

Project Planning & Control

Lesson 2

Projects & Resources, Example of Two Resources, Exercise, Two-Span Bridge Example

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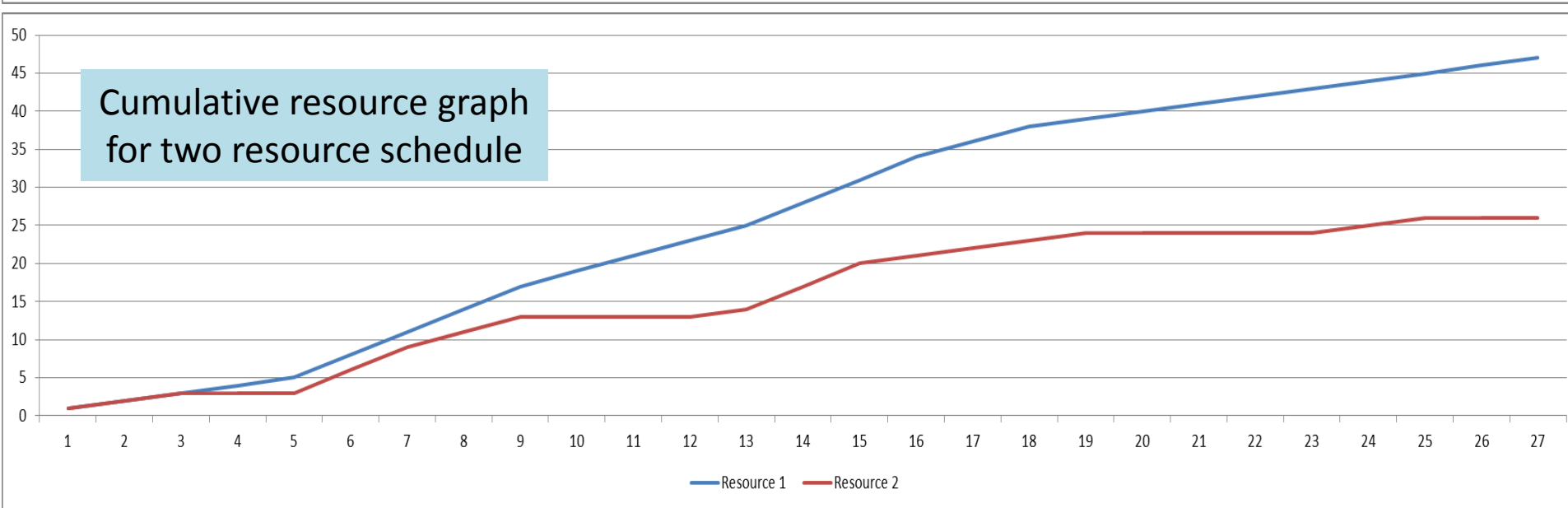
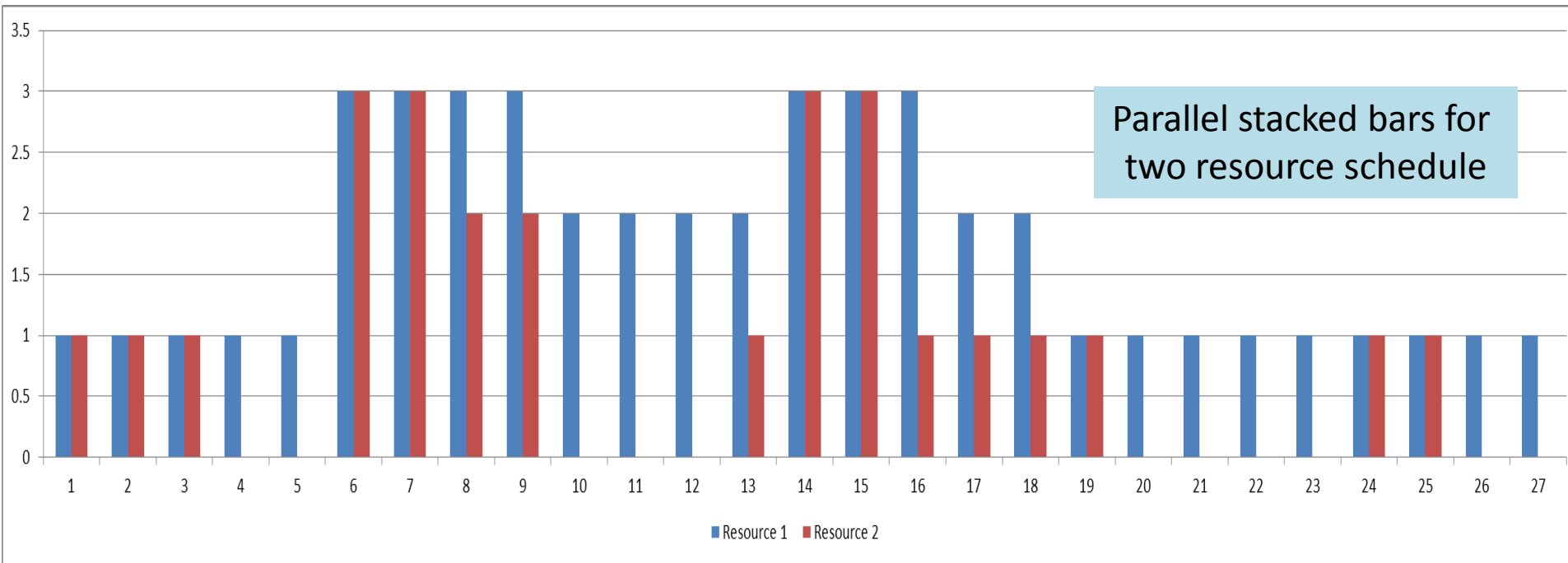
Projects & Resources

- Single Project – Single Resource
- Single project – Multiple Resources
- Multiple project – Single Resource
- Multiple Projects – Multiple Resources

Example Two resources

- Consider a scenario where you would require an equipment resource in addition to the manpower resource.
- The equipment resource is required for the first half of every activity

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
A	1	1	1	1	1																						
	1	1	1																								
B						1	1	1	1																		
						1	1																				
C						1	1	1	1	1	1	1															
						1	1	1	1																		
D						1	1	1	1	1	1	1	1														
						1	1	1	1																		
E													1	1	1	1	1	1									
													1	1	1												
F														1	1	1											
														1	1												
G														1	1	1	1	1	1	1	1	1					
														1	1	1	1	1	1								
H																								1	1	1	1
																							1	1			
RES 1	1	1	1	1	1	3	3	3	3	2	2	2	2	3	3	3	2	2	1	1	1	1	1	1	1	1	1
RES 2	1	1	1	0	0	3	3	2	2	0	0	0	1	3	3	1	1	1	1	0	0	0	0	1	1	0	0

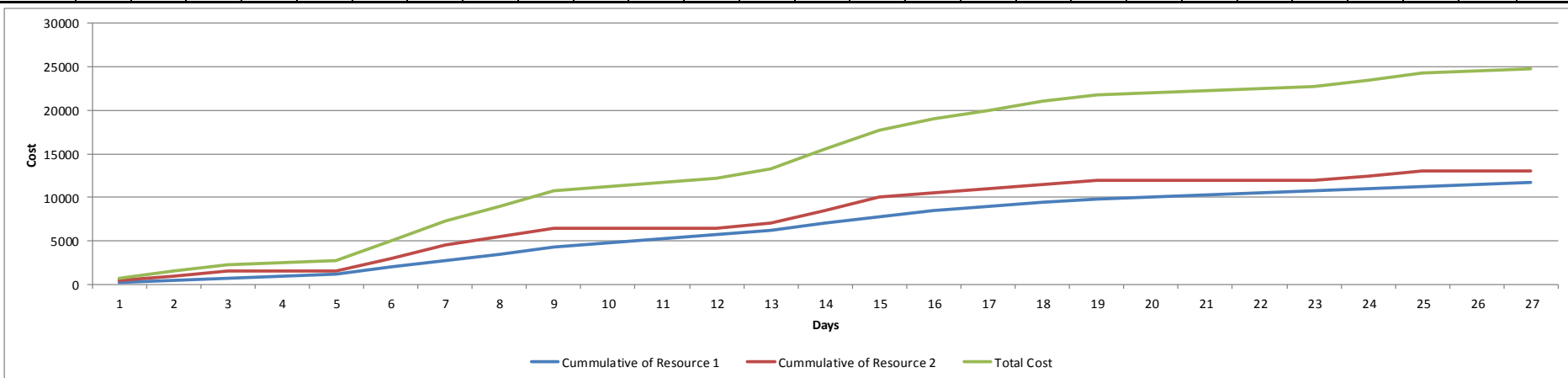


Cumulative resource graph

Cost loaded

- Consider resource 1 with a cost of Rs.250/- & resource 2 with a cost Rs.500/- per day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
A	250	250	250	250	250																						
	500	500	500																								
B						250	250	250	250																		
						500	500																				
C						250	250	250	250	250	250	250															
						500	500	500	500																		
D						250	250	250	250	250	250	250	250														
						500	500	500	500																		
E													250	250	250	250	250	250									
													500	500	500												
F														250	250	250											
														500	500												
G														250	250	250	250	250	250	250	250	250	250				
														500	500	500	500	500	500								
H																								250	250	250	250
																								500	500		
RES 1	250	250	250	250	250	750	750	750	750	500	500	500	500	750	750	750	500	500	250	250	250	250	250	250	250	250	250
RES 2	500	500	500	0	0	1500	1500	1000	1000	0	0	0	500	1500	1500	500	500	500	500	0	0	0	0	0	500	500	0
Cum RES 1	250	500	750	1000	1250	2000	2750	3500	4250	4750	5250	5750	6250	7000	7750	8500	9000	9500	9750	10000	10250	10500	10750	11000	11250	11500	11750
Cum RES 2	500	1000	1500	1500	1500	3000	4500	5500	6500	6500	6500	6500	7000	8500	10000	10500	11000	11500	12000	12000	12000	12000	12000	12500	13000	13000	13000
TOTAL	750	1500	2250	2500	2750	5000	7250	9000	10750	11250	11750	12250	13250	15500	17750	19000	20000	21000	21750	22000	22250	22500	22750	23500	24250	24500	24750



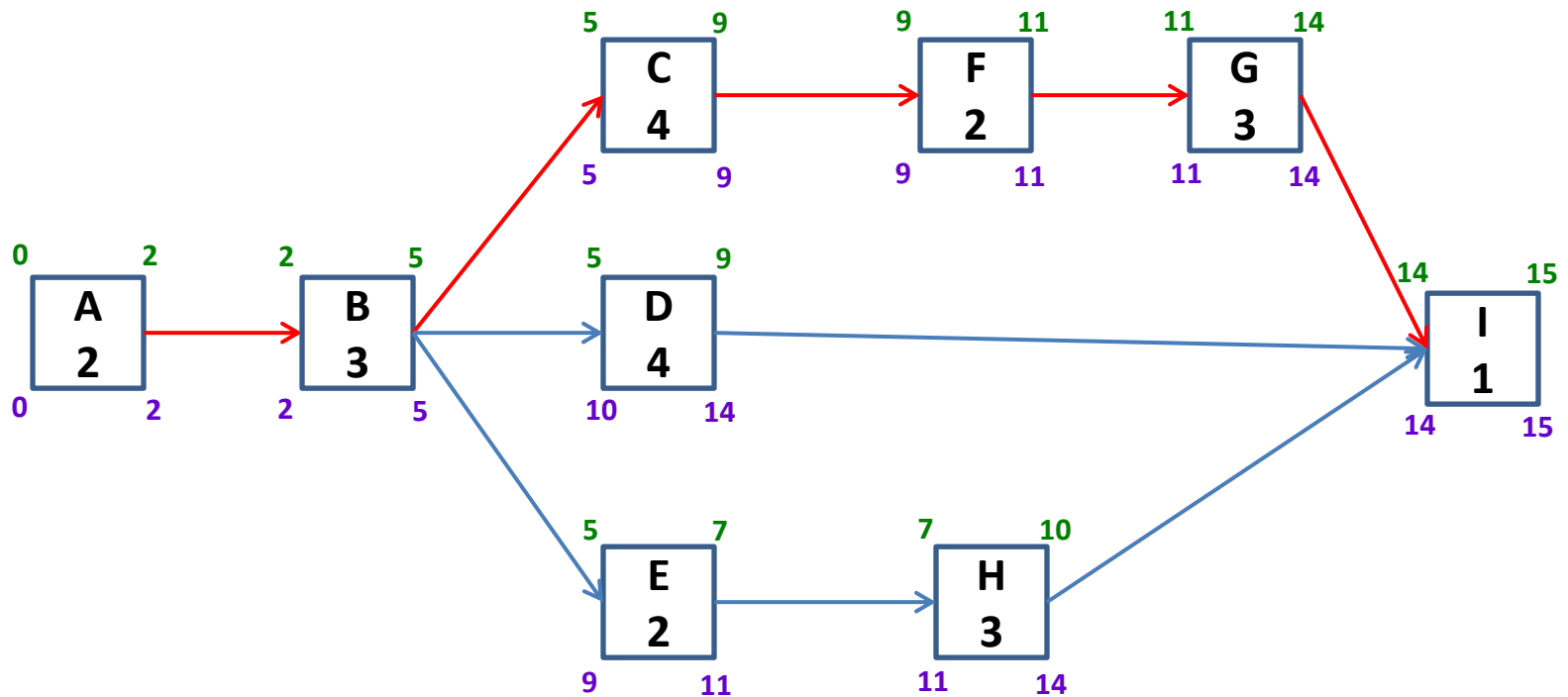
Exercise

Activity	Preceded by	Duration	Trucks
A	-	2	2
B	A	3	1
C	B	4	6
D	B	4	4
E	B	2	4
F	C	2	2
G	F	3	2
H	E	3	1
I	D,G,H	1	1

Find network parameters and plot resource histogram

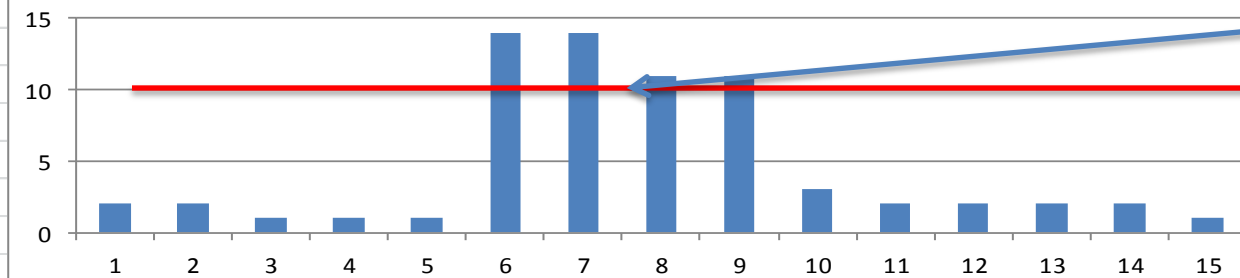
If only 10 trucks are available is this adequate if all activities are at Early Start ?
If not how can over-allocation problem be resolved ?

Network Analysis

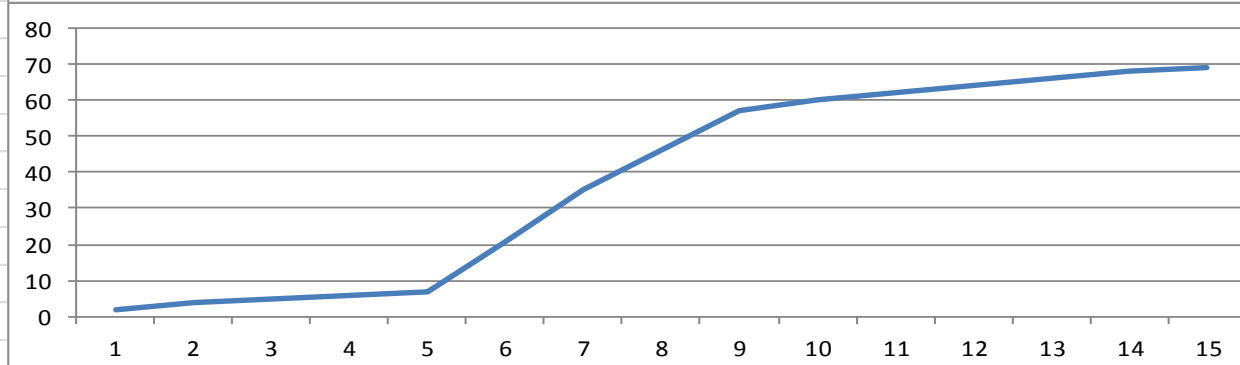


Early Start Schedule

Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	2	2													
B			1	1	1										
C						6	6	6	6						
D						4	4	4	4						
E						4	4								
F										2	2				
G												2	2	2	
H								1	1	1					
I															1
Total	2	2	1	1	1	14	14	11	11	3	2	2	2	2	1
Cum	2	4	5	6	7	21	35	46	57	60	62	64	66	68	69



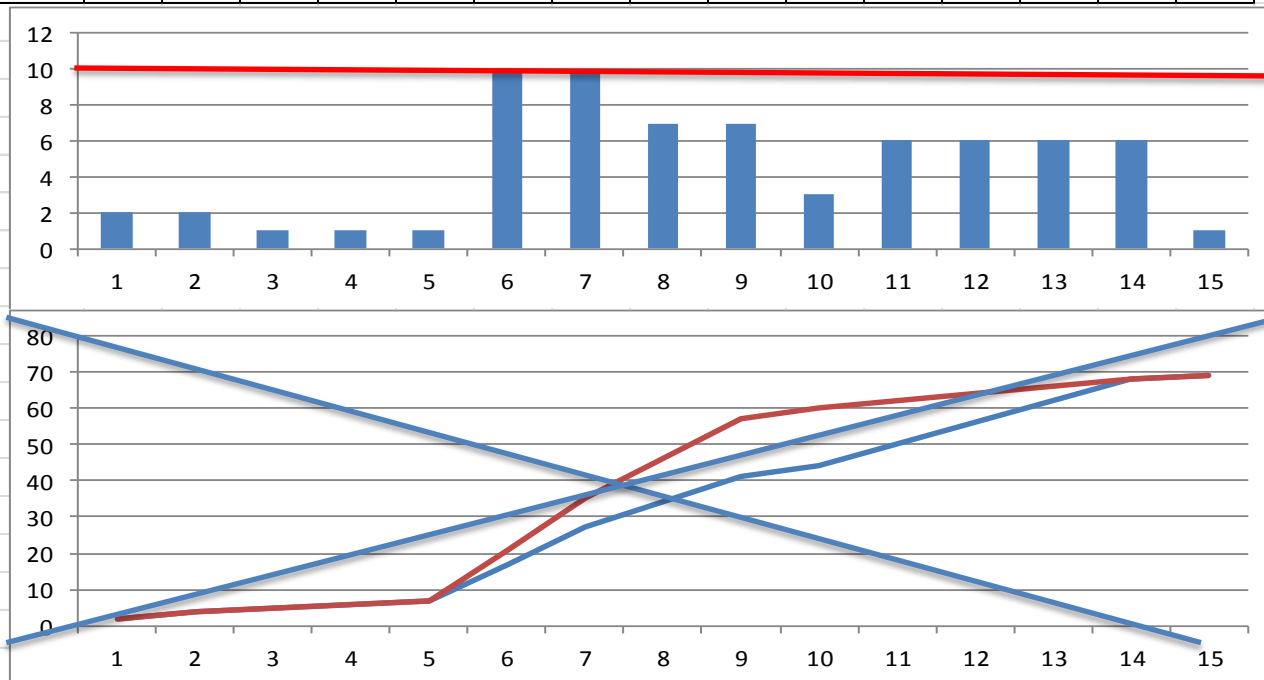
Over-allocation



Over-allocation- Resolved

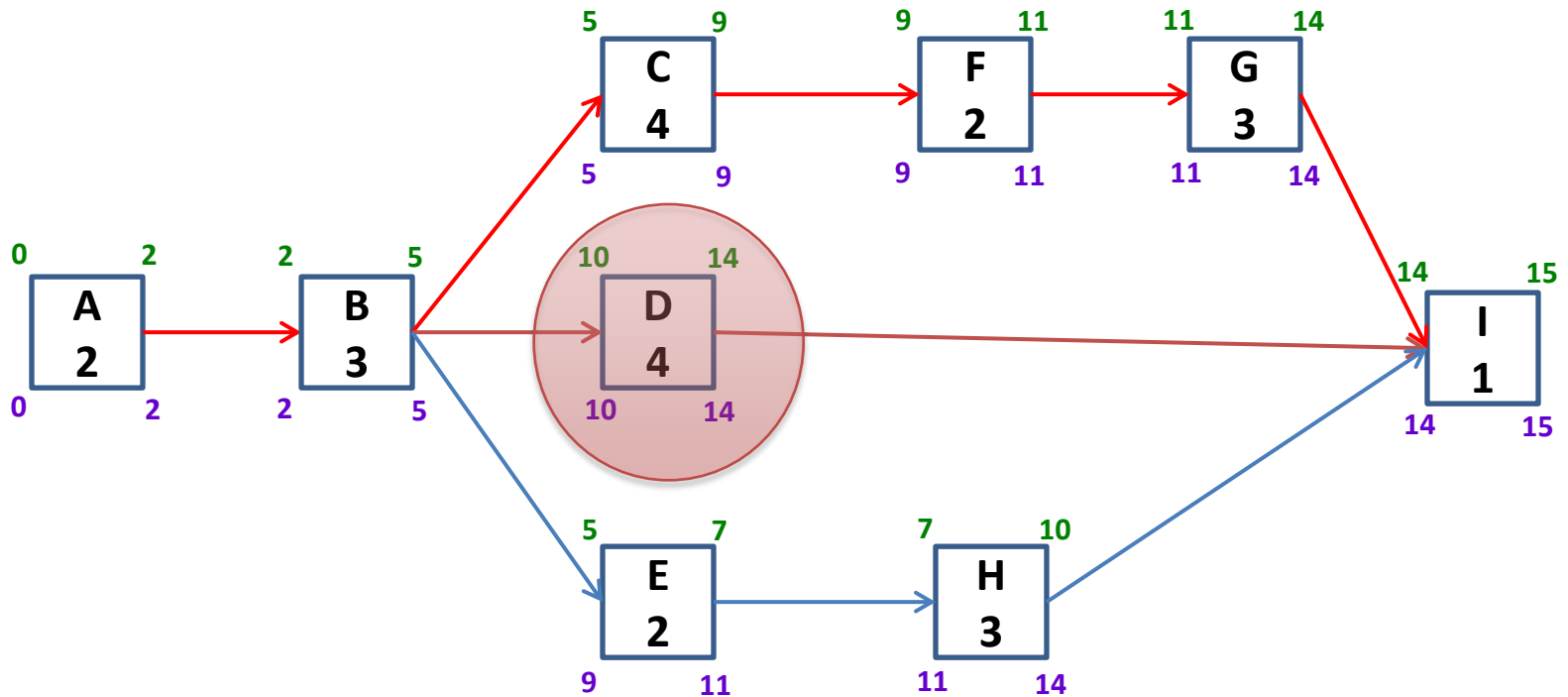
Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	2	2													
B			1	1	1										
C						6	6	6	6						
D											4	4	4	4	
E						4	4								
F										2	2				
G												2	2	2	
H								1	1	1					
I															1
Total	2	2	1	1	1	10	10	7	7	3	6	6	6	6	1
Cum	2	4	5	6	7	17	27	34	41	44	50	56	62	68	69

Float of D has been used to resolve Over-allocation



Network Parameters After Shift of D

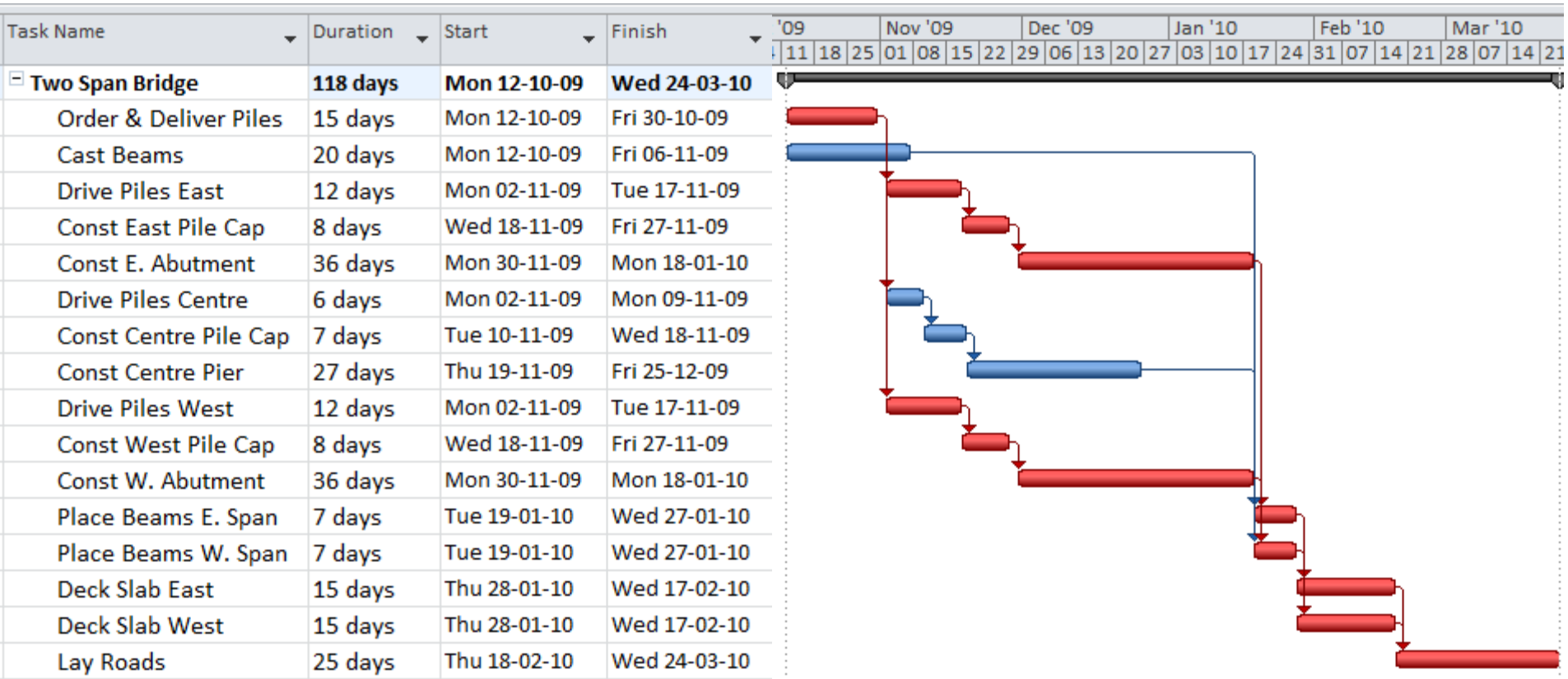
Does D need to use all its float ?


































Two Span Bridge

ID	Activity	Duration	Precedence	ES	EF	LS	LF	Float
A	Order & Deliver Piles	15	Start	0	15	0	15	0
B	Cast Beams	20	Start	0	20	51	71	51
C	Drive Piles East	12	1	15	27	15	27	0
D	Const East Pile Cap	08	3	27	35	27	35	0
E	Const E. Abutment	36	4	35	71	35	71	0
F	Drive Piles Centre	6	1	15	21	31	37	16
G	Const Centre Pile Cap	07	6	21	28	37	44	16
H	Const Centre Pier	27	7	28	55	44	71	16
I	Drive Piles West	12	1	15	27	15	27	0
J	Const West Pile Cap	08	9	27	35	27	35	0
K	Const W. Abutment	36	10	35	71	35	71	0
L	Place Beams E. Span	07	2(a),5,8	71	78	71	78	0
M	Place Beams W. Span	07	2(b),8,11	71	78	71	78	0
N	Deck Slab East	15	12	78	93	78	93	0
O	Deck Slab West	15	13	78	93	78	93	0
P	Lay Roads	25	14,15	93	118	93	118	0

Two Span Bridge

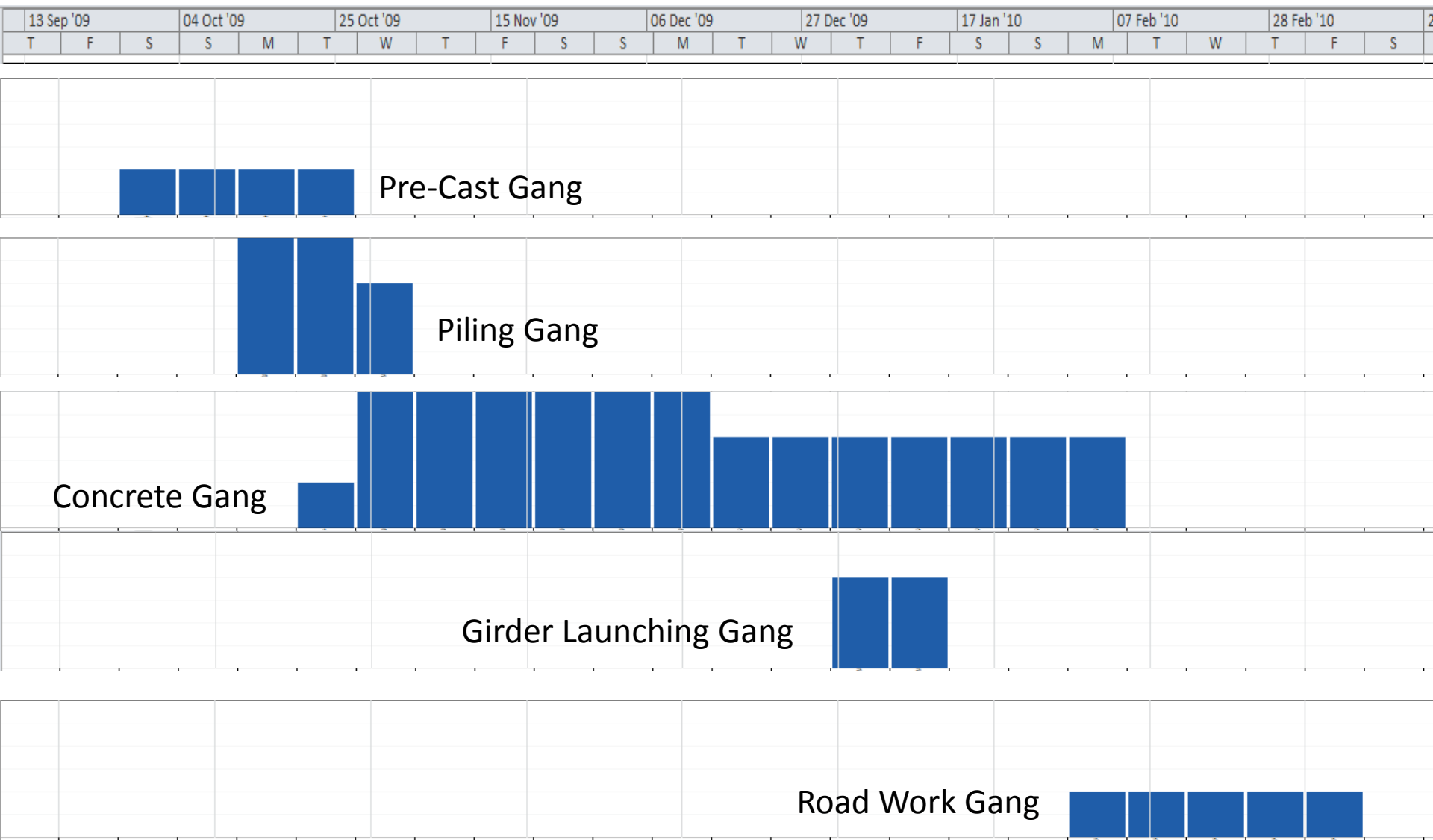


Two Span Bridge Resource Loaded

		Task Mode ▾	Task Name ▾	Duration ▾	Start ▾	Finish ▾	Predecessors ▾	Resource Names ▾
1			<input type="checkbox"/> Two Span Bridge	118 days	Mon 12-10-09	Wed 24-03-10		
2			Order & Deliver Piles	15 days	Mon 12-10-09	Fri 30-10-09		
3			Cast Beams	20 days	Mon 12-10-09	Fri 06-11-09		Pre Cast Gang
4			Drive Piles East	12 days	Mon 02-11-09	Tue 17-11-09	2	Piling Gang
5			Const East Pile Cap	8 days	Wed 18-11-09	Fri 27-11-09	4	Concrete Gang
6			Const E. Abutment	36 days	Mon 30-11-09	Mon 18-01-10	5	Concrete Gang
7			Drive Piles Centre	6 days	Mon 02-11-09	Mon 09-11-09	2	Piling Gang
8			Const Centre Pile Cap	7 days	Tue 10-11-09	Wed 18-11-09	7	Concrete Gang
9			Const Centre Pier	27 days	Thu 19-11-09	Fri 25-12-09	8	Concrete Gang
10			Drive Piles West	12 days	Mon 02-11-09	Tue 17-11-09	2	Piling Gang
11			Const West Pile Cap	8 days	Wed 18-11-09	Fri 27-11-09	10	Concrete Gang
12			Const W. Abutment	36 days	Mon 30-11-09	Mon 18-01-10	11	Concrete Gang
13			Place Beams E. Span	7 days	Tue 19-01-10	Wed 27-01-10	3,6,9	Girder Launching Gang
14			Place Beams W. Span	7 days	Tue 19-01-10	Wed 27-01-10	3,9,12	Girder Launching Gang
15			Deck Slab East	15 days	Thu 28-01-10	Wed 17-02-10	13	Concrete Gang
16			Deck Slab West	15 days	Thu 28-01-10	Wed 17-02-10	14	Concrete Gang
17			Lay Roads	25 days	Thu 18-02-10	Wed 24-03-10	15,16	Road Work Gang

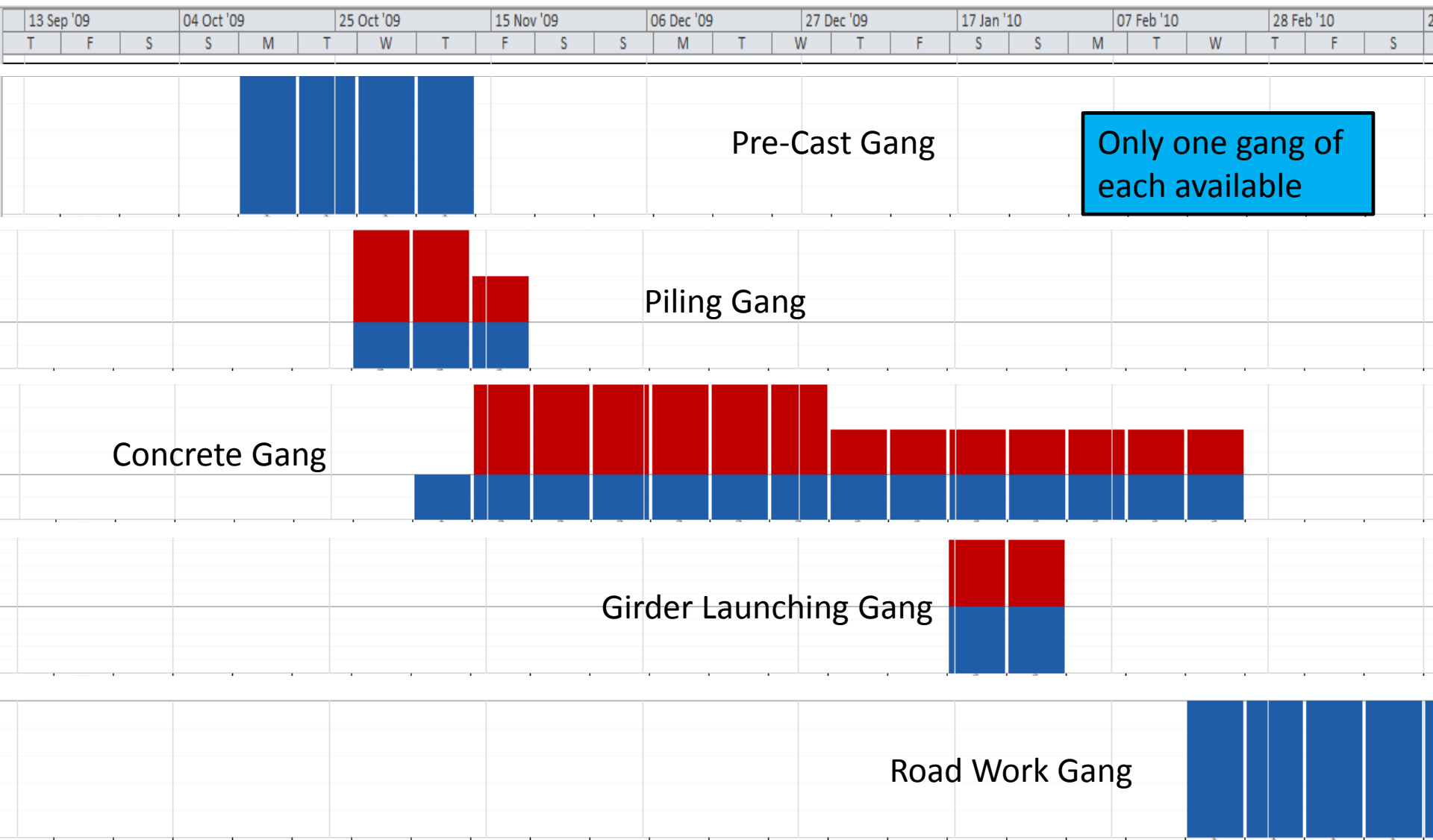
Resource Histogram

Infinite Resource Availability



Resource Histogram

Limited Resource Availability



Summary

- Influence of resources on project cost & time
- Resource loading the schedule
- Finding Overallocation
- S Curve – and variation with ES & LS
- Using Float to resolve overallocation