified duration with start and finish dates.
- Milestones Significant events with zero duration (single date only).
- Recurring tasks Tasks that occur at a fixed frequency and continuously.

					Summa Task	iry _		Sub Tasks
Task Mode	WBS -	Task Name 👻	Duratior 🚽	Start 👻	Finish 🗸	Pr.	13 Jun 9, '13 Sep 1, '13 F T S W	Nov 24, '15 S T M
3	1.5	Blok A	142 days	Mon 6/10/13	Tue 12/24/13			
3	1.5.1	Kerja Tanah	55 days	Mon 6/10/13	Fri 8/23/13	4,15	•	
3	1.5.2	Kerja Struktur	37 days	Mon 8/26/13	Tue 10/15/13	18	· · · ·	
3	1.5.3	Kerja Arkitek	50 days	Wed 10/16/13	Tue 12/24/13	19		
3	1.5.4	Kerja M+E	35 days	Wed 10/16/13	Tue 12/3/13	19	<u>ب</u>	🖿 I 📙 👘
3	1.6	Blok B	164 days	Mon 6/10/13	Thu 1/23/14			
3	1.6.1	Kerja Tanah	55 days	Mon 6/10/13	Fri 8/23/13	4,15	•	
3	1.6.2	Kerja Struktur	49 days	Mon 8/26/13	Thu 10/31/13	23		
3	1.6.3	Kerja Arkitek	60 days	Fri 11/1/13	Thu 1/23/14	24		
3	1.6.4	Kerja M+E	55 days	Fri 11/1/13	Thu 1/16/14	24		
₽	1.7	Completion of Cable Lay by TNB	0 days	Tue 1/21/14	Tue 1/21/14	21FS days		1/21
3	1.8	TnC	5 days	Wed 1/22/14	Tue 1/28/14	27		••
2	1.9	Projek Siap	0 days	Thu 1/30/14	Thu 1/30/14	3,17		1/30

Figure 2.27 : Basic Symbols

Milestone

2.2.3 Milestones

Tasks with zero (0) duration are indicated as milestones in project scheduling.

Steps to create Milestones:

Key in duration = zero (0) day for all significant events with single dates.
 Milestones symbols will be shown in the Gantt Bar.

PI		9 - (* -	-	_	Gantt Chart Tools BGN -	Membina 2 Bl	ok Bangunan - In	iitial - 01 - 2013-00	5-01 - Microsoft Projec	t
Fi	le	Task	Resource	e Proj	oject View Format					
Gar Cha	ntt t v	Paste	6 Cut ≧ Copy ▼ ∮ Format Pa	ainter	Calibri \cdot 11 \bullet \bullet \bullet \bullet B I I \bullet \bullet \bullet \bullet \bullet	nark and the second s	ect Links ivate	nually Auto	Inspect ▼ Move ▼ Mode ▼ Task	Summary Milestone Deliverable
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		1	WBS 🖕	Task , Mode	▼ Task Name ▼	Duration 🖕	1 1	Finish 🚽	May 26, '13 F S M T W	Jun 2, '13 T F S S M T V
	1		1	3	Membina 2 Blok Bangunan	1 day	. 0/1/13	Mon 6/3/13		
	2		1.1	2	Projek Mula	0 days 🦷	Sat 6/1/13	Sat 6/1,		6/1
	3		1.2	₽	Preliminari	1 day	Mon 6/3/13	Mon 6/	lilestone	
	4		1.2.1	2	Performance Bond	1 day	Mon 6/3/13	Mon 6/5, 10		-
	5		1.2.2	3	Est & remove S.O.	1 day	Mon 6/3/13	Mon 6/3/13		
	6		1.2.3	3	Maintain S.O.	1 day	3/13	Mon 6/3/13		
	7		1.2.4	2	Progress Report	1 day	3/13	Mon 6/3/13		
	8		1.3	3	Land Acqusition	0 days 🛛	Sat 6/1/13	Sat 6/1,	lilastona	6/1
	9		1.4	3	Service Relocation	0 days	Sat 6/1/13	Sat 6/1,	liestone	6/1
	10		1.5	3	Blok A	1 day	Mon 6/3/13	Mon 6/3/13		
	11		1.5.1	3	Kerja Tanah	1 day	Mon 6/3/13	Mon 6/3/13		
t	12		1.5.2	2	Kerja Struktur	1 day	Mon 6/3/13	Mon 6/3/13		
ਤੁੰ	13		1.5.3	2	Kerja Arkitek	1 day	Mon 6/3/13	Mon 6/3/13		
anti	14		1.5.4	₽	Kerja M&E	1 day	Mon 6/3/13	Mon 6/3/13		
B	15		1.6	₽	Blok B	1 day	Mon 6/3/13	Mon 6/3/13		ф ф
	16		1.6.1	₽	Kerja Tanah	1 day	Mon 6/3/13	Mon 6/3/13		
	17		1.6.2	₽	Kerja Struktur	1 day	3/13	Mon 6/3/13		
	18		1.6.3	₽	Kerja Arkitek	1 day	3/13	Mon 6/2/12		
	19		1.6.4	₽	Kerja M&E	1 day 🕇	vion o/ 3/13	Mon 6,	ilostono	
	20		1.7	3	Completion of Cable Lay by TNB	0 days	Sat 6/1/13	Sat 6/1	nesione	> \$ 6/1
	21		1.8	3	T&C	1 day	Mon 6/3/13	Mon 6 <mark>/3/13</mark>		
	22		1.9	3	Projek Siap	0 days	Sat 6/1/13	Sat 6/1	ilectone	> 🔶 6/1
						ſ	1		nestone	

Figure 2.28 : Creating Milestones

Land acquisition and service relocation are considered as external dependencies executed by third party. External dependencies are designated as milestones.

2.2.4 Recurring Task

Recurring tasks are activities that are repeated at a fixed frequency or at regular interval.

Steps to create recurring task (example Progress Report):

- 1. Select Progress Report to create as recurring task
- 2. Click Task ribbon
- 3. Click Task icon in Tasks group
- 4. Select Recurring Task



Figure 2.29 : Creating Recurring Task

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PROJECT SCHEDULING

- 5. In **Recurring Task Information** dialogue box , key in "**Progress Report**" in the **Task Name** field
- 6. Key in duration (2d) for the activity (2 days to prepare Progress Report)
- 7. Select Recurrence pattern as required (monthly)
- Key in the recurring start day of the month (start prepare progress report on 25th of every month)
- 9. Key in recurring frequency (monthly)
- 10. At Range of recurrence field, insert the project start date
- 11. At Range of recurrence field, insert the project finish date
- 12. Click **OK**



Figure 2.30 : Recurring Task Information

HANDS-ON MANUAL

Recurring task for Progress Report will appear as shown below in ID 8 to ID 12. Ensure to convert all the recurring tasks to auto schedule task mode follow steps in Figure 2.24.

ministra								010700											
		0	WBS	- Task - Mode	Task Name	• Duri	ation +	Start .	Finish •	May 12, M	'13 F 7	Jun 9, '1 5	3 J W	ul 7, '13 S T	Aug 4	1. 13 T	Sep 1, '13	Sep 29,	13 Oct M F
	1		1	3	Membina 2 Blok Bangunan	106	days	Sat 6/1/13	Mon 10/28/13		-		_						
	2		1.1	3	Projek Mula	0 da	iys	Sat 6/1/13	Sat 6/1/13		♦ 6/	1							
	3		1.2	3	- Preliminari	106	days	Mon 6/3/13	Mon 10/28/13		-					_			
	4		1.2.1	8	Performance Bond	1 da	v	Mon 6/3/13	Mon 6/3/13		1								
	5		1.2.2	-	Est & remove S.O.	1 da	W.	Mon 6/3/13	Mon 6/3/13										
	6		1.2.3	3	Maintain S.O.	1.d.	IV.	Mon 6/3/13	Mon 6/3/13		1								
	7	0	1.2.4	8	Progress Report	90 0	lays	Tue 6/25/13	Mon 10/28/13			1	0	9		0		0	6
	8		1.2.4.1	*	Progress Report 1	2 da	iys	Tue 6/25/13	Wed 6/26/13			3	I						
	9		1.2.4.2	*	Progress Report 2	2 da	iys	Thu 7/25/13	Fri 7/26/13										_
	10		1.2.4.3	*	Progress Report 3	2 da	ivs	Sun 8/25/13	Mon 8/26/13										_
	11		1.2.4.4	*	Progress Report 4	2 da	ivs	Wed 9/25/13	Thu 9/26/13										_
-	12		1.2.4.5	*	Progress Report 5	2 da	ivs	Fri 10/25/13	Mon 10/28/13										
티	13	1 L		-			1.			_	1.2					_			
E			4-6-5	-	Progress neport	10	9	WOIT 07 57 15	141011 0/3/13			22							
	14		1.3	4	Land Acquisition	0.da	iys	Sat 6/1/13	Sat 6/1/13		O 6/	1							
	15		1.4	0	Service Relocation	0 da	iys	Sat 6/1/13	Sat 6/1/13		¢ 6/	1							

Figure 2.31 : Recurring Task

2.2.5 Deleting Task

Refer to Figure 2.31, the original Progress Report task in ID 13 needs to be deleted.

Steps to delete task:

- 1. Select **Progress Report** task (ID 13) that need to be deleted; and right click
- 2. Select Delete Task

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1		1	8	Membina 2 Blok Bangunan		Delete Task	.3	Mon 10/28/13	
2		1.1	2	Projek Mula		Inactigate Task	.3	Sat 6/1/13	
3		1.2	8	Preliminari	-	Manually Schedule	/13	Mon 10/28/13	
4		1.2.1	5	Performance Bond	-	Auto Schadula	/13	Mon 6/3/13	
5		1.2.2	-	Est & remove S.O.	0	Huto Schedule	/13	Mon 6/3/13	
6	V	1.2.3	-	Maintain S.O.	33	Assign Resources	/13	Mon 6/3/13	1
7	0	1.2.4	8	Progress Report		<u>Fill Down</u>	/13	Mon 10/28/13	
8		1.2.4.1	3	Progress Report 1		<u>C</u> lear Contents	/13	Wed 6/26/13	1
9		1.2.4.2	3	Progress Report 2		Information	/13	Fri 7/26/13	1
10	COLOR.	1.2.4.3	3	Progress Report 3		Notes	5/13	Tue 8/27/13	
11	12.8	1.2.4.4	2	Progress Report 4	100	Add to Timeline	5/13	Thu 9/26/13	
12	100	1.2.4.5	8	Progress Report 5	0		/13	Mon 10/28/13	
5 13		1.2.5	3	Progress Report	20	Hyperlink	/13	Mon 6/3/13	1
			1000						1.1

Figure 2.32 : Deleting Task

File	7 • (F	- - Resour	ce Proi	ect View	Ganit Chart Tools B	GN - Membina	2 B	lok Bangunan - I	nitial - 01 - 2013-06	5-01 -	Microso	oft Proje	ct		
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(fc	ns or R	lecui	rina	task	onlv)	eu	*	Start .	Tasks	Ma	y 12, '13	Jun 9	Inser 9, '13 5 W	Jul 7, '1	3 T
1			3		,,			Sat 6/1/13	Mon 10/28/13		Ψ				_
2		1.1	8	Proj	ek Mula	0 days		Sat 6/1/13	Sat 6/1/13		•	6/1			
3		1.2	8	- Prel	iminari	106 days		Mon 6/3/13	Mon 10/28/13		5	_			
4		1.2.1	8	P	erformance Bond	1 day		Mon 6/3/13	Mon 6/3/13	1	ŝ,				
5		1.2.2	8	E	st & remove S.O.	1 day		Mon 6/3/13	Mon 6/3/13	1					
б		1.2.3	3	N	faintain S.O.	1 day		Mon 6/3/13	Mon 6/3/13	1					
7	0	1.2.4	3	⊟ p	rogress Report	90 days		Tue 6/25/13	Mon 10/28/13				0		0
8	-	1741	8		Progress Report 1	2 days		Tue 6/25/13	Wed 6/26/13	1			0		
9		This task h	as a 'Start	No Earlier	Progress Report 2	2 days		Thu 7/25/13	Fri 7/26/13						0
10		6/25/13.	scialite on	Tue	Progress Report 3	2 days		Mon 8/26/13	Tue 8/27/13						
11		1.2.4.4	3		Progress Report 4	2 days		Wed 9/25/13	Thu 9/26/13						
12		1.2.4.5	2		Progress Report 5	2 days		Fri 10/25/13	Mon 10/28/13						
13		1.3	8	Lan	d Acqusition	0 days		Sat 6/1/13	Sat 6/1/13	1	•	6/1			
1.0		14	8	Sen	vice Relocation	0 days		Sat 6/1/13	Sat 6/1/13			6/1			

Figure 2.33 : Constraint Symbol for Recurring Task

Breakdown **Est. & remove S.O** to **Establish S.O** and **Removal S.O** (WBS level 4) as shown in figure 2.34 to complete the scope management process.

P	H) - (*	- -		Gantt Chart Tools	BGN - Membina 2	Blok Bangunan - Init	ial - 01 - 2013-06-01 - 1	Microsoft Project	- @ X
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			😫 Network 🛙)iagram ×	📰 🖪 Resource Usage 👻 🗛 🕂	📊 💋 Highl	ight: [No Highlight]	 Timescale: 	🔘 🏹 📖 🗌 Timeline 🔹 🛁	87.
4			Calendar	*	🚟 🚳 Resource Sheet 👻 🔟	Filter	[No Filter]	* [12] Days *	Details -	
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		Tas	k Views		Resource Views	Data			Zoom Split View Wind	low Macros
		0	WBS 🚽	Task 🚽	Task Name	Duration 🚽	Start 🚽	Finish 🚽	1 2 May '13 9 Jun '13 7 Jul '13 4 Aug '13 1 Sep '13 29	Sep '13 27 Oct
	1		1		Membina 2 Blok Bangunan	106 days?	Sat 1/6/13	Mon 28/10/13		
	2		11	3	Projek Mula	0 days	Sat 1/6/13	Sat 1/6/13		
	3		1.2	3	Preliminari	106 days?	Mon 3/6/13	Mon 28/10/13	-	
	4		121	2	Performance Bond	1 day	Mon 3/6/13	Mon 3/6/13	1	
	5		1.2.2	3	Est & remove S.O.	1 day?	Mon 3/6/13	Mon 3/6/13		
	6		1.2.2.1	3	Establish S.O	1 day?	Mon 3/6/13	Mon 3/6/13	1	
	7		1.2.2.2	3	Removal S.O	1 day?	Mon 3/6/13	Mon 3/6/13	1	
	8		1.2.3	3	Maintain S.O.	1 day	Mon 3/6/13	Mon 3/6/13	1	
	9	Ð	1.2.4	3	Progress Report	90 days	Tue 25/6/13	Mon 28/10/13	0 0 0	<u> </u>
	10		1.2.4.1	3	Progress Report 1	2 days	Tue 25/6/13	Wed 26/6/13	1	
	11		1.2.4.2	3	Progress Report 2	2 days	Thu 25/7/13	Fri 26/7/13	0	
	12		1.2.4.3	3	Progress Report 3	2 days	Mon 26/8/13	Tue 27/8/13	0	
	13		1.2.4.4	3	Progress Report 4	2 days	Wed 25/9/13	Thu 26/9/13	0	
	14		1.2.4.5	3	Progress Report 5	2 days	Fri 25/10/13	Mon 28/10/13		E
	15		1.3	3	Land Acqusition	0 days	Sat 1/6/13	Sat 1/6/13	4 1/6	
	16		1.4	3	Service Relocation	0 days	Sat 1/6/13	Sat 1/6/13	♦ 1/6	
	17		1.5	3	Blok A	1 day	Mon 3/6/13	Mon 3/6/13		
Par 1	18		1.5.1	3	Kerja Tanah	1 day	Mon 3/6/13	Mon 3/6/13	1	
볃	19		1.5.2	3	Kerja Struktur	1 day	Mon 3/6/13	Mon 3/6/13	1	
B	20		1.5.3	3	Kerja Arkitek	1 day	Mon 3/6/13	Mon 3/6/13	1	
	21		1.5.4	3	Kerja M&E	1 day	Mon 3/6/13	Mon 3/6/13	I. I.	
	22		1.6	3	Blok B	1 day	Mon 3/6/13	Mon 3/6/13		
	23	_	1.6.1	3	Kerja Tanah	1 day	Mon 3/6/13	Mon 3/6/13	1	
	24	_	1.6.2	3	Kerja Struktur	1 day	Mon 3/6/13	Mon 3/6/13	1	
	25		1.6.3	3	Kerja Arkitek	1 day	Mon 3/6/13	Mon 3/6/13		
	26		1.6.4	10	Kerja M&E	1 day	Mon 3/6/13	Mon 3/6/13		
	27		1.7	3	Completion of Cable Lay by TNB	0 days	Sat 1/6/13	Sat 1/6/13	♦ 1/6	
	28		1.8	13	T&C	1 day	Mon 3/6/13	Mon 3/6/13		
	29		1.9	P.	Projek Siap	0 days	Sat 1/6/13	Sat 1/6/13	♦ 1/6	

Figure 2.34 : Example for Scope and WBS

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CHAPTER 3

TIME MANAGEMENT

- 3.1 Activity Sequencing
- 3.2 Activity Resource Planning
- 3.3 Activity Duration Estimate (ADE)
- 3.4 Schedule Development

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3 TIME MANAGEMENT

3.1 Activity Sequencing

Activity sequencing is a process of linking all the activities in logical relationships based on construction method statements, drawings, resource planning and other documents as stated in contract.

To develop a work program in Ms Project, there are seven (7) basic elements to be considered in activity sequencing process:

- i. Predecessor
- ii. Successor
- iii. Link type
- iv. Lead time
- v. Lag time
- vi. Task constraint
- vii. Network diagram

3.1.1 Predecessor / Successor

A predecessor is an activity that must start or finish before the subsequent activity can start or finish.

A successor is an activity whose start or completion is dependent on the start or finish of the precedent activity.





Steps to create Activity Sequencing:

 In Predecessors column of selected activity, key in the predecessor ID including link type and lag/lead time. Ms Project assumes Finish to Start (FS) as default if link type is not shown in the predecessor column.

For example,

- i. *Kerja Tanah Blok A* (ID 18) is the predecessor for *Kerja Struktur Blok A* (ID 19).
- ii. Kerja Struktur Blok A (ID 19) can only start after Kerja Tanah BlokA (ID 18) is finished. Therefore, the link type is 'FS'.
- iii. Key in '18' in the **Predecessors** column for Kerja Struktur Blok A
- Repeat for all activities to ensure they are logically linked except for recurring tasks.

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Figure 3.2 : Example for Activity Sequencing

3.1.2 Link Types

There are four (4) ways to link predecessor and successor in Ms Project:

i. Finish to Start (FS)

Activity B can only start after activity A finishes.



Figure 3.3 : Finish to Start Link Type

ii. Start to Start (SS)

Activity B can only start when activity A starts.



Figure 3.4 : Start to Start Link Type

iii. Finish to Finish (FF)

Activity A & B must finish to start the succeeding activity.



Figure 3.5 : Finish to Finish Link Type

iv. Start to Finish (SF)

Activity B cannot finish until activity A starts.



Figure 3.6 : Start to Finish Link Type

Steps to view and change link types :

- 1. Click on an activity (e.g Kerja Tanah Blok A)
- 2. Click Task ribbon
- 3. Select Information in Properties group
- 4. Click Predecessors in Task Information dialogue box
- 5. Click inverted arrow in the Type column to view or change link type
- 6. Click OK

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3.1.3 Lead time

The time allocated to start successor's work earlier than the completion of predecessor.



Figure 3.8 : Lead Time

3.1.4 Lag time

The time allocated to delay the start of successor's work after the completion of predecessor.



Figure 3.9 : Lag Time

Steps to view and change lead & lag time :

- 1. Click on an activity (eg. Completion of cable laying by TNB)
- 2. Click Task ribbon
- 3. Select Information in Properties group
- 4. Click Predecessors in Task Information dialogue box
- 5. View or change the lead or lag time in the Lag column for the selected activities
- 6. Click OK



Figure 3.10 : To View or Change Lead and Lag Time

3.1.5 Task Constraint

There are eight (8) types of task constraints as shown in Figure 3.9 below:

i.	ASAP :	A Soon As Possible
		Schedule method based on Project Start Date Forward Pass
i.	ALAP :	As Late As Possible
		Schedule method based on Project Finish Date
		Backward Pass
		↑
i.	SNET :	Start Not Earlier Than
ii.	SNLT :	Start Not Late Than
ш.	FNET :	Finish Not Earlier Than
	-	Circle Markinsky Theory
IV.	FNLI :	Finish Not Late Than
v.	INISO :	Must Start On
vi.	MFO :	Must Finish On 🔶

Figure 3.11 : Types of Task Constraint

In JKR practice, only constraint type ASAP (default) is allowed.

Steps to view task constraint :

- 1. Click on a task (eg. Completion of cable lay by TNB)
- 2. Click Task ribbon
- 3. Select Information in Properties group
- 4. Click Advanced in Task Information dialogue box
- 5. Click inverted arrow in the **Constraint Type** field to change constraint type if needed
- 6. Click OK

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Figure 3.12 : Types of Task Constraints

3.1.6 Network Diagram

Network Diagram will show the continuity of linkages of all activities from project start to project finish. Network Diagram can also be used to check that all tasks are linked.

Steps to view network diagram :

- 1. Click Task ribbon
- 2. Click inverted arrow at the Gantt Chart in View group
- 3. Select Network Diagram

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Figure 3.13 : Steps to View Network Diagram

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Figure 3.14 : Network Diagram

3.2 Activity Resource Planning

Activity Resource Planning is a process to plan and allocate available resources to execute work activities.

In general, there are four (4) types of resources i.e. Manpower, Money, Machine and Material.

Ms Project however, categorises resources into three (3) types i.e. Work, Material and Cost resources whereby:

- i. Work resources are manpower and machine
- ii. Material resources are consumable supplies, such as steel, concrete or soil
- iii. Cost resource is work done by others (outsourced works) and fees (money) paid out by the contractor.

For construction works scheduling, the resources should be determined by the contractor. JKR project managers must check to ensure resources are reasonable and adequate to meet project requirements.

3.2.1 Resource Information

A list of the resources required for the project needs to be prepared. (Refer to Table 1.1: Resource Availability and Productivity Rate)

Steps to key in resource information:

1. Click Task ribbon

- 2. Select inverted arrow at the Gantt Chart in View group
- 3. Select **Resource Sheet**

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Figure 3.15 : Steps to View Resource Sheet

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Figure 3.16 : Resource Sheet

- 4. Key in resource name into the Resource Name column
- Click inverted arrow under Type column and select either Work / Material / Cost. By default Ms Project will identify the task as Work
- Key in abbreviation as appropriate in **Initials** column, e.g. ET for Earthwork Team
- Key in maximum number of team available in Max. column
 For example, enter 4 if 4 teams available. Ms Project allows assignment units in either decimal or percentage.

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			Work									
			Material Cost									

Figure 3.17 : Resources Information Sheet

Steps to change assignment unit from percentage (%) to decimal:

- 1. Click File ribbon
- 2. Select Options



Figure 3.18 : Steps to Change Assignment Unit

- 3. Select Schedule in Project Options dialog box
- 4. Click inverted arrow and select decimal in **Show assignment units as a** field

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 Clipboard Resource Name Earthwork Tean Project Options 1 ? 2 Structure Team 3 Archetectural T General Change options related to scheduling, calendars, and calculations. 4 M&E Team Display Calendar options for this project: 📳 BGN - Membina 2 Blok Bangu... 💌 Schedule Week starts on: Sunday Proofing Save Eiscal year starts in: January 3 Use starting year for FY numbering Languag These times are assigned to tasks when you enter a start or finish date without specifying a time. If you change this setting, consider matching the project calendar using the Change Working Time command on the Project tab in the ribbon. Default start time: 8:00 AM 💌 Advanced Default end time: 5:00 PM 💌 Customize Ribbon Hours per <u>d</u>ay: 8 Quick Access Toolbar Add-Ins Days per <u>m</u>onth: 20 🖨 Trust Center Schedule Show scheduling messages () 4 Show assignment units as a: Percentage 💌 Scheduling options for this pro New tasks created: Manually Scheduled 💌 Auto scheduled tasks scheduled on: Project Start Date 💌 Dury store is an effort drigen O Tasks will always honor their contraint dates O
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Figure 3.19 : Selection of Assignment Unit

3.2.2 Additional Resource Details

Additional information on what constitutes a team can be detailed in resource information.

Steps to create additional information:

- 1. Double click the selected resource (e.g Earthwork Team) in **Resource Name** column
- 2. Click Notes in Resources Information dialog box
- 3. Key in additional resource details
- 4. Click OK

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Figure 3.20 : Additional Resource Details

Additional resource details can be viewed from indicator column as shown below.

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Figure 3.21 : Resource Information Indicator

3.2.3 Resource Allocation

The available resources need to be allocated to work activities (Refer to Table

1.2 : Resource Allocation and Quantity of Works)

Steps to allocate resource to work activities:

- 1. Click Gantt Chart in View group
- 2. Click inverted arrow in the Resource Name column at selected activity row
- 3. Select resource teams required for the activity. More than 1 team can be allocated to each activity

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	11		1.2.4.2	3	Progress Report 2	2 days	Thu 25/7/13	Fri 26/7/13			
	12		1.2.4.3	3	Progress Report 3	2 days	Mon 26/8/13	3 Tue 27/8/13			
	13		1.2.4.4	3	Progress Report 4	2 days	Wed 25/9/1	3 Thu 26/9/13			
	14		1.2.4.5	3	Progress Report 5	2 days	Fri 25/10/13	Mon 28/10/13			
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	24		1.6.2	3	Kerja Struktur	1 day?	Wed 5/6/13	Wed 5/6/13	23		
	25		1.6.3	3	Kerja Arkitek	1 day?	Thu 6/6/13	Thu 6/6/13	24		
	26		1.6.4	3	Kerja M&E	1 day?	Thu 6/6/13	Thu 6/6/13	24		1
	27		1.7	3	Completion of Cable Laying by TNB	0 days	Tue 11/6/13	Tue 11/6/13	21FS+3 days,26FS+3 days		11/6
	28		1.8	3	T&C	1 day?	Wed 12/6/1	3 Wed 12/6/13	27		K
	29		1.9	3	Projek Siap	0 days	Thu 13/6/13	Thu 13/6/13	28,8,25,20,7		13/6

Figure 3.22 : Resource Allocation

3.2.4 Resource Quantity

The method to allocate quantity of resource team to work activities is done using [] square brackets. The use of () or {} are not acceptable. For example, use [2] to indicate 2 teams.

Refer to Table 1.2 : Resource Allocation and Quantity of Works

Steps to allocate quantity of resource team to work activities:

- 1. Select the resource team in the **Resource Name** column at selected task row
- 2. Press F2 on keyboard to prompt the cursor next to resource name
- 3. Key in quantity of resource team

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19		1.5.2	3	Kerja Struktur	1 day?	Wed 5/6/13	Wed 5/6/13	18	Structure Team	Structure Team
20		1.5.3	3	Kerja Arkitek	1 day?	Thu 6/6/13	Thu 6/6/13	19	Architectural Team	Architectural Team
21		1.5.4	3	Kerja M&E	1 day?	Thu 6/6/13	Thu 6/6/13	19	M&E Team	M&E Team
22		1.6	3	Blok B	3 days?	Tue 4/6/13	Thu 6/6/13			
23		1.6.1	3	Kerja Tanah	1 day?	Tue 4/6/13	Tue 4/6/13	4,15,16	Earthwork Team	Earthwork Team
24		1.6.2	3	Kerja Struktur	1 day?	Wed 5/6/13	Wed 5/6/13	23	Structure Team	Structure Team
25		1.6.3	3	Kerja Arkitek	1 day?	Thu 6/6/13	Thu 6/6/13	24	Architectural Team	Architectural Team
26		1.6.4	3	Kerja M&E	1 day?	Thu 6/6/13	Thu 6/6/13	24	M&E Team	M&E Team
27		1.7	3	Completion of Cable Laying by TNB	0 days	Tue 11/6/13	Tue 11/6/13	21FS+3 days,26FS+3 days		\$ 11/6
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19		1.5.2	3	Kerja Struktur	0.33 days	Tue 4/6/13	Tue 4/6/13	18	Structure Team[3]	
20		1.5.3	3	Kerja Arkitek	0.33 days	Tue 4/6/13	Wed 5/6/13	19	Archetectural Team[3]	
21		1.5.4	3	Kerja M&E	0.5 days	Tue 4/6/13	Wed 5/6/13	19	M&E Team[2]	
22		1.6	3	Blok B	1.17 days	Tue 4/6/13	Wed 5/6/13			
23		1.6.1	3	Kerja Tanah	0.33 days	Tue 4/6/13	Tue 4/6/13	4,15,16	Earthwork Team[3]	
24		1.6.2	3	Kerja Struktur	0.33 days	Tue 4/6/13	Tue 4/6/13	23	Structure Team[3]	
25		1.6.3	3	Kerja Arkitek	0.5 days	Tue 4/6/13	Wed 5/6/13	24	Archetectural Team[2]	
26		1.6.4	3	Kerja M&E	0.5 days	Tue 4/6/13	Wed 5/6/13	24	M&E Team[2]	
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Figure 3.23 : Resource Quantity Allocation

below:

3.3 Activity Duration Estimate (ADE)

Duration of project is estimated through resource productivity rate and quantity of work that need to be carried out. This is the basis of Effort Driven Scheduling.

3.3.1 Techniques of Estimating Duration

There are four (4) techniques to determine activity duration as listed in Table 3.1.

No.	Teknik Anggaran	Keterangan
1.	Analogous Estimate	Use the actual cost of a previous, similar project as the basis for the new estimate (e.g: project with std design)
2.	Parametric Estimates D=Q/PR	Use project characteristics in mathematic model to estimate
3.	Expert Judgment	Expertise that has been acquired in a specific knowledge area (personal experience)
4.	Reserve Analysis	Consider risk at that respective time

Table 3.1: Estimating Techniques

Parametric Estimates use a mathematical model as illustrated in the example





3.3.2 Examples for Parametric Estimates

				Blo	k A		
No.	Activity	No. of Team	Qty = m ³ /d/t	Q= Quantity	Production rate, PR = team x qty	Risk consideration	Duration D=Q/PR
1	Kerja Tanah	2	1000	100,000.00	2,000.00	10%+	55
2	Kerja Struktur	3	100	9,000.00	300.00	Testing : 7 days	37
3	Kerja Arkitek	3	100	12,000.00	300.00	Delivery : 10 d	50
4	M&E	2	40	2,400.00	80.00	Procurement : 5 d	35
				Blo	k B		
No.	Activity	No. of Team	Qty = m ³ /d/t	Q= Quantity	Production rate, PR = team x qty	Risk consideration	Duration D=Q/PR
1	Kerja Tanah	3	800	120,000.00	2,400.00	10%+	55
2	Kerja Struktur	3	100	12,000.00	300.00	Testing :7 days, Access : 5%	49
3	Kerja Arkitek	2	150	15,000.00	300.00	Delivery : 10 d	60
4	M&E	2	50	5,000.00	100.00	Procurement : 5 d	55

Table 3.2: Calculation of Duration using Parametric Estimates

Example of calculation for Kerja Tanah (Blok A):

Duration = (Quantity \div Production Rate) + Risk Consideration = (100,000 m³ \div 1000 m³/d/g x 2 Teams) + 10% = 50 days + (10% of 50 days) = 50 days + 5 days = 55 days

Steps to insert activity duration:

- 1. Key in the calculated duration for the respective activity in the **Duration** column
- 2. For the other activities, duration can be estimated using other suitable techniques as tabulated in Table 3.1
- At this stage, the duration for activity "Maintain S.O" (ID 8) will remain as 1 day? until the final project duration is established whereby the duration will be adjusted accordingly

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	12		1.2.4.3	3	Progress Report 3	3 2 days	Mon 20/0/ 1	3 Tue 27/8/13		
	13		1.2.4.4	3	Progress Report 4	4 2 days	Wed 25/9/1	3 Thu 26/9/13	I I	
	14		1.2.4.5	3	Progress Report 5	5 2 days	Fri 25/10/1	3 Mon 28/10/13	•	
	15		1.3	3	Land Acquisition	0 days	Sat 1/6/13	Sat 1/6/13	→ 0-1/6	
	16		1.4	3	Services Relocation	0 days	Sat 1/6/13	Sat 1/6/13	→φ −1/6	
hart	17		1.5	3	Blok A	142 days	Mon 10/6/1	3 Tue 24/12/13	<u>4</u>	
Ę	18	1	1.5.1	3	Kerja Tanah	55 days	Mon 10/6/1	3 Fri 23/8/13	Earthwork Team[2]	
B	19	1	1.5.2	3	Kerja Struktur	37 days	Mc	Tue 15/10/13	Structure Team[3]	
	20	1	1.5.3	3	Kerja Arkitek	50 days	M/z	Tue 24/12/13	Archi	tee
	21	1	1.5.4	3	Kerja M&E	35 days	We	Tue 3/12/13	M&E Team	2]
	22		1.6	3	Blok B	164 days	Mon 10/6/1	3 Thu 23/1/14	1 T	-
	23	1	1.6.1	3	Kerja Tanah	55 days	Mon 10/6/1	3 Fri 23/8/13	Earthwork Team[3]	
	24	1	1.6.2	3	Kerja Struktur	49 days	Mon 26/8/1	3 Thu 31/10/13	Structure Team[3]	
	25	1	1.6.3	3	Kerja Arkitek	60 days	Fri 1/11/13	Thu 23/1/14		₽
	26	1	1.6.4	3	Kerja M&E	55 davs	Fri 1/11/13	Thu 16/1/14		۲N
	27		1.7	B	Completion of Cable Laying by TNB	0 days	Tue 21/1/14	1 Tue 21/1/14		۵
	28		1.8	3	T&C	5 days	2	Tue 28/1/14		¢
	29		1.9	3	Projek Siap	0 days	Th	Thu 30/1/14		

Figure 3.25 : Inserting Activity Duration

Steps to view entire Gantt Bar on single page:

- 1. Click View ribbon
- 2. Click Entire Project icon in Zoom group



Figure 3.26 : Viewing Entire Project Gantt Bar

3.4 Schedule Development

Schedule development is the process of intergrating activity sequencing, activity resource planning and activity duration estimate to produce the work program.

3.4.1 Calendar

Calendar and working times shall be created based on JKR Project Scheduling Guidelines unless otherwise stated in contract document.

The default calendar in Ms Project (Standard Calendar) is based on:

- 5 working days per week
- Saturday and Sunday as non-working days
- No public holidays
- Working hours 8 hours per day (8:00am to 12:00pm and 1:00pm to 5:00pm)

3.4.1.1 Changing Working Days

For states adopting Friday and Saturday as non-working days, the calendar shall be customised accordingly.

Steps to change non-working day to working day:

- 1. Click **Project** ribbon
- 2. Click Change Working Time in Properties group
- 3. Click Work Weeks in Change Working Time dialogue box
- 4. Click Details in Change Working Time dialogue box
- 5. Click Sunday in Details for '[Default]' dialogue box
- 6. Click radio button to select Set day(s) to these working times
- 7. Key in the working times
- 8. Click OK

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	2		1.1	3	Projek Mula	
	3		1.2	3	- Prelinimar	For <u>calendar</u> : Standard (Project Calendar) Create <u>New Calendar</u>
	4		1.2.1	\$	Performa	Calendar 'Standard' is a base calendar.
	5		1.2.2	3	= Est. & R	Legend: Click on a day to see its working times:
	6		1.2.2.1	3	Establ	June 2013 1 June 2013 is nonworking.
	7		1.2.2.2	3	Romov	Working S M T W Th F S
	8	0	1.2.3	3	Maintain	Nonworking 1
	9	Ð	1.2.4	3	Progres	21 Edited working Details for 'Default'
	10		1.2.4.1	3	Progre	hours Cotworks to adverse
	11		1.2.4.2	3	Progre	On this calendar:
	12		1.2.4.3	3	Progre	31 Select day(select day(select day). Use Project default times for these days. ar 'Standard'.
	13		1.2.4.4	3	Progre	Sunday Sunday
	14		1.2.4.5	3	Progre	31 Monday Set day(s) to these specific working times:
	15		1.3	3	Land Acqui	Wednesday
ч	16		1.4	3	Services R	Exceptions Work Weeks Friday 1 8:00 AM 12:00 PM 7
Char	17		1.5	3	Blok A	Saturday 2 1:00 PM 5:00 PM
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	21	1	1.5.4	3	Kerja M8	Help OK Cancel
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	24	1	1.6.2	3	Kerja Str	
	25	1	1.6.3	2	Kerja Ark	
	26	1	1.6.4	75	Kerja M8	
	27		1.7	Þ	Completion	
	20		4.0	-	Laying by I	Help Options OK Cancel
	28		1.8	è	I&C	

Figure 3.27 : Changing Non-Working Day to Working Day

Steps to change working day to non-working day:

- 1. Click Work Weeks in Change Working Time dialogue box
- 2. Click Details in Change Working Time dialogue box
- 3. Click Friday in Details for '[Default]' dialogue box
- 4. Click radio button to select Set days to nonworking time
- 5. Click OK in Details for '[Default]' dialogue box
- 6. Click OK



Figure 3.28 : Changing working day to non-working day



Figure 3.29 : Difference Between Working days and Non-Working days

HANDS-ON MANUAL

3.4.1.2 Inserting Public Holidays

All national and state public holidays shall be indicated in the project calendar.

Steps to insert public holidays:

- 1. Click **Project** ribbon
- 2. Click Change Working Time in Properties group
- 3. Click Exceptions tab in Change Working Time dialogue box
- 4. Select the public holiday date on the calendar
- 5. Key in the holiday name in **Name** field, the date will appear automatically
- 6. Repeat steps 4 and 5 for all other public holidays



Figure 3.29 : Inserting Public Holidays
3.4.2 Critical Path Method (CPM)

The critical path method (CPM) consists of critical activities in a project that must start and finish on time to ensure that the project completes on schedule. A delay in any critical activity will delay the completion of the project. Critical Path is the longest path through a network of critical activities that determine the earliest time to complete the project.

There are three (3) representations to show critical activities:

- i. Gantt Table
- ii. Gantt Bar
- iii. Float/Slack

3.4.2.1 Slack/Float

There are two types of slack namely Total Slack and Free Slack.

i. Total Slack/Float

Total slack is the amount of time that can be delayed the earliest start of a task without delaying the ending of the project.

Total slack can be positive or negative or zero (0):

- a. If total slack is positive, it indicates the amount of time an activity can be delayed without delaying the project finish date.
- b. If total slack is negative, it indicates that there is not enough time for the scheduled activity to complete.
- c. By default and by definition, a task with 0 slack is considered as critical task. If a critical task is delayed, the project finish date is also delayed.

ii. Free Slack/Float

Free slack is the amount of time that can be delayed the start of a task without delaying the earliest start of a successor task.

Steps to show critical activities in Gantt Table:

- 1. Click **Format** ribbon
- 2. Click Text Style in Format group
- 3. Click Inverted arrow to select Critical Tasks in Item to Change field
- 4. Click Inverted arrow to select Red Color in Color field
- 5. Click Inverted arrow to select Yellow Color in Background Color field
- 6. Click OK

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Gan	19	1	1.5.2	3	Kerja Struktur		37 days	Thu 29/8/13	Wed 23/10/13				
	20	1	1.5.3	3	Kerja Arkitek		50 days	Thu 24/10/13	Wed 1/1/14				
	21	1	1.5.4	₽	Kerja M&E		35 days	Thu 24/10/13	Wed 11/12/13				
	22		1.6	₽	Blok B		164 days	Mon 10/6/13	Sun 2/2/14	9			
	23	1	1.6.1	₽	Kerja Tanah		55 days	Mon 10/6/13	Wed 28/8/13		(Earthw
	24	1	1.6.2	3	Kerja Struktur		49 days	Thu 29/8/13	Sun 10/11/13				
	25		1.6.3	3	Kerja Arkitek		60 days	Mon 11/11/13	Sun 2/2/14				
	26	1	1.6.4	3	Kerja M&E		55 days	Mon 11/11/13	Sun 26/1/14				
	27		1.7	3	Completion of Cable Laying by TNB	е	0 days	Wed 29/1/14	Wed 29/1/14				
	28		1.8	3	T&C		5 days	Thu 30/1/14	Wed 5/2/14				
	29		1.9	3	Projek Siap		0 days	Sun 9/2/14	Sun 9/2/14				

Figure 3.30 : Steps to Show Critical Activities in Gantt Table

2014

Critical activities will be represented as red text with yellow background as shown below.

		6	WBS 🖕	Task 🖕	Task Name	Duration 🖕	Start 🖕	Finish 🚽	or '1	3 9) Jun '13	21 Ju	'13	1 Sep '	13	13 Oct	13 2	4 Nov	'13	5 Jan '14	16 F	eb ' 🔺
		•		Mode					T	N	1 F	T S	W	S	TN	И F	T	S	W	S T	M	F
	1		1	\$	Membina 2 Blok	174 days?	Sat 1/6/13	Sun 9/2/14		¥-											- Y	
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	2	_	1.1	3	Projek Mula	0 days	Sat 1/6/13	Sat 1/6/13		<u>*</u>]1	/6											
	3		1.2	\$	Prelinimaries	174 days?	Sun 2/6/13	Sun 9/2/14		1								_			-V	
	4		1.2.1	3	Performance Bond	5 days	Sun 2/6/13	Sun 9/6/13														
	5		1.2.2	3	Est. & Remove S.O	169 days	Mon 10/6/13	Sun 9/2/14			_										ų.	
	6		1.2.2.1	3	Establish S.O	5 days	Mon 10/6/13	Sun 16/6/13			h											
	7		1.2.2.2	2	Romoval S.O	2 days	Thu 6/2/14	Sun 9/2/14													Ś.	
	8		1.2.3	3	Maintain S.O	1 day?	Mon 17/6/13	Mon 17/6/13			ř—							-			h l	
	9	Ð	1.2.4	3	Progress Report	84 days	Tue 25/6/13	Mon 28/10/13			1	0	1			1						
	15		1.3	3	Land Acquisition	0 days	Sat 1/6/13	Sat 1/6/13	+	∲ _1	/6											
	16		1.4	3	Services Relocation	0 days	Sat 1/6/13	Sat 1/6/13	կեր	ó I	/6											
	17		1.5	3	Blok A	142 days	Mon 10/6/13	Wed 1/1/14	1	÷♥								_				
	18	÷	1.5.1	3	Kerja Tanah	55 days	Mon 10/6/13	Wed 28/8/13						Earthw	/ork Te	am[2]						
	19	1	1.5.2	3	Kerja Struktur	37 days	Thu 29/8/13	Wed 23/10/13					i	-		📑 Str	ucture	. Team	[3]			
	20	1	1.5.3	3	Kerja Arkitek	50 days	Thu 24/10/13	Wed 1/1/14	1							Ť				Architee	tural Tea	m[3
	21	1	1.5.4	3	Kerja M&E	35 days	Thu 24/10/13	Wed 11/12/13								Ľ			M&E T	eam[2]		
Tart	22		1.6	3	Blok B	164 days	Mon 10/6/13	Sun 2/2/14		¢								_				
tt C	23	ŧ.	1.6.1	3	Kerja Tanah	55 days	Mon 10/6/13	Wed 28/8/13			×			Earthw	/ork Te	am[3]						
Gan	24	1	1.6.2	3	Kerja Struktur	49 days	Thu 29/8/13	Sun 10/11/13					i	·			Stru	icture	Team	[3]		
	25	÷	1.6.3	2	Kerja Arkitek	60 days	Mon 11/11/13	Sun 2/2/14									Ť				Archite	ctu
	26	1	1.6.4	3	Kerja M&E	55 days	Mon 11/11/13	Sun 26/1/14									Ľ			 \'	V &E Tea	n[2]
	27		1.7	3	Completion of Cable Laying by TNB	0 days	Wed 29/1/14	Wed 29/1/14												*	29/1	
	28		1.8	3	T&C	5 days	Thu 30/1/14	Wed 5/2/14													*	
	29		1.9	3	Projek Siap	0 days	Sun 9/2/14	Sun 9/2/14													8 9/2	

Figure 3.31 : Critical Activities in Gantt Table

Steps to show critical activities in Gantt Bar:

- 1. Click Format ribbon
- 2. Select Critical Tasks in Bar Styles group

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	2		1.1	3	Projek Mula	0 days	Sat 1/6/13	Sat 1/6/13	\$ ₁ 1/6
	3		1.2	3	Prelinimaries	174 days?	Sun 2/6/13	Sun 9/2/14	V
	4		1.2.1	3	Performance Bond	5 days	Sun 2/6/13	Sun 9/6/13	👗
	5		1.2.2	3	Est. & Remove S.O	169 days	Mon 10/6/13	Sun 9/2/14	· · · · · · · · · · · · · · · · · · ·
	6		1.2.2.1	3	Establish S.O	5 days	Mon 10/6/13	Sun 16/6/13	
	7		1.2.2.2	3	Romoval S.O	2 days	Thu 6/2/14	Sun 9/2/14	
	8		1.2.3	3	Maintain S.O	1 day?	Mon 17/6/13	Mon 17/6/13	
	9	Ð	1.2.4	3	* Progress Report	84 days	Tue 25/6/13	Mon 28/10/13	
	15	_	1.3	3	Land Acquisition	0 days	Sat 1/6/13	Sat 1/6/13	+0-1/6
	16	_	1.4	3	Services Relocation	0 days	Sat 1/6/13	Sat 1/6/13	₩0−1/6
	17		1.5	3	Blok A	142 days	Mon 10/6/13	Wed 1/1/14	
	18	1	1.5.1	3	Kerja Tanah	55 days	Mon 10/6/13	Wed 28/8/13	Earthwork Team[2]
	19	1	1.5.2	3	Kerja Struktur	37 days	Thu 29/8/13	Wed 23/10/13	Structure Team[3]
	20		1.5.3	3	Kerja Arkitek	50 days	Thu 24/10/13	Wed 1/1/14	Architectural Team[3
+	21		1.5.4	2	Kerja M&E	35 days	Thu 24/10/13	Wed 11/12/13	M&E (cam[2]
Char	22		1.6	3		164 days	Mon 10/6/13	Sun 2/2/14	
ţ	23	1	1.6.1		Kerja Tanan	55 days	Mon 10/6/13	Wed 28/8/13	Earthwork Team(3)
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	25	1	1.0.3		Kerja Arkitek	60 days	Mon 11/11/13	Sun 2/2/14	Mat Transla
	27		1.7	3	Completion of Cable Laying by TNB	0 days	Wed 29/1/14	Wed 29/1/14	↓ White Fearing 2 ↓ 23/1
	28		1.8	3	T&C	5 days	Thu 30/1/14	Wed 5/2/14	
	29		1.9	3	Projek Siap	0 days	Sun 9/2/14	Sun 9/2/14	\$ 9/2

Figure 3.32 : Steps to show Critical Activities in Gantt Bar

Critical activities will be represented as red bars as shown below.

		0	WBS 🖕	Task 🖕	Task Name	Duration 🚽	Start 🗸	Finish 🗸	or '13 9	9 Jun '13 // F	21 Jul T S	'13 1 Se W S	ep '13 T	13 Oct '1 M F	3 24 T	Nov '13 S W	5 Jan '14 S T	16 Feb ' M F
	1		1	B	Membina 2 Blok Bangunan	174 days?	Sat 1/6/13	Sun 9/2/14	-									•
	2		1.1	3	Projek Mula	0 days	Sat 1/6/13	Sat 1/6/13		/6								
	3		1.2	3	Prelinimaries	174 days?	Sun 2/6/13	Sun 9/2/14	9						-			Ý 📘
	4		1.2.1	3	Performance Bond	5 days	Sun 2/6/13	Sun 9/6/13	i i	n in the second s								
	5		1.2.2	3	Est. & Remove S.O	169 days	Mon 10/6/13	Sun 9/2/14							-			Ψ.
	6		1.2.2.1	2	Establish S.O	5 days	Mon 10/6/13	Sun 16/6/13		μ.								
	7		1.2.2.2	8	Romoval S.O	2 days	Thu 6/2/14	Sun 9/2/14										Ś.
	8		1.2.3	3	Maintain S.O	1 day?	Mon 17/6/13	Mon 17/6/13		ř—								
	9	Ð	1.2.4	3	* Progress Report	84 days	Tue 25/6/13	Mon 28/10/13		1	٥	1		1				
	15		1.3	3	Land Acquisition	0 days	Sat 1/6/13	Sat 1/6/13	 	/6								
	16		1.4	3	Services Relocation	0 days	Sat 1/6/13	Sat 1/6/13	0	/6								
	17		1.5	3	Blok A	142 days	Mon 10/6/13	Wed 1/1/14							_	_	7	
	18	÷	1.5.1	3	Kerja Tanah	55 days	Mon 10/6/13	Wed 28/8/13		-		Earl	thwork 1	[eam[2]				
	19	÷.	1.5.2	2	Kerja Struktur	37 days	Thu 29/8/13	Wed 23/10/13				Ľ		Strue	ture T	eam[3]		
	20	÷	1.5.3	3	Kerja Arkitek	50 days	Thu 24/10/13	Wed 1/1/14						- L			Architee	ural Tearr 3
	21	1	1.5.4	3	Kerja M&E	35 days	Thu 24/10/13	Wed 11/12/13						Ľ		M&E	Team[2]	
hart	22		1.6	3	Blok B	164 days	Mon 10/6/13	Sun 2/2/14	•						-		_	
tt C	23	÷	1.6.1	3	Kerja Tanah	55 days	Mon 10/6/13	Wed 28/8/13		*								
Gan	24	÷	1.6.2	3	Kerja Struktur	49 days	Thu 29/8/13	Sun 10/11/13				Ľ						
	25	+	1.6.3	3	Kerja Arkitek	60 days	Mon 11/11/13	Sun 2/2/14						6			-	Architectu
	26	1	1.6.4	3	Kerja M&E	55 days	Mon 11/11/13	Sun 26/1/14						1				
	27		1.7	3	Completion of Cable Laying by TNB	0 days	Wed 29/1/14	Wed 29/1/14									*	29/1
	28		1.8	3	T&C	5 days	Thu 30/1/14	Wed 5/2/14										R
	29		1.9	3	Projek Siap	0 days	Sun 9/2/14	Sun 9/2/14										8 9/2

Figure 3.33 : Critical Activities in Gantt Bar

Steps to show critical activities using Total Float/Slack:

- 1. Insert new column
- 2. Select Total Slack

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	2		1.1	3	Projek Mula		0 days	Sat 1/6/13	Sat 1/6 TCPI	Otativa Dandina	ן	/6			
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	4		1.2.1	3	Performan	ce Bond	5 days	Sun 2/6/13	Sun 9/6 Text1	0	Ě				
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	6		1.2.2.1	3	Establis	h S.O	5 days	Mon 10/6/13	Sun 16 Text1	15 14	6	ի			
	7		1.2.2.2	3	Romova	I S.O	2 days	Thu 6/2/14	Sun 9/2 Text1	5					
	8		1.2.3	3	Maintain S	.0	1 day?	Mon 17/6/13	Mon 17Text1	7		ř—			
	9	Ð	1.2.4	3	Progress	Report	84 days	Tue 25/6/13	Mon 2	.8 .9		1	٥	I I.	1
	15		1.3	3	Land Acquisi	tion	0 days	Sat 1/6/13	Sat 1/6 Text2	2	-1	/6			
	16		1.4	3	Services Rel	ocation	0 days	Sat 1/6/13	Sat 1/6 Text2	11	-1	/6			
	17		1.5	3	Blok A		142 days	Mon 10/6/13	Wed 1/Text2 Text2	12	9				
	18		1.5.1	3	Kerja Tana	ιh	55 days	Mon 10/6/13	Wed 2{Text2	4				Earthwor	k Team[2]
	19	1	1.5.2	3	Kerja Struk	ctur	37 days	Thu 29/8/13	Wed 2	15				Ľ	Struc
	20	1	1.5.3	3	Kerja Arkit	ek	50 days	Thu 24/10/13	Wed 1/Text2	17					
	21	1	1.5.4	3	Kerja M&E		35 days	Thu 24/10/13	Wed 1 Text2	19					
hart	22		1.6	3	Blok B		164 days	Mon 10/6/13	Sun 2/ Text3	10	•				
	23	1	1.6.1	3	Kerja Tana	ıh	55 days	Mon 10/6/13	Wed 2		1			h	
5	24	1	1.6.2	3	Kerja Struł	ctur	49 days	Thu 29/8/13	Sun 10 Texts	2				č	
	25	1	1.6.3	3	Kerja Arkit	ek	60 days	Mon 11/11/1	3 Sun 2/2 Text7		=				4
	26	1	1.6.4	3	Kerja M&E		55 days	Mon 11/11/1	3 Sun 26 Text9						č
	27		1.7	₿	Completion of Laying by TN	of Cable B	0 days	Wed 29/1/14	Wed 29 Total	Slack	*				
	28		1.8	3	T&C		5 days	Thu 30/1/14	Wed 5/2/14	4					
	29		1.9	3	Projek Siap		0 days	Sun 9/2/14	Sun 9/2/14						

Figure 3.34 : Inserting Total Slack column

2014

Activities with zero (0) days in **Total Slack** column are the critical activities as shown below.

		0	WBS 💂	Task 🚽 Mode	Task Name 👻	Duration 🖕	Start 🗸	Finish 🗸	Total Slack 🖕	L4 Apr '13 T M	9	Jun '1 F	3 4 T 5	4 Aug '1 6 W	13 29 Se / S 1
	1		1	3	Membina 2 Blok	174 days?	Sat 1/6/13	Sun 9/2/14	0 days?		_				
				_	Bangunan										
	2		1.1	3	Projek Mula	0 days	Sat 1/6/13	Sat 1/6/13	0 days		<u>h</u> 1	/6			
	3		1.2	\$	Prelinimaries	174 days?	Sun 2/6/13	Sun 9/2/14	0 days?	9	Ţ				
	4		1.2.1	3	Performance Bond	5 days	Sun 2/6/13	Sun 9/6/13	0 days		6				
	5		1.2.2	3	Est. & Remove S.O	169 days	Mon 10/6/13	Sun 9/2/14	0 days		9				
	6		1.2.2.1	3	Establish S.O	5 days	Mon 10/6/13	Sun 16/6/13	163 days		¢	ի			
	7		1.2.2.2	₽	Romoval S.O	2 days	Thu 6/2/14	Sun 9/2/14	0 days			L			
	8		1.2.3	3	Maintain S.O	1 day?	Mon 17/6/13	Mon 17/6/13	163 days?			ř—			
	9	Ð	1.2.4	3	Progress Report	84 days	Tue 25/6/13	Mon 28/10/13	74 days			1	0	1	1
	15		1.3	3	Land Acquisition	0 days	Sat 1/6/13	Sat 1/6/13	5 days	×	┝┤	/6			
	16		1.4	3	Services Relocation	0 days	Sat 1/6/13	Sat 1/6/13	5 days	ુખ	⊢∣	/6			
	17		1.5	3	Blok A	142 days	Mon 10/6/13	Wed 1/1/14	27 days		4				
	18	1	1.5.1	3	Kerja Tanah	55 days	Mon 10/6/13	Wed 28/8/13	27 days		I			_	Earthwork 1
	19	1	1.5.2	3	Kerja Struktur	37 days	Thu 29/8/13	Wed 23/10/13	27 days					č	
	20	1	1.5.3	3	Kerja Arkitek	50 days	Thu 24/10/13	Wed 1/1/14	27 days						
	21	1	1.5.4	3	Kerja M&E	35 days	Thu 24/10/13	Wed 11/12/13	32 days						
lart	22		1.6	3	Blok B	164 days	Mon 10/6/13	Sun 2/2/14	0 days		#				
t t	23	1	1.6.1	3	Kerja Tanah	55 days	Mon 10/6/13	Wed 28/8/13	0 days		ľ				
Ban	24	ŧ	1.6.2	3	Kerja Struktur	49 days	Thu 29/8/13	Sun 10/11/13	0 days					Ľ	
	25	ŧ.	1.6.3	3	Kerja Arkitek	60 days	Mon 11/11/13	Sun 2/2/14	5 days						
	26	ŧ	1.6.4	3	Kerja M&E	55 days	Mon 11/11/13	Sun 26/1/14	0 days						
	27		1.7	3	Completion of Cable Laying by TNB	0 days	Wed 29/1/14	Wed 29/1/14	0 days						
	28		1.8	5	T&C	5 days	Thu 30/1/14	Wed 5/2/14	0 days						
	29		1.9	2	Projek Siap	0 days	Sun 9/2/14	Sun 9/2/14	0 days						

Figure 3.35 : Critical Activities With Zero (0) Total Slack

3.4.3 Schedule Compression

Schedule Compression is a form of mathematical analysis that 's used to shorten the project schedule duration without changing the project scope. This technique should be applied to critical activities.

Schedule compression can be applied in two (2) conditions:

- i. During planning stage to ensure the project finish date is according to contract finish date;
- ii. During execution stage to ensure that the recovery plan (if there any delay) to meet the contract finish date.

There are two (2) techniques to perform schedule compression:

- i. Fast Tracking
- ii. Crashing

3.4.3.1 Fast Tracking

A technique where the links / relationship may be modified so that tasks may be carried out concurrently or working in parallel.

- Concurrent work.
- For works not yet started.

3.4.3.2 Crashing

This is a technique that increases the resource capacity to decrease the task duration at minimum cost.

- For tasks that have not started or task in progress.
- Involves time & cost.
- Increase productivity (4M : Money, Machine, Manpower, Material).

3.4.3.3 Setting Project Deadline

Before perform schedule compression, project deadline must be set according to the contract finish date.

Steps to set project deadline:

- 1. Double click on the Project Siap task
- 2. Click Advanced in Task Information dialogue box
- 3. Select Project Finish Date (30 Oct 2013) in the Deadline field
- 4. Click OK

					2						
	0	Task Information	tant Marrie	Z				-			
13		General Predecessors	s Resources Adva	nced	Note	es (Custo	m Fi	elds		
14		Name: Projek Siap									Duration: 0 days 🚔 🔲 Estimated
15		Constrain task									
16		Deadline:	NA							-	
17				4	(Octol	ber, 2	2013			1
18	•	Constraint type:	As Soon As Possible	Su	Мо	ти	We	Th	Fr	Sa	NA 👻
19	•			29	30	1	2	3	4	5	· · · · · · · · · · · · · · · · · · ·
20	•	Task type:	Fixed Units	13	7	15	9	10	11	12	
21	•	Calendar:	None	20	21	22	23	24	25	26	source calendars
22		WBS code:	1.9	27	28	29	30	31	1	2	3
23	1	Earned value method	d: % Compl		-1	-	0	- -	0	9	
24						I	oday				
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27		1									
28											Cancei
29		1.9 🗟	Projek Siar)				0 d	ays	5	Wed 30-10-13 Wed 30-10-13

Figure 3.36 : Setting Project Deadline

Deadline arrow will appear as shown below. The quantity of critical activities increase after deadline set compare to Figure 3.35.

0	age • 0	Calendar Calendar Other Vie Views	Nagram + + +5. +	Team Resource Views	Oution Tables	V Filter Pic Group by: No Data	Highlight) + Times Filter) - (39) C Group) +	care Days + R Zsom Zcom	Enter Selected Project Table	Details	
	0	W85 .	Task	Task Nome .	Duration +	Start 🖌	Finish .	Total Slack 🖕	Mar 13 9 Jun 13	15ep 18 2	4 Nov 13 16 1
3		1	3	- Membina 2 Blok Bangunan	174 days?	Sat 1/6/13	Sun 9/2/14	-71 days?			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
2		1.1	3	Projek Mula	0 days	Sat 1/6/13	Sat 1/6/13	-71 days	0,1/6		
5		1.2	3	- Prelinimaries	174 days?	Sun 2/6/13	Sun 9/2/14	-71 days?	9		
4		121	10	Performance Bond	5 days	Sun 2/6/13	Sun 9/6/13	.71 days			
5		1.2.2	8	Est. & Remove S.O	169 days	Mon 10/6/13	Sun 9/2/14	-71 days	-	_	~
6		1.2.2.1	8	Establish S.O	5 days	Mon 10/6/13	Sun 16/6/13	92 days	- F		
7		1222	8	Romoval S.O	2 days	Thu 6/2/14	Sun 9/2/14	-71 days			6
٤.		1.2.3	8	Maintain S.O	1 day?	Mon 17/6/13	Mon 17/6/13	92 days?	r		
9.	e	1.2.4	2	* Progress Report	84 days	Tue 25/6/13	Mon 28/10/13	74 days	1 1	1 1 1	
5		1.3	3	Land Acquisition	0 days	Sat 1/6/13	Sat 1/6/13	-66 days	+0-1/6		
6		1.4	3	Services Relocation	0 days	Sat 1/6/13	Sat 1/6/13	-66 days	90-1/6		1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.
17		1.5	10	- Blok A	142 days	Mon 10/6/13	Wed 1/1/14	-44 days	-		
5		1.5.1	3	Kerja Tanah	55 days	Mon 10/6/13	Wed 28/8/13	-44 days	-		
9		1.5.2	8	Kerja Struktur	37 days	Thu 29/8/13	Wed 23/10/13	-44 days			
10	+	1.5.3	8	Kenja Arkitek	50 days	Thu 24/10/13	Wed 1/1/14	-44 days		-	
11		1.5.4	8	Kerja M&E	35 days	Thu 24/10/13	Wed 11/12/13	-39 days			
2		1.6	8	- Blok B	164 days	Mon 10/6/13	Sun 2/2/14	-71 days	-		
3	+	1.6.1	8	Kerja Tanah	55 days	Mon 10/6/13	Wed 28/8/13	-71 days		D 1	
14		1.6.2	10	Kerja Struktur	49 days	Thu 29/8/13	Sun 10/11/13	-71 days		<u> </u>	
5		1.6.3	3	Kerja Arkitek	60 days	Mon 11/11/13	Sun 2/2/14	-66 days		-	
6	+	1.6.4	10	Kerja M&E	55 days	Mon 11/11/13	Sun 26/1/14	71 days		-	
7		1.7	10	Completion of Cable Laying by TNB	0 days	Wed 29/1/14	Wed 29/1/14	-71 days			· 29/1
8		1.8	3	TAC	5 days	Thu 30/1/14	Wed 5/2/14	-71 days			•
19	٠	1.9	18	Projek Siap	0 days	Sun 9/2/14	Sun 9/2/14	-71 days		•	· 9/2
				Contraction and the							

Deadline arrow

The current project finish date as calculated by Ms Project is 09.02.2014 but the actual deadline is on 30.10.2013. The work schedule need to be compressed to the finish contract date i.e 30.10.2013.

3.4.3.4 Fast Tracking Technique

Step to apply Fast Tracking technique:

For example, *Kerja Struktur Blok A* was planned to start after *Kerja Tanah Blok A* completed. In order to reduce the project duration, decision was make to start *Kerja Struktur* 15 days before Kerja Tanah finished.

- 1. A lead time of 15 days was applied to the *Kerja Struktur Blok A* indicate as (18FS-15d) in the **Predecessors** column.
- 2. Repeat Fast Tracking technique for other critical tasks as appropriate until all options are exhausted.



Figure 3.38 : Fast Tracking Technique

Refer to Figure 3.38, the project finish date was 2.1.2014 after the Fast Tracking technique which still later than the deadline set. Crashing technique will be apply for further schedule compression to achieve the actual project finish date.

3.4.3.5 Crashing Technique

Steps to apply crashing technique:

For example, *Kerja Tanah Blok A* was planned to finish within the duration of 55 days using two (2) Earthwork Team. To reduce the *Kerja Tanah* duration:

- a. Allow 2 hours overtime to each Earthwork Team.
- b. Total overtime per day will become 4 hours (2 Team) with additional of 0.5 team to Earthwork Team. The productivity rate for Earthwork Team become 2.5 in the calculation.
- Assuming work done in dry season, risk can be reduced from 10% to 5%.
- d. Duration = (Quantity ÷ Production Rate) + Risk

= 100,000 m³ \div (2.5 team x 1000 m³/d/t) + 5%

- = 40 days + (5% of 40 days)
- = 40 days + 2 days
- = 42 days

- 1. Replace the duration of Kerja Tanah from 55 days to 42 days.
- 2. Repeat this technique for other critical tasks as appropriate until we meet the dateline date.

				-	. .							:
	15		1.3	₽	Land Acquisition	0 days	13	Sat 1/6/13	2	+0	n 1/6	
	16		1.4	3	Services Relocation	0 days	13	Sat 1/6/13	2	90	- 1/ 6	
	17		1.5	3	Blok A	93 days	Mon 10/6/13	Thu 24/10/13				ŧ.
	18	ŧ.	1.5.1	3	Kerja Tanah	42 days	Mon 10/6/13	Wed 7/8/13	4,15			
	19	ŧ	1.5.2	3	Kerja Struktur	33 days	Thi 18/7/13	Wed 4/9/13	18FS-15 days			
	20	ŧ.	1.5.3	3	Kerja Arkitek	43 days	Thu 22/8/10	<u>7</u> 24/10/13	19FS-10 days			Architectural Team[3]
	21	ŧ.	1.5.4	3	Kerja M&E	32 days	Th 129/8/	2 14/10/13	19FS-5 days			
hart	22		1.6	3	Blok B	97 days	Mon	weu 30/10/13				ų.
ŭ	23	ŧ.	1.6.1	3	Kerja Tanah	53 days	Mcn 10/6/13	Mon 26/8/13	4,15,16			
Gan	24	ŧ	1.6.2	3	Kerja Struktur	30 days	Mc n 29/7/13	Tue 10/9/13	23SS+34 days			
	25	ŧ.	1.6.3	3	Kerja Arkitek	43 days	W d 28/8/13	Wed 30/10/13	24FS-10 days		9	
	26	ŧ.	1.6.4	3	Kerja M&E	28 days	Wed 4/9/13	Mon 14/10/13	24FS-5 days		<u> </u>	
	27		1.7	3	Completion of Cable Laying by TNB	0 days	Mon 21/10/13	Mon 21/10/13	21FS+3 days,26FS+3 days		2	21/10
	28		1.8	3	T&C	5 days	Tue 22/10/13	Mon 28/10/13	27		r	
	29		1.9	3	Projek Siap	0 days	Wed 30/10/13	Wed 30/10/13	28,8,25,20,7		ľ	30/10

Figure 3.39 : Crashing Technique

Optimize the duration of "Maintain S.O" until a maximum duration without affecting the Project Finish Date (30.10.2014).

			1.2.2.1	4	Latabilari 0.0	Judys	WOIT T0/0/15	Out 10/0/10	4		41				
	7		1.2.2.2	3	Romoval S.O	2 days	Tue 29/10/13	Wed 30/10/13	28				5	1	
	8		1.2.3	3	Maintain S.O	91 days	Ion 17/6/13	Tue 29/10/13	6		<u> </u>				
	9	Ð	1.2.4	3	Progress Report	84 days	Tue 25/6/13	Mon 28/10/13			1.1		1.1		
	15		1.3	3	Land Acquisition	0 days	Sat 1/6/13	Sat 1/6/13	2	+0-	1/6				
	16		1.4	3	Services Relocation	0 days	Sat 1/6/13	Sat 1/6/13	2	- hộ-	1/6				
	17		1.5	3	Blok A	93 days	Mon 10/6/13	Thu 24/10/13			-				
	18	1	1.5.1	3	Kerja Tanah	42 days	Mon 10/6/13	Wed 7/8/13	4,15	1	İ	- 1			
	19	ŧ	1.5.2	3	Kerja Struktur	33 days	Thu 18/7/13	Wed 4/9/13	18FS-15 days		9	Ĕ)			
	20	ŧ.	1.5.3	3	Kerja Arkitek	43 days	Thu 22/8/13	Thu 24/10/13	19FS-10 days			F		Architect	tural Team[3]
	21	ŧ.	1.5.4	3	Kerja M&E	32 days	Thu 29/8/13	Mon 14/10/13	19FS-5 days			- è	<u>ل</u>		
ar	22		1.6	3	Blok B	97 days	Mon 10/6/13	Wed 30/10/13					-		
tt Char	22 23	ŧ	1.6 1.6.1	le Le	Blok B Kerja Tanah	97 days 53 days	Mon 10/6/13 Mon 10/6/13	Wed 30/10/13 Mon 26/8/13	4,15,16			_			
Gantt Char	22 23 24	•	1.6 1.6.1 1.6.2	la la La	Blok B Kerja Tanah Kerja Struktur	97 days 53 days 30 days	Mon 10/6/13 Mon 10/6/13 Mon 29/7/13	Wed 30/10/13 Mon 26/8/13 Tue 10/9/13	4,15,16 23SS+34 days	ĺ					
Gantt Char	22 23 24 25	÷ ÷	1.6 1.6.1 1.6.2 1.6.3	ին ին ին ին ին ին	Blok B Kerja Tanah Kerja Struktur Kerja Arkitek	97 days 53 days 30 days 43 days	Mon 10/6/13 Mon 10/6/13 Mon 29/7/13 Wed 28/8/13	Wed 30/10/13 Mon 26/8/13 Tue 10/9/13 Wed 30/10/13	4,15,16 23SS+34 days 24FS-10 days	(
Gantt Char	22 23 24 25 26	+ + +	1.6 1.6.1 1.6.2 1.6.3 1.6.4	ին ին ին ին	Blok B Kerja Tanah Kerja Struktur Kerja Arkitek Kerja M&E	97 days 53 days 30 days 43 days 28 days	Mon 10/6/13 Mon 10/6/13 Mon 29/7/13 Wed 28/8/13 Wed 4/9/13	Wed 30/10/13 Mon 26/8/13 Tue 10/9/13 Wed 30/10/13 Mon 14/10/13	4,15,16 23SS+34 days 24FS-10 days 24FS-5 days	ĺ					
Gantt Char	22 23 24 25 26 27	+ + +	1.6 1.6.1 1.6.2 1.6.3 1.6.4 1.7	a da da da da da	Blok B Kerja Tanah Kerja Struktur Kerja Arkitek Kerja M&E Completion of Cable Laying by TNB	97 days 53 days 30 days 43 days 28 days 0 days	Mon 10/6/13 Mon 10/6/13 Mon 29/7/13 Wed 28/8/13 Wed 4/9/13 Mon 21/10/13	Wed 30/10/13 Mon 26/8/13 Tue 10/9/13 Wed 30/10/13 Mon 14/10/13 Mon 21/10/13	4,15,16 23SS+34 days 24FS-10 days 24FS-5 days 21FS+3 days,26FS+3 days	Ċ				21/10	
Gantt Char	22 23 24 25 26 27 28	•	1.6 1.6.1 1.6.2 1.6.3 1.6.4 1.7	ին ին ին ին ին ին ին ին ին ին ին	Blok B Kerja Tanah Kerja Struktur Kerja Arkitek Kerja M&E Completion of Cable Laying by TNB T&C	97 days 53 days 30 days 43 days 28 days 0 days 5 days	Mon 10/6/13 Mon 10/6/13 Mon 29/7/13 Wed 28/8/13 Wed 4/9/13 Mon 21/10/13 Tue 22/10/13	Wed 30/10/13 Mon 26/8/13 Tue 10/9/13 Wed 30/10/13 Mon 14/10/13 Mon 21/10/13 Mon 28/10/13	4,15,16 23SS+34 days 24FS-10 days 24FS-5 days 21FS+3 days,26FS+3 days 27	Ì				21/10	
Gantt Char	22 23 24 25 26 27 28 29	• • • •	1.6 1.6.1 1.6.2 1.6.3 1.6.4 1.7 1.8 1.9	ին ին ին ին ին ին ին ին ին ին	Blok B Kerja Tanah Kerja Struktur Kerja Arkitek Kerja M&E Completion of Cable Laying by TNB T&C Projek Siap	97 days 53 days 30 days 43 days 28 days 0 days 5 days 0 days 5 days 0 days	Mon 10/6/13 Mon 10/6/13 Mon 29/7/13 Wed 28/8/13 Wed 4/9/13 Mon 21/10/13 Tue 22/10/13 Wed 30/10/13	Wed 30/10/13 Mon 26/8/13 Tue 10/9/13 Wed 30/10/13 Mon 14/10/13 Mon 21/10/13 Wed 30/10/13	4,15,16 23SS+34 days 24FS-10 days 24FS-5 days 21FS+3 days,26FS+3 days 27 28,8,25,20,7	Ċ				21/10 30/10	

Figure 3.40 : Increasing Duration for "Maintain S.O"

After applying the schedule compression to achieve the contract finish date, the deadline arrow has to be removed.

Steps to remove deadline:

- 1. Double click on the Projek Siap task.
- 2. Key in **NA** in **Deadline** field in the **Task Information** dialogue box
- 3. Click OK

	4		1.2.1	3	Task Information			ĥ					
	5		1.2.2	3	General Predecessors Resources Advanced Notes Custom Fields			1	_		-÷		
	6		1.2.2.1	3				б –					
	7		1.2.2.2	3	Name: Projek Siap Duration: 0 days 😴 🔳 Estimate						<u>b</u>		
	8		1.2.3	3	Constrain task			Ľ	_				
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	15		1.3	3	La		÷	1/6	(
	16		1.4	3	Se Constraint type: As Soon As Possible Constraint date: NA		40	1/6	6				
	17		1.5	3		-		╞	_		-		
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	19	ŧ	1.5.2	3	Calendar: None 💌 🗌 Scheduling ignores resource calendars				×	ի			
	20	ŧ.	1.5.3	3	WBS code: 1.9				9		- A1	rch <mark>itect</mark> u	ural Te
	21	1	1.5.4	3	Earned value method: % Complete					Č.	-		
hart	22		1.6	3			1		_		-		
tt C	23	1	1.6.1	3	Mark task as milestone 3		1						
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	26	1	1.6.4	3	<u>Help</u>					Č.			
	27		1.7	1	Completion of Cable 0 days Mon 21/10/13 Mon 21/10/13 21FS+3	Γ					<mark>ہ</mark> 2	1/10	
	20		4.0		Laying by TNB days,20F5+3 days								
	28		1.8		T&C 5 days Tue 22/10/13 Mon 28/10/13 27					1			ר
	29		1.9	₽	Projek Siap 0 days Wed 30/10/13 Wed 30/10/13 28,8,25,20,7							30/10	

Figure 3.41 : Removing Deadline Arrow

HANDS-ON MANUAL

The project schedule with final scope, critical activities and duration according to contract start and finish date is as shown below. This was accomplished using the Critical Path Method (CPM).

P) • (°'	- -		Gantt Charl	Tools BGN - I	Membina 2 Blok Ban	gunan - Initial - 01 - 2	013-06-01 - Microsoft Proj	ject 🗆 🗇
F	ile	Task	Resourc	e Proje	ct View Add-Ins Forma	t				۵ 🕜 🗟
Ga	intt 1 art • Us	Task age + E	Network [Calendar Other View Views	Diagram ¥ * ws *	Team Planner & Cotter Views Resource Views	Outline Table	✓ Highlight: [No ▼ Filter: [No Group by: [No Data	Highlight] Time: Filter] Group]	Days Zoom Entire Zoom Zoom	e Selected et Tasks Split View Window Window
			WBS 🖕	Task 🖕	Task Name	Duration 🖕	Start 🗸	Finish	Predecessors 🖕	r '13 9 Jun '13 21 Jul '13 1 Sep '13 13 Oct '13 2
	1		1	Node	Membina 2 Blok Bangunan	102 days	Sat 1/6/13	Wed 30/10/13		
	2		1.1	3	Projek Mula	0 days	Sat 1/6/13	Sat 1/6/13		♦ 1/6
	3		1.2	3	Prelinimaries	102 days	Sun 2/6/13	Wed 30/10/13		
	4		1.2.1	3	Performance Bond	5 days	Sun 2/6/13	Sun 9/6/13	2	🚔
	5		1.2.2	3	Est. & Remove S.O	97 days	Mon 10/6/13	Wed 30/10/13		
	6		1.2.2.1	3	Establish S.O	5 days	Mon 10/6/13	Sun 16/6/13	4	• •
	7		1.2.2.2	2	Romoval S.O	2 days	Tue 29/10/13	Wed 30/10/13	28	 ⊾
	8		1.2.3	3	Maintain S.O	91 days	Mon 17/6/13	Tue 29/10/13	6	
	9	0	1.2.4	3	Progress Report	84 days	Tue 25/6/13	Mon 28/10/13		
	10		1.2.4.1	3	Progress Report 1	2 days	Tue 25/6/13	Wed 26/6/13		
	11		1.2.4.2	3	Progress Report 2	2 days	Thu 25/7/13	Sun 28/7/13		•
	12		1.2.4.3	3	Progress Report 3	2 days	Sun 25/8/13	Mon 26/8/13		
	13		1.2.4.4	3	Progress Report 4	2 days	Wed 25/9/13	Thu 26/9/13		
	14		1.2.4.5	3	Progress Report 5	2 days	Sun 27/10/13	Mon 28/10/13		
	15		1.3	3	Land Acquisition	0 days	Sat 1/6/13	Sat 1/6/13	2	+ 0−1/6
	16		1.4	3	Services Relocation	0 days	Sat 1/6/13	Sat 1/6/13	2	₩0 —1/6
hart	17		1.5	3	Blok A	93 days	Mon 10/6/13	Thu 24/10/13		· · · · · · · · · · · · · · · · · · ·
t t t	18	1 - C	1.5.1	3	Kerja Tanah	42 days	Mon 10/6/13	Wed 7/8/13	4,15	
Gar	19	<u>۲</u>	1.5.2	3	Kerja Struktur	33 days	Thu 18/7/13	Wed 4/9/13	18FS-15 days	
	20	1 -	1.5.3	5	Kerja Arkitek	43 days	Thu 22/8/13	Thu 24/10/13	19FS-10 days	Architectu
	21	1	1.5.4	3	Kerja M&E	32 days	Thu 29/8/13	Mon 14/10/13	19FS-5 days	
	22		1.6	3	Blok B	97 days	Mon 10/6/13	Wed 30/10/13		
	23	1	1.6.1	3	Kerja Tanah	53 days	Mon 10/6/13	Mon 26/8/13	4,15,16	
	24	1	1.6.2	3	Kerja Struktur	30 days	Mon 29/7/13	Tue 10/9/13	23SS+34 days	
	25	1	1.6.3	3	Kerja Arkitek	43 days	Wed 28/8/13	Wed 30/10/13	24FS-10 days	×
	26	1	1.6.4	3	Kerja M&E	28 days	Wed 4/9/13	Mon 14/10/13	24FS-5 days	
	27		1.7	3	Completion of Cable Laying by TNB	0 days	Mon 21/10/13	Mon 21/10/13	21FS+3 days,26FS+3 days	★ 11/10
	28		1.8	3	T&C	5 days	Tue 22/10/13	Mon 28/10/13	27	
	29		1.9	3	Projek Siap	0 days	Wed 30/10/13	Wed 30/10/13	28,8,25,20,7	30/10

Figure 3.44 : Project Schedule

CHAPTER 4

COST MANAGEMENT

- 4.1 Cost Estimating
- 4.2 Cost Budgeting
- 4.3 Fixed Cost Accrual
- 4.4 Changing Currency Symbol
- 4.5 S-Curve
- 4.6 Saving File for S.O Approval

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4 COST MANAGEMENT

4.1 Cost Estimating

Cost estimating involves developing approximation of the cost of the resource to complete each schedule activity.

Estimates should include:

- all expenses involved in initiating, implementing and commissioning projects (e.g.labour, materials, subcontractors, equipment & facilities, travelling);
- allowances for in-house and external resources;
- allowances for inflation and contingencies.

4.2 Cost Budgeting

Cost budgeting involves aggregating the cost estimate of activities and establish the cost baseline for the project.

Steps to insert cost data:

- 1. Click View ribbon
- 2. Click inverted arrow in **Tables** icon
- 3. Select Cost

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3		1.2	3	-	1	Tracking)2 days	3	Sun 02-	06-13	Wed 30-10-	13				
4		1.2.1	3			Variance		days		Sun 02-0	6-13	Sun 09-06-1	3	2			
5		1.2.2	3			Work		/ days		Mon 10-	06-13	Wed 30-10-	13				
6		1.2.2.1	3			VVOIK		days		Mon 10-0	06-13	Sun 16-06-1	3	4			
7		1.2.2.2	3			S <u>u</u> mmary		days		Tue 29-1	0-13	Wed 30-10-	13	28			
8		1.2.3	3			Usa <u>q</u> e		days		Mon 17-0	06-13	Tue 29-10-1	3	6			
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10		1.2.4.1	3			Sa <u>v</u> e Fields	as a New Table	days		Tue 25-0	6-13	Wed 26-06-	13		1		
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12		1.2.4.3	3		_	Progress	Report 3	2 days		Sun 25-0	8-13	Mon 26-08-	13				
13		1211				Drogroce	Doport /	2 dave		Wod 25	00 13	Thu 26 00 1	2				

Figure 4.1 : Inserting Cost Data

Cost table will be appeared as shown below.

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		Task Name		Fixed Cost 🖕	Fixed Cost Accrual 🗸	Total Cost 💂	Baseline 💂	Variance 💂	Actual 💂	Remaining 🖕	in '13 F
	1	🗆 Membi	na 2 Blok Banguna	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
	2	Proje	ek Mula	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
	3	Prelin	minari	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
	4	Pe	rformance Bond	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
	5	= Est	t & remove S.O.	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
	6		Establish S.O	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00)
	7		Removal S.O	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
	8	Ma	aintain S.O.	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	
	9	- Pro	ogress Report	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	1
	10		Progress Report 1	\$0.00	Prorated	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	1

Figure 4.2 : Cost Table

- 4. Key in **cost for each activity** in **Fixed Cost** column (refer Table 1.3 for cost of activities).
 - Cost must be key in only at the sub task level.
 - No cost for milestone and external dependancy activities.

F	ile	Task F	Resource Proj	ect	View	F	Format							
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	Task \	Views	Resourc	e V	iews		_	Data		Zoom			Split View	/
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		Bangun	an											
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	7		Removal S.O		RM5,000.00	D		Prorated	RM5,000.00	RM0.00	RM5,0	00.00	RM0.0	D
	8	M	aintain S.O.		RM15,000.00	D		Prorated	RM15,000.00	RM0.00	RM15,0	00.00	RM0.00	0
	9	🗆 Pr	ogress Report		RM0.00	D		Prorated	RM5,000.00	RM0.00	RM5,	00.00	RM0.0	0
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ŧ	11		Progress Repo	t	RM1,000.00	D		Prorated	RM1,000.00	RM0.00	RM1,(00.00	RM0.0	0

Figure 4.3 : Inserting Cost for Each Activity

Project Total Cost must equal to project contract sum.

							*	
	Task Name 👻	Fixed Cost 🖕	Fixed Cost Accrual	Total Cost 🖕	aseline 🖕	Variance 🖕	Actual 🖕	Jun
1	Membina 2 Blok Bangunan	RM0.00	Prorated	2,000,000.00	RM0.00	2,000,000.00	RM0.00	
2	Projek Mula	RM0.00	Prorated	RM0.00	RM0.00	RM0.00	RM0.00	⊢_1/ 6
3	Preliminari	RM0.00	Prorated	RM50,000.00	RM0.00	RM50,000.00	RM0.00	F
4	Performance Bond	RM10,000.00	Prorated	RM10,000.00	RM0.00	RM10,000.00	RM0.00	Ь.
5	Est & remove S.O.	RM0.00	Prorated	RM20,000.00	RM0.00	RM20,000.00	RM0.00	
6	Establish S.O	RM15,000.00	Prorated	RM15,000.00	RM0.00	RM15,000.00	RM0.00	₩-
7	Removal S.O	RM5,000.00	Prorated	RM5,000.00	RM0.00	RM5,000.00	RM0.00	
8	Maintain S.O.	RM15,000.00	Prorated	RM15,000.00	RM0.00	RM15,000.00	RM0.00	4
9	Progress Report	RM0.00	Prorated	RM5,000.00	RM0.00	RM5,000.00	RM0.00	1
10	Progress Report 1	RM1,000.00	Prorated	RM1,000.00	RM0.00	RM1,000.00	RM0.00	I

Figure 4.4 : Project Total Cost

4.3 Fixed Cost Accrual

Fixed Cost Accrual defines as how the payment is made for each activity. By default, Ms Project assigns the **Prorated Accrual** for **fixed costs. Start** or **End** method also can be used depending on contract requirement.

- Start Payment made at start of work
- Prorated Payment made according to work progress
- End Payment made at completion of work

Performance Bond	RM10,000.00	Prorated	RM10,000.00	RM0.00	RM10,000.00	RN
Est & remove S.O.	RM0.00	Prorated	RM20,000.00	RM0.00	RM20,000.00	RN
Establish S.O	RM15,000.00	Prorated 💌	RM15,000.00	RM0.00	RM15,000.00	RN
Removal S.O	RM5,000.00	Start	RM5,000.00	RM0.00	RM5,000.00	RN
Maintain S.O.	RM15,000.00	Prorated End	RM15,000.00	RM0.00	RM15,000.00	RM
Progress Report	RM0.00	Prorated	RM5,000.00	RM0.00	RM5,000.00	RI
Progress Report	RM1,000.00	Prorated	RM1,000.00	RM0.00	RM1,000.00	RM
1						

Figure 4.5 : Fixed Cost Accrual

4.4 Changing Currency Symbol (in Malaysia Ringgit ,MYR)

Steps to change currency symbol :

- 1. Click File ribbon
- 2. Click Options



Figure 4.6 : Changing Currency Symbol

- 3. Select Display
- 4. Click inverted arrow in Currency field to select MYR

Jeline	Project Options	? <mark>- ×</mark>	
9	General Display	Change how Project content is displayed on the screen.]
	Schedule	Calendar	
	Proofing 3	Calendar Type: Gregorian Calendar	
	Save	Currency options for this project: BGN_Membina 2 Blok Banguna 💌	
	Language	Sumboli S Decimal digity 2	
	Advanced		
	Customize Ribbon		
	Quick Access Toolbar	Show indicators and options buttons for:	
	Add-Ins	Resource <u>a</u> ssignments Edits to <u>w</u> ork MAD ation	
	Trust Center	Edits to start and finish dates Image: Book of the start and finish dates Image: Book of the start and finish dates Image: Book of the start and finish dates Image: Book of the start and finish dates	
	hase center	Show these elements: MOP	
		Entry <u>b</u> ar MVR	
		MYR	
Е		NIO	

Figure 4.7 : Changing Currency Symbol

5. Click OK

Project Options			8 22
General	Change how Project content is displayed	on the screen.	
Schedule	Calendar		
Proofing	Calendar Type: Gregorian Calendar 💌		
Save Language	Currency options for this project: BGN - Membi	na 2 Blok Bangu 💌	
Advanced	Symbol: RM Decimal dig Placement: RM1 Currency:	jits: 2 NYR	•
Customize Ribbon Quick Access Toolbar	Show indicators and options buttons for:		
Add-Ins	Image: Resource assignments Image: Edits to get and finish dates Image: Edits to start and finish dates Image: Deletion	<u>w</u> ork, units, or duration ns in the Na <u>m</u> e columns	
Trust Center	Show these elements:		_
	Entry <u>b</u> ar	5	
		OK	Cancel

Figure 4.8 : Currency Change to MYR

4.5 S-Curve

S-Curve is used to track the progress of a project visually over time and form a historical record of what has happened to date.

Analysis of S-Curve allow project managers to quickly identify project growth, slippage and potential problems that could adversely impact the project if no remedial action is taken.

4.5.1 Financial S-Curve

- This Financial S-Curve is derived from the cost perform based on duration
 - Work cost (RM) vs Project Duration (Months)
- Report of financial work progress shall be based on the Financial S-Curve.

4.5.2 Physical S-Curve

- Physical S-Curve is derived from % complete which is based on duration.
 - Works Duration (days) vs Project Duration (Months)
- Report of physical work progress shall be based on the Physical S-Curve.

4.5.3 Perform S-Curve

There are two (2) methods to perform S-Curve.

- i. Visual Report
- ii. Task Usage

4.5.3.1 Perform Financial S-Curve Using Visual Report

Visual report can perform S-Curve only in **Week** (limitation for Ms Project 2010).

Steps to perform Financial S-Curve using Visual Report :

- 1. Click **Project** ribbon
- 2. Click Visual Reports in Reports group

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	File	Task	Res	ource	Pro	oject	View	Format											
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	2		9		11	D	roiek M	lula		0 dave		Sat 1/6	/12	Sat 1	/6/12		Pivot)iagram	c in Mi

Figure 4.9 : Perform Financial S-Curve Using Visual Reports

- 3. Select Cash Flow Report in All field
- 4. Click Inverted arrow to select Weeks in Select level of usage data to include in report field
- 5. Click View

Visual Reports - Create Report	X
Select Template Show report templates created in: Microsoft Excel Microsoft Visio Task Summary Resource Summary Assignment Summary All Task Usage Resource Usage Assignment Usage Baseline Cost Report Baseline Report (Metric) Baseline Report (US) Baseline Work Report Budget Cost Report Cash Flow Report Cash Flow Report (Metric) Critical Tasks Status Report (US) Critical Tasks Status Report (Metric) Critical Tasks Status Report (Metr	New Template Edit Template Manage Template Sample Image Template Image Template Image Template Sample Image Template Image Template
Help Save Data	5 Vie <u>w</u> <u>C</u> lose

Figure 4.10 : Perform Financial S-Curve Using Visual Reports

Ms Project will export the financial data into Ms Excel format as shown in Figure 4.11 below.

Steps to change quarter year view to week view :

- 1. Click Task Usage
- 2. Open summary button for each quarter (+Q) to show S-Curve in week view
- 3. Click Chart1







2014



Financial S-Curve in week view will be shown as below.

Figure 4.12 : Financial S-Curve in Week View

Steps to change word alignment :

- 1. Right click at X-Axis title description
- 2. Click Format Axis
- 3. Click Alignment in Format Axis field
- 4. Select type of Vertical alignment or Text direction in Text Layout field
- 5. Click Close



Figure 4.13 : Setting Alignment of X-Axis Title Description

Weekly Financial S-Curve and cash flow for entire project will be shown as below.



Figure 4.14 : Financial S-Curve

4.5.3.2 Perform Financial S-Curve Using Task Usage

Task Usage can be used to perform monthly S-Curve.

Steps to perform Financial S-Curve using Task Usage :

- 1. Click Gantt Chart in Task Views group
- 2. Click Task Usage

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L	R	lesource <u>U</u> sag	je		1.2.1	Perf	ormano	ce Bond	5 days		Sun 2/	6/13	Sun 9/6/1	3	2			
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L	R	esource Gran	h		.2.1	E	stablish	S.O	5 days		Mon 1	0/6/13	Sun 16/6/	13	4			
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Ľ		as <u>k</u> Usage 🥖			1.2.3	Mai	ntain S.	0.	91 days		Mon 1	7/6/13	Tue 29/10	/13	6			

Figure 4.15 : Perform Financial S-Curve Using Task Usage

- 3. Right click at any cell in the task usage table.
- 4. Click **Detail Styles** in dialogue box.

Gantt Chart • View	Paste Clipboa	Calib	$\begin{array}{c c} \mathbf{r} & \mathbf{r} & 11 & \mathbf{r} & 0 \\ \mathbf{r} & \mathbf{U} & 0 & \mathbf{r} & \mathbf{A} \\ \mathbf{Font} & \mathbf{r} \\ \mathbf{r} & \mathbf{r} \\ \mathbf{r} \\ \mathbf{r} \\ \mathbf{r} \\ \mathbf{r} \\ \mathbf{r} \end{array}$	50× 75× 100×	₹ Mark Resp ← Inact edule	con track * eect Links tivate	Manual Schedu	ly Auto Schedule Tasks	Wove *	Task	nsert	Information Properties	Scro Scro to Ta	offit v v 2 v pll isk 9 v diting
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23	1	3	😑 Kerja Tanah	1,272 hrs	53 days	Work								
			Earthwork Tean	1,272 hrs		Work					2_	Detail <u>S</u> tyles	<	4
24	1 - C	3	Kerja Struktur	960 hrs	30 days	Work		32h	32h	32h		Work		
			Structure Team	960 hrs		Work		32h	32h	32h		Actual Work		
25	1	3	Kerja Arkitek	688 hrs	43 days	Work		16h	16h	16h		Cumulative)	Work	
			Architectural Te	688 hrs		Work		16h	16h	16h		Baseline Wo	rk	
26	1	3	Kerja M+E	672 hrs	28 days	Work		24h	24h	24h		Cort		
			M&E Team	672 hrs		Work		24h	24h	24h		Cost Advertigent		
27	1	3	Completion of Cable L	0 hrs	0 days	Work						Actual Cost		
28		3	TnC	0 hrs	5 days	Work		Dia	ht olio			Show Timeli	ne	
29		3	Projek Siap	0 hrs	0 days	Work		i <mark>rtig</mark>		'n		Show Split		
						Work		Ĺ			1			
						Work								

Figure 4.16 : Perform Financial S-Curve Using Task Usage

- Click inverted arrow to select Cost and Cummulative Cost in Available fields field
- 6. Click Show; Cost and Cummulative Cost will be shown in Show these fields field
- 7. Click OK

	⁼ Blok B	3,592 hrs 97 days	Work	72h	72h	72h	40h	
2	Detail Styles	5	14/				x	
3	- Usage Details Usage P	Properties	6					
2	Available fields: Budget Cost Budget Work	I		Show these fields: Cost Cumulative Cost		^	_	
2	CPI Cumulative Percent Co Cumulative Work CV	mplete	<< <u>H</u> ide			1	Aove	
	C CV% T Field settings for Cum	ulative Cost				Ŧ		L
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	Pattern:		•		7			
					СК	Ca	ncel	

Figure 4.17 : Perform Financial S-Curve Using Task Usage

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			_				Cum. Cost	RM1,228,670.97	RM1,263,431.87	RM1,298,192.78	RM1,332,953.68	RM	
	2		₽	Projek Mula	0 hrs	0 days	Cost						
							Cum. Cost	t					
	3		\$	Preliminari	0 hrs	102 days	Cost		RM164.84	RM164.84	RM164.84		
							Cum. Cost	t RM37,230.77	RM37,395.60	RM37,560.44	RM37,725.27	F	
	4		3	Performance Bond	0 hrs	5 days	Cost						
							Cum. Cost	RM10,000.00	RM10,000.00	RM10,000.00	RM10,000.00	F	
	5		3	Est & remove S.O.	0 hrs	97 days	Cost						
							Cum. Cost	RM15,000.00	RM15,000.00	RM15,000.00	RM15,000.00	F	
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	8		3	Maintain S.O.	0 hrs	91 days	Cost		RM164.84	RM164.84	RM164.84		
							Cum. Cost	RM9,230.77	RM9,395.60	RM9,560.44	RM9,725.27		
	9	O (3	Progress Report	0 hrs	83 days	Cost						
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Figure 4.18 : Cost & Cummulative Cost Table

Steps to change timescale :

- 1. Right click at any cell in the calendar area.
- 2. Click **Timescale**

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							Cum. Cost	RM	10,000.00	RM10,00	00.00	RM10,000.0	0 RM1	0,000

Figure 4.19 : Changing Timescale

- 3. Click Middle Tier in Timescale field
- 4. Click Inverted arrow to select Years in Units field

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Figure 4.20 : Changing Timescale

- 5. Click Bottom Tier in Timescale field
- 6. Click Inverted arrow to select Months in Units field
- 7. Click OK

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Figure 4.21 : Changing Timescale

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				Cum. Cost	RM150,020.32	RM484,337.70	RM1,031,024.46	RM1,660,178.76	RM2,000,000.00	
	5	Projek Mula	hrs	Cost						
				Cum. Cost						
	3	Preliminari	hrs	Cost	RM27,648.35	RM4,626.37	RM4,131.87	RM4,461.54	RM9,131.87	
				Cum. Cost	RM27,648.35	RM32,274.73	RM36,406.59	RM40,868.13	RM50,000.00	
	3	Performance Bond	d hrs	Cost	RM10,000.00					
				Cum. Cost	RM10,000.00	RM10,000.00	RM10,000.00	RM10,000.00	RM10,000.00	
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Figure 4.22 : Cost & Cummulative Cost Table

Steps to copy data from Ms Project to Ms Excel :

- 1. Click Task ribbon.
- 2. Highlight **Cost and Cumulative Cost** at project duration time of range.
- 3. Click Copy in Clipboard group.

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Figure 4.23 : Copy Data From Ms Project

4. Open new Ms Excel file, and click Paste.

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Steps to plot S-Curve in Ms Excel:

- 1. Type in Cost and Cumulative Cost to show Y-Axis title description
- 2. Type in project duration in Month to show X-Axis title description

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Figure 4.25 : Inserting Y-Axis and X-Axis Title Description

- 3. Highlight all data
- 4. Click Insert ribbon
- 5. Click Line in Charts group
- 6. Select any type of line graph

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Monthly Financial S-Curve wil be plotted as shown below.



Figure 4.27 : Financial S-Curve

Steps to change type of graph:

- 1. Right Click at Cost line
- 2. Click Change Series Chart Type





- 3. Select chart type in Column field
- 4. Click OK

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Figure 4.29 : Changing Chart Type

Steps to add data labels :

- 1. Right Click at Cumulative Cost line
- 2. Click Add Data Labels







Figure 4.31 : Monthly Financial S-Curve and Cash Flow
4.5.3.3 Perform Physical S-Curve Using Task Usage

Physical S-Curve can be plotted using Task Usage only. Ms Excel is used to plot the S-Curve graph by using data created from MsProject.

Steps to perform Physical S-Curve using Task Usage :

- 1. Click Gantt Chart in Task Views group
- 2. Click View ribbon
- 3. Click inverted arrow on Tables in Data group
- 4. Select Tracking



Figure 4.32 : Perform Physical S-Curve Using Task Usage

5. Key in **100** in **% Comp** column (at the project name level)

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Figure 4.33 : Key In 100% in % Comp Column

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Figure 4.34 : Table Tracking With 100% complete

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Figure 4.35 : Table Tracking With 100% complete

- 7. Right click at any cell in the task usage table
- 8. Click **Detail Styles** in dialogue box

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Figure 4.36 : Perform Physical S-Curve Using Task Usage

- Click inverted arrow to select Percent Complete and Cumulative
 Percent Complete in Available fields field
- 10. Click Show; Percent Complete and Cumulative Percent Complete will be shown in Show these fields field
- 11. Click **OK**

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Figure 4.37 : Perform Physical S-Curve Using Task Usage

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Figure 4.38 : Percent Complete & Cumulative Percent CompleteTable

Steps to change timescale :

Repeat steps as per Financial S-Curve procedure as shown in Figure 4.19 to Figure 4.21. The monthly physical progress data will be shown as figure below.

F	ile	Task	Resourc	e Project	View	F	ormat									۵
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	Task	Task Views Resource Views			/5		Da	ta		Zoom		S	plit View		Vindow	Macros
	1 Task → Task Name Mode			Task Name		-	Work 🚽	Duration	Detai	ls	Maria	t un	L. L.	A	0	0-1
	Mode				May	Jun	Jul	Aug	Sep	Oct						
	1	\checkmark	3	Membina	2 Blok Bang	guna	6,600 hrs	102 day	% Co	mplete	(0% 12%	6 19%	21%	27%	20%
									Cum	. % Complete	(0% 12%	6 31%	52%	80%	100%
	2	\checkmark	₽	Projek N	Лula		0 hrs	0 days	% Co	mplete	(0% 0%	6			
									Cum	. % Complete	100	0% 100%	6			
	3	\checkmark	3	Prelimit	nari		0 hrs	102 day:	% Co	mplete		19%	6 21%	18%	20%	20%
									Cum	. % Complete		19%	41%	59%	80%	100%
	4	\checkmark	₽	Perfo	rmance Bo	nd	0 hrs	5 days	% Co	mplete		100%	6			

Figure 4.39 : % Complete & Cumulative % Complete Table

Steps to copy data from MsProject to Ms Excel :

Repeat steps as per Financial S-Curve procedure as shown in Figure 4.23 and Figure 4.24 to export monthly physical progress data from Ms Project to Ms Excel.

Steps to plot S-Curve in Ms Excel :

- 1. Type in **% Complete** and **Cumulative % Complete** to show Y-Axis title description
- 2. Type in project duration in **Month** to show X-Axis title description

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3					Jun	Julai	Ogos	September	Oktober		
4			% com	plete	12%	19%	21%	27%	20%		
5			Cumm.	. % complete	12%	31%	52%	80%	100%		

Figure 4.40 : Inserting Y-Axis and X-Axis Title Description

Repeat steps from Figure 4.26 to Figure 4.30 to plot the Monthly Physical S-Curve and Cash Flow for the entire project.

The final Monthly Physical S-Curve and Cash Flow for the entire project is as shown below.



Figure 4.41 : Monthly Physical S-Curve and Cash Flow

4.6 Saving File for S.O Approval

This file shall be save and submit to S.O. for approval.

Steps to save file :

1. On Ms Project file, click Gantt Chart in Task Views group

1											
File lask Resource Pro	ject View Acro	bat F	ormat								
📑 📑 Network Diagram 🔻	Resour	ce Usage 🔻		Þ	💋 Highlight: [No High	nlight] 🔹	Timescale:	Q	=0		Timeline
Gantt Task	Team	ce Sheet 🔻	Z↓ □ − Sort Outline Ta	bles	Y Filter: [No Filte	r] *	Months	Zoor	m Entire	Selected	Details
Chart 🛛 Usage 🖌 🛗 Other Views 🔻	Planner 👻 🗒 Other \	/iews ▼	v v	٣	Group by: [No Grou	nb] 🔒		*	Project	Tasks	
Task Views	Resource Vie	WS			Data			Zoon	n		Split
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corresponding to the task					Cum. % Complete		12%	31%	52%	809	6 100%
durations on the other side of the view.	ojek Mula	0 days	Sat 01 06 13		% Complete		100%				
					Cum, % Complete		100%				

Figure 4.42 : Saving File

2. Key in **0** in **% Comp.** column (at the project name level)

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	3	Preliminari	Sun 02 06 13	Wed 30 10 13	100%	0%	102 days	0 days	\$50,000.	00
	4	Performance Bond	Sun 02 06 13	Sun 09 06 13	100%	0%	5 days	0 days	\$10,000.	00
	5	Est & remove S	Mon 10 06 13	Wed 30 10 13	100%	0%	97 days	0 days	\$20,000.	00
	6	Establish S.C	Mon 10 06 13	Sun 16 06 13	100%	0%	5 days	0 days	\$15,000.	00
	7		T 004040		4000/	00/	0.1	0.1	Å5.000	

Figure 4.43 : Saving File

- 3. Click View ribbon
- 4. Click inverted arrow on Tables in Data group

٦

5. Select Entry

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File		Task Resource Pr	oject View	Acrobat	Format			4			
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		S.O						Usa <u>q</u> e			
	8	Maintain S.O.	NA	NA	0%	0%	5	Reset to Default		\$0.00	
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	12	Progress Rep	NA	NA	0%	0%		0 days	1 day	\$0.00	
	13	Progress Rep	NA	NA	0%	0%		0 days	1 day	\$0.00	

Figure 4.44 : Saving File

6. Click File ribbon

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			7								
	5		3	1.2.2	Est & remove S.O.	97 days	Mon 10 06 13	Wed 30 10 13			
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1	9	0	3	1.2.4	Progress Report	83 days	Sun 23 06 13	Wed 23 10 13			
3	10		3	1.2.4.1	Progress Report 1	1 day	Sun 23 06 13	Sun 23 06 13			
1	11		-	1.2.4.2	Progress Report 2	1 day	Tue 23 07 13	Tue 23 07 13			
1	12		-	1.2.4.3	Progress Report 3	1 day	Sun 25 08 13	Sun 25 08 13			
1	13		3	1.2.4.4	Progress Report 4	1 day	Mon 23 09 13	Mon 23 09 13			
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	19	1	2	1.5.2	Kerja Struktur	33 days	Thu 18 07 13	Wed 04 09 13	18FS-15 days		
	20	1	3	1.5.3	Kerja Arkitek	43 days	Thu 22 08 13	Thu 24 10 13	19FS-10 days	Architectural lear	3]
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Figure 4.45 : Saving File

7. Click Save



Figure 4.46 : File Saved

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CHAPTER 5

MONITORING & CONTROL

- 5.1 Project Monitoring
- 5.2 Project Control

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5 MONITORING AND CONTROL

5.1 **Project Monitoring**

Project equilibrium consists of time, cost & quality. In project scheduling, project cost and schedule are the primary focus of progress measurement.

There are six (6) steps involved in project monitoring:

- i. Set Baseline
- ii. Determine Status Date
- iii. Update Scheduled Progress
- iv. Track Actual Progress Tracking
- v. Identify Variances
- vi. Take Action

5.1.1 Set Baseline

A baseline program is the approved plan used as the basis to measure the actual work performance. Baselines used in monitoring are:

- i. Baseline Start Date
- ii. Baseline Finish Date
- iii. Baseline Duration
- iv. Baseline Cost
- v. Baseline Resources

The first baseline program is set from the **Initial Work Program** as approved by the S.O.

2014

Steps to set baseline from Initial Work Program:

Open Initial Work Program file.

- 1. Click View ribbon
- 2. Click Table in Data group
- 3. Select Entry to view default entry table

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	4		1.2.1	2	Performance Bon	d	5 days		Variance	5/ 1 3	📥
	5		1.2.2	2	Est. & Remove S	S.O	97 day		Work	0/10/13	
	6		1.2.2.1	3	Establish S.O		5 days		WORK C	/6/13	•
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	13		1.2.4.4	3	Progress Repo	rt 4	2 days		Wed 25/9/13 Thu:	26/9/13	

Figure 5.1: Selecting Entry Table

- 4. Click Project ribbon
- 5. Click Set Baseline in Schedule group
- 6. Select Set Baseline



Figure 5.2: Selecting Baseline

Jabatan Kerja Raya Malaysia_JKR 29300-0015-14 5-110

- 7. Select Set baseline radio button in Set Baseline dialogue box
- 8. Click inverted arrow to select Baseline
- 9. Select Entire project radio button
- 10. Click **OK**



Figure 5.3: Creating Baseline

- 11. Click View ribbon
- 12. Click Gantt Chart in Tasks Views group
- 13. Select Tracking Gantt to view default tracking table





Tracking Gantt Chart with baseline bars will be displayed as shown below.



Figure 5.5 : Tracking Gantt Chart

Steps to save baseline file as Accepted Work Program:

1. Click File ribbon

2. Click S	Save As					
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File Task	Resource Project	View Add-Ins	Format			
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Save & Send	Organizer		2		Schedule from	Star
					Current Date	Toda

Figure 5.6 : Saving Baseline File

HANDS-ON MANUAL

- 3. Type in project file name, refer to JKR File Naming Convention (Figure 2.12)
- 4. Click Save



Figure 5.7 : Naming Baseline File

5.1.2 Determine Status Date

Determining status date will ensure the generated scheduled physical and financial progress is current for progress reporting. Monthly tracking should be carried out at preferably the same date.

Steps to save accepted file as Updated Work Program:

On the Accepted Work Program file,

1. Click File ribbon



Figure 5.8 : Saving Updated File

HANDS-ON MANUAL

- 3. Type in project file name, refer to JKR File Naming Convention (Figure 2.12)
- 4. Click Save



Figure 5.9 : Naming Updated File

2014

Steps to Set Status Date:

- 1. Click **Project** ribbon
- 2. Click **Project Information** in the **Properties** group
- 3. Click inverted arrow in Status Date field
- 4. Determine and select the required Status Date In calendar
- 5. Click OK

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i	File	Task	Reso	ource	Project	View Add-Ins	Format						
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	8		1.2.3		All t	tasks begin as soon as possible.		Priority:	5	26	27 28 29 30	31 1	
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Figure 5.10 : Determining Status Date

Steps to show status date line in Gantt Bar:

- 1. Click Format ribbon
- 2. Click Gridlines in Format group
- 3. Click Gridlines

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3 1.2 🗟	Prelinimaries	102 days	Sun 2/6/13	Wed 30/10/13	
4 1.2.1 🗟	Performance Bond	5 days	Sun 2/6/13	Sun 9/6/13	
5 1.2.2 🗟	Est. & Remove S.O	97 days	Mon 10/6/13	Wed 30/10/13	
6 1.2.2.1 🗟	Establish S.O	5 days	Mon 10/6/13	Sun 16/6/13	

Figure 5.11 : Selecting Status Date Line in Gantt Bar

- 4. Select Status Date in the Line to change column
- 5. Select line Type
- 6. Select Color
- 7. Click OK



Figure 5.12 : Formatting Status Date Line in Gantt Bar

2014

Status Date Line will be as shown below.

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	13		1.2.4.4	1 🕏	Progress	Report 4	2 days	Wed 25/9/	/13 Thu 26/9/	13				C1.			4 - 1	:	
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	15		1.3	3	Land Acquisitio	n	0 days	Sat 1/6/13	Sat 1/6/13	3	+0-1/6								
	16		1.4	3	Services Reloc	ation	0 days	Sat 1/6/13	Sat 1/6/13	3	4 ∲1/6		L						
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antt	18	1	1.5.1	-	Kerja Tanah		42 days	Mon 10/6/1	13 Wed 7/8/	13)	D%				
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	23	1	1.6.1	-	Kerja Tanah		53 days	Mon 10/6/1	13 Mon 26/8/	13	i i i i i i i i i i i i i i i i i i i								
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	26	1	1.6.4	3	Kerja M&E		28 days	Wed 4/9/1	3 Mon 14/10	0/13					× *	¥		3 %	
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	28		1.8	3	T&C		5 days	Tue 22/10	/13 Mon 28/10)/13								Ě	0%
	29		1.9	3	Projek Siap		0 days	Wed 30/10	0/13 Wed 30/1	0/13								1	\$ 30/10

Figure 5.13: Status Date Line in Gantt Bar

5.1.3 Update Scheduled Progress

Updating scheduled progress will generate the progress of the project as planned corresponding to the status date.

Steps to Update Scheduled Progress:

- 1. Click View ribbon
- 2. Click Tables in Data group
- 3. Select Tracking to view default tracking table



Figure 5.14 : Selecting Tracking Table

2014

Default Tracking Table will be as shown below.

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	4	Performance Bond		NA	NA	0%	0%	0 days	5 days	\$0.0	0	È	0%							
	5	Est. & Remove S.	0	NA	NA	0%	0%	0 days	97 days	\$0.0	0		_	-			1		\rightarrow	P 0%
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	7	Romoval S.O		NA	NA	0%	0%	0 days	2 days	\$0.0	0								8	P ^{0%}
	8	Maintain S.O		NA	NA	0%	0%	0 days	91 days	\$0.0	0							-		0%
	9	Progress Report		NA	NA	0%	0%	0 days	84 days	\$0.0	0			🕲 ^{0%}	S> 09	• •	0%	≫ 0%	۵	0%
	10	Progress Report	1	NA	NA	0%	0%	0 days	2 days	\$0.0	0			8 0%						
	11	Progress Report	2	NA	NA	0%	0%	0 days	2 days	\$0.0	0				8 09					
	12	Progress Report	3	NA	NA	0%	0%	0 days	2 days	\$0.0	0					8	0%			
	13	Progress Report	4	NA	NA	0%	0%	0 days	2 days	\$0.0	0							8 0%		
	14	Progress Report	5	NA	NA	0%	0%	0 days	2 days	\$0.0	0								8	0%
	15	Land Acquisition		NA	NA	0%	0%	0 days	0 days	\$0.0	0	+\$ 1/6								
	16	Services Relocation		NA	NA	0%	0%	0 days	0 days	\$0.0	0	+\$ 1/6								
	17	Blok A		NA	NA	0%	0%	0 days	93 days	\$0.0	0	9		-					——————————————————————————————————————	*
ntt	18	Kerja Tanah		NA	NA	0%	0%	0 days	42 days	\$0.0	0					B) ^{0%}				
ğ	19	Kerja Struktur		NA	NA	0%	0%	0 days	33 days	\$0.0	0				¥		<u>₩</u> 0%			
ki,	20	Kerja Arkitek		NA	NA	0%	0%	0 days	43 days	\$0.0	0					*		-		4
Trac	21	Kerja M&E		NA	NA	0%	0%	0 days	32 days	\$0.0	0					9	E			
	22	Blok B		NA	NA	0%	0%	0 days	97 days	\$0.0	0	9	_	-			1			0%
	23	Kerja Tanah		NA	NA	0%	0%	0 days	53 days	\$0.0	0	2					0%			
	24	Kerja Struktur		NA	NA	0%	0%	0 days	30 days	\$0.0	0	_					^{0%}			
	25	Kerja Arkitek		NA	NA	0%	0%	0 days	43 days	\$0.0	0					*	-	-		- 0%
	26	Kerja M&E		NA	NA	0%	0%	0 days	28 days	\$0.0	0						¥			
	27	Completion of Cable L by TNB	aying	NA	NA	0%	0%	0 days	0 days	\$0.0	0								* @ 21	10
	28	T&C		NA	NA	0%	0%	0 days	5 days	\$0.0	0								Ě	0%
	29	Projek Siap		NA	NA	0%	0%	0 days	0 days	\$0.0	0								1	30/10
																	1	1		1

Figure 5.15 : Default Tracking Table

- 4. Click Project ribbon
- 5. Click Update Project in Status group
- 6. Select **Update work as complete through** radio button
- Select Set 0% 100% complete radio button to update progress according to percentage complete
- 8. Check the **Status Date** as required (ensure that the date is the predetermined status date)
- 9. Click OK

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										-
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Figure 5.16 : Updating Project Status

The updated project schedule progress (physical and financial) until 30.6.2013 is as shown below.

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	1	Membina 2 Blok Bangunan	Sat 1/6/13	NA	12%	0%	12.57 days	89.43 days	RM150,050.00		4.10		
	2	Projek Mula	Sat 1/6/13	Sat 1/6/13	100%	0%	0 days	0 days	RM0.00		ן יי		
	3	Prelinimaries	Sun 2/6/13	NA	19%	0%	19.86 days	82.14 days	RM27,650.00		-		
	4	Performance Bond	Sun 2/6/13	Sun 9/6/13	100%	0%	5 days	0 days	RM10,000.00		 1	100%	
	5	Est. & Remove S.O	Mon 10/6/13	NA	71%	0%	69.29 days	27.71 days	RM15,000.00		4		
	6	Establish S.O	Mon 10/6/13	Sun 16/6/13	100%	0%	5 days	0 days	RM15,000.00	. 1	80	100%	
	7	Romoval S.O	NA	NA	0%	0%	0 days	2 days	RM0.00	. [Ļ	
	8	Maintain S.O	Mon 17/6/13	NA	11%	0%	10 days	81 days	RM1,650.00				
	9	Progress Report	Tue 25/6/13	NA	20%	0%	16.8 days	67.2 days	RM1,000.00			10	0%
	10	Progress Report 1	Tue 25/6/13	Wed 26/6/13	100%	0%	2 days	0 days	RM1,000.00			10	0%
	11	Progress Report 2	NA	NA	0%	0%	0 days	2 days	RM0.00	. 1			
	12	Progress Report 3	NA	NA	0%	0%	0 days	2 days	RM0.00				
	13	Progress Report 4	NA	NA	0%	0%	0 days	2 days	RM0.00				
	14	Progress Report 5	NA	NA	0%	0%	0 days	2 days	RM0.00				
	15	Land Acquisition	Sat 1/6/13	Sat 1/6/13	100%	0%	0 days	0 days	RM0.00	•	-1/6		
	16	Services Relocation	Sat 1/6/13	Sat 1/6/13	100%	0%	0 days	0 days	RM0.00	•	-1/6		
	17	Blok A	Mon 10/6/13	NA	10%	0%	9.3 days	83.7 days	RM72,000.00				
ut	18	Kerja Tanah	Mon 10/6/13	NA	36%	0%	15 days	27 days	RM72,000.00			1	
ğ	19	Kerja Struktur	NA	NA	0%	0%	0 days	33 days	RM0.00				÷
kin	20	Kerja Arkitek	NA	NA	0%	0%	0 days	43 days	RM0.00				
Trac	21	Kerja M&E	NA	NA	0%	0%	0 days	32 days	RM0.00				
ľ.	22	Blok B	Mon 10/6/13	NA	10%	0%	9.45 days	87.55 days	RM50,400.00		•		
	23	Kerja Tanah	Mon 10/6/13	NA	28%	0%	15 days	38 days	RM50,400.00		, Ta		
	24	Kerja Struktur	NA	NA	0%	0%	0 days	30 days	RM0.00				
	25	Kerja Arkitek	NA	NA	0%	0%	0 days	43 days	RM0.00				
	26	Kerja M&E	NA	NA	0%	0%	0 days	28 days	RM0.00				
	27	Completion of Cable Laying by TNB	NA	NA	0%	0%	0 days	0 days	RM0.00				
	28	T&C	NA	NA	0%	0%	0 days	5 days	RM0.00				
	29	Projek Siap	NA	NA	0%	0%	0 days	0 days	RM0.00				

Figure 5.16 : Updated Project Schedule Progress

HANDS-ON MANUAL

By default, updated scheduled progress is shown in **% comp** and **actual cost** columns. Information in these column will be updated for actual progress tracking. Therefore, there is a need to create additional columns to store the scheduled progress information.

Steps to create additional column for Scheduled Progress (% Schedule):

- 1. Right Click on % Comp column
- 2. Select Insert Column to create a new column

🖪 🚽 🔊 र (भ र 🖃 BGN - Membina 2 Blok Bangunan - Updated Task Resource Project View Add-Ins Format 📲 Network Diagram [Resource Usage 🤊 A Zv 💋 Highlight: [No Highlight] 🔹 R. + HTT. 8 进 Calendar 🔻 🔣 Resource Sheet 🔻 Filter 1 Task Gantt Team Sort Ou rial - 11 Chart 🔻 Usage 👻 📇 Other Views 🔻 Planner 👻 📆 Other Views 🔻 Ŧ BII≣≣ = ۲. - A Task Views **Resource Views** Task Name Act. Start Phys % Rem. Act. Finish Act Dur Comp * Cut Membina 2 Blok Bangunan NA 12% 89.4 Sat 1/6/13 Þ Сору days 2 Projek Mula Sat 1/6/13 Sat 1/6/13 days 10 Ë. Paste 3 Prelinimaries Sun 2/6/13 NA days 82.1 Paste Special... 4 Performance Bond Sun 9/6/13 Sun 2/6/13 10 days Wrap Text 5 Est. & Remove S.O Mon 10/6/13 NA 27.7 ł 2 6 Insert Column Establish S.O Mon 10/6/13 Sun 16/6/13 10 7 Romoval S.O NA ¥ Hide Column NA days 8 Maintain S.O Mon 17/6/13 NA days 8 Font... A 9 Progress Report NA 67. Tue 25/6/13 days A Text Styles... 10 Progress Report 1 Tue 25/6/13 Wed 26/6/13 days 1(Field Settings 11 Progress Report 2 NA NA days Custom Fields 12 Progress Report 3 NA NA davs

Figure 5.17 : Inserting a New Column

3. Select **Text 1** to create a column with fix text property.

	Idsk views	Resource views		Data			20
	Task Name 👻	Act. Start	Act. Finish	task Calendar	Phys. % Comp. 🔻	Act. Dur. 🗸	Rem. Dur. 👻
1	Membina 2 Blok Bangunan	Sat 1/6/13	NA	Task Calendar		.57 days	89.43 days
2	Projek Mula	Sat 1/6/13	Sat 1/6/13	Task Calendar GUID Task Mode		0 days	0 days
3	Prelinimaries	Sun 2/6/13	NA	TCPI	-).86 days	82.14 days
4	Performance Bond	Sun 2/6/13	Sun 9/6/13	Text1 3		5 days	0 days
5	Est. & Remove S.O	Mon 10/6/13	NA	Text10).29 days	27.71 days
6	Establish S.O	Mon 10/6/13	Sun 16/6/13	Text12		5 days	0 days
7	Romoval S.O	NA	NA	Text13		0 days	2 days
8	Maintain S.O	Mon 17/6/13	NA	Text15		10 days	81 days



Text 1 column is created as shown below.

		Task Name	Act. Start	Act. Finish 🚽	Text1 🗸	% Comp. 🔻	Phys. % Comp.	Act. Dur. 👻	Rem. Dur. 🗸
	1	Membina 2 Blok Bangunan	Sat 1/6/13	NA		12%	0%	12.57 days	89.43 days
	2	Projek Mula	Sat 1/6/13	Sat 1/6/13		100%	0%	0 days	0 days
	3	Prelinimaries	Sun 2/6/13	NA		19%	0%	19.86 days	82.14 days
	4	Performance Bond	Sun 2/6/13	Sun 9/6/13		100%	0%	5 days	0 days
	5	Est. & Remove S.O	Mon 10/6/13	NA		71%	0%	69.29 days	27.71 days
	6	Establish S.O	Mon 10/6/13	Sun 16/6/13		100%	0%	5 days	0 days
	7	Romoval S.O	NA	NA		0%	0%	0 days	2 days
	8	Maintain S.O	Mon 17/6/13	NA		11%	0%	10 days	81 days
	9	Progress Report	Tue 25/6/13	NA		20%	0%	16.8 days	67.2 days
	10	Progress Report 1	Tue 25/6/13	Wed 26/6/13		100%	0%	2 days	0 days
	11	Progress Report 2	NA	NA		0%	0%	0 days	2 days
	12	Progress Report 3	NA	NA		0%	0%	0 days	2 days
	13	Progress Report 4	NA	NA		0%	0%	0 days	2 days
	14	Progress Report 5	NA	NA		0%	0%	0 days	2 days
	15	Land Acquisition	Sat 1/6/13	Sat 1/6/13		100%	0%	0 days	0 days
	16	Services Relocation	Sat 1/6/13	Sat 1/6/13		100%	0%	0 days	0 days
	17	Blok A	Mon 10/6/13	NA		10%	0%	9.3 days	83.7 days
IJ	18	Kerja Tanah	Mon 10/6/13	NA		36%	0%	15 days	27 days
Ga	19	Kerja Struktur	NA	NA		0%	0%	0 days	33 days
ång	20	Kerja Arkitek	NA	NA		0%	0%	0 days	43 days

Figure 5.19 :	Created	Text 1	Column
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- 4. Right Click on **Text 1**
- 5. Select Field Settings to name the column title

Gi	antt art • U	Task Vetwork Diagram *	Team Planner	Resource Usag Control Resource Shee Control Control Control Resource Views Act. Start	er * A · · · · · · · · · · · · · · · · · ·	4 VB Text1	Highlight: [No Filter: [No 11 I = = = 3 % Phys. %	Highlight] Filter] • Act. [v Tim v [15] v Dur. v	escale: Days v Zo Rem. Dur. v
	1	Membina 2 Blok Ban	gunan	Sat 1/6/13	N/	× 🎽	Cu <u>t</u>	12.5	7 days	89.43 days
	2	Projek Mula		Sat 1/6/13	Sat 1/6/13	3	Copy		0 days	0 days
	3	Prelinimaries		Sun 2/6/13	N/	N 🔲 📇	<u>P</u> aste	19.8	6 days	82.14 days
	4	Performance Bor	nd	Sun 2/6/13	Sun 9/6/13	3	Paste <u>S</u> pecial		5 days	0 days
	5	Est. & Remove	s.o	Mon 10/6/13	N/	N 🗖 📑	Wrap Text	69.2	9 days	27.71 days
	6	Establish S.O		Mon 10/6/13	Sun 16/6/13	3 u.u	Insert Column		5 days	0 days
	7	Romoval S.O		NA	NA	۹ ۲	Hide Column		0 days	2 days
	8	Maintain S.O		Mon 17/6/13	NA			1	0 days	81 days
	9	Progress Report	t	Tue 25/6/13	N/	A	<u>F</u> ont	16.	8 days	67.2 days
	10	Progress Repo	ort 1	Tue 25/6/13	Wed 26/6/13	B 🗛	Text Styles		2 days	0 days
	11	Progress Repo	ort 2	NA	NA	A 🛛 🔛	Field Settings	5) days	2 days
	12	Progress Repo	ort 3	NA	NA	A	Custom Fiel <u>d</u> s		D days	2 days
	13	Progress Repo	ort 4	NA	NA	۹ 🗖	<u>D</u> ata Type →		0 days	2 days
	14	Progress Repo	ort 5	NA	N	A	0% 0%		0 days	2 days

Figure 5.20 : Formatting Field Settings

- 6. Key in "% Schedule" in **Title** field in **Field Settings** text box
- 7. Select Centre in Align title field
- 8. Select **Right** in **Align data** field
- 9. Click **Best Fit**

	Task Name		✓ Act. Start	▼ Act. Fir	iish 🗸	% Schedule 💂	% Comp. 🔻	Phys. % Comp. 🕶
1	Membina 2 Blo	<u>k Banguna</u>	n Sat 1/6	5/13	NA		12%	0%
2	Projek Mula	Field Setting	5			—	100%	0%
3	Prelinimaries	Field name:	Text1				19%	0%
4	Performan	Tules	N Colordada	6	<u> </u>		100%	0%
5	Est. & Rer	litte:	% Schedule		7		71%	0%
6	Establist	<u>A</u> lign title:	Center			–	100%	0%
7	Romova	Align <u>d</u> ata:	Right		8	-	0%	0%
8	Maintain S.	Width:	14 🌲	√ <u>H</u> ea	der Text V	Vrapping	11%	0%
9	Progress						20%	0%
10	Progress	9	<u>B</u> est Fit	ОК	Ci	ancel	100%	0%
11	Progress	s Report 2		NA	NA		0%	0%
12	Progress	Report 3		ΝΔ	MΔ		0%	0%

Figure 5.21 : Formatting of Field Settings

The "% Schedule" column is created as shown below.

		Task Name	Act. Start	Act. Finish	% Schedule 🗸	% Comp. 🔻	Phys. % Comp.	Act. Dur. 👻	Rem. Dur. 👻
	1	Membina 2 Blok Bangunan	Sat 1/6/13	N/		12%	0%	12.57 days	89.43 days
	2	Projek Mula	Sat 1/6/13	Sat 1/6/13		100%	0%	0 days	0 days
	3	Prelinimaries	Sun 2/6/13	N/		19%	0%	19.86 days	82.14 days
	4	Performance Bond	Sun 2/6/13	Sun 9/6/13		100%	0%	5 days	0 days
	5	Est. & Remove S.O	Mon 10/6/13	N/		71%	0%	69.29 days	27.71 days
	6	Establish S.O	Mon 10/6/13	Sun 16/6/13		100%	0%	5 days	0 days
	7	Romoval S.O	NA	N/		0%	0%	0 days	2 days
	8	Maintain S.O	Mon 17/6/13	N/		11%	0%	10 days	81 days
	9	Progress Report	Tue 25/6/13	N/		20%	0%	16.8 days	67.2 days
	10	Progress Report 1	Tue 25/6/13	Wed 26/6/13		100%	0%	2 days	0 days
	11	Progress Report 2	NA	N/		0%	0%	0 days	2 days
	12	Progress Report 3	NA	N/		0%	0%	0 days	2 days
	13	Progress Report 4	NA	N/		0%	0%	0 days	2 days
	14	Progress Report 5	NA	N/		0%	0%	0 days	2 days
	15	Land Acquisition	Sat 1/6/13	Sat 1/6/13		100%	0%	0 days	0 days
	16	Services Relocation	Sat 1/6/13	Sat 1/6/13		100%	0%	0 days	0 days
	17	Blok A	Mon 10/6/13	N/		10%	0%	9.3 days	83.7 days
Ħ	18	Kerja Tanah	Mon 10/6/13	N/		36%	0%	15 days	27 days
ğ	19	Kerja Struktur	NA	N/		0%	0%	0 days	33 days
ki,	20	Kerja Arkitek	NA	N/		0%	0%	0 days	43 days
Itac	21	Kerja M&E	NA	N/		0%	0%	0 days	32 days
	22	Blok B	Mon 10/6/13	N/		10%	0%	9.45 days	87.55 days
	23	Kerja Tanah	Mon 10/6/13	N/		28%	0%	15 days	38 days
	24	Kerja Struktur	NA	N/		0%	0%	0 days	30 days
	25	Kerja Arkitek	NA	N/		0%	0%	0 days	43 days
	26	Kerja M&E	NA	N/		0%	0%	0 days	28 days
	27	Completion of Cable Laying by TNB	NA	N4		0%	0%	0 days	0 days
	28	T&C	NA	NA		0%	0%	0 days	5 days
	29	Projek Siap	NA	N/		0%	0%	0 days	0 days

Figure 5.22 : Created % Schedule Column

- 10. Right Click on % Comp column
- 11. Select **Copy** to transfer data to new column (ensure all tasks and sub tasks are shown before copying)

P	🛃 🗳 ▼ (°4 ▼ ₹				Gantt Chart Tool	s BGN - Memł	bina 2 Blok I	Bangunan - Updat	ed - 01 - 20
I	File	Task Resource Project	View	Add-Ins	Format				
Ga	Gantt Calendar × Task Chart × Usage × Other Views × Task Views		Team anner + E	Resource Usage * Content of the second seco		rtline Tal	Highlight: Filter: Jup Aria	[No Highlight] × [No Filter] × I × 11	Timescale [15] Days
		Task Name	•	Act. Start	Act. Finish	% Schedule	% Comp		t. Dur.
	1	Membina 2 Blok Bangu	nan	Sat 1/6/13	N/	λ	12%	Conv	11 5
	2	Projek Mula		Sat 1/6/13	Sat 1/6/13	3	10 🔚	Deate	s
	3	Prelinimaries		Sun 2/6/13	NA	A	1	Paste	i days
	4	Performance Bond		Sun 2/6/13	Sun 9/6/13	3	10	Paste <u>S</u> pecial	i days
	5	Est. & Remove S.C) IV	lon 10/6/13	NA	۱	7 📑	Wrap Text) days
	6	Establish S.O	Ν	lon 10/6/13	Sun 16/6/13	3	1C 🖳	Insert Column	5 days
	7	Romoval S.O		NA	NA	4		Hide Column) days
	8	Maintain S.O	Ν	lon 17/6/13	NA	4	1) days
	9	Progress Report	1	ue 25/6/13	NA	۱	2 A	<u>F</u> ont) days
	10	Progress Report 1	1	Fue 25/6/13	Wed 26/6/13	3	10 🐴	Text Styles	2 days
	11	Progress Report 2	2	NA	NA	4		Field Settings) days
	12	Progress Report 3	3	NA	NA	4		Custom Fiel <u>d</u> s) days

Figure 5.23 : Selecting % Comp Data

- 12. Right Click on % Schedule column
- 13. Select Paste to insert data

P	<u>]</u> , , , , , , , , , , , , , , , , , , 			Gantt Chart Tools		BGN - Me	embina 2 Blok B	angunan - L	Jpdated - 01 - 20
	File	Task Resource Proje	ect View	Add-Ins	Format				
		📑 Network Diagram 🔻		Resource Usa	ge 🖌 🔥 🕂	L 🖦	💋 Highlight:	[No Highligh	t] * Timescale:
ų		💻 🔳 Calendar 🛪		🛃 Resource She	et - Z		V Filter	No Filter	* [15] Days
C	antt hart ≖	Task Usage + 🔜 Other Views +	Planner 🛪 🖥	🙎 Other Views 👻	· ^s 11	Tat Aria	- 1	1 -	-
		Task Views	Re	source Views		B	I ≣ ≣ ≡	🔕 - <u>A</u>	-
		Task Name		Act. Start	Act. Finish	% Schedule	%	Phys. %	Act. Dur.
			· ·	•	*	¥	Cu <u>t</u>	mp. 🎽	•
	1	1 E Membina 2 Blok Banguna		Sat 1/6/13	NA		<u>С</u> ору	2/2	12.57 days
	2	Projek Mula		Sat 1/6/13	Sat 1/6/13		Paste	13	0 days
	3	Prelinimaries		Sun 2/6/13	NA		Paste Special.		19.86 days
	4	Performance Bon	d	Sun 2/6/13	Sun 9/6/13			%	5 days
	5	Est. & Remove S	S.O	Mon 10/6/13	NA		<u>W</u> rap Text	%	69.29 days
	6	Establish S.O		Mon 10/6/13	Sun 16/6/13	1	Insert <u>C</u> olumn	%	5 days
	7	Romoval S.O		NA	NA	₩۲	<u>H</u> ide Column	%	0 days
	8	Maintain S.O		Mon 17/6/13	NA	Δ	Font	%	10 days
	9	Progress Report	t	Tue 25/6/13	NA	A	Text Styles	%	16.8 days
	10	Progress Repo	rt 1	Tue 25/6/13	Wed 26/6/13	7A	Text Styles	%	2 days
	11	Progress Repo	rt 2	NA	NA		Field Settings	%	0 days
	12	Progress Repo	rt 3	NA	NA		Custom Fiel <u>d</u> s	%	0 days

Figure 5.24 : Inserting % Schedule Data

The % Schedule data is as shown below.

P		9 - (≅ - -		Gantt Chart Tools	BGN - Memb	ina 2 Blok I	Bangunan -	Updated - 01 - 20
I	ile	Task Resource Project Vi	ew Add-Ins	Format				
		📑 📲 Network Diagram 👻	Resource Usa	ge ∗ Al +	L 🖦 💋	Highlight:	[No Highlig	ht] - Timescale
ų		Calendar -	Resource She	et - Ž↓ –	- =	Filter:	[No Filter]	 [15] Days
Ga	intt	Task Team	- 📴 Other Views	Sort Out	line Tables	Group by:	[No Group]	*
Chi		Task Views	Resource Views		Da	ata	[
		Task Name	Act. Start	Act. Finish	% Schedule	%	Phys. %	Act. Dur.
		•	*	*	· ·	Comp. 👗	Comp.	*
	1	Membina 2 Blok Bangunan	Sat 1/6/13	L C C C C C C C C C C C C C C C C C C C	12%	12%	0%	12.57 days
	2	Projek Mula	Sat 1/6/13	Sat 1/6/13	100%	100%	0%	0 days
	3	Prelinimaries	Sun 2/6/13	NA	19%	19%	0%	19.86 days
	4	Performance Bond	Sun 2/6/13	Sun 9/6/13	100%	100%	0%	5 days
	5	Est. & Remove S.O	Mon 10/6/13	NA	71%	71%	0%	69.29 days
	6	Establish S.O	Mon 10/6/13	Sun 16/6/13	100%	100%	0%	5 days
	7	Romoval S.O	NA	NA	0%	0%	0%	0 days
	8	Maintain S.O	Mon 17/6/13	NA	11%	11%	0%	10 days
	9	Progress Report	Tue 25/6/13	NA	20%	20%	0%	16.8 days
	10	Progress Report 1	Tue 25/6/13	Wed 26/6/13	100%	100%	0%	2 days
	11	Progress Report 2	NA	NA	0%	0%	0%	0 days
	12	Progress Report 3	NA	NA	0%	0%	0%	0 days
	13	Progress Report 4	NA	NA	0%	0%	0%	0 days
	14	Progress Report 5	NA	NA	0%	0%	0%	0 days
	15	Land Acquisition	Sat 1/6/13	Sat 1/6/13	100%	100%	0%	0 days
	16	Services Relocation	Sat 1/6/13	Sat 1/6/13	100%	100%	0%	0 days
	17	Blok A	Mon 10/6/13	NA	10%	10%	0%	9.3 days
Ħ	18	Kerja Tanah	Mon 10/6/13	NA	36%	36%	0%	15 days
ga	19	Kerja Struktur	NA	NA	0%	0%	0%	0 days
king	20	Kerja Arkitek	NA	NA	0%	0%	0%	0 days
[rac	21	Kerja M&E	NA	NA	0%	0%	0%	0 days
	22	Blok B	Mon 10/6/13	NA	10%	10%	0%	9.45 days
	23	Kerja Tanah	Mon 10/6/13	NA	28%	28%	0%	15 days
	24	Kerja Struktur	NA	NA	0%	0%	0%	0 days
	25	Kerja Arkitek	NA	NA	0%	0%	0%	0 days
	26	Kerja M&E	NA	NA	0%	0%	0%	0 days
	27	Completion of Cable Laying by TNB	NA	NA	0%	0%	0%	0 days
	28	T&C	NA	NA	0%	0%	0%	0 days
	29	Projek Siap	NA	NA	0%	0%	0%	0 days

Figure 5.25 : Created % Schedule Column

Steps to Create Schedule Cost Column:

Repeat steps from Figure 5.17 to Figure 5.24 to create new "Schedule Cost" column by using data from **Act Cost** column. Using **Text 2** in the new column property.

The **Schedule Cost** column is as shown below.

P	🛛 🖵 🥙 🔻 🔍 🗧 🕞 🐨 🖓 🖛 🖓 🐨 🖓 🐨 🖓 🐨 🖓 🐨 🖓 🐨 🖓 🐨 🖓 🐨 🖓 🐨 🖓 🐨 🖓 🐨 🖓 🐨 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓 🖓											
1	File	Task Resource Project Vi	ew Add-Ins	Format								
		🐂 Network Diagram 👻 📰	[Resource Usag	e A +		💋 Highligl	nt: [No High	nlight] - Times	cale: 🥑		Timeline	
4		💻 🗉 Calendar 🔹 🛛 🕮	Resource Shee	t- Z+ ¬		Filter	[No Filte	r] - [22] C	ays 👻		Details	
Ga	antt II	Task Team	- 🗒 Other Views -	Sort Out	line Tables	🖳 Group b	v: No Grou	v lau	Zo	om Entire Selected		
CIII		Task Views	Resource Views			Data			Zoo	m	Split Vie	w
		Task Name	Act. Start	Act. Finish	%	%	Phys. %	Act. Dur.	Rem. Dur.	Schedule Cost	Act. Cost	-
		•	•	•	Schedule	Comp. 👗	Comp.	•	*	•	•	T
	1	Membina 2 Blok Bangunan	Sat 1/6/13	NA	12%	12%	0%	12.57 days	89.43 days	RM150,050.00	RM150,050.00	
	2	Projek Mula	Sat 1/6/13	Sat 1/6/13	100%	100%	0%	0 days	0 days	RM0.00	RM0.00	1
	3	Prelinimaries	Sun 2/6/13	NA	19%	19%	0%	19.86 days	82.14 days	RM27,650.00	RM27,650.00	
	4	Performance Bond	Sun 2/6/13	Sun 9/6/13	100%	100%	0%	5 days	0 days	RM10,000.00	RM10,000.00	
	5	Est. & Remove S.O	Mon 10/6/13	NA	71%	71%	0%	69.29 days	27.71 days	RM15,000.00	RM15,000.00	
	6	Establish S.O	Mon 10/6/13	Sun 16/6/13	100%	100%	0%	5 days	0 days	RM15,000.00	RM15,000.00	1
	7	Romoval S.O	NA	NA	0%	0%	0%	0 days	2 days	RM0.00	RM0.00	
	8	Maintain S.O	Mon 17/6/13	NA	11%	11%	0%	10 days	81 days	RM1,650.00	RM1,650.00	
	9	Progress Report	Tue 25/6/13	NA	20%	20%	0%	16.8 days	67.2 days	RM1,000.00	RM1,000.00	
	10	Progress Report 1	Tue 25/6/13	Wed 26/6/13	100%	100%	0%	2 days	0 days	RM1,000.00	RM1,000.00	1
	11	Progress Report 2	NA	NA	0%	0%	0%	0 days	2 days	RM0.00	RM0.00	
	12	Progress Report 3	NA	NA	0%	0%	0%	0 days	2 days	RM0.00	RM0.00	1
	13	Progress Report 4	NA	NA	0%	0%	0%	0 days	2 days	RM0.00	RM0.00	
	14	Progress Report 5	NA	NA	0%	0%	0%	0 days	2 days	RM0.00	RM0.00	1
	15	Land Acquisition	Sat 1/6/13	Sat 1/6/13	100%	100%	0%	0 days	0 days	RM0.00	RM0.00	
	16	Services Relocation	Sat 1/6/13	Sat 1/6/13	100%	100%	0%	0 days	0 days	RM0.00	RM0.00	1
	17	Blok A	Mon 10/6/13	NA	10%	10%	0%	9.3 days	83.7 days	RM72,000.00	RM72,000.00	
antt	18	Kerja Tanah	Mon 10/6/13	NA	36%	36%	0%	15 days	27 days	RM72,000.00	RM72,000.00	1
ğ	19	Kerja Struktur	NA	NA	0%	0%	0%	0 days	33 days	RM0.00	RM0.00	
ki	20	Kerja Arkitek	NA	NA	0%	0%	0%	0 days	43 days	RM0.00	RM0.00	
Trac	21	Kerja M&E	NA	NA	0%	0%	0%	0 days	32 days	RM0.00	RM0.00	1
	22	Blok B	Mon 10/6/13	NA	10%	10%	0%	9.45 days	87.55 days	RM50,400.00	RM50,400.00	1
	23	Kerja Tanah	Mon 10/6/13	NA	28%	28%	0%	15 days	38 days	RM50,400.00	RM50,400.00	1
	24	Kerja Struktur	NA	NA	0%	0%	0%	0 days	30 days	RM0.00	RM0.00	
	25	Kerja Arkitek	NA	NA	0%	0%	0%	0 days	43 days	RM0.00	RM0.00	1
	26	Kerja M&E	NA	NA	0%	0%	0%	0 days	28 days	RM0.00	RM0.00	
	27	Completion of Cable Laying by TNB	NA	NA	0%	0%	0%	0 days	0 days	RM0.00	RM0.00	1
	28	T&C	NA	NA	0%	0%	0%	0 days	5 days	RM0.00	RM0.00	
	29	Projek Siap	NA	NA	0%	0%	0%	0 days	0 days	RM0.00	RM0.00	
												1

Figure 5.26 : Created Schedule Cost Column

5.1.3.1 Tracking Actual Progress

Tracking actual progress involves updating project status on physical and financial progress and the impact on the project completion date.

Before tracking the actual progress, insert the "Baseline Start" and "Baseline Finish" column and hide all other columns to display information as shown below.

P 🖬 🤊	• (*	* -	Gantt Chart T	ools BGN - Me	embina 2 Blok Ba	ngunan - Update	d - 01 - 2013-0	6-30.mpp	- Microsoft Project	_ 0 _ X
File	Task	Resource Project Vie	ew Format							⊲ 😮 ۵
P.	ſ					tatus Date:	1	-		ABC
Subproject	P	roject Custom Links Between \ rmation Fields Projects	WBS Change Working Time	Calculate S Project Base	et Move	Up	date Syn	to Actuals	Visual Reports Com Reports Proj	pare Spelling
Insert		Properties	tronking hine	Schei	dule	2	tatus		Reports	Proofing
		Task Name 🖕	Baseline Start 🖕	Act. Start 🖕	Baseline Finish	Act. Finish	% 🗸	% 🗸	Schedule Cost 🖕	Act. Cost 🖕
	1	Membina 2 Blok	Sat 01-06-13	Sat 01-06-13	Wed 30-10-1	3 N	Schedule A 12%	Comp. 12%	RM150 050 00	RM150 050 00
Calendar		Bangunan								
	2	Projek Mula	Sat 01-06-13	Sat 01-06-13	Sat 01-06-13	Sat 01-06-1	3 100%	100%	6 RM0.00	RM0.00
	3	Prelinimaries	Sun 02-06-13	Sun 02-06-13	Wed 30-10-	3 N	A 19%	19%	6 RM27,650.00	RM27,650.00
Gantt	4	Performance Bond	Sun 02-06-13	Sun 02-06-13	Sun 09-06-1	3 Sun 09-06-1	3 100%	100%	6 RM10,000.00	RM10,000.00
Chart	5	Est. & Remove S.C	Mon 10-06-13	/Ion 10-06-13	Wed 30-10-	3 N	A 71%	71%	6 RM15,000.00	RM15,000.00
	6	Establish S.O	Mon 10-06-13	Mon 10-06-13	Sun 16-06-1	3 3un 16-06-1	3 100%	100%	6 RM15,000.00	RM15,000.00
	7	Romoval S.O	Tue 29-10-13	NA	Wed 30-10-	13 N	A 0%	0%	6 RM0.00	RM0.00
Network	8	Maintain S.O	Mon 17-06-13	Mon 17-06-13	Tue 29-10-1	3 N	A 11%	11%	6 RM1,650.00	RM1,650.00
Diagram	9	Progress Report	Tue 25-06-13	Tue 25-06-13	Mon 28-10-	13 N	A 20%	20%	6 RM1,000.00	RM1,000.00
a	10	Progress Report 1	Tue 25-06-13	Tue 25-06-13	Wed 26-06-	3 We 26-06-1	d 100% 3	100%	6 RM1,000.00	RM1,000.00
Task Form	11	Progress Report 2	Thu 25-07-13	NA	Sun 28-07-1	3 N	A 0%	0%	6 RM0.00	RM0.00
3	12	Progress Report 3	Sun 25-08-13	NA	Mon 26-08-1	3 N	A 0%	0%	6 RM0.00	RM0.00
Task Sheet	13	Progress Report 4	Wed 25-09-13	NA	Thu 26-09-1	3 N	A 0%	0%	6 RM0.00	RM0.00
	14	Progress Report 5	Sun 27-10-13	NA	Mon 28-10-1	3 N	A 0%	0%	6 RM0.00	RM0.00
Task	15	Land Acquisition	Sat 01-06-13	Sat 01-06-13	Sat 01-06-13	Sat 01-06-1	3 100%	100%	6 RM0.00	RM0.00
Usage	16	Services Relocation	Sat 01-06-13	Sat 01-06-13	Sat 01-06-13	Sat 01-06-1	3 100%	100%	6 RM0.00	RM0.00
	17	Blok A	Mon 10-06-13	/lon 10-06-13	Thu 24-10-1	3 N	A 10%	10%	6 RM72,000.00	RM72,000.00
	18	Kerja Tanah	Mon 10-06-13	Mon 10-06-13	Wed 07-08-7	13 N	A 36%	36%	6 RM72,000.00	RM72,000.00
Timeline	19	Kerja Struktur	Thu 18-07-13	NA	Wed 04-09-7	3 N	A 0%	0%	6 RM0.00	RM0.00
	20	Varia Arkitak	Thu 22 00 42	NIA.	Thu 04 40 4	5 N	A 00/	00/	DM0.00	DM0.00

Figure 5.27: Progress Tracking Table

Table below shows example of actual physical progress data collected from site evaluation on the 30.6.2013

Baseline: 1 Status date: 30.6.2013	Actual Start	Actual Finish	% Schedule
Blok A			
Kerja Tanah	15/6	-	20%
Kerja Struktur	-	-	-
Blok B			
Kerja Tanah	20/6	-	15%
Kerja Struktur	-	-	-

 Table 5.1: Actual Progress Data as on 30 Jun 2013

Steps to perform actual progress tracking :

- 1. Key in actual start date for all started tasks in the Act. Start column.
- For completed tasks, key in the actual finish dates in the Act. Finish column. Ms Project will automatically update the actual progress as 100% in % Comp. column.
- 3. For uncompleted tasks, key in the actual percentage in the % Comp. column.

The actual progress tracking is shown as below.

P 🛃 🖌	7 - 6	l × ↓	Gantt Chart	Tools BGN	- Membina 2 Blo	k Bangunan - Updateo	1 - 01 - 2013-06	5-30.mpp - M	Microsoft Project	
File	Task	Resource Project V	iew Format							a 🕜 🗗
	Ê	∦ Arial ~ 10	- 0× 25× 50× 7	s 💼 🌹	Mark on Track 🔻 Respect Links	* 🔁	Inspect ▾ 🔁 Move ▾	- -		
Gantt	Paste	🧃 В Г Ц 🆄 - 🗛	- 👎 루 👾	e e e e e e e e e e e e e e e e e e e	Inactivate	Manually Auto	2 Mode -	Task	Information	Scroll
View	Clipb	oard Font	G.	Schedule		Tasks		Insert	Properties	Editing
		Task Name	Baseline Start	Act. Start	Baseline Finis	h _ Act. Finish	%	%	Schedule Cost	Act. Cost
		•	•		•		Schedule	Comp.		•
	1	Membina 2 Blok Rengunen	Sat 01-06-13	Sat 01-06	i-13 Wed 30-10	.13 N	IA 12%	9%	RM150,050.00	RM94,650.00
Calendar		Dangunan Deside Mede	0-1-04-00-42	0-1.04.00	42 0-+ 04 00 4	0 0-1.01.00	10 4000/	4000/	D140.00	D140.00
	2	Projek Mula	Sal 01-06-13	Sal 01-00	12 Wed 20 10	3 Sal 01-00-		100%	RIVIU.UU	RIVIU.00
		Porformance Bond	Sun 02.06.13	Sup 02.06	13 Sup 09 06 1	13 Sup 09 06	12 2	370 0%	PM10 000 00	PM10 000 00
Gantt Chart		- Est & Domovo S O	Sun 02-06-13	Sun 02-00	13 Wed 30 10	12 Sun 09-00-		0 %	PM15 000.00	PM15 000.00
	6	Establish S O	Mon 10-06-13	Mon 10-06	13 Sup 16.06.1	13 Sun 16-06	13 100%	100%	RM15,000.00	PM15.000.00
~ 6	7	Removal S O	Tue 29-10-13	WOIL 10-00	NA Wed 30-10-	13 Gui 10-00-	IA 0%	0%	RM0.00	RM0.00
Network	8	Maintain S O	Mon 17-06-13	Mon 17-06	-13 Tue 29-10-1	3	IA 076	11%	RM1 650 00	RM1 650 00
Diagram	9	Progress Report	Tue 25-06-13	Tue 25.06	13 Mon 28.10	13 N	Δ 20%	20%	RM1.000.00	RM1.000.00
	10	Progress Report 1	Tue 25-06-13	Tue 25-06	-13 Wed 26-06-	13 Wed 26-06-	13 100%	100%	RM1 000 00	RM1 000 00
	11	Progress Report 2	Thu 25-07-13		NA Sun 28-07-1	13 N	IA 0%	0%	RM0.00	RM0.00
Task	12	Progress Report 3	Sun 25-08-13		NA Mon 26-08-	13 N	IA 0%	0%	RM0.00	RM0.00
Form	13	Progress Report 4	Wed 25-09-12		NA Thu 26-09-1	3 N	IA 0%	0%	RM0.00	RM0.00
	14	Progress Report 5	Sun 27-10-	2	NA Mon 28-10-	13 N	IA 0%	0%	RM0.00	RM0.00
	15	Land Acquisition	Sat 01-06-1	_ 06	-13 Sat 01-06-1	3 Sat 01-06-	13 100%	100%	RM0.00	RM0.00
Task	16	Services Relocation	Sat 01-06-13	S. 11-06	-13 Sat 01-06-1	3 Sat 01-06-	13 100%	100%	PM0.00	RM0.00
Sheet	17	Blok A	Mon 10-06-13	Sat 5-06	-13 Thu 24-10-	13 N	IA 10%	6%	RM72	M40,000.00
	18	Kerja Tanah	Mon 10-06-13	Sat 15-06	-13 Wed 07-08-	13 N	IA 36%	20%	Dates	M40,000.00
	19	Kerja Struktur	Thu 18-07-13		NA Wed 04-09-	13 N	IA 0%	0%	RM0.00	RM0.00
Task	20	Kerja Arkitek	Thu 22-08-13		NA Thu 24-10-1	3 N	IA 0%	0%	RM0.00	RM0.00
Usage	21	Kerja M&E	Thu 29-08-13		NA Mon 14-10-	13 N	IA 0%	0%	RM0.00	RM0.00
	22	Blok B	Mon 10-06-13	Thu 20-06	-13 Wed 30-10	13 N	IA 10%	5%	RM50,400.00	RM27,000.00
Timeline	23	Kerja Tanah	Mon 10-06-13	Thu 20-06	-13 Mon 26-08-	13 N	IA 28%	15%	RM50,400.00	RM27,000.00
TimeTine	24	Kerja Struktur	Mon 29-07-13		NA Tue 10-09-1	3 N	IA 0%	0%	RM0.00	RM0.00
	25	Kerja Arkitek	Wed 28-08-13		NA Wed 30-10-	13 N	IA 0%	0%	RM0.00	RM0.00

Figure 5.28: Examples of Updated Progress Tracking Table

The tracking bar (upper bar) is automatically adjusted according to actual start and finish dates while baseline bar (lower bar) remains unchanged as shown below.



Figure 5.29: Examples of Updated Progress Tracking Bar

5.1.4 Identify Variances

Variances determine the differences between the actual progress and scheduled progress. Appropriate action should be taken depending on the types of variances i.e :

- 1. Financial variances Actual Cost against Schedule Cost
- 2. Physical variances % Comp against % Schedule
- Project Finished Date (PFD) variances schedule PFD against actual
 PFD

	Task Name 👻	Baseline Start 🖕	Act. Start 🖕	Baseline Finish 🖕	Act. Finish 🖕	% Schedule	% 🗸	Schedule Cost 🖕	Act. Cost 🗸
1	Membina 2 Blok Bangunan	Sat 01-06-13	Sat 01-06-13	Wed 30-10-13	NA	12%	9%	RM150,050.00	RM94,650.00
2	Projek Mula	Sat 01-06-13	Sat 01-06-13	Sat 01-06-13	Sat 01-06-13	3 100%	100%	RM0.00	RM0.00
3	Prelinimaries	Sun 02-06-13	Sun 02-06-13	Wed 30-10-13	N/	A 19%	19%	RM27,650.00	RM27,650.00
4	Performance Bond	Sun 02-06-13	Sun 02-06-13	Sun 09-06-13	Sun 09-0	Dhyei	cal	RM Ein	ancial ⁰⁰
5	Est. & Remove S.O	Mon 10-06-13	Mon 10-06-13	Wed 30-10-13		· 11y31	cai	RM	
6	Establish S.O	Mon 10-06-13	Mon 10-06-13	Sun 16-06-13	Sun 16-0	varian	ce	_{RM} var	iances 👦

Figure 5.30: Financial and Physical Variances

	Task Name	, Baseline Start 🖕	Act. Start 🖕	Baseline Finish 🖕	y '13 F	09 Jun '1 T S	3 (W	07 Jul '13 S T	04 Aug '13 M F T	01 Sep '13 S W	29 Sep '13 S T M	27 Oct '1 F T	3 24 No S W
1	Membina 2 Blok Bangunan	Sat 01-06-13	Sat 01-06-13	Wed 30-10-13			J						9%
2	Projek Mula	Sat 01-06-13	Sat 01-06-13	Sat 01-06-13] 🖕	01-06							
3	Prelinimaries	Sun 02-06-13	Sun 02-06-13	Wed 30-10-13		:			-			 -	19%
- 1	5 Land Acquisition	Sat 01-06-13	Sat 01-06-13	Sat 01-06-13	+++ (01-06							
1	Services Relocation	Sat 01-06-13	Sat 01-06-13	Sat 01-06-13	<u> </u> 40 (01-06							
1	7 🗄 Blok A	Mon 10-06-13	Sat 15-06-13	Thu 24-10-13									
2	2 • Blok B	Mon 10-06-13	Thu 20-06-13	Wed 30-10-13			.,					 -	5%
2	7 Completion of Cable Laying by TNB	Mon 21-10-13	NA	Mon 21-10-13							\$	\$ 31-1	0
2	3 T&C	Tue 22-10-13	-	Mon 20-10-13				P	FU			<u>له</u> کړ	%
2	Projek Siap	Wed 30-10-13	NA.	Wed 30-10-13	←		١	/aria	ances		>	◊ ቕ	11-11

Figure 5.31: PFD Variances
Tabulate the three variances as shown below.

Baseline: 1 Status date: 30.6.2013	Actual Progress	Schedule Progress	Variances
Financial (RM)	94,650.00	150,050.00	- 55,400.00
Financial (%)	4.7	9.5	- 4.8
Physical (%)	9	12	- 3
Project Finish Date	11.11.2013	30.10.2013	+12days

Table 5.2: Project Variances

5.1.5 Action

Based on the project variances identified, appropriate actions need to be taken to ensure the project is effectively managed.

- 1. Identify slipped critical activities.
- 2. Identify the source of problem/delay.
- 3. Prioritise and implement the solution options (e.g fast tracking or crashing technique)
- 4. For further improvement, select non critical activities that can start or finish earlier than the schedule and execute them.

Baseline: 1 Status date: 30.6.2013	Actual Progress	Schedule Progress	Variances	Action (Examples)
Financial (RM)	94,650.00	150,050.00	- 55,400.00	Execute tasks
Financial (%)	4.7	9.5	- 4.8	with high values
Physical (%)	9	12	- 3	Focus on completion of critical activities
Project Finish Date	11.11.2013	30.10.2013	+12days	Execute unstarted tasks as soon as possible

Table 5.3: Examples of Variances Action

5.2 Project Control

Project control can be defined as management action, either preplanned to achieve the desired result or taken as a corrective measure prompted by the monitoring process. Project control is mainly concerned with the metrics of the project such as scope, time, cost and quality.

Project control is needed to ensure that project can be completed with minimal changes in terms of scope, time and cost.

5.2.1 Methodology of Project Control

Control schedule process involves determining the status of the project schedule, determining whether changes have occurred or should occur, taking corrective or preventive action when needed, and influencing and managing schedule changes.

If the changes are outside of the control of contractor, they are eligible for extension of time (EOT) or otherwise.

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The following are procedures to carry out the analyse of project change requests:

- i. List all change request (refer to Changes Requests in Chapter 1)
- Analyse the effect of change request on Scope, Time, Cost, Project
 Finish Date and Contract Sum using methodology as shown in table below.
- iii. For each change request analysed, the impact to the project scope, cost and finish date must be updated subsequently in table 5.4.

HANDS-ON MANUAL

No	Change Request	Scope	Time	Cost	EOT/ Delay	Contract Sum	Project Finish Date
1.	Land acquisition – resolved on 1 st July 2013.	х		х	EOT		
2.	Services relocation – resolved 5 days after land issue.	х		х	EOT		
3.	VO No. 1 (Kerja tanah) at Blok Asrama (A) – duration 25 days, by main contractor and it cost RM200,000.00				EOT		
4.	VO No. 2 (Kerja tanah) at Blok Akademik (B) – duration 35 days, by main contractor and it cost RM150,000.00				EOT		
5.	Work Omission – Kerja Arkitek at Blok Asrama – New Value of Work is RM180,000.00				-		
6.	Workers laid off, need to hire new workers for M&E work at Blok Akademik – need additional 10 days.	x		x	Delay		
7.	Late delivery of material for Architectural work by 3 days	x		х	Delay		
8.	Additional Public Holiday	х		х	EOT		

Table 5.4: Analysis of Change Request

Steps to analyse impact of changes

1. Open Accepted Work Program and save file as Revised-01



Figure 5.32: Saving Revised File

- 2. Click View ribbon.
- 3. Click Table in Data Group
- 4. Select Entry.

R 🔒 🤊	 ([™] - 	-					2 ,	3	2 Blok Bangunar	n - Revise	ed - 01- 2013	-07-10.mpp - Micros	oft Pr	oject		0	x
File	Task	Resou	irce Pro	ject \	/iew		Format	7/							ć	ຈ 🕜 ເ	a X
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	1		1	3	- Me	V	Entry		102 davs	Sat 0	1-06-13	Wed 30-10-13					-
Calendar	2		1.1	3	F		<u>H</u> yperlink		0 days	Sat 0	1-06-13	Sat 01-06-13					
	3		1.2	3	₽F		Schedule		102 days	Sun (02-06-13	Wed 30-10-13		-		_	-
	4		1.2.1	3			Tracking		5 days	Sun 0	2-06-13	Sun 09-06-13	2				
Gantt Chart	5		1.2.2	3	E		Variance		97 days	Mon	10-06-13	Wed 30-10-13					-
	6		1.2.2.1	3			Work		5 days	Mon 1	10-06-13	Sun 16-06-13	4				
-6	7		1.2.2.2	3			Summany		2 days	Tue 2	9-10-13	Wed 30-10-13	29				
Network	8		1.2.3	3			Summary		91 days	Mon 1	17-06-13	Tue 29-10-13	6				
Diagram	9	Ð	1.2.4	3	B		Usa <u>q</u> e		84 days	Tue 2	25-06-13	Mon 28-10-13		0	1		
	10		1.2.4.1	3		6	<u>R</u> eset to Def	ault	2 days	Tue 2	5-06-13	Wed 26-06-13					



File	Task	Resou	rce Pro	ject V	/iew Format	-					۵ (? 🗗 X
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		1	WBS 🖕	Task Mode	Task Name	Duration 💂	Start 🗸	Finish	Pre	21 Jul	'13 01	Sep '13 ▲
	1		1	3	Membina 2 Blok Bangunan	102 days	Sat 01-06-13	Wed 30-10-13		1 3	VV 3	
Network	2		1.1	3	Projek Mula	0 days	Sat 01-06-13	Sat 01-06-13				
Didgidin	3		1.2	3	Prelinimaries	102 days	Sun 02-06-13	Wed 30-10-13				_
	4		1.2.1	3	Performance Bond	5 days	Sun 02-06-13	Sun 09-06-13	2			
Task	5		1.2.2	3	Est. & Remove S.O	97 days	Mon 10-06-13	Wed 30-10-13				_
Form	6		1.2.2.1	3	Establish S.O	5 days	Mon 10-06-13	Sun 16-06-13	4			
	7		1.2.2.2	3	Removal S.O	2 days	Tue 29-10-13	Wed 30-10-13	29			
	8		1.2.3	3	Maintain S.O	91 days	Mon 17-06-13	Tue 29-10-13	6			
Task	9	0	1.2.4	3	Progress Report	84 days	Tue 25-06-13	Mon 28-10-13		0	I	
Sheet	10		1.2.4.1	3	Progress Report 1	2 days	Tue 25-06-13	Wed 26-06-13				
	11		1.2.4.2	3	Progress Report 2	2 days	Thu 25-07-13	Sun 28-07-13		0		
∠	12		1.2.4.3	3	Progress Report 3	2 days	Sun 25-08-13	Mon 26-08-13				
lask Usage	13		1.2.4.4	3	Progress Report 4	2 days	Wed 25-09-13	Thu 26-09-13				
	14		1.2.4.5	3	Progress Report 5	2 days	Sun 27-10-13	Mon 28-10-13				
目	15		1.3	3	Land Acquisition	0 days	Sat 01-06-13	Sat 01-06-13	2			
Timeline	16		1.4	3	Services Relocation	0 days	Sat 01-06-13	Sat 01-06-13	2			
	5		1.5	3	Blok A	93 days	Mon 10-06-13	Thu 24-10-13				_
			1.5.1	₽	Kerja Tanah	42 days	Mon 10-06-13	Wed 07-08-13	4,1)	
Tracking	19	1	1.5.2	3	Kerja Struktur	33 days	Thu 18-07-13	Wed 04-09-13	18	<u>ч</u>		
Gantt	20	1	1.5.3	2	Kerja Arkitek	43 days	Thu 22-08-13	Thu 24-10-13	19		- 4	
	0.4	1 4	4 5 4			0.0 -1	Thu 00 00 40	Man 44 40 40	401			

5. Select Tracking Gantt on menu bar to show tracking and baseline bar

Figure 5.34: Selecting Tracking Gantt

The analysis impact of change must perform using tracking gantt view as shown below.

	6	WBS 💂	Task Mode	Task Name 👻	Duratior 🚽	Start 👻	Finish ,	13 19 May '13 07 Jul '13 25 Aug '13 13 Oct '
1		1	3	Membina 2 Blok Bangunan	102 days	Sat 01-06-13	Wed 30-10-13	0
2		1.1	3	Projek Mula	0 days	Sat 01-06-13	Sat 01-06-13	♦ _ 01-06
3		1.2	3	Prelinimaries	102 days	Sun 02-06-13	Wed 30-10-13	ф о
4		1.2.1	3	Performance Bond	5 days	Sun 02-06-13	Sun 09-06-13	₫ 0%
5		1.2.2	3	Est. & Remove S.O	97 days	Mon 10-06-13	Wed 30-10-13	• •
6		1.2.2.1	3	Establish S.O	5 days	Mon 10-06-13	Sun 16-06-13	6 0%
7		1.2.2.2	3	Removal S.O	2 days	Tue 29-10-13	Wed 30-10-13	ia 09
8		1.2.3	3	Maintain S.O	91 days	Mon 17-06-13	Tue 29-10-13	0%
9	Ð	1.2.4	3	Progress Report	84 days	Tue 25-06-13	Mon 28-10-13	
10		1.2.4.1	3	Progress Report 1	2 days	Tue 25-06-13	Wed 26-06-13	0%
11		1.2.4.2	3	Progress Report 2	2 days	Thu 25-07-13	Sun 28-07-13	8 0%
12		1.2.4.3	3	Progress Report 3	2 days	Sun 25-08-13	Mon 26-08-13	0%
13		1.2.4.4	3	Progress Report 4	2 days	Wed 25-09-13	Thu 26-09-13	0%
14		1.2.4.5	3	Progress Report 5	2 days	Sun 27-10-13	Mon 28-10-13	₿ 0%
15		1.3	3	Land Acquisition	0 days	Sat 01-06-13	Sat 01-06-13	→ ⊕_01-06
16		1.4	3	Services Relocation	0 days	Sat 01-06-13	Sat 01-06-13	→ ⊕_01-06
17		1.5	3	Blok A	93 days	Mon 10-06-13	Thu 24-10-13	•••••••••••••••••••••••••••••••••••••••
18	1	1.5.1	3	Kerja Tanah	42 days	Mon 10-06-13	Wed 07-08-13	0%
19	ŧ.	1.5.2	3	Kerja Struktur	33 days	Thu 18-07-13	Wed 04-09-13	0%
20	ŧ.	1.5.3	3	Kerja Arkitek	43 days	Thu 22-08-13	Thu 24-10-13	9 1%
21	i	1 5 4		Korio M&F	22 days	Thu 20,00,12	Mon 14 10 12	

Figure 5.35: Tracking Gantt View

- 6. Key in new start date for Land Acquisition in Start column.
- Select Move the (Land Acquisition)to start on Mon 01 July 2013 and keep the link in Planning Wizard dialogue box (if appears).
- 8. Click OK

1	4		1.2.4.5	3	Progress Report 5	2 days	Sun 27-10-13	Mon 28-10-13				09
1	5		1.3	3	Land Acquisition	0 days	Sat 01-06-13	Sat 01-06-13	++	01-06		
1	6		1.4	2	Services Relocation	0 days	Sat 01-00-15	Sat 01-00-15	HÝ.	01 00	1	
1	7	L	1.5	3	Blok A	93 days	Mon 10-06-13	Thu 24-10-13				P 09
1	8	ŧ.	1.5.1	3	Kerja Tanah	42 days	Mon 10-06-13	Wed 07-08-13			0%	
1	9	ŧ.	1.5.2	3	Kerja Struktur	33 days	Thu 13-07-13	Wed 04-09-13		9	0%	
2	0	ŧ.	1.5.3	3	Kerj Origina	otort	data 1	luna 2012			9	ስ <mark>የ</mark> %
					- Origina	start	uate 1 J	une zurs)		I	



9	Ð	1.2.4	3	* Progress Report	84 days	Tue 25-06-13	Mon 28-10-13	0%
15		1.3	3	Land Acquisition	0 days	Mon 01-07-13	Mon 01-07-13	
16		1.4	3	Services Relocation	0 days	Sat 01-06-13	Sat 01-06-13	+0 010 6
17		1.5	3	Blok A	93 days	Mon 01-07-13	Thu 14-11-13	0%
18	ŧ.	1.5.1	3	Kerja Tanah	42 days	Mon 01-07-13	Sun 01-09-13	0%
19	ŧ.	1.5.2	3	Kerja Struktur	33 days	Mon 12-08-13	Thu 26-09-13	0%
20	ŧ.	1.5.3	3	Ke			0040	
21	ŧ.	1.5.4	3	_{Ke} New St	art da	ate 1 Jul	y 2013	
22		1.6	3	- Blok B	97 days	Mon 01-07-13	Wed 20-11-13	· · · · · · · · · · · · · · · · · · ·
23	ŧ.	1.6.1	3	Kerja Tanah	53 days	Mon 01-07-13	Tue 17-09-13	0%
24	ŧ.	1.6.2	3	Kerja Struktur	30 days	Wed 21-08-13	Wed 02-10-13	0%
25	ŧ.	1.6.3	3	Kerja Arkitek	43 days	Thu 19-09-13	Wed 20-11-13	0%
26	ŧ.	1.6.4	3	Kerja M&E	28 days	Thu 26-09-13	Wed 06-11-13	
27		1.7	5	Completion of Cable Laying by TNB	0 days	Mon 11-11-13	Mon 11-11-13	♦ 🕹 11-1
28		1.8	3	T&C	ot to	nrojoot	linich da	
29		1.9	-	Projek Sia		project	iiiiish da	

Figure 5.36: Impact of Change Request for Land Aquisition

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For all other request changes involving milestones, repeat steps 6,7 and 8 as above. e.g change request for service relocation.

	Tas Mo	Task Name 👻	Duratior 🗸	Start 🗸	Finish 👻	Cost	tober 01 March 21 July 11 Decen 09-12 17-02 28-04 07-07 15-09 24-11 02-
1	₿	Membina 2 Blok Bangunan	121 days	Sat 01-06-13	Tue 26-11-13	RM2,000,000.00	0%
2	3	Projek Mula	0 days	Sat 01-06-13	Sat 01-06-13	RM0.00	Φ _01-06
3	3	Prelinimaries	121 days	Sun 02-06-13	Tue 26-11-13	RM50,000.00	v v v
4	3	Performance Bond	5 days	Sun 02-06-13	Sun 09-06-13	RM10,000.00	8 0%
5	3	± Est. & Remove S.O	116 days	Mon 10-06-13	Tue 26-11-13	RM20,000.00	• 0%
8	3	Maintain S.O	91 days	Mon 17-06-13	Tue 29-10-13	RM15,000.00	-0%
9	3	Progress Report	84 days	Tue 25-06-13	Mon 28-10-13	RM5,000.00	OQ5 606000 005 0%
15	3	Land Acquisition	0 days	Mon 01-07-13	Mon 01-07-13	RM0.00	01-07
16	3	ervices Relocation	0 days	Sun 07-07-13	Sun 07-07-13	RM0.00	07-07
17	3	Blok A	93 days	Mon 01-07-13	Thu 14-11-13	RM1,050,000.00	0%
18	3	Kerja Tanah	42 days	Mon 01-07-13	Sun 01-09-13	RM200,000.00	0%
19	3	Kerj			0010	M400,000.00	0%
20	3	_{Kerj} New S	tart d	ate / Jul	y 2013	M250,000.00	0%
21	3	Kerja M&E	32 days	Sun 22-09-13	Wed 06-11-13	RM200,000.00	0%
22	3	Blok B	97 days	Sun 07-07-13	Tue 26-11-13	RM900,000.00	V 0%
23	3	Kerja Tanah	53 days	Sun 07-07-13	Mon 23-09-13	RM180,000.00	_ 0%
24	3	Kerja Struktur	30 days	Tue 27-08-13	Tue 08-10-13	RM290,000.00	0%
25	3	Kerja Arkitek	43 days	Wed 25-09-13	Tue 26-11-13	RM200,000.00	0%
26	3	Kerja M&E	28 days	Wed 02-10-13	Tue 12-11-13	RM230,000.00	6 %
27	₿	Completion of Cable Laying by TNB	0 days	Sun 17-11-13	Sun 17-11-13	RM0.00	♦ 8- 17-11
28	3	T&C	5 days	Impact		finiah da	10
29	3	Projek Siap	0 days	impact	to project	iinish da	Ce > 26-11

Figure 5.37: Impact of Change Request for Service Relocation

- 9. For change request involving additional scope of work, insert new task row after *Kerja Tanah (Blok A)*.
- 10. In the new task row, key in the change request information i.e new scope, duration, link type and additional cost.
- 11.Assume that *Kerja Struktur* will start only after VO1 (*Kerja Tanah Tambahan*) is completed. Key in ID 19 as predecessor for *Kerja Struktur*.

	Task Name 👻	Duratior 🗸	Start 👻	Finish	Cost 🗸	Predecessors	arch 21 July 11 December 28-04 07-07 15-09 24-11 02-02 1
1	Membina 2 Blok Bangunan	157 days	Sat 01-06-13	Wed 15-01-14	RM2,200,000.00)	0%
2		0 days	Sat 01-06-13	Sat 01-06-13	RM0.00		Φ_ 01-06
3	9 & 10	157 days	Sun 02-06-13	Wed 15-01-14	RM50,000.00		Ý 0%
15	Acquisition	0 days	Mon 01-07-13	Mon 01-07-13	RM0.0	and to pro	leat aget
16	S ces Relocation	0 days	Sun 07-07-13	Sun 07-07-13	RM0.0	pact to pro	Dject cost
17	= Blo A	133 days	Mon 01-07-13	Thu 09-01-14	RM1,250,000.00	0	♥ 0%
18	Ke ja Tanah	42 days	Mon 01-07-13	Sun 01-09-13	RM200,000.00	4,15	
19	VOL_Kerja Tanah Tambahan	25 days	Mon 02-09-13	Mon 07-10-13	RM200,000.00	18	Č 0%
20	Kerja Struktur	33 days	Tue 08-10-13	Mon 25-11-13	RM400,000.00	18FS-15 days,19	0%
21	Kerja Arkitek	43 days	Tue 12-11-13	Thu 09-01-14	RM250,000.00	20FS-10 days	0%
22	Kerja M&E	32 days	Tue 19-11-13	Wed 01-01-14	RM200,000.00	20FS-5 days	^{0%}
23	Blok B	97 days	Sun 07-07-13	Tue 26-11-13	RM900,000.00	7	0%
24	Kerja Tanah	53 days	Sun 07-07-13	Mon 23-09-13	RM180,000.00	4,15,16	1 1 0%
25	Kerja Struktur	30 days	Tue 27-08-13	Tue 08-10-13	RM290,000.00	24SS+34 days	0%
26	Kerja Arkitek	43 days	Wed 25-09-13	Tue 26-11-13	RM200,000.00	25FS-10 days	-0%
27	Kerja M&E	28 days	Wed 02-10-13	Tue 12-11-13	RM230,000.00	25FS-5 days	-0%
28	Completion of Cable Laying by TNB	0 days	Mon 06-01-14	Mon 06-01-14	RM0.00	22FS+3 days,27FS+3 days	\$ \$ 6 -01
29	T&C	5 days	Tue 07-01-1	mnact to	project	finish date	■ 1 0%
30	Projek Siap	0 days	Wed 15-01		p. 0 j001		🔷 🚺 15-01

Figure 5.38: Impact of Change Request for Additional Work (Blok A)

For all others request changes involving additional tasks, repeat steps 9,10 & 11 as above e.g VO2 (*Kerja Tanah Tambahan Blok B*) Assume that *Kerja Struktur* will not be affected by VO2 (*Kerja Tanah Tambahan*).

	Tas Mo ▼	Task Name 👻	Duratior 🗸	Start 🗸	Finish	Cost 🗸	Predecessors	r 21 May 17-02 09-06 29-09	11 Januar 19-01 1
1	3	Membina 2 Blok Bangunan	157 days	Sat 01-06-13	Wed 15-01-14	RM2,350,000.00			0%
2	3	Projek Mula	0 days	Sat 01-06-13	Sat 01-06-13	RM0.00		01-06	
3	3	Prelinimaries	157 days	Sun 02-06-13	Wed 15-01-14	RM50,000.00		¢	0%
15	3	Land Acquisition	0 days	Mon 01-07-13	Mon 01 07 12	DM0.00	2	u1-07	
16	3	Services Relocation	0 days	Sun 07-07-13	Impact	to proje	ct cost	07-07	
17	3	Blok A	133 days	Mon 01-07-13					0%
18	3	Kerja Tanah	42 days	Mon 01-07-13	Sun 01-09-13	RM200,000.00	4,15	4 70%	
19	3	VO1_Kerja Tanah Tambahan	25 days	Mon 02-09-13	Mon 07-10-13	RM200,000.00	18	≥ 0%	
20	3	Kerja Struktur	33 days	Tue 08-10-13	Mon 25-11-13	RM400,000.00	18FS-15 days,19	🗕 🍎 09	6
21	3	Kerja Arkitek	43 days	Tue 12-11-13	Thu 09-01-14	RM250,000.00	20FS-10 days		0%
22	3	Kerja M&E	32 days	Tue 19-11-13	Wed 01-01-14	RM200,000.00	20FS-5 days	🛛 🗧 📥	0%
23	3	Blok B	97 days	Sun 07-07-13	Tue 26-11-13	RM1,050,000.00			%
24	3	Kerja Tanah	53 days	Sun 07-07-13	Mon 23-09-13	RM180,000.00	4,15,16	0%	
25	₽	VO2_Kerja Tanah Tambahan	35 days	Tue 24-09-13	Wed 13-11-13	RM150,000.00	24	<u> </u>	
26	3	Kerja Struktur	30 days	Tue 27-08-13	Tue 08-10-13	RM290,000.00	24SS+34 days	0%	
27	3	Kerja Arkitek	43 days	Wed 25-09-13	Tue 26-11-13	RM200,000.00	26FS-10 days	o	6
28	3	Kerja M&E	28 days	Wed 02-10-13	Tue 12-11-13	RM230,000.00	26FS-5 days	<u> </u>	
29	3	Completion of Cable Laying by TNB	0 days	Mon 06-01-14	Mon 06-01-14	RM0.00	22FS+3 days,28F days	♦ ₹	06-01
30	3	T&C	5 days	Impac	t to proje	oct finish	date		0%
31	3	Projek Siap	0 days						5-01

Figure 5.39: Impact of Change Request for Additional Work (Blok B)

12. For change request involving cost change, insert new cost in the **Cost** column i.e reduce cost for *Kerja Arkitek* at *Blok B* to RM180,000.00

	Tas Mo	Task Name 👻	Duratior 🚽	Start 🗸	Finish ,	Cost	Predecessors	r 21 May	11 Januar
1	3	Membina 2 Blok Bangunan	157 days	Sat 01-06-13	Wed 15-01-14	RM2,330,000.00		V	9 0%
2	3	Projek Mula	0 days	Sat 01-06-13	Sat 01-06-13	RM0.00			
3	3	* Prelinimaries	157 days	Sun 02-06-13	Wed 15-01-14	RM50,000.00		Ŵ.	W 0%
15	3	Land Acquisition	0 days	Mon 01-07-13		D140.00	2	01-07	
16	3	Services Relocation	0 days	Sun 07-07-13	Impact t	to project	t cost	07-07	
17	3	Blok A	133 days	Mon 01-07-13		j j			II 0%
18	3	Kerja Tanah	42 days	Mon 01-07-13	Sun 01-09-13	RM200,000.00	4,15		
19	3	VO1_Kerja Tanah Tambahan	25 days	Mon 02-09-13	Mon 07-10-13	RM200,000.00	18	2 0%	
20	3	Kerja Struktur	33 days	Tue 08-10-13	Mon 25-11-13	RM400,000.00	18FS-15 days,19	- -	96
21	3	Kerja Arkitek	43 days	Tue 12-11-13	Thu 09-01-14	RM250,000.00	20FS-10 days		^{>} 0%
22	3	Kerja M&E	32 days	Tue 19-11-13	Wed 01-01-14	RM200.000.00	20FS-5 days	i i i i i i i i i i i i i i i i i i i	0%
23	3	Blok B	97 days	Sun 07-07-13	Tue 26-11-13	RI 12 0			c%
24	3	Kerja Tanah	53 days	Sun 07-07-13	Mon 23-09-13	RI	4,15,16	0%	
25	\$	VO2_Kerja Tanah Tambahan	35 days	Tue 24-09-13	Wed 13-11-13	RM150,00 00	24	-09	6
26	3	Keria Struktur	30 days	Tue 27-08-13	Tue 08-10-13	RM290.00 1.00	24SS+34 days	0%	
27	3	Kerja Arkitek	43 days	Wed 25-09-13	Tue 26-11-13	RM180,000.00	26FS-10 days		196
28	3	Kerja M&E	28 days	Wed 02-10-13	Tue 12-11-13	RM230,000.00	26FS-5 days		6
29	3	Completion of Cable Laying by TNB	0 days	Mon 06-01-14	Mon 06-01-14	RM0.00	22FS+3 days,28F days	♦ ₹	06-01
30	3	T&C	5 days	Tue 07-01-14	Mon 13-01-14	RM0.00	29		0%
31	3	Projek Siap	0 days	Wed 15-01-14	Wed 15-01-14	RM0.00	30,8,27,21,7,25		4 15-01

Figure 5.40 : Impact of Change Request for Cost Change

For request changes that do not warrant any EOT, those change requests will not be analysed. For example:

- i. Change of workers
- ii. Late delivery of material or machine (as it is the contractor's responsibility to ensure adequate resources provided on time).

13. For change request involving additional public holiday, use project calendar to incorporate the date. e.g Cuti peristiwa Piala Malaysia on 24.9.2013.

Change Working Time	Deep		1. C	pros.			
For <u>c</u> alendar: Standard (P	roject Cale	ndar)			•	-	Create New Calendar
Calendar 'Standard' is a base of	calendar.						
Legend:	Click on a	a day to s	ee its <u>v</u>	<u>v</u> orkin	g time	es:	
Working		May	2014			-	03 May 2014 is nonworking.
	S M	TV	/ Th	F	S		
Nonworking			1	2	đ		
31 Edited working	4 5	6 7	8	9	10		
hours	11 12	13 14	15	16	17		
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	25 26	27 28	3 29	30	31	1	'Standard'.
31 Nondefault work	\vdash		_				
Exceptions Work Weeks							
Name				Star	t 16 201	12	Finish Details
2 Awal Ramadan				10-0	7-201	13	10-07-2013 Delete
3 Hari Raya Puasa				08-0	8-201	13	11-08-2013
4 Hari Kebangsaan				31-0	8-201	13	31-08-2013
5 Hari Malaysia				16-0	9-201	13	16-09-2013
6 Hari Raya Qurban				15-1	0-201	13	16-10-2013
/ Cut Bola				24-0	9-201	13	24-09-2013
13							
Help							Options OK Cancel

Figure 5.41 : Insert Additional Holiday

	Tas -	Task Name 👻	$Duratior_{\blacktriangledown}$	Start 🗸	Finish 🗸	Cost 🗸	Predecessors	r 21 May	11 Januar
1	3	Membina 2 Blok Bangunan	157 days	Sat 01-06-13	Thu 16-01-14	RM2,330,000.00		17-02 09-06 29-09	9 0%
2	3	Projek Mula	0 days	Sat 01-06-13	Sat 01-06-13	RM0.00			
3	3	* Prelinimaries	157 days	Sun 02-06-13	Thu 16-01-14	RM50,000.00		• •	₱ 0%
15	3	Land Acquisition	0 days	Mon 01-07-13	Mon 01-07-13	RM0.00	2	♦01-07	
16	3	Services Relocation	0 days	Sun 07-07-13	Sun 07-07-13	RM0.00	2	♦ 07-07	
17	3	Blok A	133 days	Mon 01-07-13	Sun 12-01-14	RM1,250,000.00			0%
18	3	Kerja Tanah	42 days	Mon 01-07-13	Sun 01-09-13	RM200,000.00	4,15		
19	\$	VO1_Kerja Tanah Tambahan	25 days	Mon 02-09-13	Tue 08-10-13	RM200,000.00	18	Č 0%	
20	3	Kerja Struktur	33 days	Wed 09-10-13	Tue 26-11-13	RM400,000.00	18FS-15 days,19	📙 📥 🍋 09	6
21	3	Kerja Arkitek	43 days	Wed 13-11-13	Sun 12-01-14	RM250,000.00	20FS-10 days		0%
22	3	Kerja M&E	32 days	Wed 20-11-13	Thu 02-01-14	RM200,000.00	20FS-5 days		0%
23	3	🖻 Blok B	97 days	Sun 07-07-13	Wed 27-11-13	RM1,030,000.00			%
24	3	Kerja Tanah	53 days	Sun 07-07-13	Mon 23-09-13	RM180,000.00	4,15,16	0%	
25	3	VO2_Kerja Tanah Tambahan	35 days	Wed 25-09-13	Thu 14-11-13	RM150,000.00	24	<u>~_</u> 0%	
26	3	Kerja Struktur	30 days	Tue 27-08-13	Wed 09-10-13	RM290,000.00	24SS+34 days	6 %	
27	3	Kerja Arkitek	43 days	Thu 26-09-13	Wed 27-11-13	RM180,000.00	26FS-10 days	o	
28	3	Kerja M&E	28 days	Thu 03-10-13	Wed 13-11-13	RM230,000.00	26FS-5 days	<u> </u>	
29	₿	Completion of Cable Laying by TNB	0 days	Impact	to projec	t finish	date 28F	→	07-01
30	3	T&C	5 days	Wed 08-01-14	Tue 14-01-14	RM0.00	29	0	0%
31	3	Projek Siap	0 days	Thu 16-01-14	Thu 16-01-14	RM0.00	30,8,27,21,7,25		5 16-01

Figure 5.42 : Impact of Change Request for Additional Holiday

Ensure this file was **save** as shown in Figure 5.32 (Revised 01)

Fill in the final contract sum value and new Project Finish Date as impacted by the respective change requests as shown below.

No	Change Request	Scope	Time	Cost	EOT/ Delay	Contract Sum (RM)	Project Finish Date
1.	Land acquisition – resolved on 1 st July 2013.	х		х	EOT	2 juta	20.11.13
2.	Services relocation – resolved 5 days after land issue.	x		х	EOT	2 juta	26.11.13
3.	VO No. 1 (Kerja tanah) at Blok Asrama (A) – duration 25 days, by main contractor and it cost RM200,000.00				EOT	2.2 juta	15.1.14
4.	VO No. 2 (Kerja tanah) at Blok Akademik (B) – duration 35 days, by main contractor and it cost RM150,000.00				EOT	2.35 juta	15.1.14
5.	Work Omission – Kerja Arkitek at Blok Asrama – New Value of Work is RM180,000.00	V			-	2.33 juta	15.1.14
6.	Workers laid off, need to hire new workers for M&E work at Blok Akademik – need additional 10 days.	x		x	Delay	-	-
7.	Late delivery of material for Architectural work by 3 days	x	V	х	Delay	-	-
8.	Additional Public Holiday	x		х	EOT	2.33 juta	16.1.14

Table 5.6 : Final Value of Data from Change Request

The summary of changes in scope, time and cost due to request changes are as shown below.

	Scope	Time	Cost (RM)
	No. of tasks	Project Finish Date	Contract Sum
Original	29	30.10.2013	2 juta
New	31	16.1.2014	2.33 juta

Table 5.7 : Control Summary Table with Data

With the new project scope, time and cost, this is necessary to set a new baseline for the revised work program.

Steps to set new baseline:

Open project file Revised-01

- 1. Click **Project** ribbon
- 2. Click Project Information in the Properties group
- 3. Set Status date to current date or date of EOT approval.

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2014

Update project based on the status date.following step 4 to 9 as shown in Figure 5.16.

- 4. Select Tracking Gantt view,
- 5. In the View ribbon, click Filter
- 6. Select Incomplete Tasks.

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-6	16 17	Services Relocatio	Sun 07-07-13 Mon 01-07-13	Sun 07-07	Tasks With Estima Using Resource	ated Durations		4	07-07	
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1	24	Kerja Tanah	Sun 07-07-13	N	NA 11%	RM19,800.00)	_	11%	

Figure 5.44 : Filtering Incomplete Tasks

- 7. Highlights all incomplete tasks.
- 8. Click **Project** ribbon
- 9. Click Set Baseline and select Clear Baseline
- 10. Select Clear baseline plan in Clear Baseline dialogue box
- 11. Select Selected tasks in For field
- 12. Click OK

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	3		1.2	lţ,	Prelinimaries	157 days	Sun 02-06-13	Thu 16-01-14	RM50,000.00		28%
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	22		1.5.5	₽\$	Kerja	32 days	Wed 20-11-13	02-01-14	RM200,000.00		⇒ <mark>≫</mark> %
	23		1.6	₽	Blok B 11	97 days	Sun 07 🧧 📶	127-11-13	RM1,030,000.00		
Task	24	1	1.6.1	₽	Kerja	53 days	Sun 07	1 23-09-13	RM180,000.00		11%
Sneet	25		1.6.2	l (t)	VO2_Kerja Tanah Tambahan	35 days	Wed 2 <mark>5-09-1</mark> 3	Thu 14-11-13	RM150,000.00		<u> </u>
	26	1	1.6.3	Ð	Kerja Struktur	30 days	Tue 27-08-13	Wed 09-10-13	RM290,000.00		Y 0%
Task	27	1	1.6.4	Ð	Kerja Arkitek	43 days	Thu 26-09-13	Wed 27-11-13	RM180,000.00	_	<mark>-o</mark> ≉
Obdec	28		1.6.5	l)	Kerja M&E	28 days	Thu 03-10-13	Wed 13-11-13	RM230,000.00	_	<u>~-0%</u>
	29		1.7	R)	Completion of Cable Laying by TNB	0 days	Tue 07-01-14	Tue 07-01-14	RM0.00		
Ilmeline	30		1.8	R.	T&C	5 days	Wed 08-01-14	Tue 14-01-14	RM0.00		ı 1 0%
	31		1.9	2	Projek Siap	0 days	Thu 16-01-14	Thu 16-01-14	RM0.00		👌 🐝 16-01
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Figure 5.45 : Setting Baseline for Incomplete Tasks

- 13. Highlights all incomplete tasks.
- 14. Click **Project** ribbon
- 15. Click Set Baseline and select Set Baseline
- 16. Select Set baseline plan in Set Baseline dialogue box
- 17. Select Selected tasks in For field
- 18. Tick To all summary tasks in Roll up baselines field
- 19. Click OK

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Figure 5.46 : Setting Baseline for Incomplete Tasks

The result of new baseline for the incomplete tasks is as shown below.

			-		D 11	o	er. 1.1	0.1	
	0	WB -	Ias Mo	Task Name	Duratior	Start	Finish	Cost 👻	11 June 21 September 01 January
1		1	3	Membina 2 Blok Bangunan	157 days	Sat 01-06-13	Thu 16-01-14	RM2,330,000.00	
3		1.2	₿.	Prelinimaries	157 days	Sun 02-06-13	Thu 16-01-14	RM50,000.00	28%
17		1.5	3	Blok A	133 days	Mon 01-07-13	Sun 12-01-14	RM1,250,000.00	6%
18	ŧ.	1.5.1	3	Kerja Tanah	42 days	Mon 01-07-13	Sun 01-09-13	RM200,000.00	24%
19		1.5.2	3	VO1_Kerja Tanah Tambahan	25 days	Mon 02-09-13	Tue 08-10-13	RM200,000.00	0%
20	ŧ.	1.5.3	₽.	Kerja Struktur	33 days	Wed 09-10-13	Tue 26-11-13	RM400,000.00	0%
21	ŧ.	1.5.4	₿	Kerja Arkitek	43 days	Wed 13-11-13	Sun 12-01-14	RM250,000.00	0%
22		1.5.5	₽.	Kerja M&E	32 days	Wed 20-11-13	Thu 02-01-14	RM200,000.00	é%
23		1.6	₿.	Blok B	97 days	Sun 07-07-13	Wed 27-11-13	RM1,030,000.00	₽ 3%
24	ŧ.	1.6.1	₿.	Kerja Tanah	53 days	Sun 07-07-13	Mon 23-09-13	RM180,000.00	11%
25		1.6.2	3	VO2_Kerja Tanah Tambahan	35 days	Wed 25-09-13	Thu 14-11-13	RM150,000.00	-0%
26	ŧ.	1.6.3	3	Kerja Struktur	30 days	Tue 27-08-13	Wed 09-10-13	RM290,000.00	0%
27	ŧ.	1.6.4	3	Kerja Arkitek	43 days	Thu 26-09-13	Wed 27-11-13	RM180,000.00	9 0%
28		1.6.5	₽.	Kerja M&E	28 days	Thu 03-10-13	Wed 13-11-13	RM230,000.00	
29		1.7	2	Completion of Cable Laying by TNB	0 days	Tue 07-01-14	Tue 07-01-14	RM0.00	V 07-01
30		1.8	3	T&C	5 days	Wed 08-01-14	Tue 14-01-14	RM0.00	8 0%
31		1.9	₿.	Projek Siap	0 days	Thu 16-01-14	Thu 16-01-14	RM0.00	😽 16-01

Figure 5.47 : Baseline for Incomplete Tasks

- 20. Click inverted arrow at filter icon
- 21. Select [No Filter] in data group to show all tasks

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Figure 5.48 : Unfiltering for All Tasks

The result of the new baseline for all tasks is as shown below.

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	6	₩B-	Tas Mo	Task Name 👻	Duratior 🗸	Start 🚽	Finish 🚽	Cost 👻	r 01 Marc	h 1 3 19 0	1 June	21 Septen	ber 0	1 January	11 April	2
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2	\checkmark	1.1	3	Projek Mula	0 days	Sat 01 06 13	Sat 01 06 13	RM0.00	-	÷٦	4 06					
3		1.2	3	Prelinimaries	157 days	Sun 02 06 13	Thu 16 01 14	RM50,000.00		ų,	-			28%		
4	~	1.2.1	\$	Performance Bond	5 days	Sun 02 06 13	Sun 09 06 13	RM10,000.00		8	190%					
5		1.2.2	3	± Est. & Remove S.	152 days	Mon 10 06 13	Thu 16 01 14	RM20,000.00						71%		
8		1.2.3	3	Maintain S.O	91 days	Mon 17 06 13	Wed 30 10 13	RM15,000.00		5	•	22	%			
9	Ð	1.2.4	3	Progress Report	83 days	Tue 25 06 13	Mon 28 10 13	RM5,000.00			0 100%0%	0% 0% 0%				
15	\checkmark	1.3	3	Land Acquisition	0 days	Mon 01 07 13	Mon 01 07 13	RM0.00		¢.	01 07					
16	\checkmark	1.4	3	Services Relocation	0 days	Sun 07 07 13	Sun 07 07 13	RM0.00		\diamond	67 07					
17		1.5	3	Blok A	133 days	Mon 01 07 13	Sun 12 01 14	RM1,250,000.00			VI		_	6%		
18	1	1.5.1	3	Kerja Tanah	42 days	Mon 01 07 13	Sun 01 09 13	RM200,000.00				24%				
19		1.5.2	3	VO1_Kerja Tanah Tambahan	25 days	Mon 02 09 13	Tue 08 10 13	RM200,000.00				0%				
20	÷.	1.5.3	₿.	Kerja Struktur	33 days	Wed 09 10 13	Tue 26 11 13	RM400,000.00				*	h 0%			
21	ŧ.	1.5.4	3	Kerja Arkitek	43 days	Wed 13 11 13	Sun 12 01 14	RM250,000.00				9=		0%		
22		1.5.5	3	Kerja M&E	32 days	Wed 20 11 13	Thu 02 01 14	RM200,000.00				6	<u>نہ</u>	0%		
23		1.6	3	Blok B	97 days	Sun 07 07 13	Wed 27 11 13	RM1,030,000.00					3%			
24	1	1.6.1	3	Kerja Tanah	53 days	Sun 07 07 13	Mon 23 09 13	RM180,000.00			Ľ	11%				
25		1.6.2	8	VO2_Kerja Tanah Tambahan	35 days	Wed 25 09 13	Thu 14 11 13	RM150,000.00					0%			
26	ŧ.	1.6.3	3	Kerja Struktur	30 days	Tue 27 08 13	Wed 09 10 13	RM290,000.00				0%				
27	ŧ.	1.6.4	3	Kerja Arkitek	43 days	Thu 26 09 13	Wed 27 11 13	RM180,000.00				9	0%			
28		1.6.5	3	Kerja M&E	28 days	Thu 03 10 13	Wed 13 11 13	RM230,000.00	-			È-	0%			
29		1.7	₽¢	Completion of Cable Laying by TNB	0 days	Tue 07 01 14	Tue 07 01 14	RM0.00					*	07 01		
30		1.8	3	T&C	5 days	Wed 08 01 14	Tue 14 01 14	RM0.00					8	0%		
31		1.9	-	Projek Siap	0 days	Thu 16 01 14	Thu 16 01 14	RM0.00					4	6 16 01		



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Figure 5.50 : Saving Accepted File

This file is considered as Baseline 2 and will be used for further monitoring and control.

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ACKNOWLEDGEMENTS

The appreciation goes to JKR Work Group for their contribution and efforts in developing this Project Scheduling Hands-On Manual. The committee also would like to express the appreciation and thanks to Ir. Hj Nazari bin Hashim, Director of PROKOM for his guidance and support in making this manual possible.



(Behind from left) : Shari Keling; Siaw Wai San; Ir. Zamilah Said; Ir. Nor Hazlin Mohammad; Ir. Arnita Sofia Osman; Noraniza Mohamad Yusof; Sharifah Maznah Syed Ahmad Zahri; Amiliah Chikon;

(Front from left) : Ir. Mohamad Salehhuddin Othman; Ir. Mas Abdul Rahman Mas Mohamad; Ir. Abd Rahman Shamsuddin; Ir. Wan Ibrahim Wan Yusoff; Ir. Razali Muda; Zainal Abidin Sin