

Assessing and Preventing Project Delays: A Prospective Approach

Presented by:

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My Background

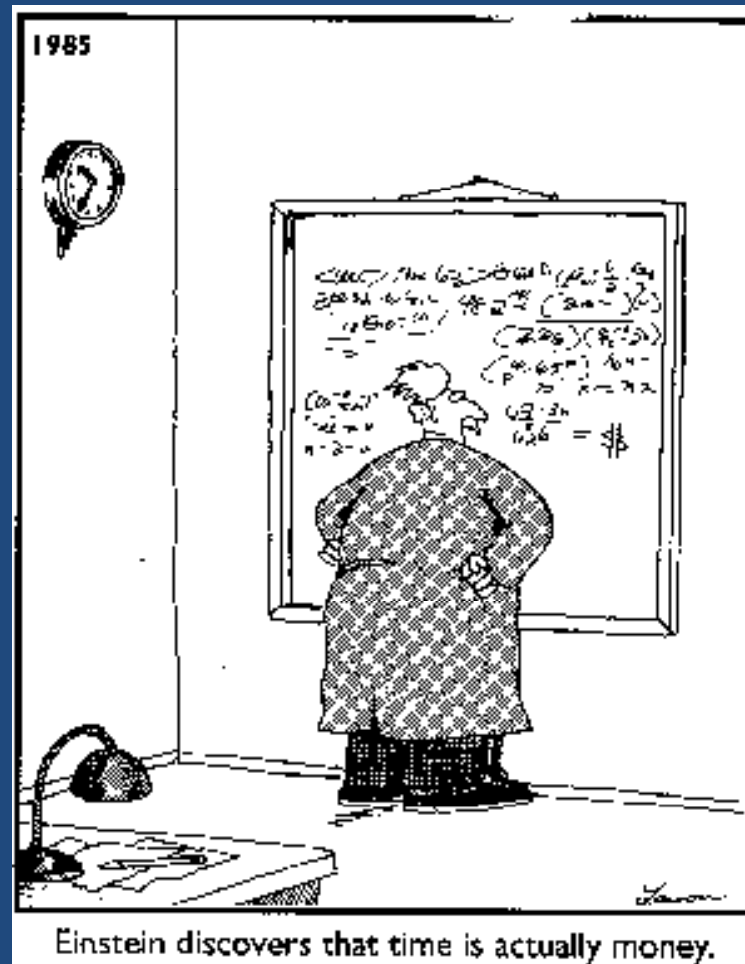
- **Brian Furniss**
 - Director, *Trauner Consulting Services*
 - Over 10 Yrs. Experience
 - Experience: Scheduling, Analysis of Delays and Inefficiencies, Change Orders, Entitlement, Claims, Claims Avoidance, and Damages.
 - Co-Author of *Construction Delays: Understanding Them Clearly, Analyzing Them Correctly – 2nd Ed.*
 - Planning and Scheduling Professional, AACEI
 - Assists contractors, owners, architects, and attorneys.
 - Analyst, Scheduler, Author, Instructor, Dog Lover



Agenda

- I. Preventing Delays Using Current Indicators
 - A. Duration
 - B. Longest Path
 - C. Total Float
- II. Reasons New Indicators are Needed
 - A. Constraints
 - B. Calendars
- III. A Detailed Method for Prospectively Assessing and Preventing Delays
- IV. Real-Life Example – Applying the Method

I. Preventing Delays Using Current Indicators

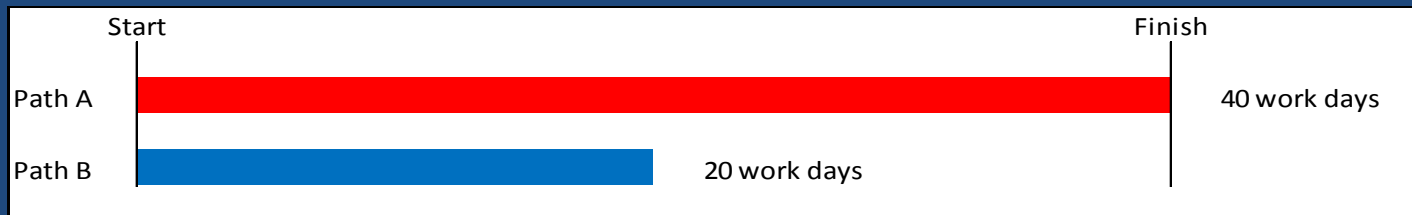


Preventing Delays Using Current Indicators

- Why prevent delays?
- Ways to assess delays.
 - Retrospectively – what actually occurred.
 - Analysis of plan that *was* used to manage project.
 - Prospectively – what may occur.
 - Analysis of plan that *is being* used to manage project.
- Focus today will be on prospectively *preventing* delays and not on prospectively modeling changes or retrospectively analyzing delays.
- What is the critical path?
 - Can be measured through any project milestone.
 - Varying definitions.
 - Often incorrectly associated with total float.

Preventing Delays Using Current Indicators

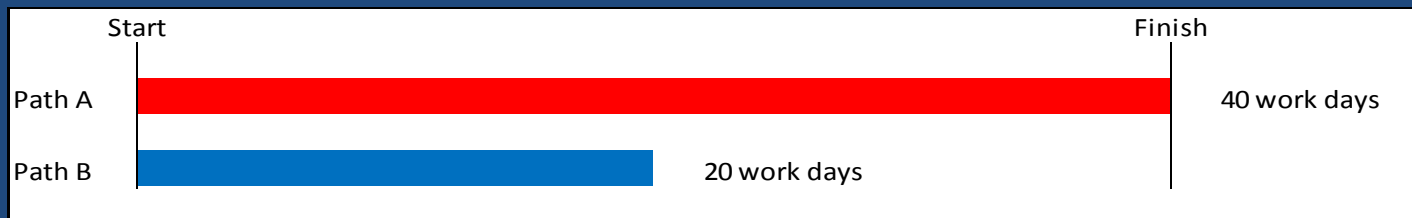
- What are the current indicators to identify what must be progressed to prevent delays?
 - Duration
 - Compares duration of paths of work.
 - Useful if all activities use the same calendar.
 - Easy to understand.



- Path A controls the critical path.
- Progress Path A to prevent delay – may have to progress Path B to prevent delays if update periods are greater than 20 work days.
- If Path A makes 20 more days of progress than Path B, the critical path will shift to Path B.

Preventing Delays Using Current Indicators

- What are the current indicators to identify what must be progressed to prevent delays?
 - Longest Path
 - The measurement of the Longest Path is static, while the Longest Path, by nature, is dynamic.
 - Changes based on the progress, or lack of progress, to all activities in the schedule.
 - Often equated with the critical path.
 - Defined as the longest continuous chain of activities that controls the early finish date of the milestone.



- May or may not accurately identify the activities that must be progressed in order to prevent delays.

Preventing Delays Using Current Indicators

- What are the current indicators to identify what must be progressed to prevent delays?
 - Total Float (Float)
 - Uses forward and backward passes to calculate early dates and late dates.
 - $\text{Total Float} = \text{Late Date} - \text{Early Date}$
 - Often defined as the amount of time an activity can be delayed, in work days, before it will delay the critical path of the project.
 - Has been used through the evolution of CPM scheduling – AOA, AON, PDM.
 - As with duration, by concept, it is easy to understand.
 - What does it mean if the float value is negative, zero, or positive?
 - Often is incorrectly correlated with the critical path of the project.
 - Reason: Float can easily be manipulated.

II. Reasons New Indicators are Needed

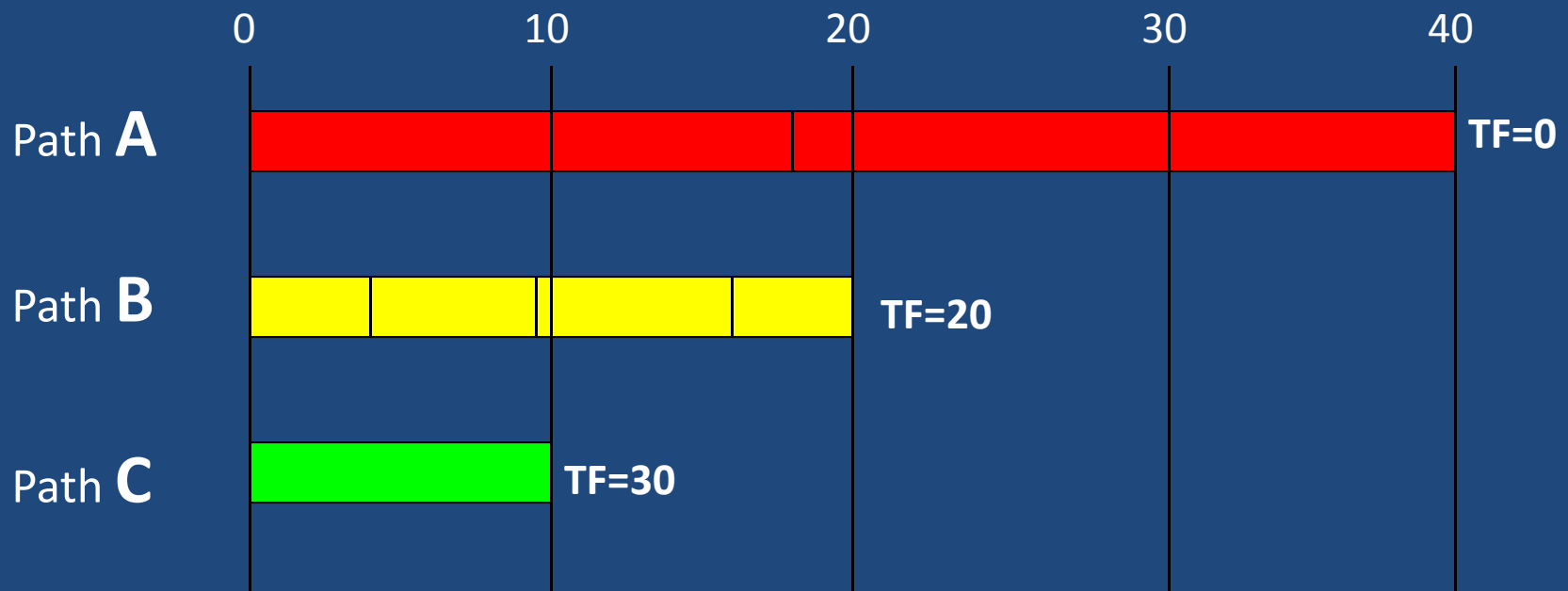


Reasons New Indicators are Needed

- Duration – impractical for most projects because its use is limited to single calendar projects.
- Longest Path – may not identify what must be progressed in order to prevent delays.
- Float
 - Constraints can change dates, and as a result, float values.
 - Multiple calendars may cause float values to vary along a path of work.
 - When both are combined, the float value may become useless as a project management tool to prevent delays.
 - Examples with Constraints and Multiple Calendars.

Constraints

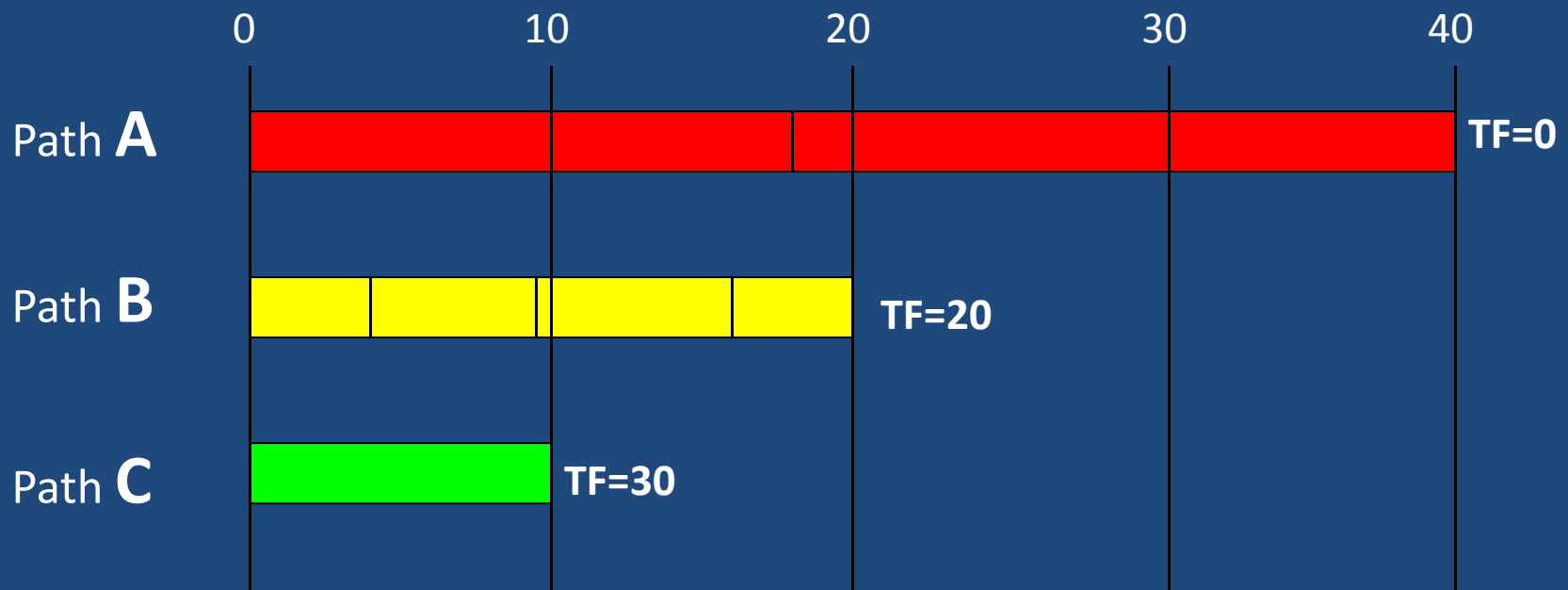
- When will the Project finish?



TF = Total Float

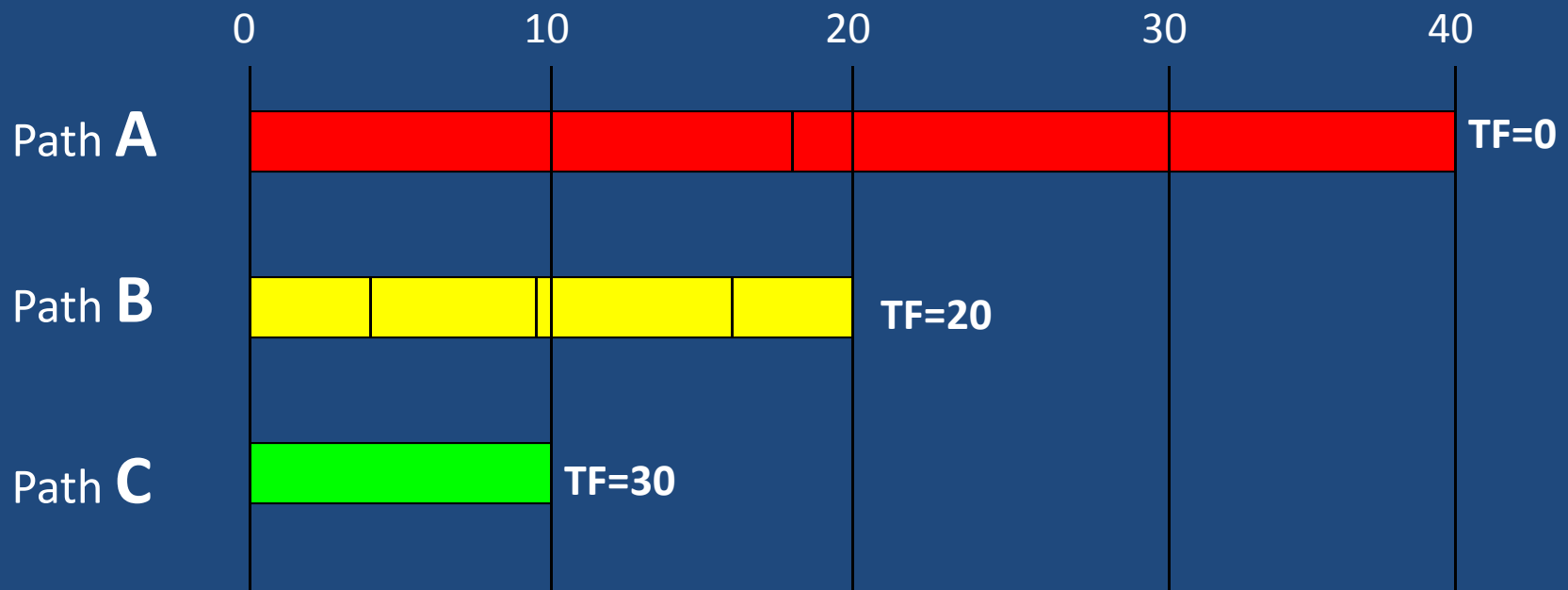
Constraints

- How long can Path A be delayed without delaying the Project?



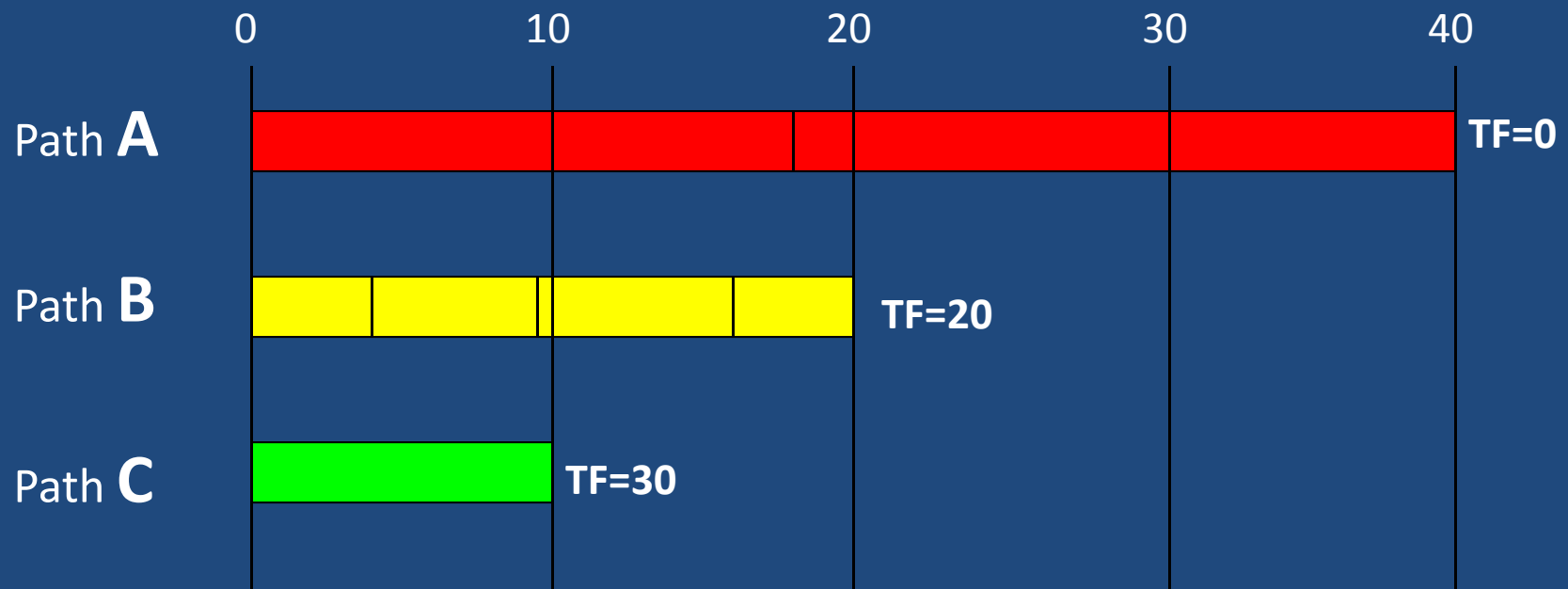
Constraints

- How long can Path B be delayed without delaying the Project?



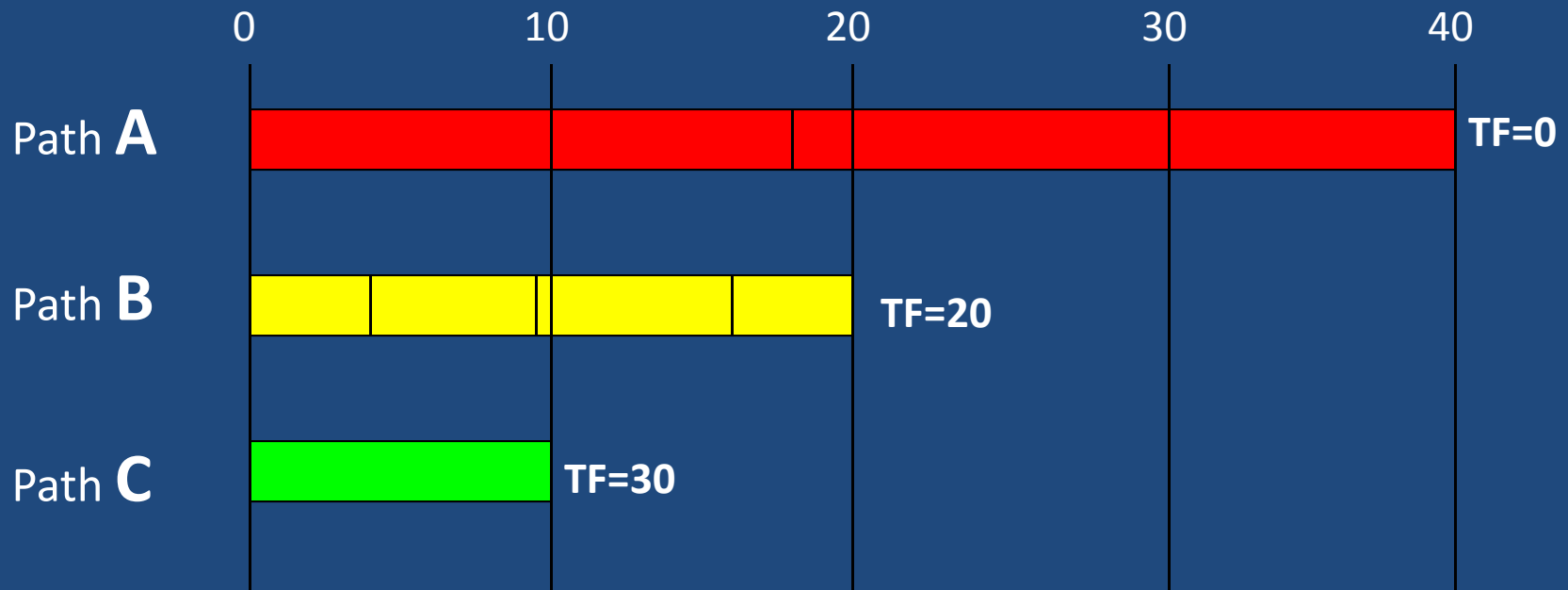
Constraints

- How long can Path C be delayed without delaying the Project?



Constraints

- Can we assume that the path with zero float is the critical path? NO!

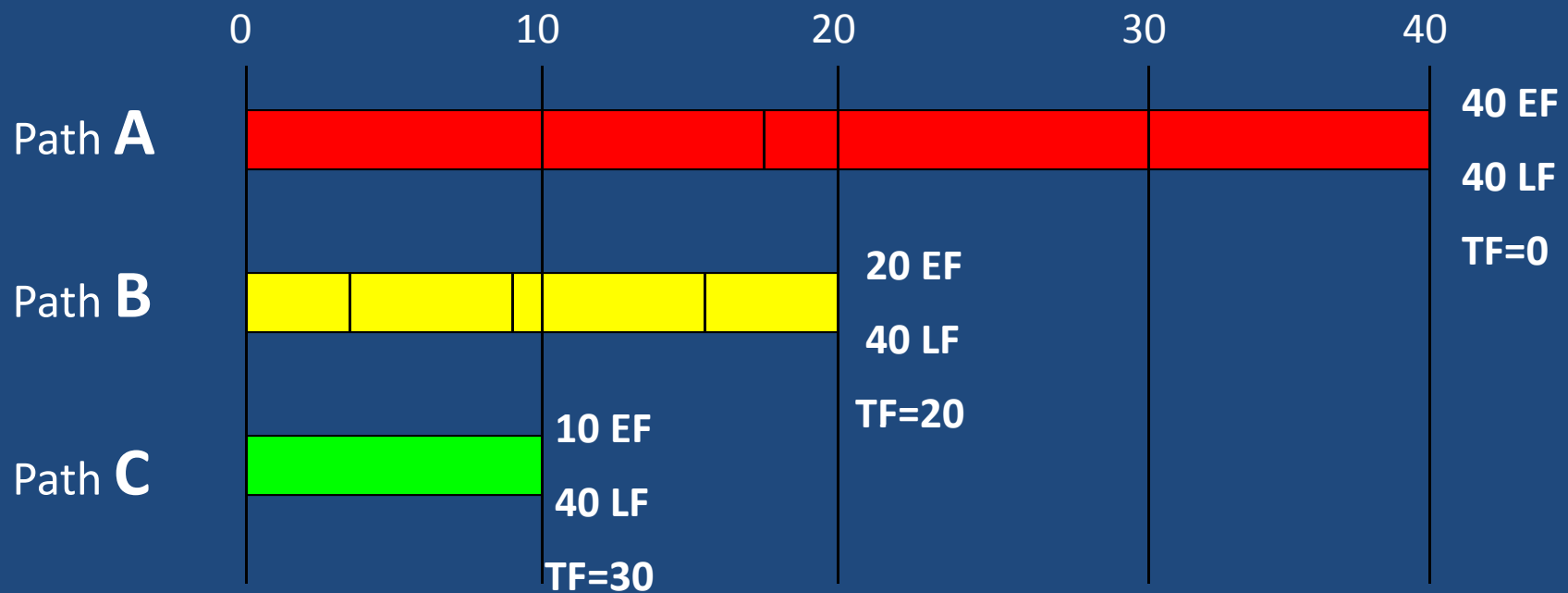


Constraints

- Allow the scheduler to fix times and dates in the logic network.
- Often affect the calculation of float.

Constraints

- Using the earlier example, note the early and late finish dates of each of path.

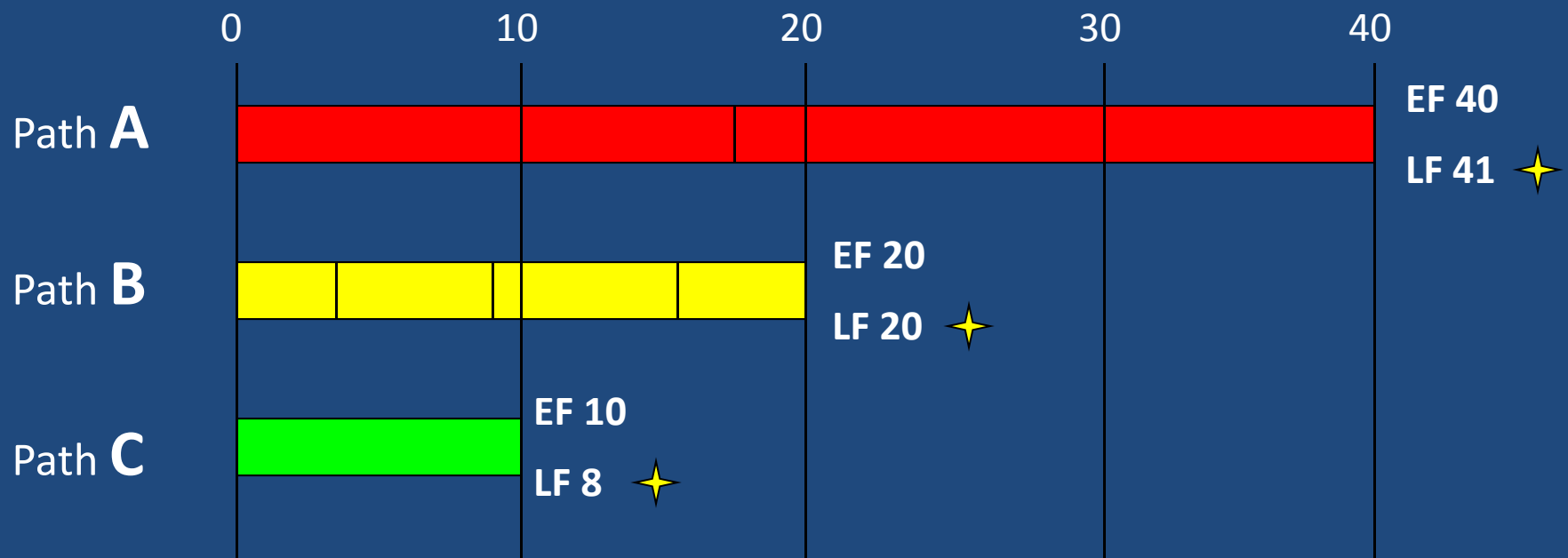


Constraints

- Using a constraint, we can choose to fix the late finish date.
- We constrain Path A to finish on day 41.
- We constrain Path B to finish on day 20.
- We constrain Path C to finish on day 8.

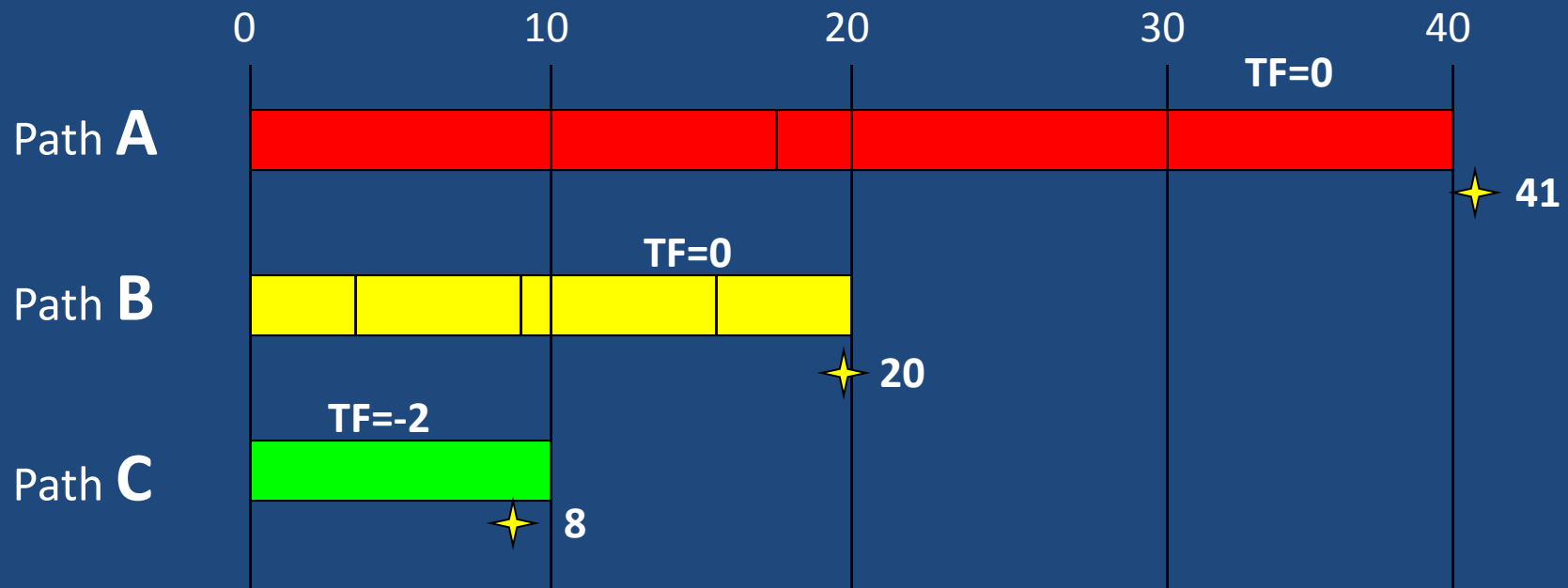
Constraints

- The constrained late finish dates replace the original late finish dates.



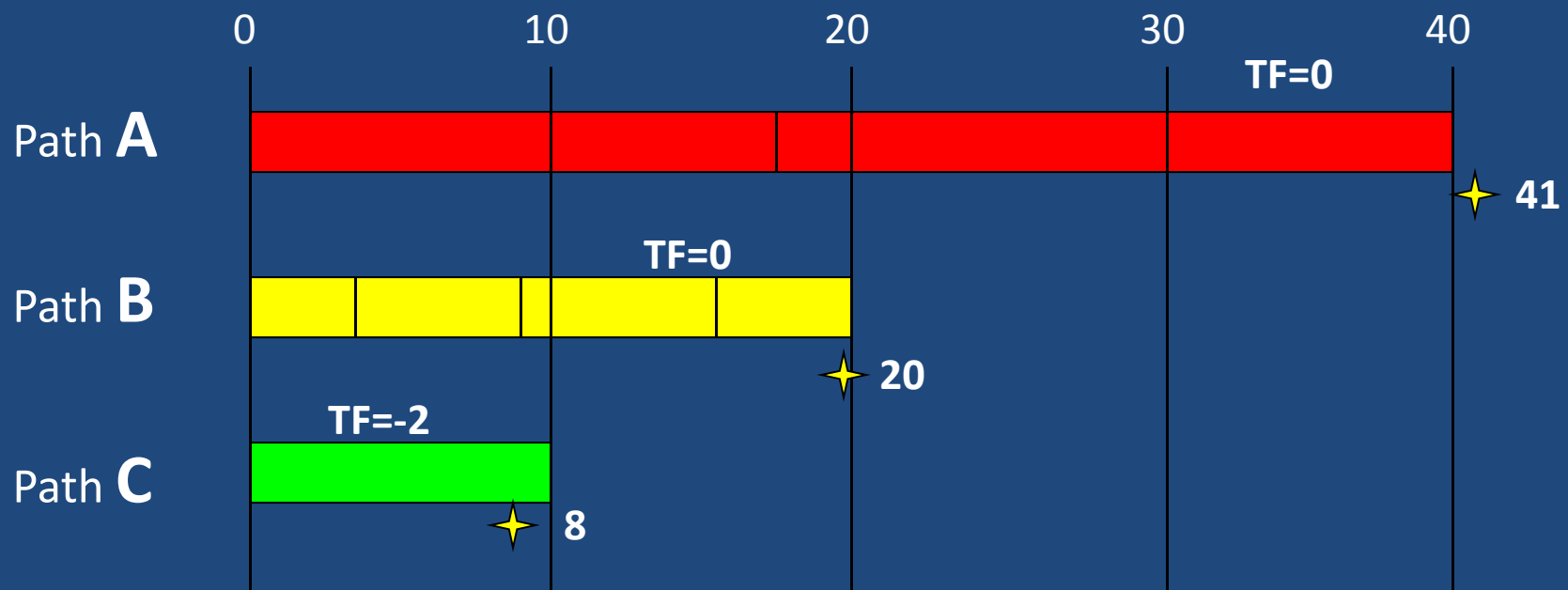
Constraints

- When will the Project finish?
- What path has the most negative float?



Constraints

- How long can Path C be delayed without delaying the Project?
- Which path is critical to the Scheduled Project Completion Date?

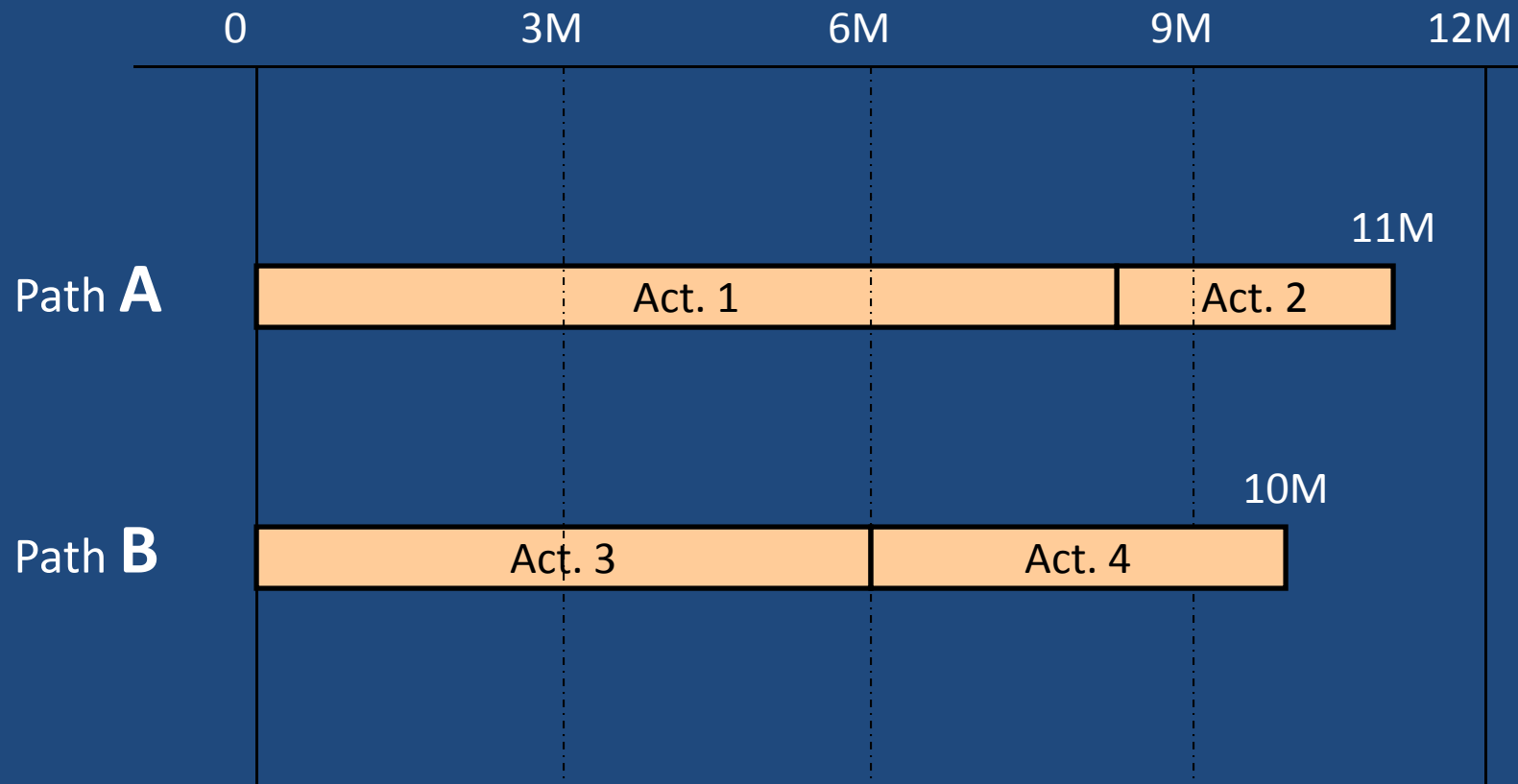


Constraints

- Not limited to finish constraints.
 - Float constraints
 - Start constraints
- Often affect the calculation of float.
- Let's talk about how multiple calendars affect the use of float.



Multiple Calendars

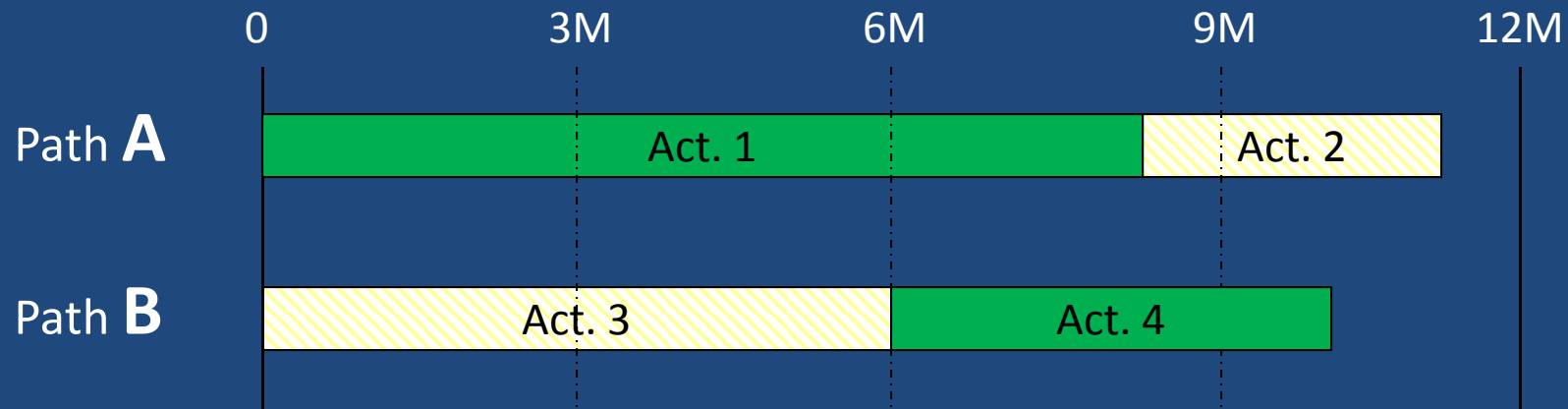
Time Line without Multiple Calendars



Multiple Calendars

Identifying the work restrictions

-  Activities that can be worked on any time.
-  Activities that cannot be worked on during turtle season (Months 7 – 9).



Multiple Calendars

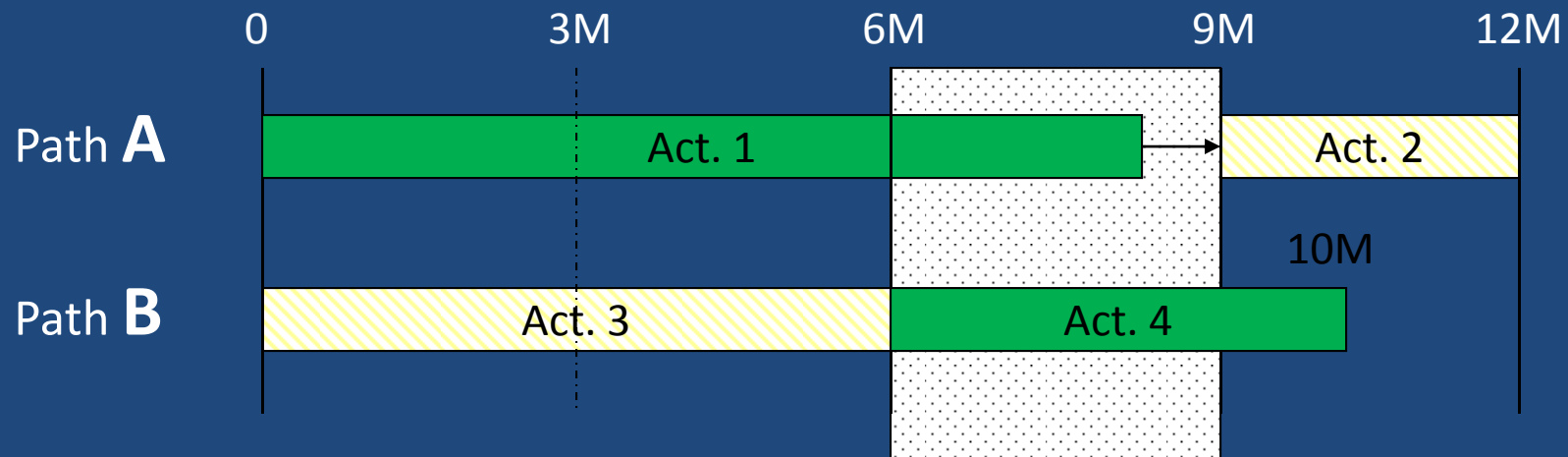
Incorporating the work restrictions



Activities that can be worked on any time.



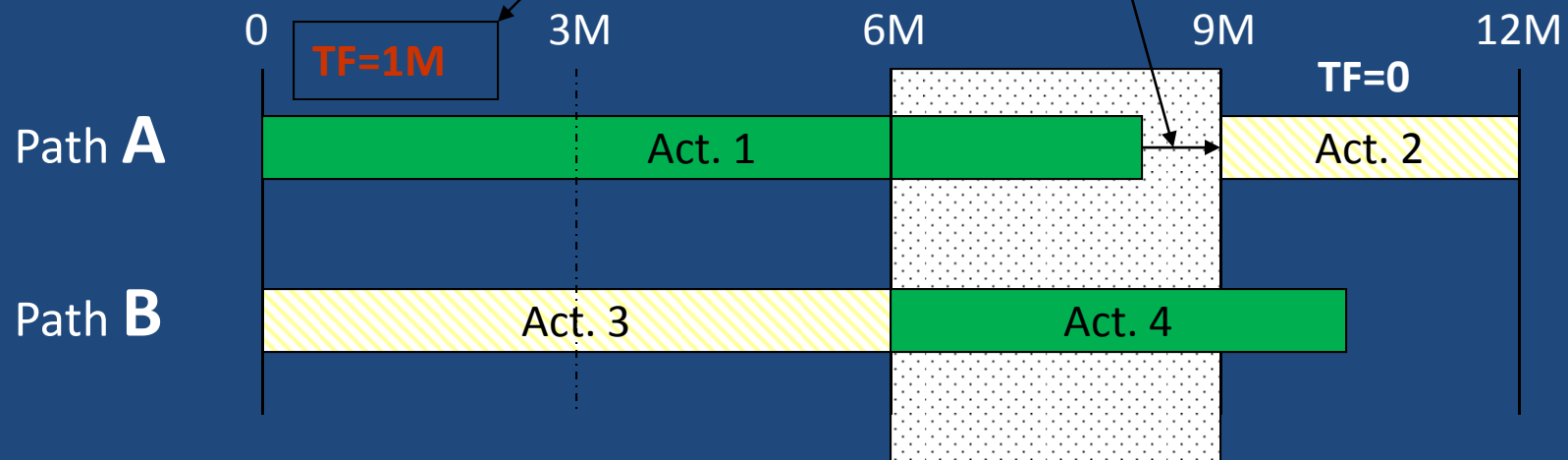
Activities that cannot be worked on during turtle season (Months 7 – 9).



Multiple Calendars

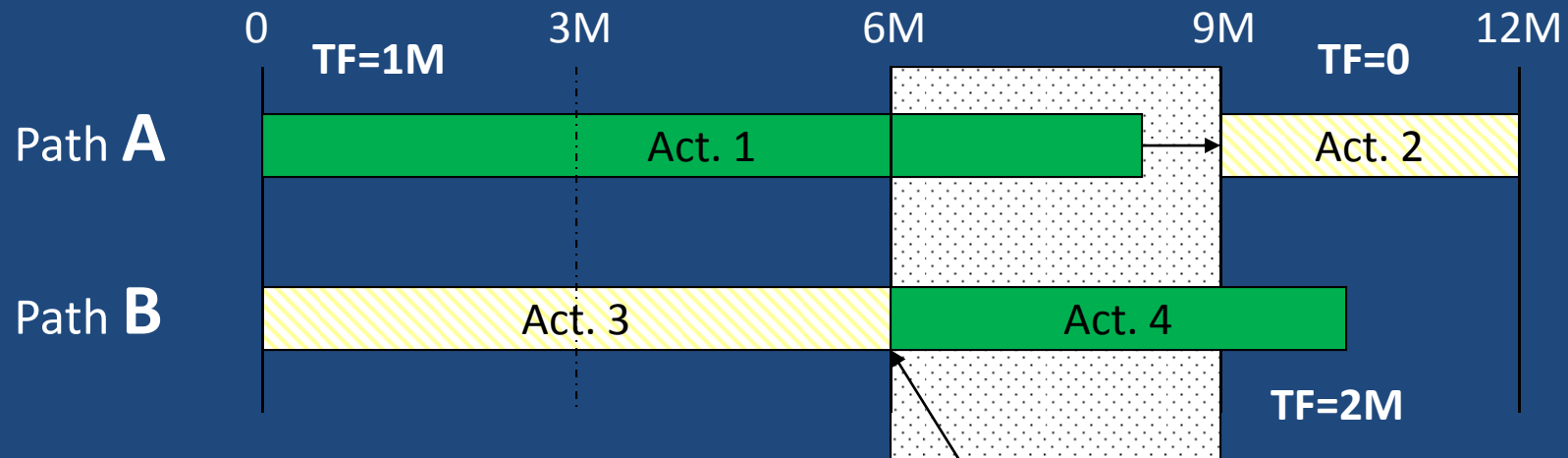
Calculation of float with calendars

Because the first activity on Path A will not affect the Schedule Project Completion Date for a month, it has a month of float.



Multiple Calendars

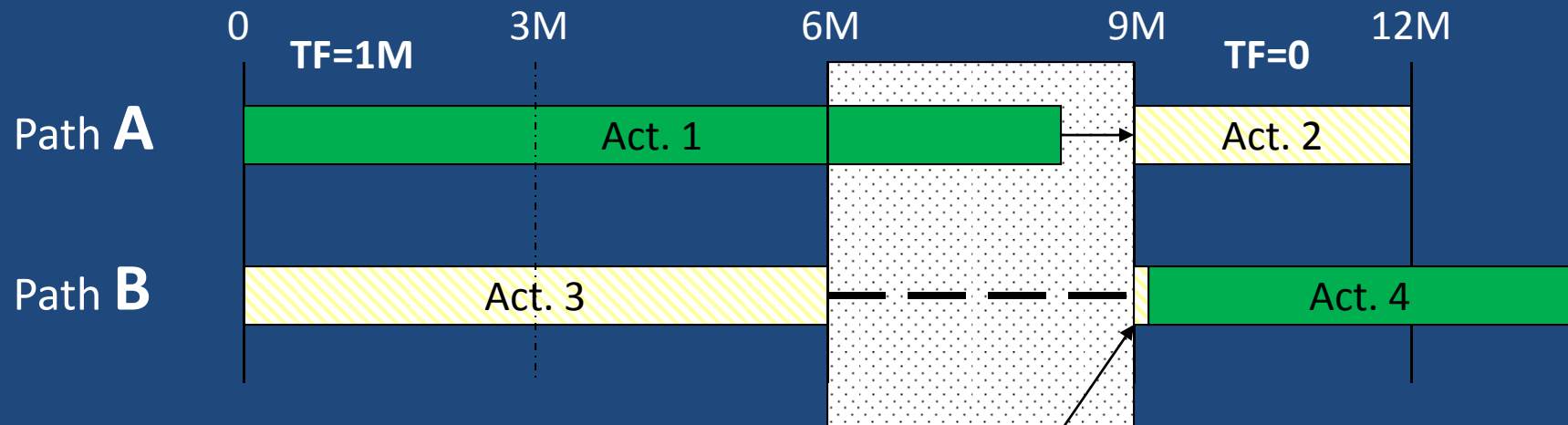
Calculation of float with calendars



The first activity on Path B must finish on time or it will "spill over" into turtle season.

Multiple Calendars

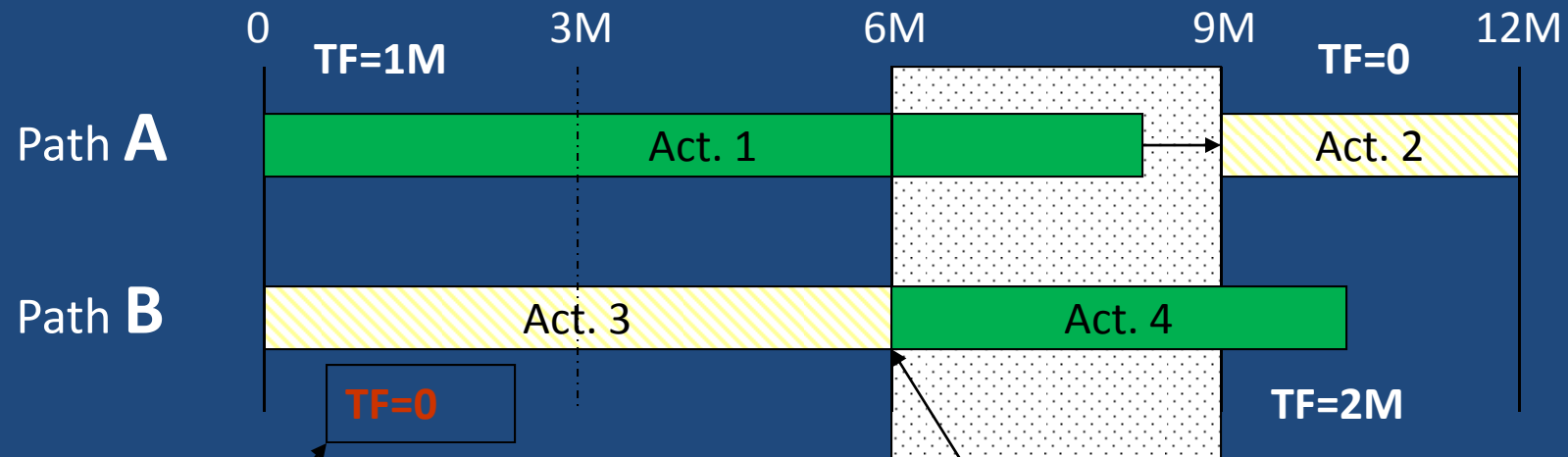
Calculation of float with calendars



If Path B were delayed, it would finish after turtle season and delay the Scheduled Project Completion Date.

Multiple Calendars

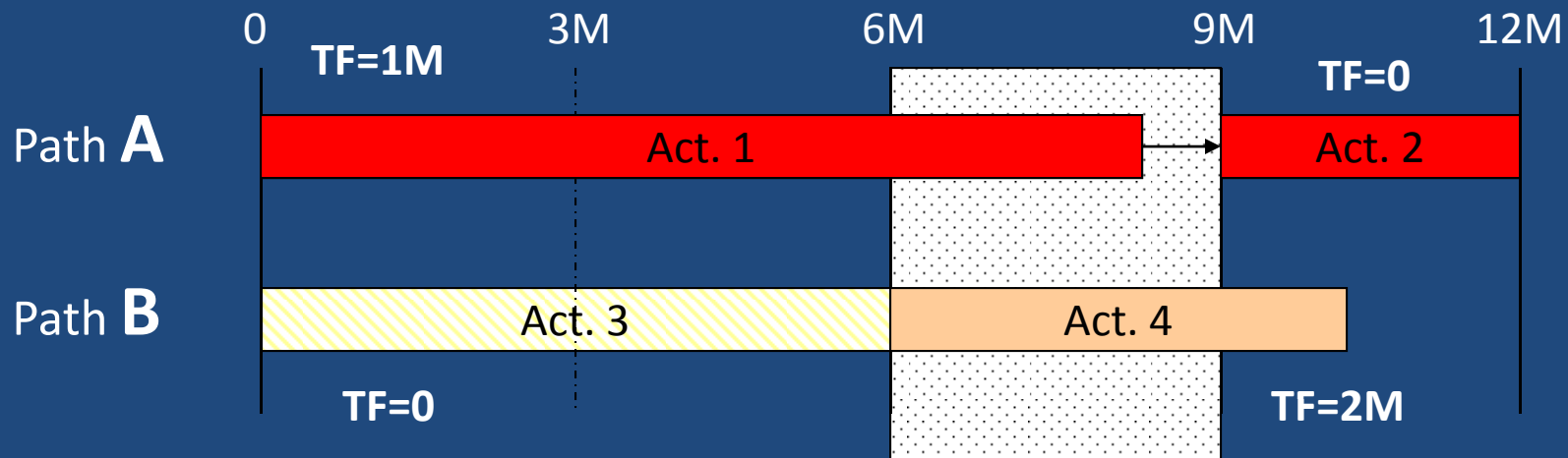
Calculation of float with calendars



Because the first activity on Path B must be completed on time (before turtle season) or delay the project, it has no float.

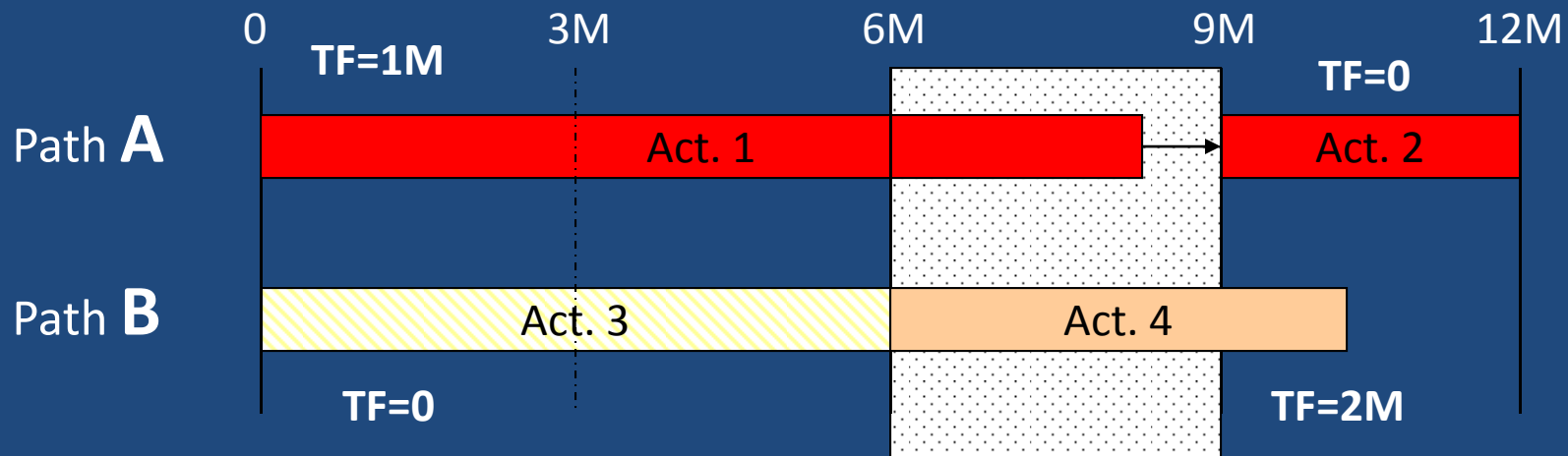
Multiple Calendars

- When will the Project finish?
- Which path is critical?
- Which path must be progressed in 1st month to prevent delays?



Multiple Calendars

When there are multiple calendars, (with no constraints) float helps determine when a delay to completion *could* occur, but it cannot be relied upon to identify the path that leads to completion.



Reasons for New Indicators

- The current indicators only work sometimes, and are only practical if certain scheduling options are avoided.
 - No constraints.
 - No multiple calendars.
- These options are used frequently, so the current indicators are impractical.
- No indicator exists that will allow project managers to accurately and consistently identify the activities that must be progressed in order to prevent delays.

III. A Detailed Method for Prospectively Assessing and Preventing Delays



A Detailed Method for Prospectively Assessing and Preventing Delays

1. Take the schedule currently being used to manage the project.
2. Identify the Longest Path through a milestone – phase, shutdown, project completion?
3. Note the scheduled completion date (early finish) of that milestone.
4. Identify the frequency of updates – weekly, monthly?
5. Change the data date to the date of the next anticipated update.
6. Note the new scheduled completion date of the milestone.

A Detailed Method for Prospectively Assessing and Preventing Delays

7. Assess the first week of progress:
 - a. Provide as-expected progress to the activities controlling the Longest Path.
 - b. Start off with a week's worth of expected progress.
 - c. Add in expected progress for the week (AS, AF, RD).
8. Reschedule project to complete new forward and backward passes.
9. Note the new scheduled completion date of that milestone.
10. Again, identify the Longest Path through the milestone.

A Detailed Method for Prospectively Assessing and Preventing Delays

11. If the new scheduled completion date is equal to or less than original scheduled completion date (Step 3 - before the data date was changed) then **STOP!** If not, proceed to the next step.
12. Repeat Steps 7 through 11 until the new scheduled completion date is equal to or less than the old scheduled completion date.

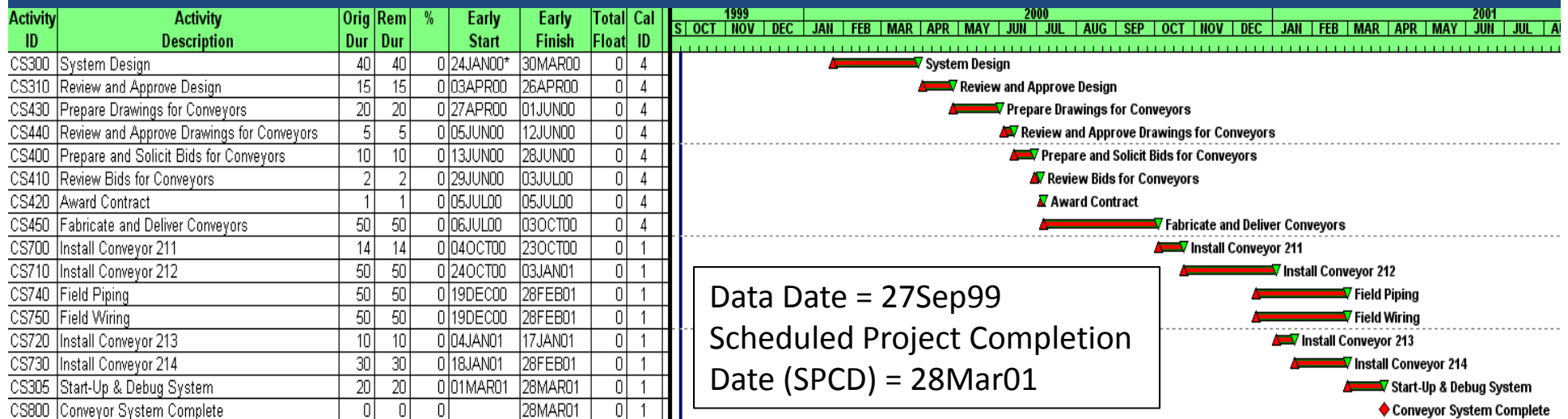
The completion of this process would represent the progress necessary to prevent a delay to the milestone.

A Detailed Method for Prospectively Assessing and Preventing Delays

Let's apply the process!

A Detailed Method for Prospectively Assessing and Preventing Delays

2. Identify the Longest Path through a milestone – Project Completion.
3. Note the scheduled completion date (early finish) of that milestone.
4. Identify the frequency of updates. Presume there are monthly updates.



Note: Critical Path is from *System Design* through *Conveyor System Complete*.

A Detailed Method for Prospectively Assessing and Preventing Delays

7. Assess the first week of progress.

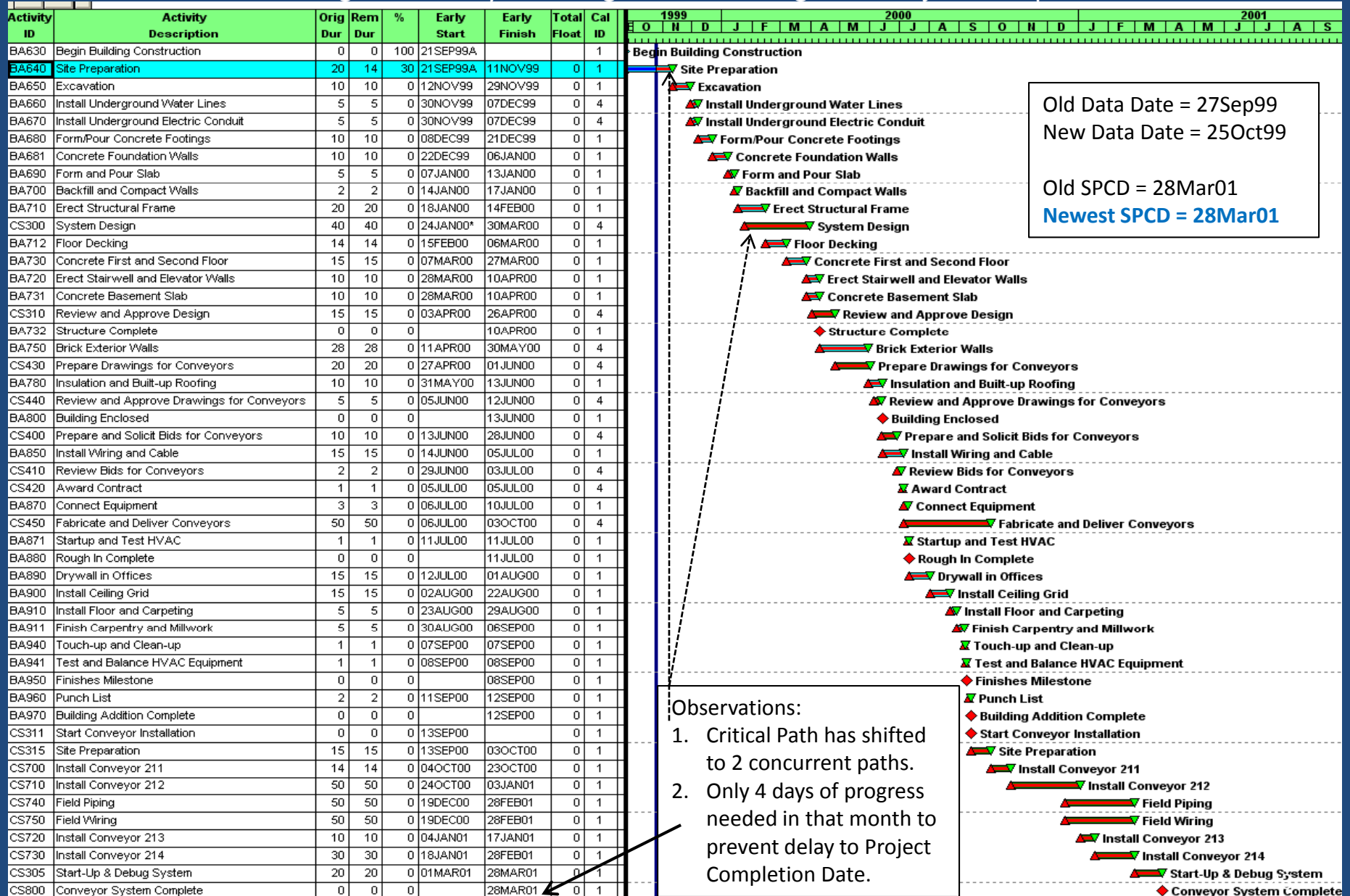
Activity ID	Activity Description	Orig Dur	Rem Dur	%	Early Start	Early Finish	Total Float	Cal ID
0								
BA640	Site Preparation	20	18	10	21SEP99A	17NOV99	0	1
BA650	Excavation	10	10	0	18NOV99	03DEC99	0	1
BA660	Install Underground Water Lines	5	5	0	06DEC99	13DEC99	0	4
BA670	Install Underground Electric Conduit	5	5	0	06DEC99	13DEC99	0	4
BA680	Form/Pour Concrete Footings	10	10	0	14DEC99	28DEC99	0	1
BA681	Concrete Foundation Walls	10	10	0	29DEC99	12JAN00	0	1
BA690	Form and Pour Slab	5	5	0	13JAN00	19JAN00	0	1
BA700	Backfill and Compact Walls	2	2	0	20JAN00	21JAN00	0	1
BA701	Foundation Phase Complete	0	0	0		21JAN00	0	1

Old Data Date = 27Sep99
 New Data Date = 25Oct99

Old SPCD = 28Mar01
 New SPCD = 3Apr01

- a. Provide as-expected progress to the activities controlling the Longest Path.
 - Activity BD640: *Site Preparation*
 - Determine As-Expected Progress to *Site Preparation*:
 - New Data Date is on a Monday – 5 day work week calendar for Site Preparation.
 - Site Preparation already started, so simply reduce remaining duration from 18 to 14 work days.
 - Note: This is only 4 out of the 5 days of progress expected for this week. Why? See Step 8...

8. Reschedule project to complete new forward and backward passes.
9. Note the new Project Completion date.
10. Again, identify the Longest Path through the Project Completion.



Old Data Date = 27Sep99
 New Data Date = 25Oct99
 Old SPCD = 28Mar01
 Newest SPCD = 28Mar01

- Observations:
1. Critical Path has shifted to 2 concurrent paths.
 2. Only 4 days of progress needed in that month to prevent delay to Project Completion Date.

When New Project Completion Date = or < Original Project Completion Date, do we continue process?

NO!

Remember, the goal is to identify the minimum progress needed to prevent delay to the milestone.

Conclusions

1. The Longest Path is accurate to identify the activities that currently control the finish date of a milestone, but it *may* not indicate what must be progressed to prevent delays.
2. Multiple Calendars and Constraints alter the dates obtained in the forward and backward passes and change the float.
3. As a result, float is not an accurate indicator to identify what must be progressed in order to prevent delays to a milestone. It *can* be accurate, but it is not absolute.
4. When prospectively evaluating delays, focus on:
 - a. The activities that are controlling the Longest Path of the milestone.
 - b. The amount of progress that must occur in order to prevent delays to the milestone.
5. This method does not account for non-critical delays that may lead to inefficiencies.

Questions?

For More Information:

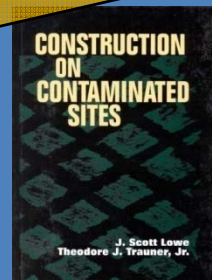
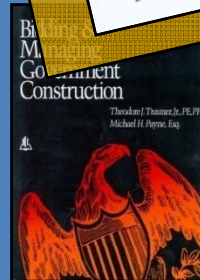
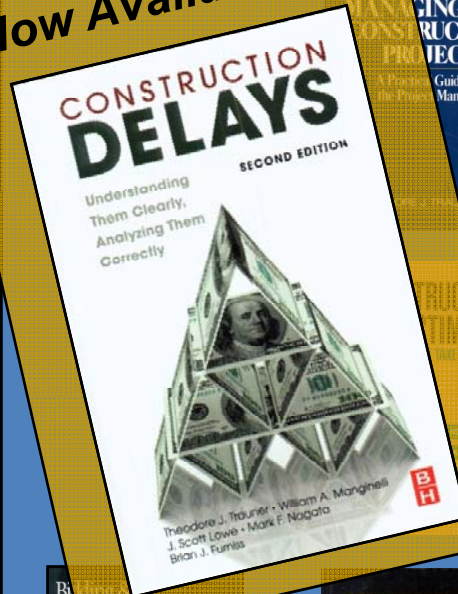


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