



A & A Works to 29 Elevated MRT Stations (J145-C1261C) INTERNAL SEMINAR (2)

27 August 2004

TALKING POINT 1: PLANNING AND PLANNING ENGINEER



How to Model the Real Nature of Work (1)?

Specification:
Function description in text

Contract:
Legal obligation



Drawing:
Product on the paper

Programme:
Construction on the paper

How to Model the Real Nature of Work (2)?

- Laying pipe: linear nature
- Residential block: repeated nature
- CPM method:
 - Logical link. Technical constraint + resource constraint
 - Activity list + Timeline + Resource + Cost
- Degree of detail Vs stage of work: work breakdown structure
- The more detail, the more confident

Bases for Planning

- Scope of work
- Key dates and drawings
- Method statement
- Quantity of work
- Production rate, etc

Planning Method

- Collect, sort, filter and compile information
- Communication with trades engineers
- From checklist to schedule
- From milestones/keydates (control point) to detail programme (top to down)
- From micro to macro programme (down to top)
- From draft to finalise
- Review, revise and report

What Does the LTA Want for Project Planning and Monitoring?

- Baseline
- Progress measurement against baseline: Weightage and S curve
- 3 month rolling programme to justify the interim progress payment
- Justify the resource usage

Baseline for C1261C

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float	2003				
								DEC	JAN	FEB	MAR	APR
STAGE 1												
STATION 29 BUKIT BATOK												
Construction & Installation												
Internal Lift												
Lift No. 2												
Pre-condition Survey												
AACN10310	Conduct pre-condition survey	6	31DEC02	05JAN03	05FEB03	10FEB03	36					
AACN10320	Submit pre-condition survey report	18	06JAN03	23JAN03	11FEB03	28FEB03	36					
Instrumentation and Monitoring												

- General Specification Appendix E, “Programme Requirements”

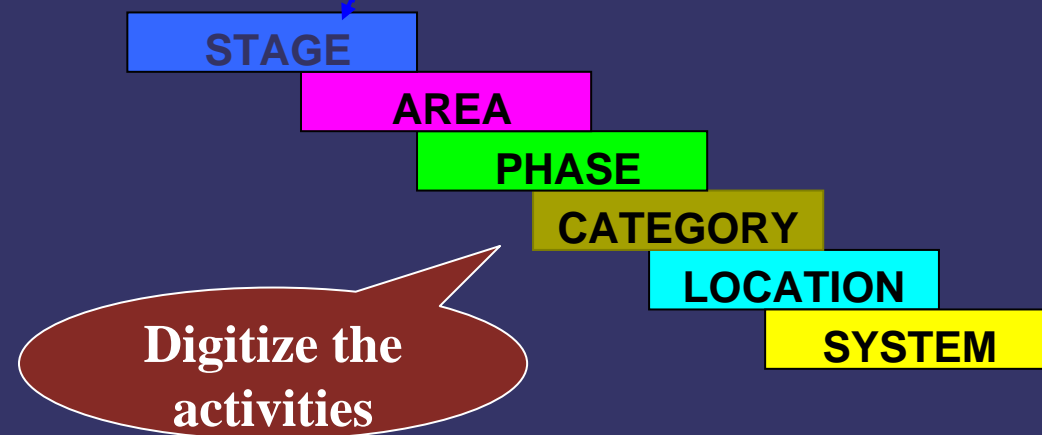
- Dictionary

- Calendar

- Activity code

- Resource pool

- Cost pool



TALKING POINT 2: DURATION



How to Determine an Activity's Duration?

- Probability (PERT). $D=(a+4b+c)/6$.
 - a=optimistic duration
 - b=expected duration
 - c=pessimistic duration
- Qty=Duration x Production Rate

Learning Curve

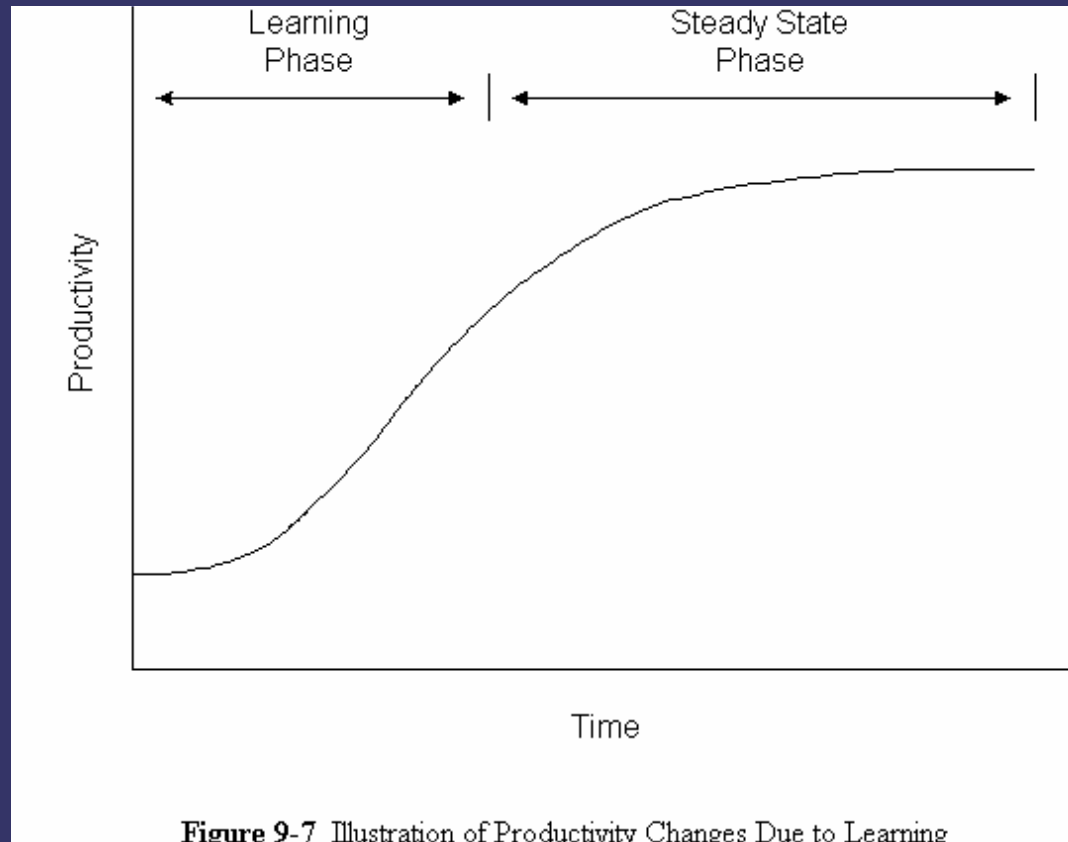


Figure 9-7 Illustration of Productivity Changes Due to Learning

Example:

- To find a friend's house
- Bukit Batok Station: Pioneer station for other stations

TALKING POINT 3: RESOURCE

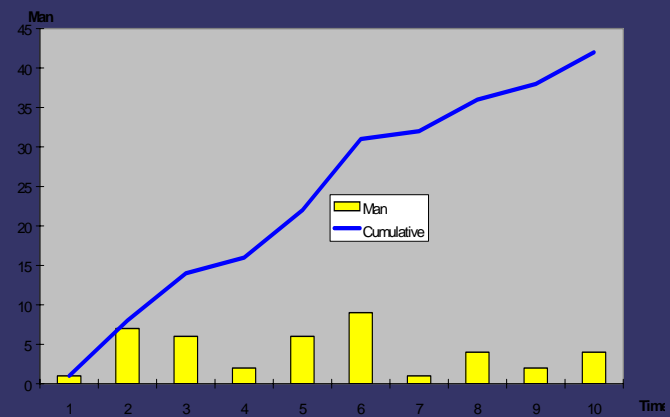
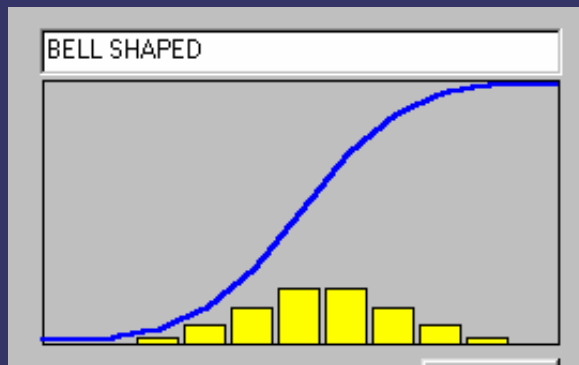
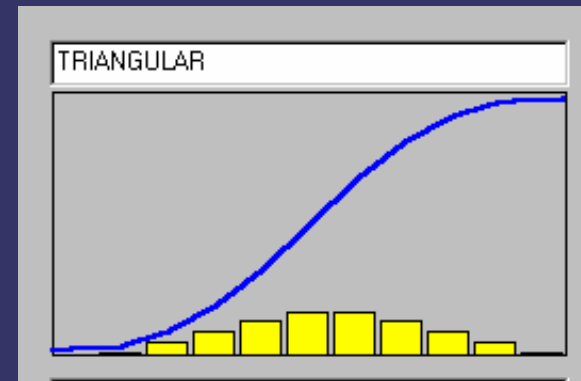
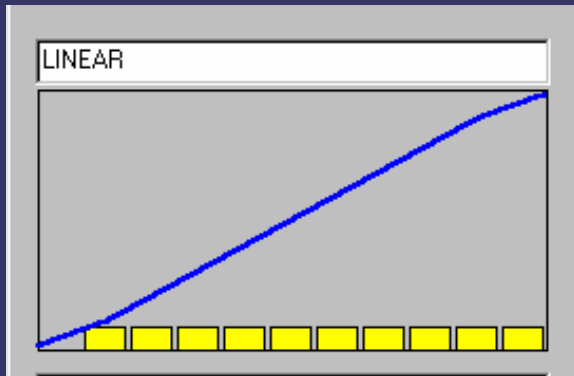


About Resource

- Resource pool: engineers, carpenter, bar bender, concreter, excavator, dump truck, etc
- Resource limit: availability
- Resource application: allocate certain resources to an activity
- Resource distribution: initial, peak and completion stage
- Resource optimization: no idle, no stretch
- Resource leveling: smooth resource usage by moving forward non-critical activities (duration fixed, resource optimised)
- Resource scheduling: maintain resource usage by extending the minimum project duration (resource fixed, duration optimised)

Resource Distribution

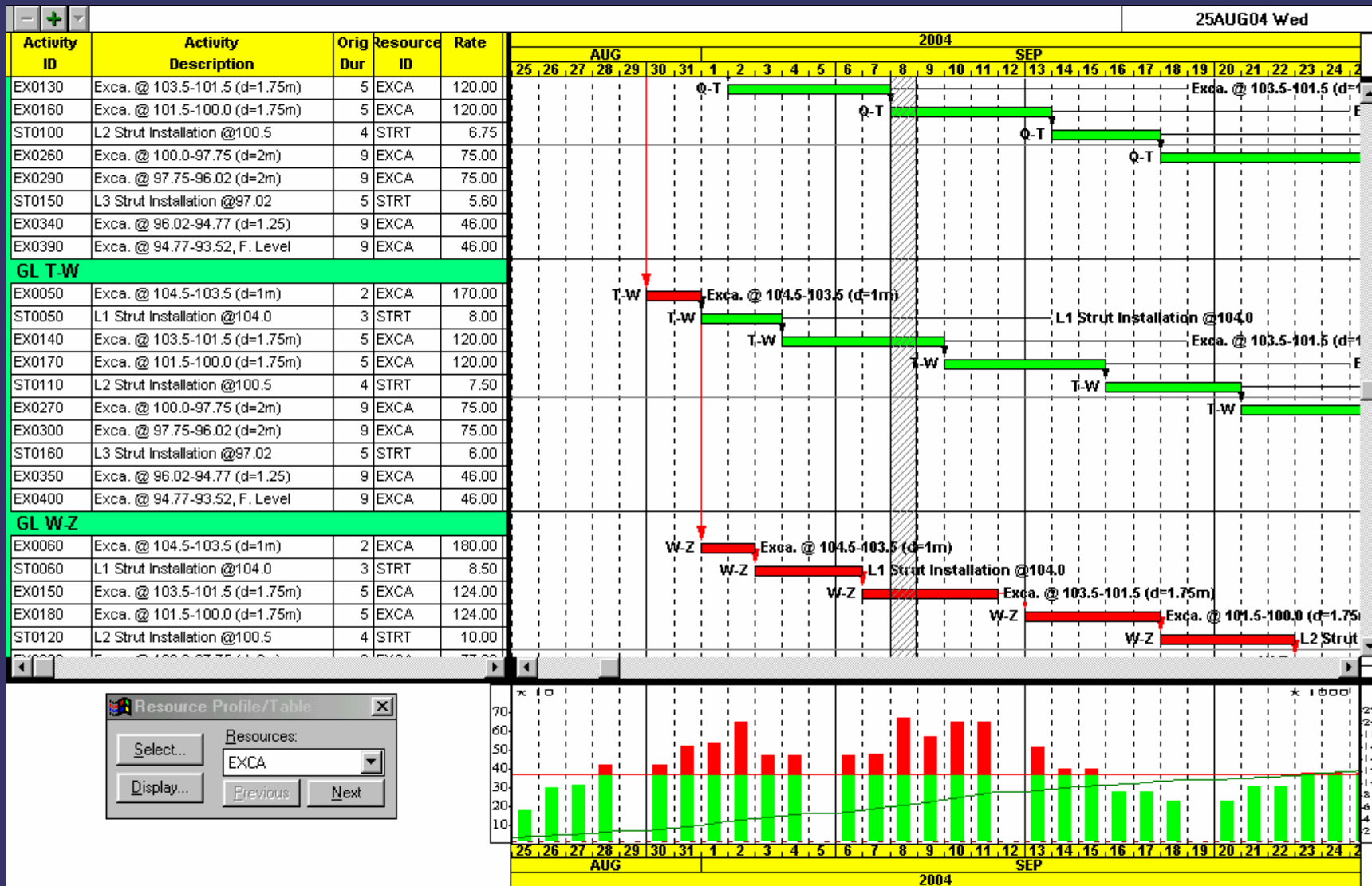
- Undesirable
- Desirable
- Ideal
- Realistic
- Achievable



Resource Scheduling- Examples

- C1261C Project example: Utraco piling rig is only available for the West and East section respectively at any time (2 nos. piling rig working at the same time)
- St Andrews Church Project example: daily excavation can not exceed 350m³

Resource Scheduling: P3 Resource Display



Resource Scheduling: Leveling Method

- By moving bar forward
 - Make use of total float
 - Set priorities
- For the Church project: extending activity duration and thus decreasing the resource usage ($Qty = Duration \times Production\ Rate$). Is this generally applicable?

TALKING POINT 4: PROGRESS ASSESSEMENT AND PAYMENT



Progress Assessment (1)

- By time lapse (linear with time)
- By resource usage
- By money spent (progress claim or certified payment)
- By artificial weightage

Progress Assessment (2)

- Earned value=Completion per cent x Original value
- “value” can be:
 - Payment (money)
 - Efforts made (man-hour)
 - Duration
 - Weightage

Progress Assessment (3): 3-month Rolling Programme

- Complete percent to be verified with LTA project team
- Earned weightage
- Rolled up to SYS code for progress claim

Payment Mode (1)

- By traditional price schedule structure (BQ): pay when completed (0% or 100%)
- By linking payment to progress: programme used as an instrument
- Staggered payment: 50%, 75%, 90% and 100%

Payment Mode (2)

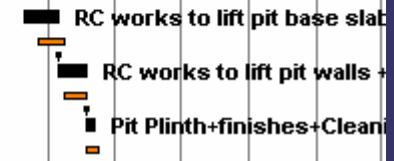
For C1261C Contract:

Price Schedule	Contents	Items	Payment Mode
Schedule A	Preliminaries		Time based
Schedule B	Provisional Sums	-Trees and landscape -Signage -Future services	Actual work based
Schedule C	Provisional Quantities	-Piling -Instrumentation and Monitoring -Soil Investigation	Actual work based
Schedule D	Civil Works	Lift and ancillary works	CTS based and by stages
Schedule E	E&M Works	By system and by categories	CTS based and by stages
Option Items	-Covered Linkway -Drop Off -Tactile	Include Civil and E&M Works	Actual work based

Payment Mode (3): Payment Linking Progress-CTS Code

Activity ID	Activity Description	% Comp	WTG	CTS	S	2003							
						F	MAR	APR	MAY	JUN	JUL	AUG	SEP
STAGE 1													
STATION 29 BUKIT BATOK													
Construction & Installation													
Internal Lift													
Lift No. 2													
RC Structure Work													
AACN10340	RC works to lift pit base slab +	100	100.00	D.BBT.4.05	1								
AACN10370	RC works to lift pit walls + waterproofing	100	76.00	D.BBT.4.05	1								
AACN10380	Pit Plinth+finishes+Cleaning	100	52.00	D.BBT.4.05	1								

SYS Code

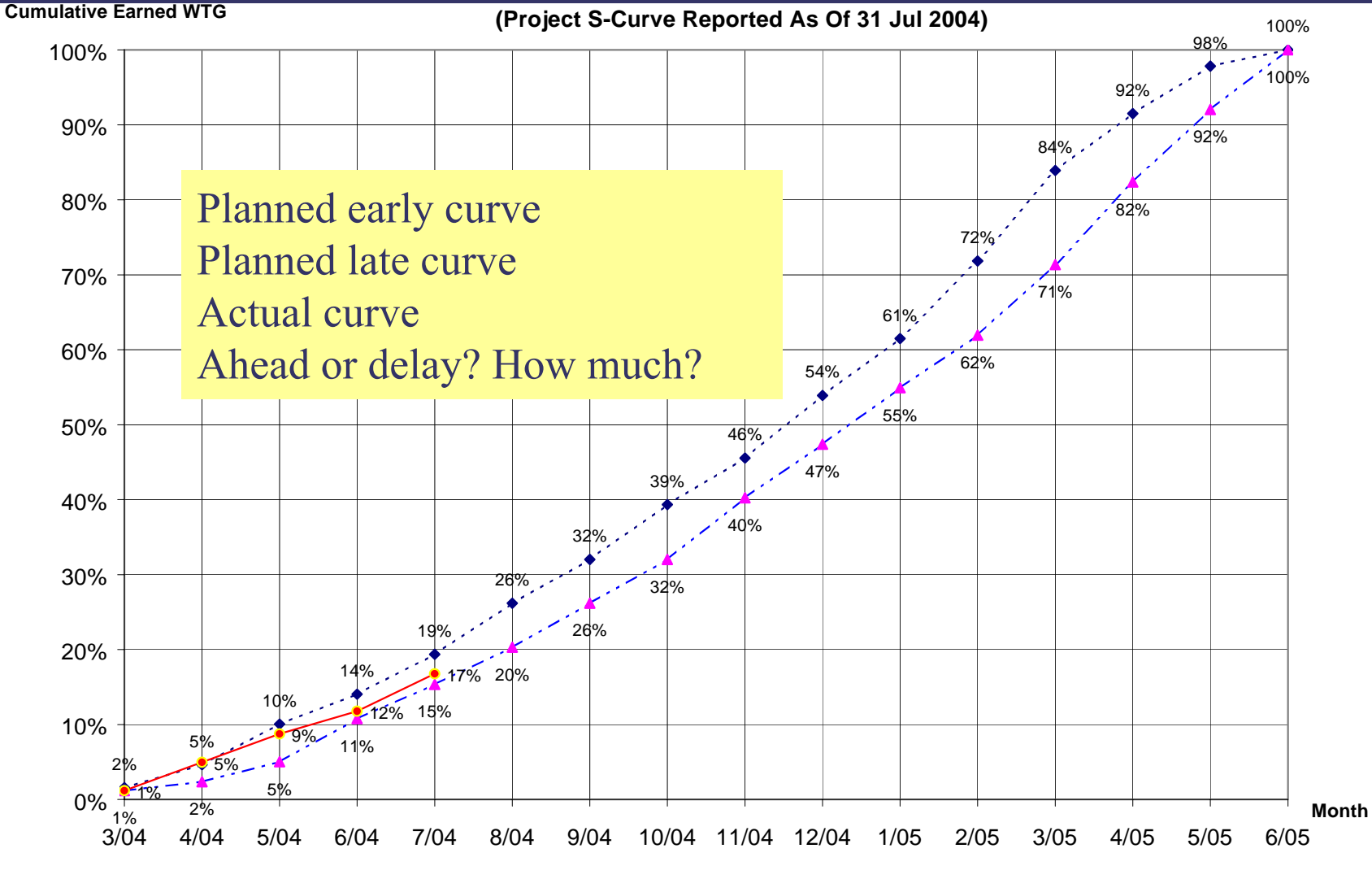


ITEM	DESCRIPTION	UNIT	AMOUNT	CTS Code
	BUKIT BATOK STATION - INTERNAL LIFT (1 No)			
4	RC Structure Work			
a	Reinforced Concrete	Sum	2,715.00	D.BBT.4.05
b	Formwork	Sum	1,474.00	D.BBT.4.05
c	Reinforcement	Sum	1,218.00	D.BBT.4.05
d	Waterproofing	Sum	2,719.00	D.BBT.4.05
e	Make good and reinstate all works disturbed	Sum	-	D.BBT.4.05
f	Others	Sum	-	D.BBT.4.05

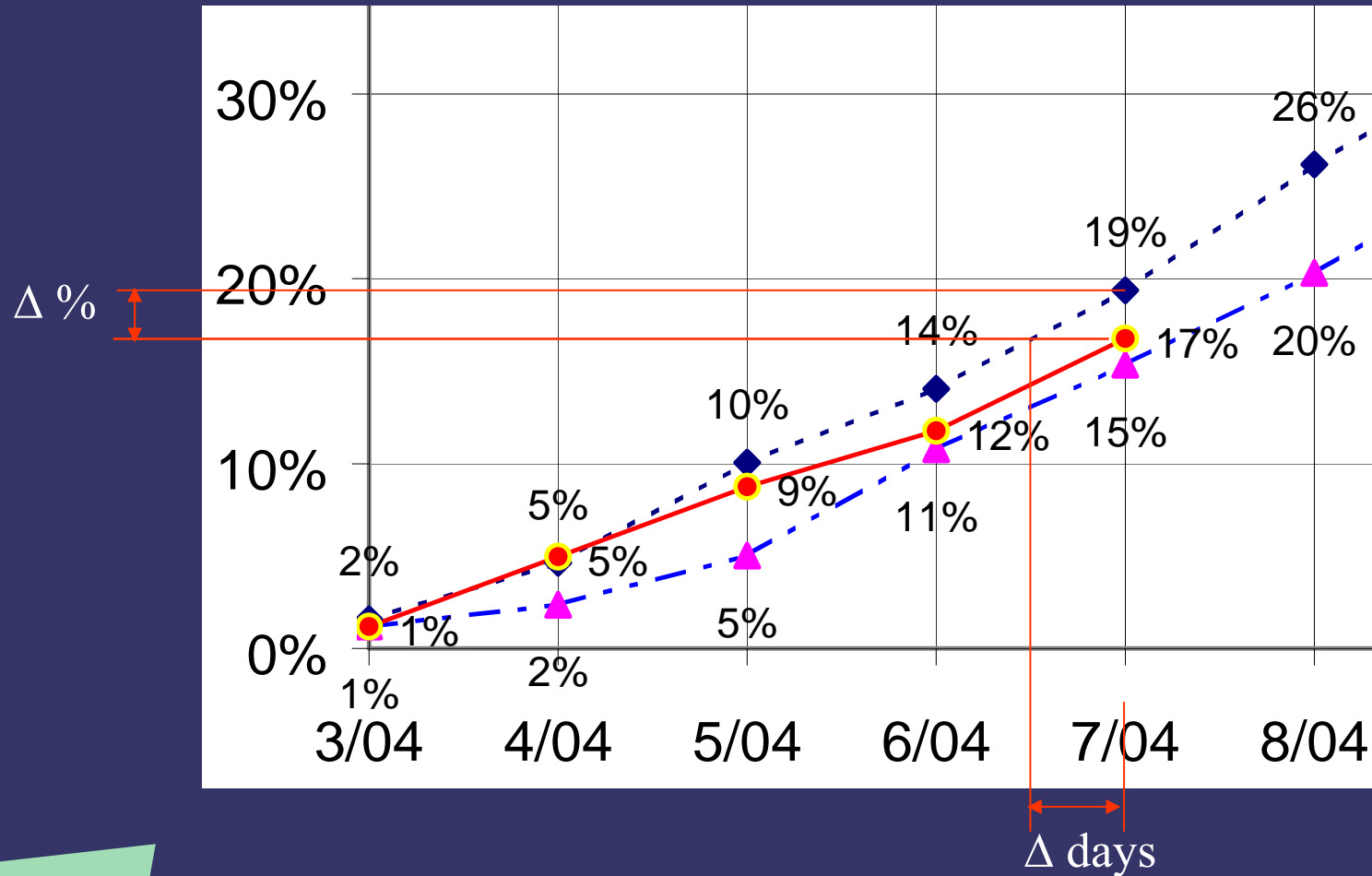
TALKING POINT 5: S CURVE



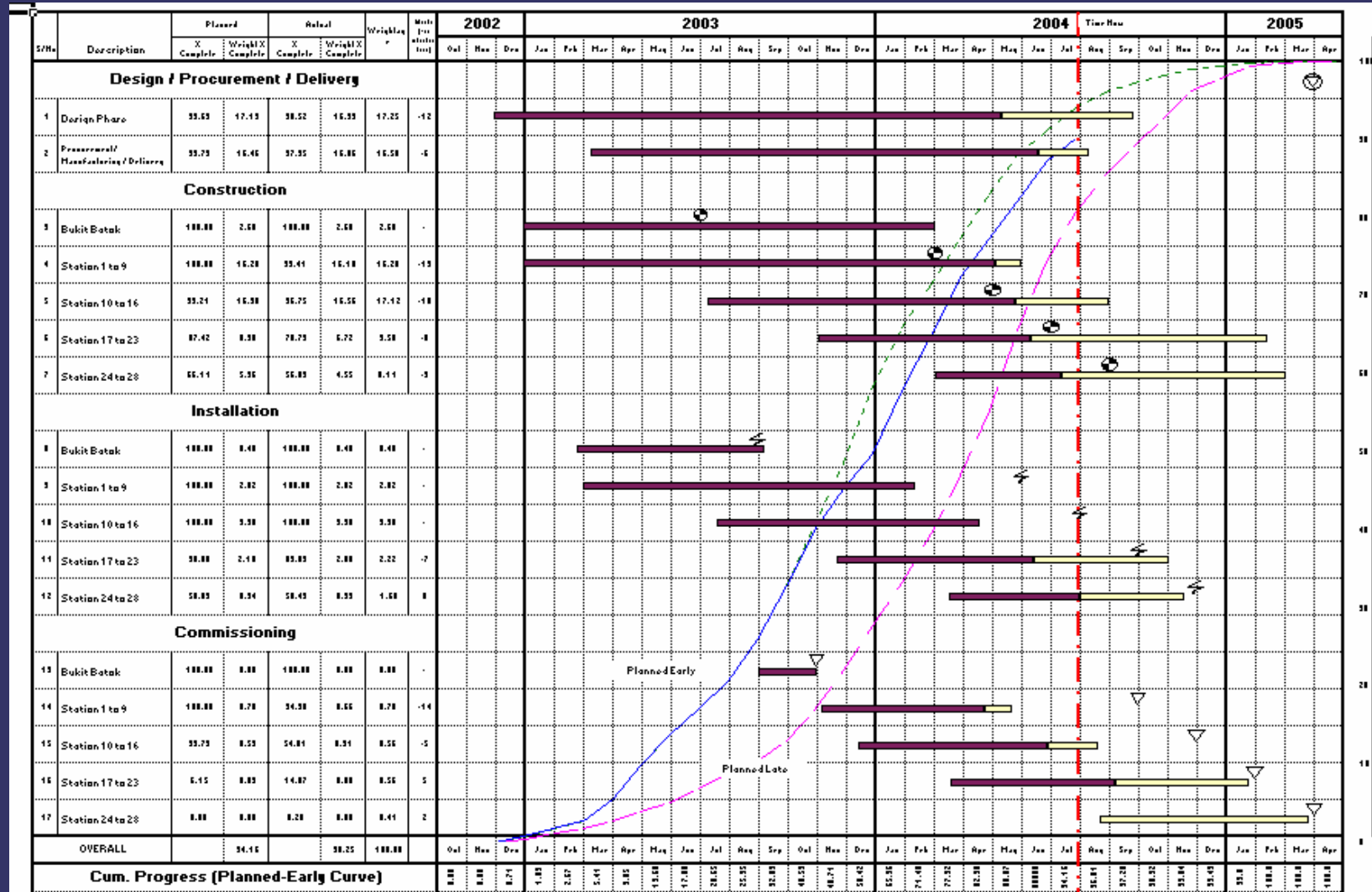
Information From S Curve



Interpretation of S Curve



C1261C S Curve



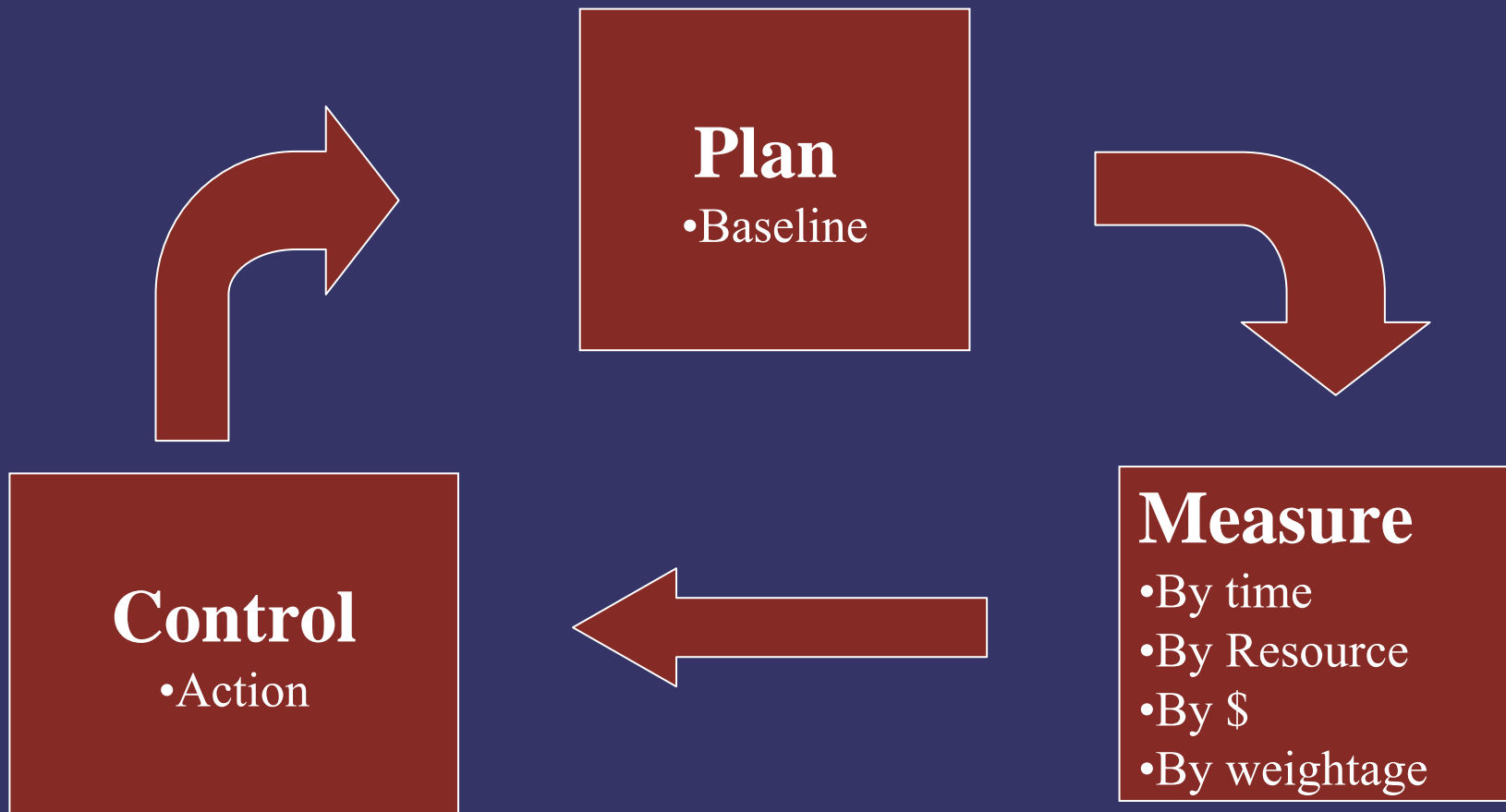
How to Get C1261C S Curve (1)

	B	C	D	E	F	G	H	Z	AA	AB	AC	AD	AE
1	Description	Planned %	Actual %	No.of day	Wght (%)	T.Wght	Month	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04
2		Complete	Complete	ahead/delay			No. Days / mth	31	30	31	30	31	31
15	Bukit Batok (CNI)	100.00	100.00	0.00	2.60	5347.07	Planned	5	0	0	0	0	0
16		Cum. Wght						5347	5347	5347	5347	5347	5347
17		Cum.Percent						100.00	100.00	100.00	100.00	100.00	100.00
18		Actual						5317.07	5317.07	5347.07	5347.07		
19		Cum.Percent						99.44	99.44	100.00	100.00	0.00	0.00
20					("-ve" = delay/ "0" = on time)			No. Days	-34	-66	0	0	
21	Stn 1 to 9 (CNI)	100.00	98.68	-73.75	16.28	33497.6	Planned	486.5556	525.5556	220	0	0	0
22		Cum. Wght						32752	33278	33498	33498	33498	33498
23		Cum.Percent						97.77	99.34	100.00	100.00	100.00	100.00
24		Actual						31833.95	32410	32735	33054.15		
25		Cum.Percent						95.03	96.75	97.72	98.68	0.00	0.00
26					("-ve" = delay/ "0" = on time)			No. Days	-52	-52	-62	-74	
27	Stn 10 to 16 (CNI)	98.21	94.61	-67.03	17.12	35229.35	Planned	2903.746	2016.131	450.9447	413.3333	350	28
28		Cum. Wght						31719	33735	34186	34599	34949	35229
29		Cum.Percent						90.04	95.76	97.04	98.21	99.21	100.00
30		Actual						27544.11	30528	32365	33330.01		
31		Cum.Percent						78.19	86.66	91.87	94.61	0.00	0.00
32					("-ve" = delay/ "0" = on time)			No. Days	-47	-43	-51	-67	
33	Stn 17 to 23 (CNI)	76.98	68.21	-30.82	9.50	19542.43	Planned	2035.75	1970.225	2083.807	1657.671	2040.633	1116.11
34		Cum. Wght						9332	11302	13386	15043	17084	18200
35		Cum.Percent						47.75	57.83	68.50	76.98	87.42	93.11
36		Actual						8515.8	9928	11303	13330.81		
37		Cum.Percent						43.58	50.80	57.84	68.21	0.00	0.00
38					("-ve" = delay/ "0" = on time)			No. Days	-12	-21	-31	-31	
39	Stn 24 to 28	51.05	40.30	-23.83	8.11	16697.33	Planned	1069.714	1917.877	3275.792	2260.737	2514.558	1077.79

How to Get C1261C S Curve? (2)

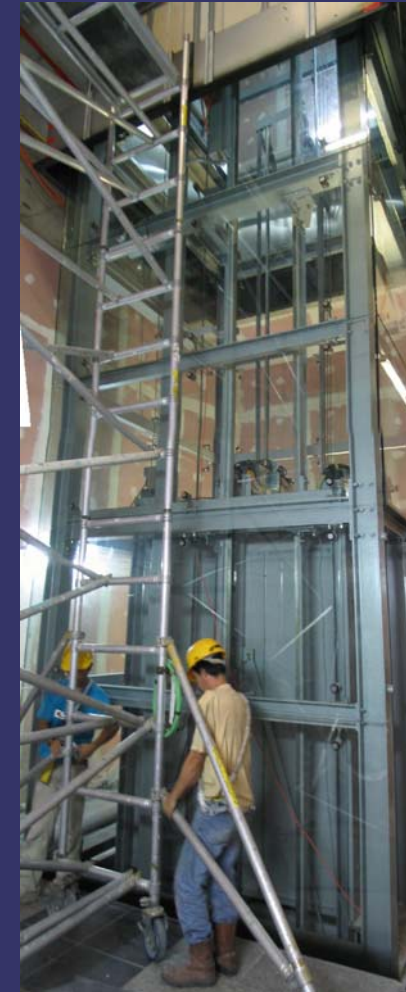
S/No	Description	Planned		Actual		Weightage
		% Complete	Weight % Complete	% Complete	Weight % Complete	
Design / Procurement / Delivery						
1	Design Phase	99.31	17.13	96.77	16.69	17.25
2	Procurement/ Manufacturing / Delivery	98.59	16.26	95.60	15.77	16.50
Construction						
3	Bukit Batok	100.00	2.60	100.00	2.60	2.60
4	Station 1 to 9	100.00	16.28	98.68	16.06	16.28
5	Station 10 to 16	98.21	16.81	94.61	16.20	17.12
6	Station 17 to 23	76.98	7.31	68.21	6.48	9.50
7	Station 24 to 28	51.05	4.14	40.30	3.27	8.11

END NOTES



- Learn, observe and practice
- Practice makes perfect

PHOTO GALLERY



MRT C1261C TEAM AT WORK- PGI (1)



MRT C1261C TEAM AT WORK-SAFETY CAMPAIGN AT CLE ON 06 AUG 04 (5)



THANK YOU!