How to Compress Project Schedules

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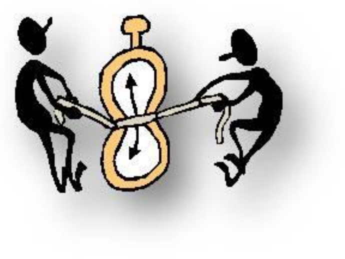
WHEN PROJECT SCHEDULES NEED COMPRESSION



There are times when the project schedule duration must be shortened (compressed) either to meet market opportunity dates, to meet the desires of key stakeholders, or when the project completion date slips. In these cases the project manager must find ways to reduce the amount of time it will take to complete all remaining activities, especially those on the critical path.

Three such schedule compression techniques can be employed under these conditions, all of which are to be applied to the critical path activities. These are: 1) optimizing activity lead-lag times, 2) fast-tracking, and 3) crashing. It must be pointed out that if the critical path is compressed enough, other paths may become the actual critical path, and must then be compressed.

HOW TO OPTIMIZE ACTIVITY LEAD-LAG TIMES

Optimizing lead-lag times along the critical path is one of the best ways to reduce the project's duration. When activity sequencing is established the default configuration is the "finish-start" (F-S) arrangement. This means that an activity begins only after the previous activity is completed. In actuality, subsequent activities can begin prior to the completion of its previous activity with no resulting risk. When this is possible, one of three other arrangements can be selected. These are: 1) start-start (S-S), 2) start-finish (S-F), and 3) finish-finish (F-F). Which arrangement to use will be determined by the nature of the activities being optimized.

Examples are as follows:

- S-S Example: At least 5 days are required from the start of the electrical hook up, to the start of employee move in.
- S-F Example: The contract requires the phase out of old system to be finished 25 days after the start of testing the new system.
- F-F Example: It will take 5 days to finish the final editing of the user manual after the new product design is finished.

A strategy sometimes adopted by project managers is to leave the critical path activities in the default F-S arrangement, and reserve the three compression arrangements for times when they are required. This creates necessary schedule margin.

HOW TO FAST-TRACK THE CRITICAL PATH

Another schedule compression technique is called "fast-tracking" the critical path, and on paper looks identical to lead-lag time optimizing. The primary difference is that with fast-tracking the activity overlap results in some degree of acceptable risk. In other words, critical path activity overlaps are "forced" in order to gain valuable schedule compression time but with known and acceptable resulting risks.

An example would be where an architect might authorize the pouring of a new building's foundation before the client gives final approval of the building design. In such cases, the project manager has enough confidence that client approval is close enough to finalization so that the first stages of construction can begin. The risk lays in any last minute design changes that might require reworking the completed building foundation.

Another example might be with the design of a hardware product which is about to be finalized. In order to gain valuable schedule time the project manager may begin procurement of needed off-the-shelf parts before final design approval. The risk would be sunk costs associated with discarding any parts that may not be needed after final design approval.

HOW TO CRASH THE CRITICAL PATH

The third technique can be employed in those cases where activity overlap is unacceptable. Crashing critical path activities is the practice of reducing their duration while allowing them to remain in series, essentially the "F-S arrangement."

By reducing the duration of a critical path activity it may be necessary to apply additional resources such as personnel, extra equipment, or supplementing with outsourced resources. Because this technique requires additional resources it should be practiced only when time is more important than cost. In other words, crashing should be practiced only when the project schedule completion date is of a higher priority than the project cost. The priorities should therefore be clearly delineated in the authorizing project charter.

Crashing the critical path is the process of reducing an activity's duration while examining the resulting increase in cost due to adding resources. Critical-path activities which produce the greatest reduction in project duration for the lowest cost increase are crashed first. This is accomplished determining the crash ratio for each critical path activity then selecting those having the lowest ratios.

$$\text{Crash Ratio} = \frac{C_c - C_n}{T_n - T_c}$$

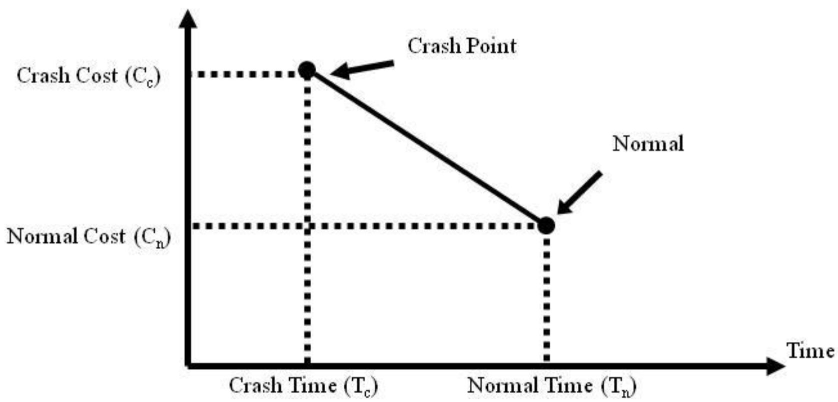


Figure 1: Calculating Critical-Path Crash Ratios

The resulting crashing table may look like the example below. Notice that Activity C has the lowest crash ratio and Activity B has the highest. For example, if the project schedule had to be compressed from 66 days to 53 days, Activities C, G, H, J, L, and E would be crashed. The project cost would increase from $98, 500 to $107,425

		NORMAL		CRASH		Allowable	Crash Ratio	Project	Cumulative
Activity	Description	Time	Cost	Time	Cost	Crash Days	(Cost Per Day)	Duration (Days)	Project Cost
C	Rough Plumbing	3	$3,000	2	$3,500	1	$500	65	$99,000
G	Rough Electrical	6	$3,500	4	$4,700	2	$600	63	$100,200
H	Sheet Rock	8	$5,000	5	$6,950	3	$650	60	$102,150
J	Paint	5	$4,000	2	$6,100	3	$700	57	$104,250
L	Final Electrical	2	$2,000	1	$2,775	1	$775	56	$105,025
E	Exterior	8	$8,000	5	$10,400	3	$800	53	$107,425
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	700	2	$850	51	$109,125
K	Final Plumbing	4	$7,000	2	$8,800	2	$900	49	$110,925
A	Excavate	3	$5,000	2	$6,000	1	$1,000	48	$111,925
F	HVAC	4	$11,000	3	$12,000	1	$1,000	47	$112,925
M	Flooring	4	$10,000	2	$12,000	2	$1,000	45	$114,925
D	Frame	10	$20,000	6	$25,000	4	$1,250	41	$119,925
B	Foundation	4	$12,000	3	$15,000	1	$3,000	40	$122,925
		66	**$98,500**	**40**	**$122,925**				

Figure 2: Critical Path Crashing