



ELECSOFT POWERPROJECT CRITICAL PATH CALCULATIONS

1 Introduction

Many building and construction contracts specify that a delay may only be claimed when it impacts activities on the **Critical Path** but in turn leave it up to the contractor to decide what scheduling options they may use in their scheduling software, thus allowing the contractor to determine how the **Critical Path** is calculated. Therefore an understanding how the Elecosoft Powerproject **Reschedule Options** and **Format Gantt Chart** functions may assist a contractor to set up their programs to put more activities on the **Critical Path** and to be able to substantiate more claims than a program with the default **Reschedule Options** is an important subject

2 Aim

The aim of this paper is to explain how the some of **Reschedule Options** and **Format Gantt Chart** functions affect the calculation of the **Critical Path** of a Elecosoft Powerproject schedule and identify which options may be useful for contractors to increase the number of client delays they may be able to substantiate with their schedule.

EASTWOODHARRIS

CREATE AND UPDATE AN UNRESOURCED PROJECT USING ELECSOFT (ASTA) POWERPROJECT

VERSION 16

DESCRIPTION OF COURSE – The course objectives are to teach participants how to create projects without resources, formatting, printing, creating a baseline and updating an un-resourced project. Successful completion of all the course workshops will confirm that the objectives have been met.

Day 1 – Create an Unresourced Project

- Introduction to ASTA Powerproject
- Navigation and Setting Options
- Creating and Editing Ganttcharts
- Creating and Editing Tasks
- Summary Tasks
- Linking tasks to create a Critical Path Schedule
- Reschedule
- Constraints

Day 2 – Formatting, Reports and Updating an Unresourced Project

- Object Task Types
- Formatting the Display
- Code Libraries
- Filters
- Grouping and Sorting Tasks
- Printing and Reports
- Queries
- Updating an Unresourced Project
- User Definable Fields and PDFs

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3 Understanding Reschedule Options that define the Critical Path

The **Reschedule Options** form has the following options and some determine the calculation of **Critical** activities:

3.1 Tasks with no links

In this paper we will leave this set as **Move to ASAP/ALAP position** so it tasks without predecessors calculates like Oracle Primavera P6 and Microsoft Project.

3.2 Tasks with no outgoing links

In this paper we will leave this set as **Move to ASAP/ALAP position** so it tasks without predecessors calculates like Oracle Primavera P6 and Microsoft Project.

The screenshot shows the 'Reschedule' dialog box with the following options:

- Options**
 - Tasks with no links**
 - Leave as drawn within constraints
 - Move if at project or chart bounds
 - Move to ASAP/ALAP position
 - Tasks with only outgoing links**
 - Leave as drawn within constraints
 - Move to ASAP/ALAP position
 - Compatibility**
 - ALAP tasks have no free float
 - Finish on or before flags are soft
 - Summaries critical where content is critical
 - Negative float applies to chain
 - Ignore link categories**
 - Default
 - Important
 - Normal
 - Resource
 - Options**
 - Move part completed links
 - Truncate float within chart boundaries
 - Use delivery date as deadline
 - Relink around completed tasks
 - Straighten progress line to period**
 - Progress entry period: [dropdown]
 - Only move forward to make straight
 - Never move completed tasks
 - Compute**
 - Critical path drag
 - Cascade activity numbers
 - Critical path integrity
 - Reschedule report**
 - Settings... [button]
 - Display [button]
 - Auto reschedule**
 - Reschedule all [dropdown]



3.3 Compatibility

3.3.1 ALAP tasks have no free float

When unchecked then the task **Free start/finish** dates are calculated displaying how far forward the task may move forward and the task will display free float at the start of the task:

Float dates		
Early start/finish	1/06/2023 8:00 AM	6/06/2023 5:00 PM
Free start/finish	1/05/2023 8:00 AM	4/05/2023 5:00 PM
Late start/finish	1/06/2023 8:00 AM	6/06/2023 5:00 PM

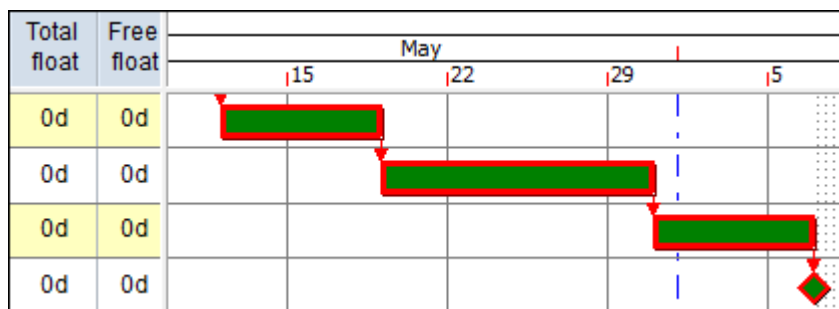
When checked then the task **Free start/finish** dates are NOT calculated and are set to the Late start/finish and Early start/finish and no free float bar displayed at the start of the task.

Float dates		
Early start/finish	1/06/2023 8:00 AM	6/06/2023 5:00 PM
Free start/finish	1/06/2023 8:00 AM	6/06/2023 5:00 PM
Late start/finish	1/06/2023 8:00 AM	6/06/2023 5:00 PM

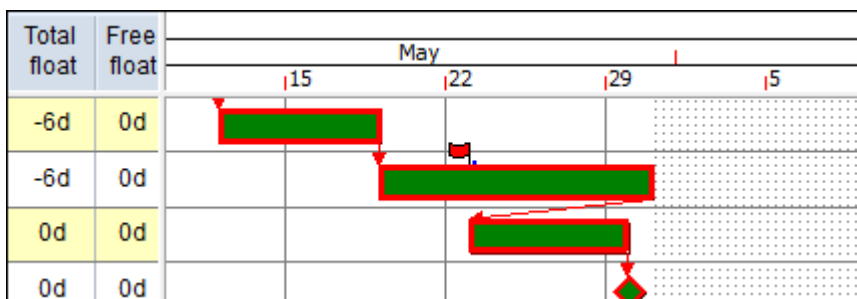
Comment: This function will not affect how many tasks are on the Critical Path.

3.3.2 Finish on or before flags are soft

This is the schedule before a **Finish on or before** constraint is set:

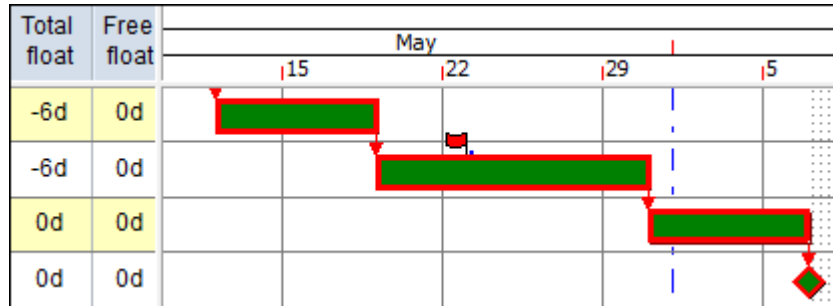


When this option is NOT Checked, therefore the **Finish on or before** flags are **hard** then the successor starts after the constraint date, the finish milestone is before the end of the last task which may be considered unrealistic:





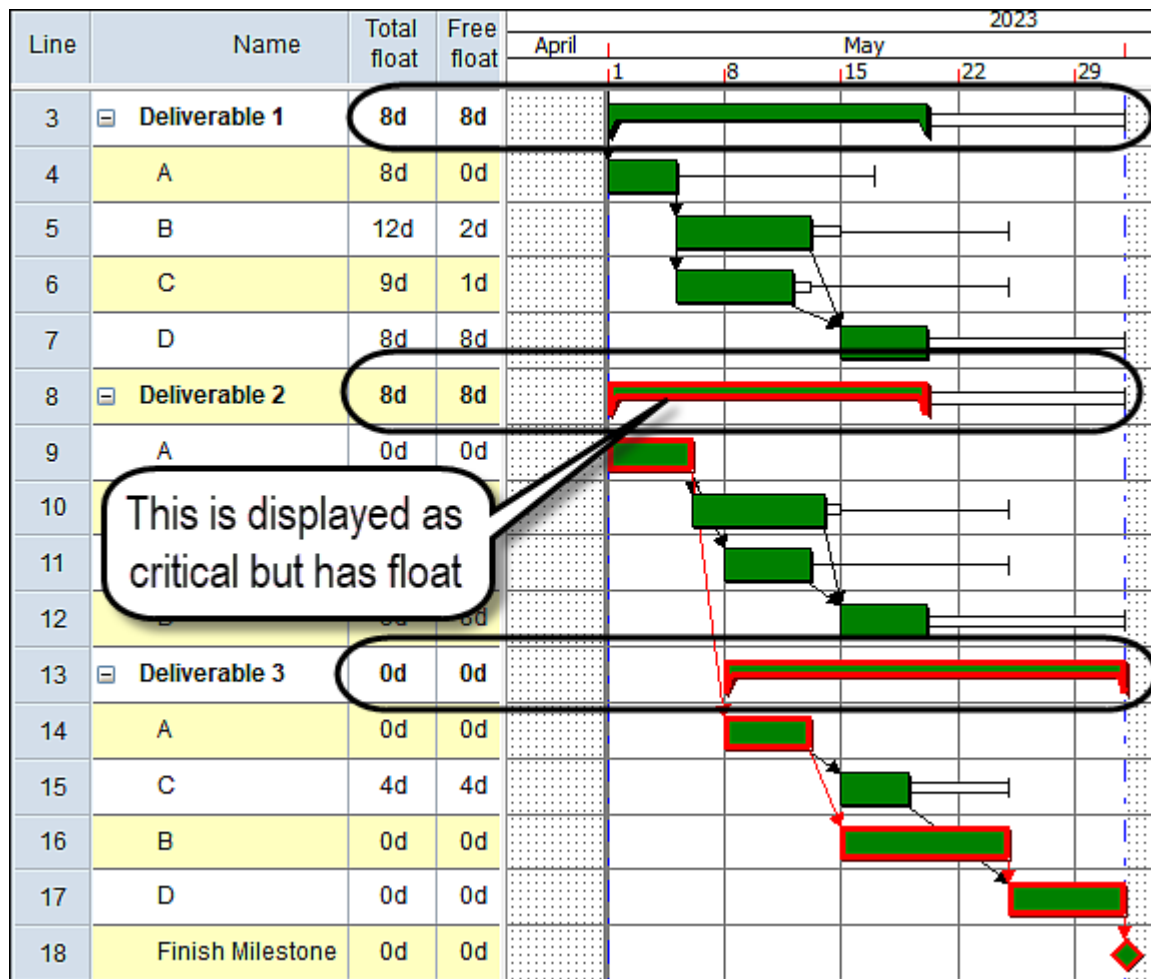
When this option is checked, therefore the **Finish on or before flags** are **soft** then the successor starts after the predecessor and this is how Microsoft Project and P6 calculate:



Comment: With it is checked it gives a more conservative schedule and logical schedule. This setting may in some circumstances affect the Critical Path of preceding tasks and does affect how dates are calculated.

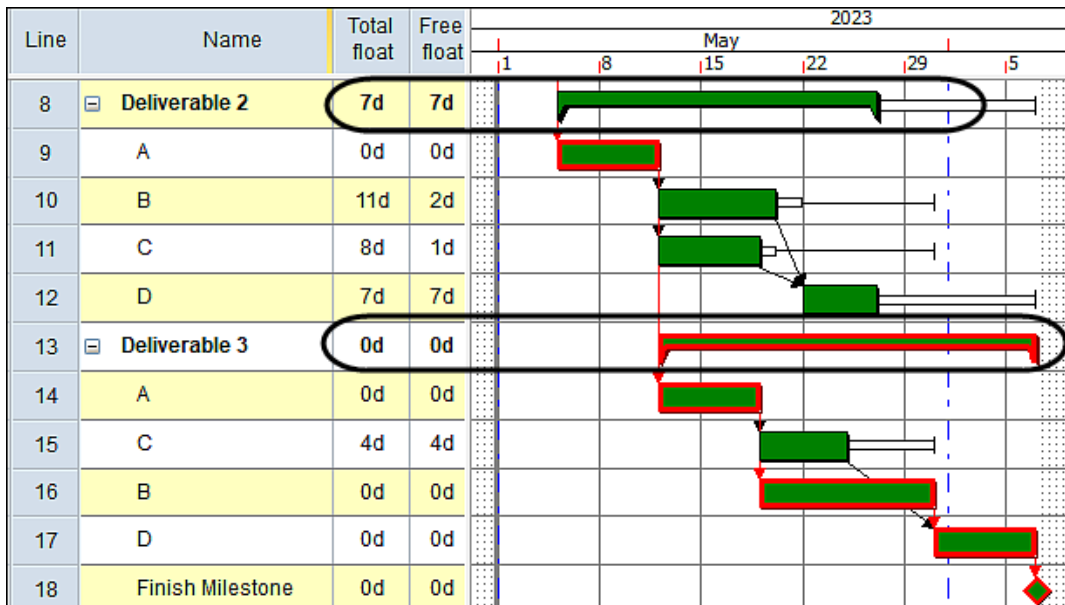
3.3.3 Summaries critical when content critical

When checked a Summary task is only critical when one of the tasks below it are critical, in the picture below **Deliverable 2** is critical and **Deliverable 3** is critical:





When unchecked a Summary task is only critical when a complete chain of tasks below it are critical, in the picture below **Deliverable 2** is NOT critical and **Deliverable 3** is critical:



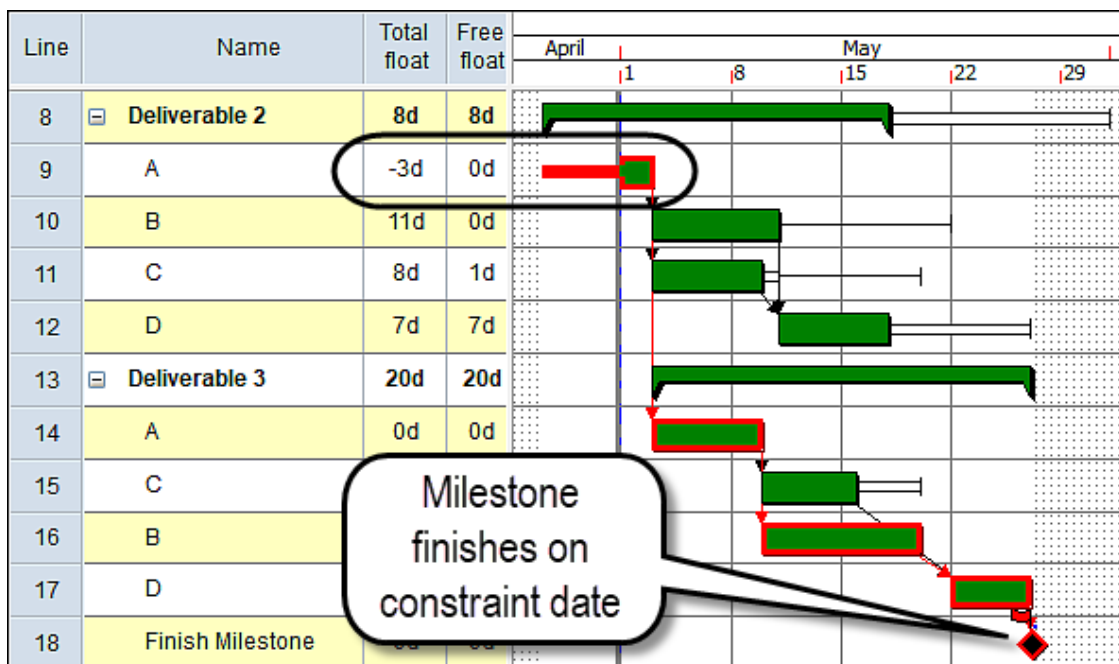
Comment: This setting when unchecked the float values match the bar colour.

3.3.4 Negative Float applies to chain

A finish on or before constraint has been set to the last milestone 3 days earlier that the calculated end date.

Negative float applies to chain option unchecked:

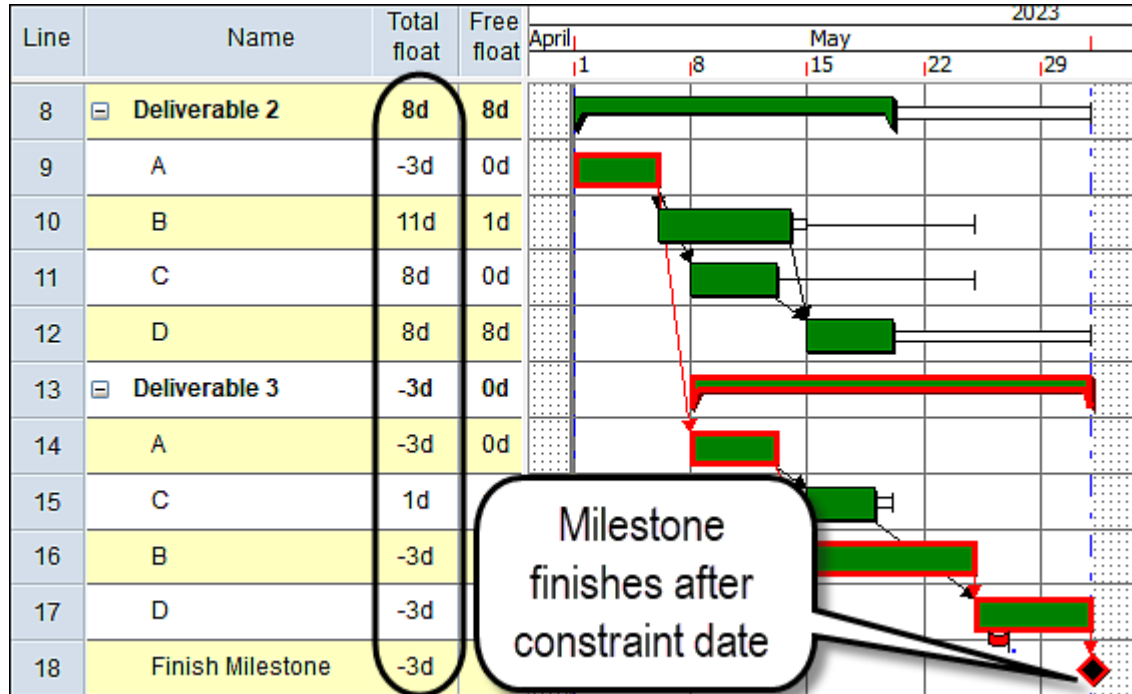
- Only the first task in a chain causing **Negative Float** is displayed with **Negative Float** and it also displays a **Negative Float** bar,
- All tasks are moved back in time so the project ends on the constraint date:





Negative float applies to chain option checked:

- All tasks in the chain calculate Negative Float but NO **Negative Float** bar is displayed against any task,
- Tasks are schedule past the constraint date:



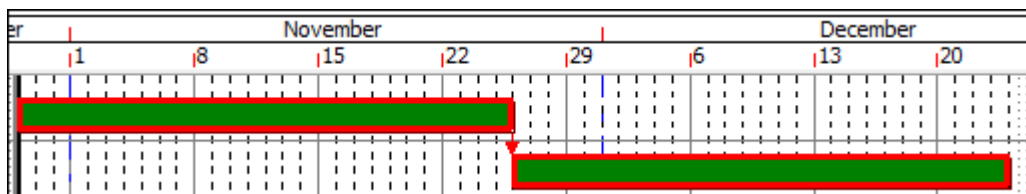
Comment With the option checked is how P6 and Microsoft Project calculate, but they will both display a Negative Float bar. Powerproject does NOT display a Negative Float bar with this option. This option will affect how float and dates are calculated and with it checked give a more logical schedule.

3.4 Options

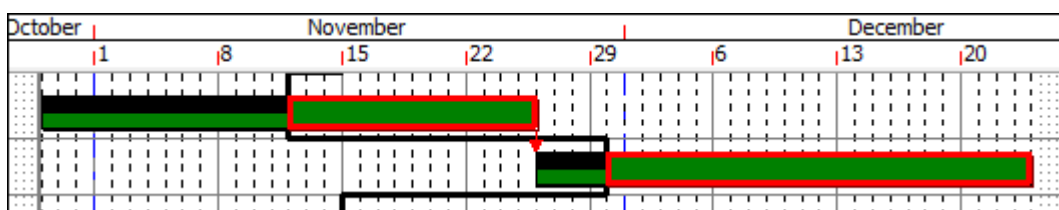
3.4.1 Move part completed links

This is similar to P6 **Retained Logic** and **Progress Override** Microsoft Projects **Split in progress** options:

Before updating:

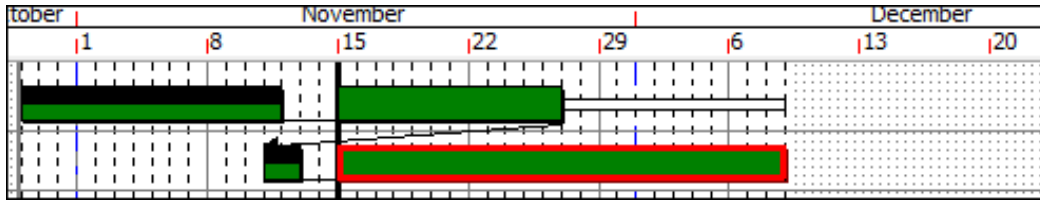


Progress entered, **Project Report Date** moved forward in time and not Rescheduled:

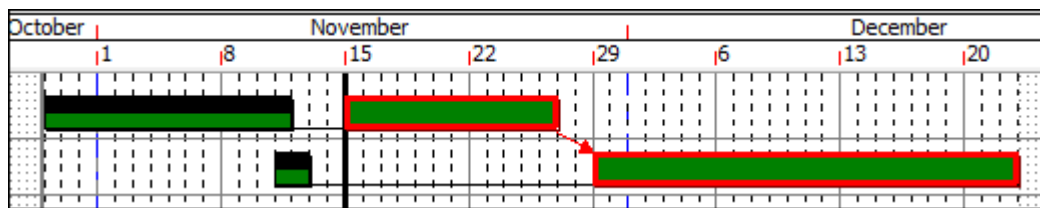




Rescheduled with option unchecked and the link is being ignored and remaining duration of the second task starts on the Report Date. This is similar to the P6 **Progress Override** and Microsoft **Project Split in Progress** not checked.



Rescheduled with option unchecked and the link is being acknowledged and remaining duration of the second task starts after the predecessor. This is similar to the P6 **Retained Logic** and Microsoft **Project Split in Progress** checked.

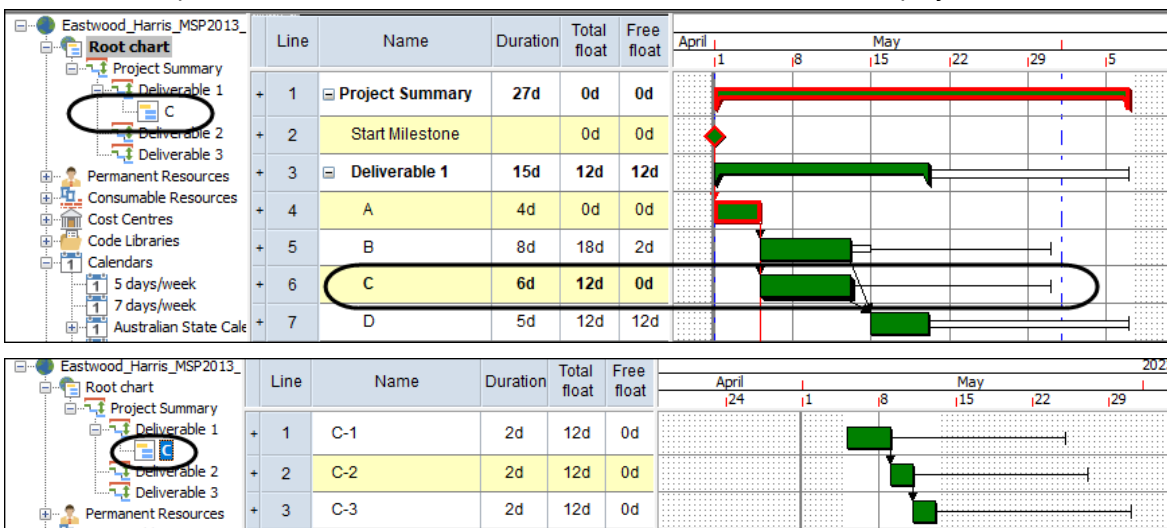


Comment: The **Move part completed links** option gives a more conservative program and usually best left on and logic changed when necessary. This option obviously change dates and the critical path. This option is only half of the **Retained Logic** and **Progress Override** Microsoft Project's **Split in progress** options and the Powerproject **Relink around completed tasks** must also be understood.

3.4.2 Truncate float within chart boundaries

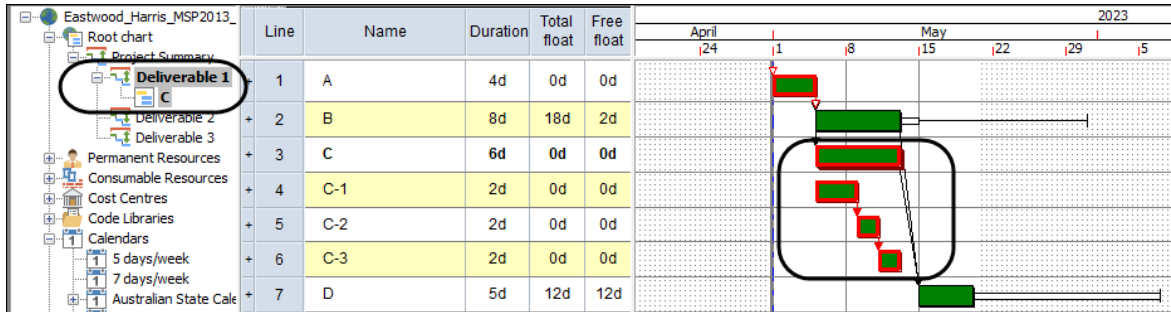
When you create an **Expanded** task then this is creating a **Subchart** and this function defines how the **Total Float** on the **Subchart** is calculated. In the picture below Task C under Deliverable 1 is an Expanded Task.

- With the option unchecked the Total Float is calculated to the end of the project:





- With the option Checked the float is calculated to the end of the Subchart and in this case all the tasks in the Subchart and now Critical and the Expanded Task C is also critical:

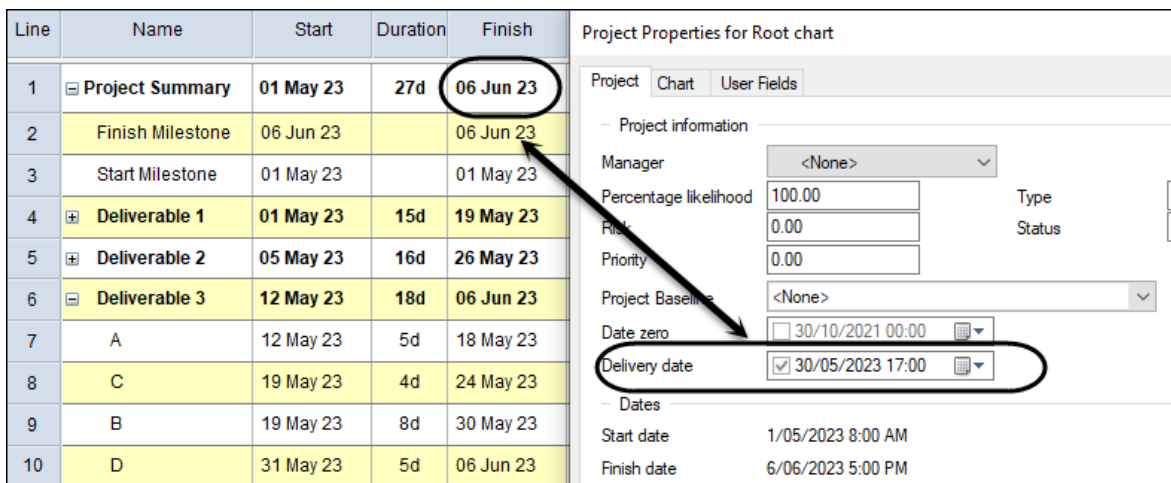


Comment: I would recommend in normal circumstances that this is not checked because this could be considered as creating a false critical path when checked and definitely affects how the critical path is calculated.

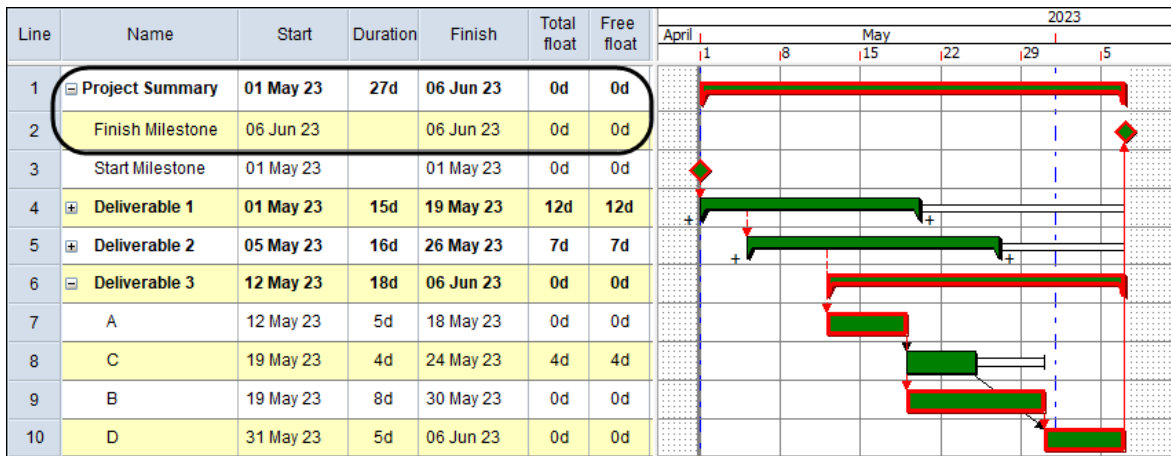
3.4.3 Use delivery date as deadline

There may be multiple projects in a Powerproject file and a **Delivery date** may be set for any project. When a **Delivery date** is set for a project then this may be used a **Late finish** constraint with this option.

In the picture below a Delivery date has been set without the option checked:

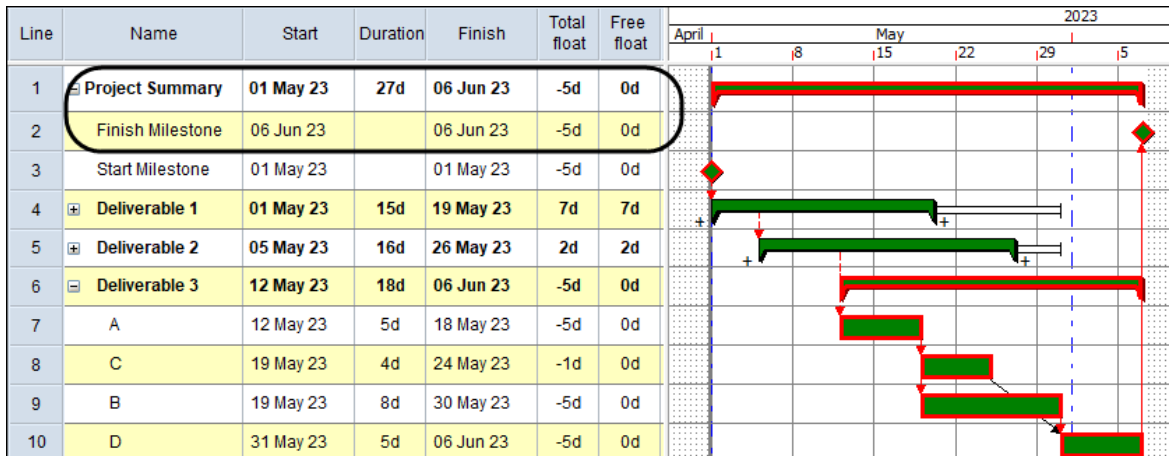


- The **Delivery date** has been ignored when this option is unchecked:





- The **Delivery date** has been acknowledged when this option is unchecked and float calculated to the **Delivery date**:

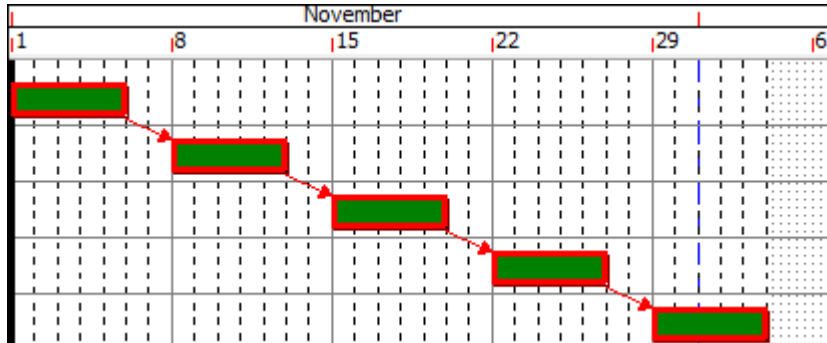


Comment: This is similar to the **P6 Project Must finish by** date and I would be inclined not to use it as it is in effect a hidden feature and I would prefer to use a constraint which people would normally expect to be used. This function would also control float and critical path calculations.

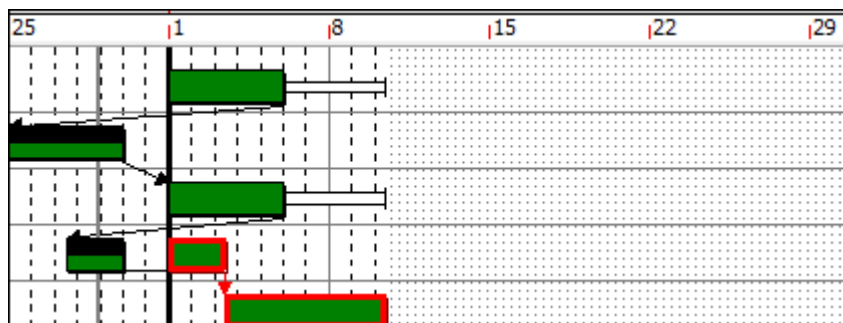
3.4.4 Relink around completed tasks

This is the Powerproject other half of the P6 **Retained Logic** and **Progress Override** Microsoft Projects **Split in progress** options:

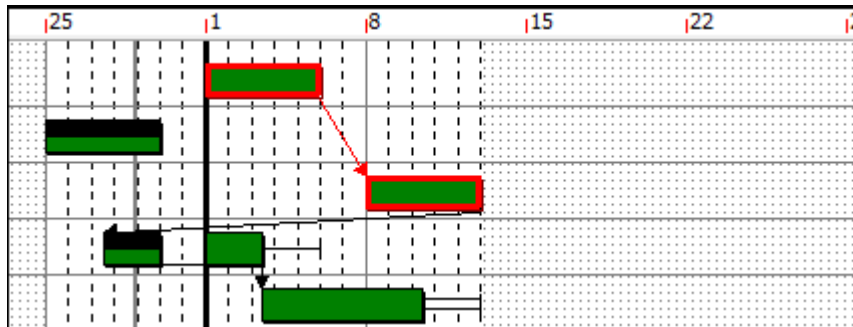
The schedule before updating:



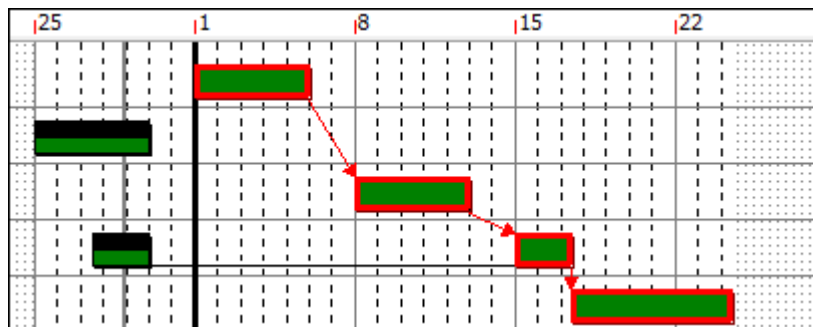
Rescheduling **NOT** checking **Relink around completed tasks**:



Rescheduling with checking **Relink around completed tasks:**



Rescheduling with checking **Relink around completed tasks** and **Move part completed tasks:**



Comment: It is my opinion that both **Relink around completed tasks** and **Move part completed tasks** should be checked to give a more conservative schedule and logic changed if required. These functions do affect the way the critical path and floats are calculated.

3.5 Ignore link categories

This paper will not cover link categories in detail but when Links are assigned a **Link category** then ignoring them will mean that they are not used in the schedule calculation and allows different build options in one schedule, such as East to West or West to East, or one or two crane options. This may save the requirement for two schedules when the tasks are the same for two build options.

3.6 *Straighten to progress line to period*

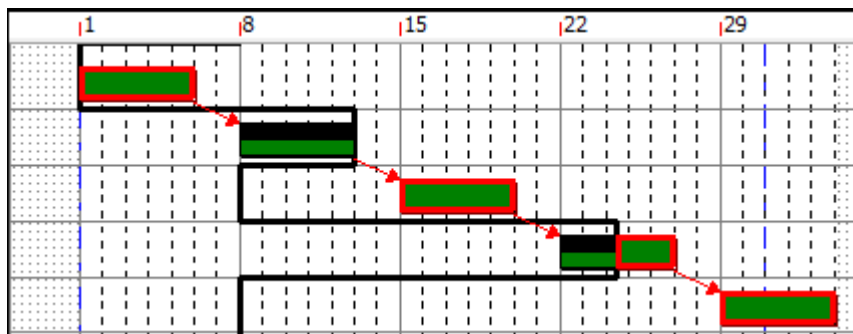
3.6.1 Drop down box options

When multiple report dates are created then this option allows the user to select which report date is being used to update the schedule.

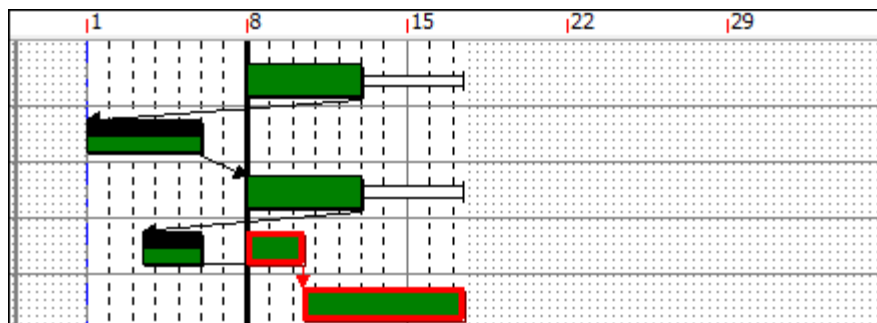
3.6.2 Only move forward to make straight

This option decides if complete work is to be moved into the past when rescheduling

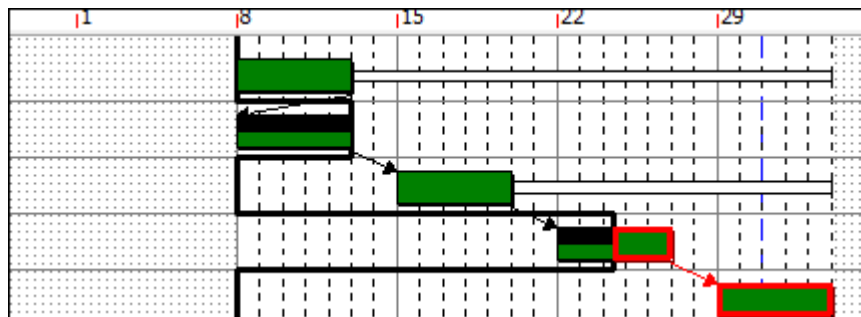
- Before rescheduling:



- After rescheduling without checking the option, all complete work has been moved to the future and incomplete work to the past:



- After rescheduling with checking the option, all complete work has been moved to the future and incomplete work to the past:

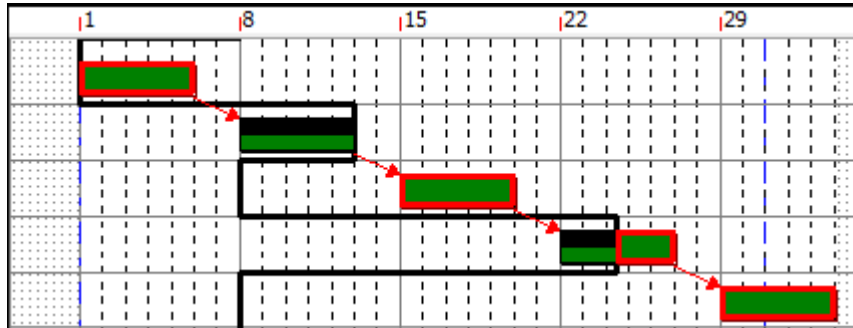


Comment: If you wish to have a properly updated program then this option should not be used and all completed work should be in the past, but some people incrementally update their programs and sometimes this function is useful when Actuals Dates are set in the future and in this situation should not be changed by the software.

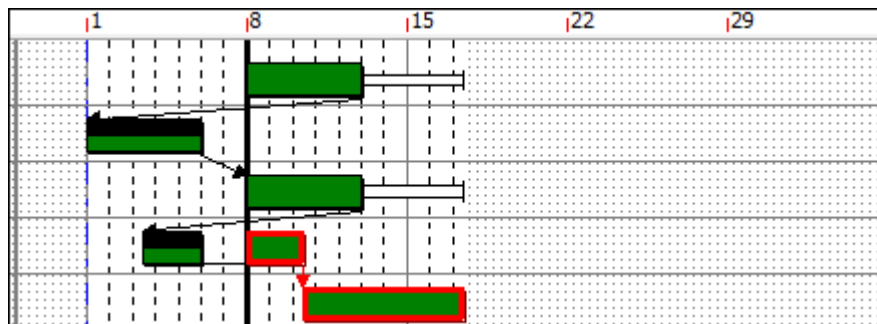
3.6.3 Never move completed tasks

This option should not be used unless you are using the Powerproject time sheeting

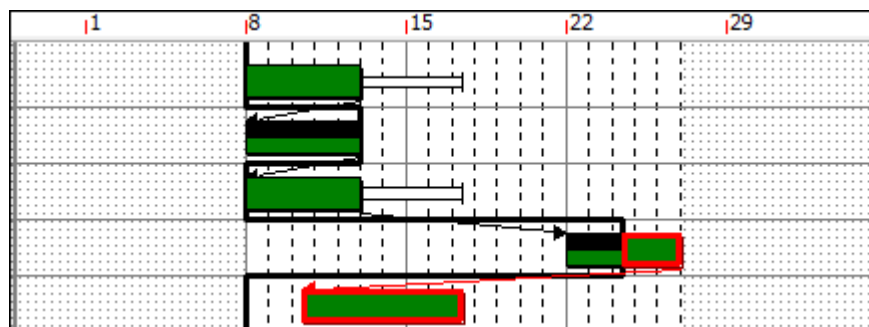
- Before rescheduling:



- After rescheduling without checking the option, all complete work has been moved to the future and incomplete work to the past:



- After rescheduling with checking the option and you can see that the program has not been scheduled correctly.



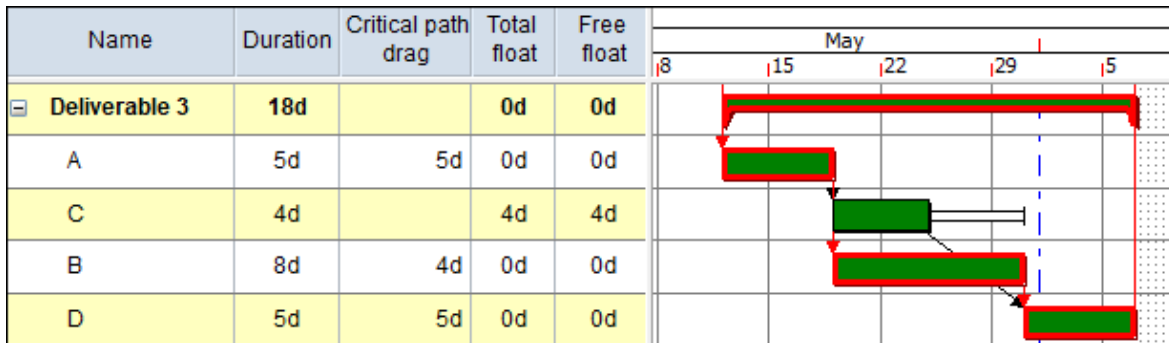
Comment: As per the Powerproject help file, this option should not be checked unless you are using the Powerproject time sheeting.



3.7 Compute

3.7.1 Critical path drag

Critical path drag is the amount of time a task may be shortened to take it off the critical path. The picture below shows that if task 16 is shortened by more than 4 days it will no longer be on the critical path:

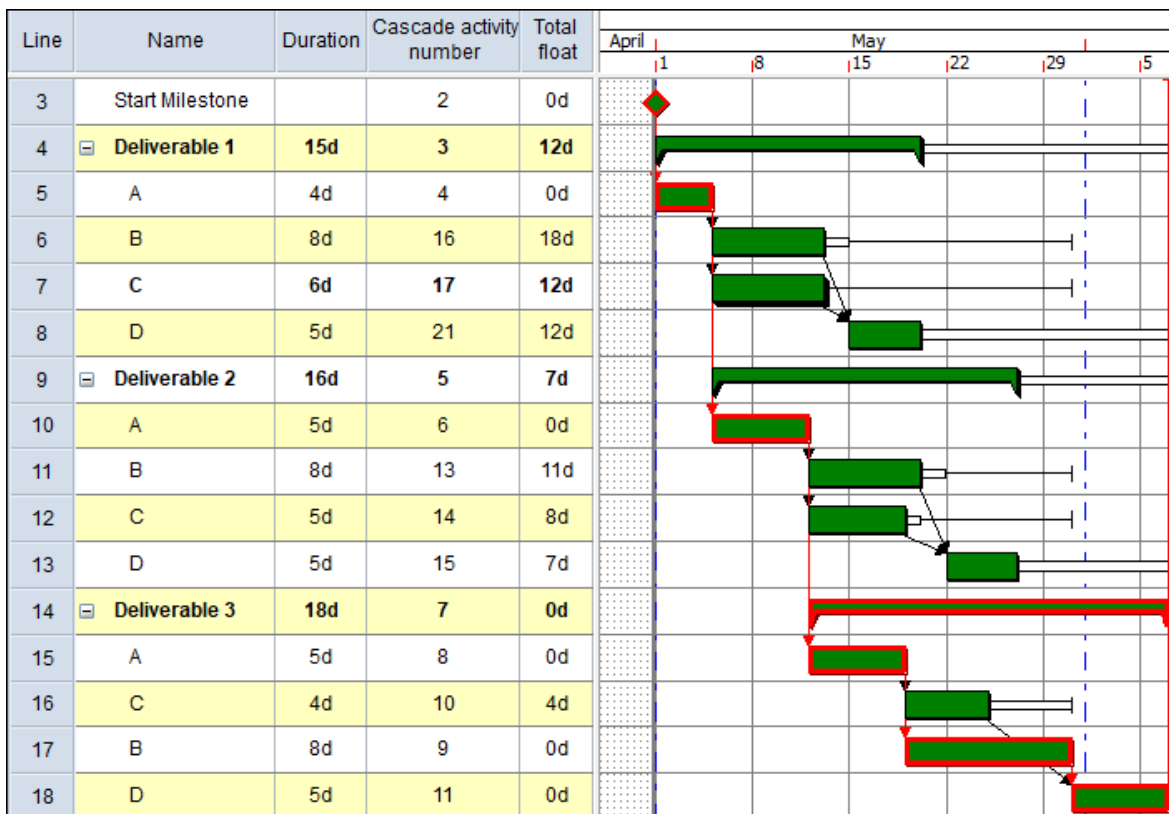


Comment: This option does not affect the critical path.

3.7.2 Cascade activity numbers

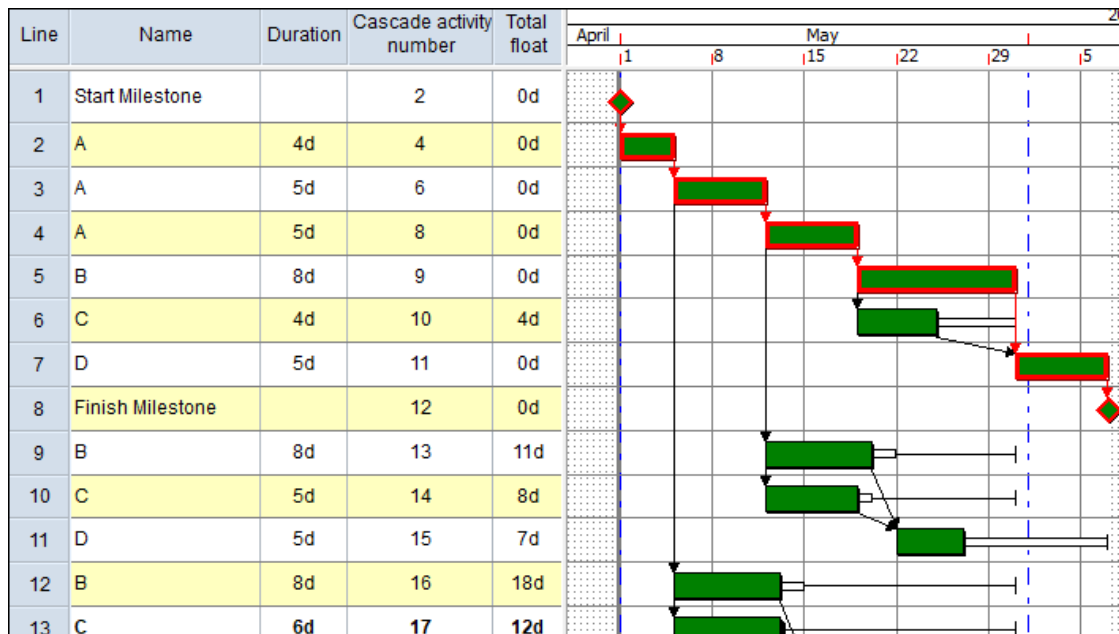
Cascade activity numbers is a function that numbers all the tasks so the can be sorted in a cascade and used with cascade planning:

- Before sorting by Cascade activity number





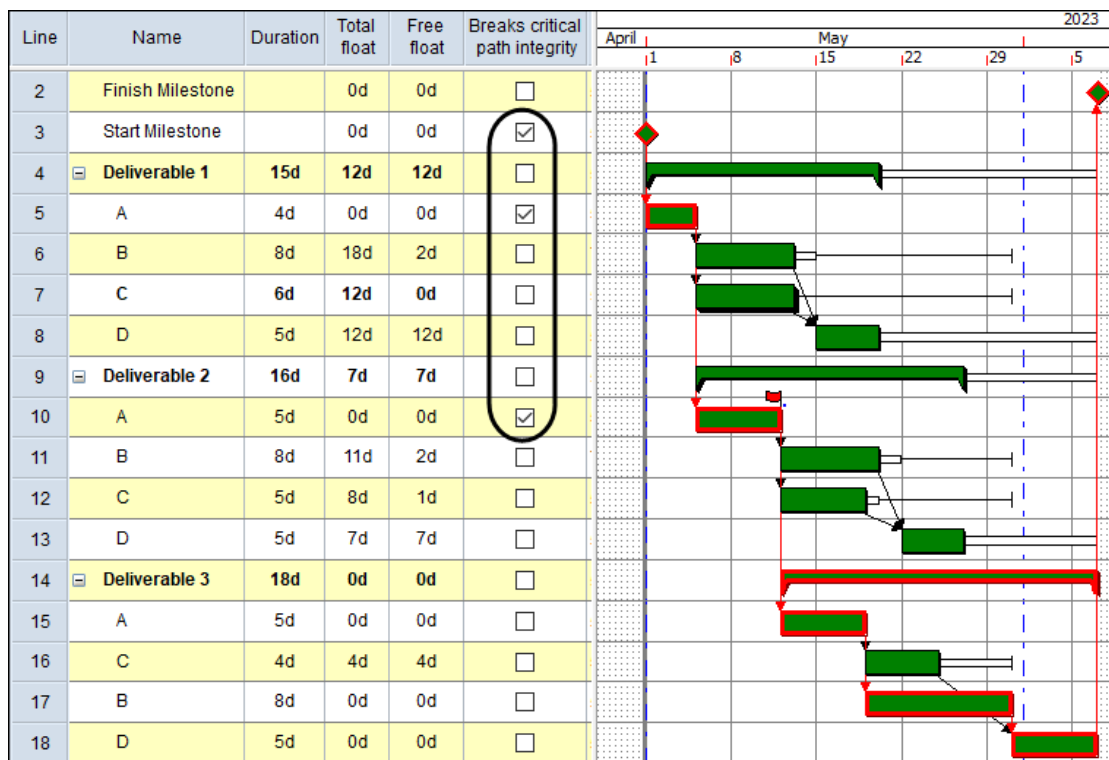
- After sorting by **Cascade activity number** and Summary Tasks filtered out:



Comment: This does not affect the critical path, but does isolate the Critical path.

3.7.3 Critical path integrity

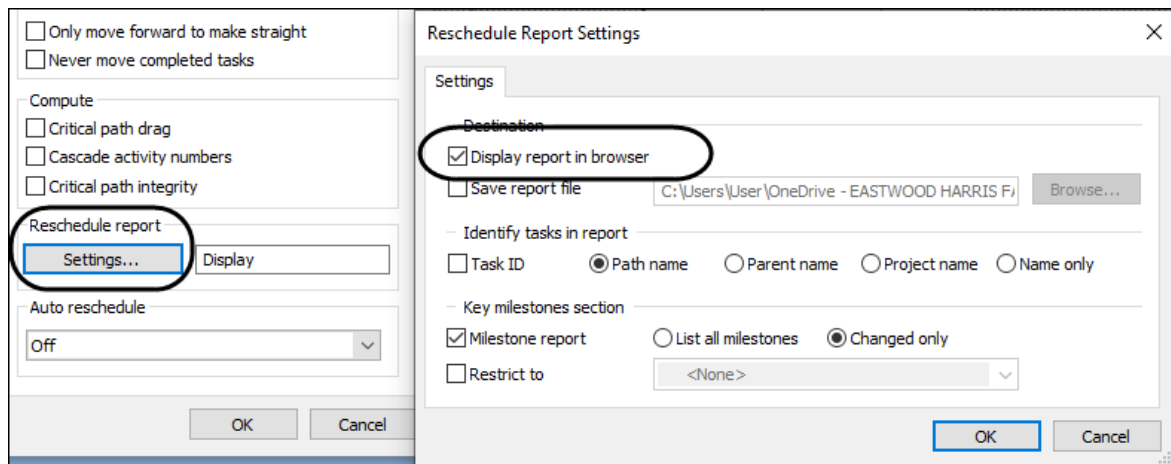
This is a check on the integrity of the critical path which may be compromised by constraints or bad links. In the picture below the Finish on or before constraint applied to task 10 affects the integrity of the critical path of preceding tasks 3 and 5:



Comment: This does not affect the critical path.

3.8 Reschedule report

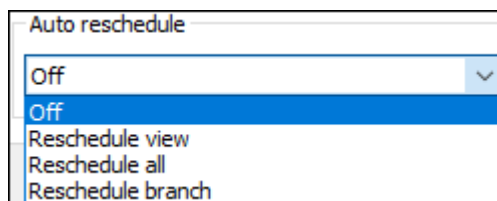
The **Settings** button allow you to tailor the schedule report including not displaying it:



Comment: This does not affect the Critical Path.

3.9 Auto reschedule

This decides what is rescheduled automatically by Powerproject:



Comment: This will affect the Critical Path and may give you an unrealistic result when you use **Reschedule branch** or **Reschedule view**.

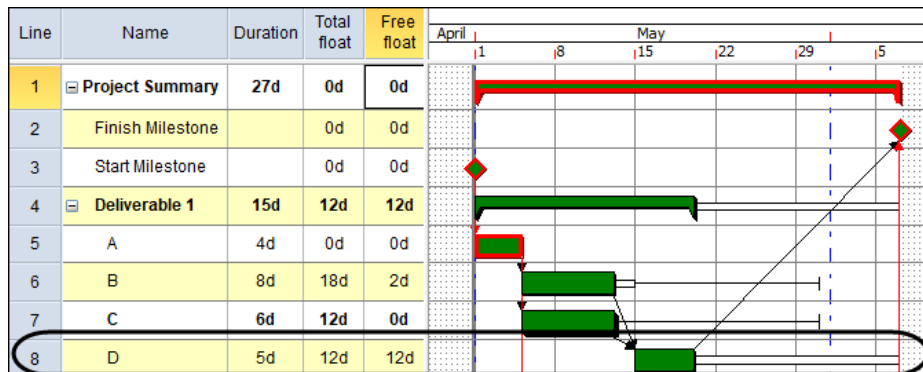
4 Multiple Critical Path

Both P6 and Microsoft project has a function that forces tasks without successors to become critical.

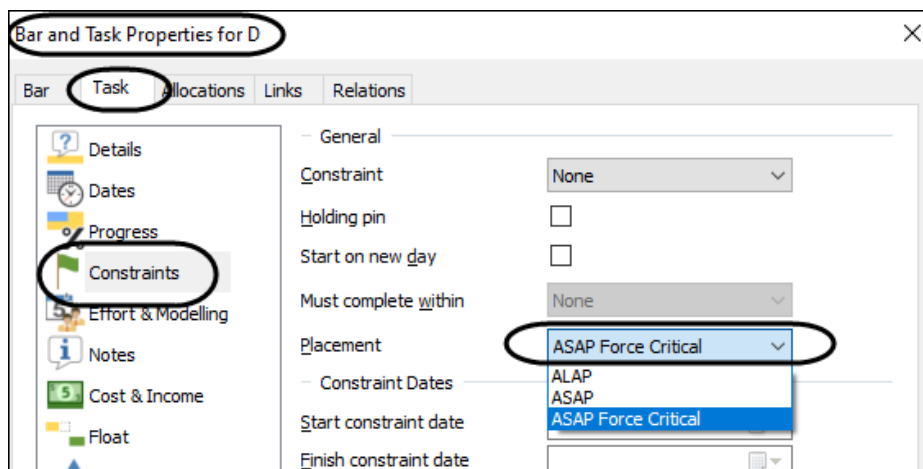
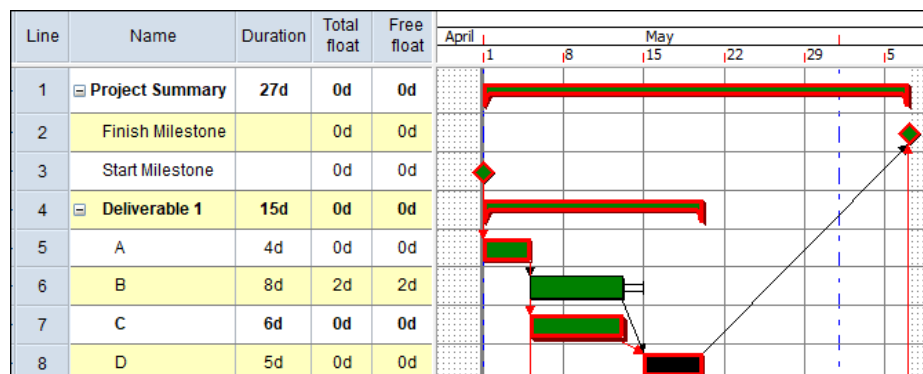
- Microsoft Project names the function **Calculate multiple critical paths** and
- P6 names the function **Open ends Critical**.

Powerproject has a function with far more flexibility called ASAP force critical.

- In the picture below task 8 has 12 days total and free float:



- When this option is turned on in the **Bar and Task Properties** form **Task, Constraints, Placement** drop down box, then the task is force critical without a constraint and unlike P6 or Microsoft Project it may have a successor:

Comment: This has a significant advantage over P6 and Microsoft Project because the user is able to maintain a multiple critical path program with a closed network.



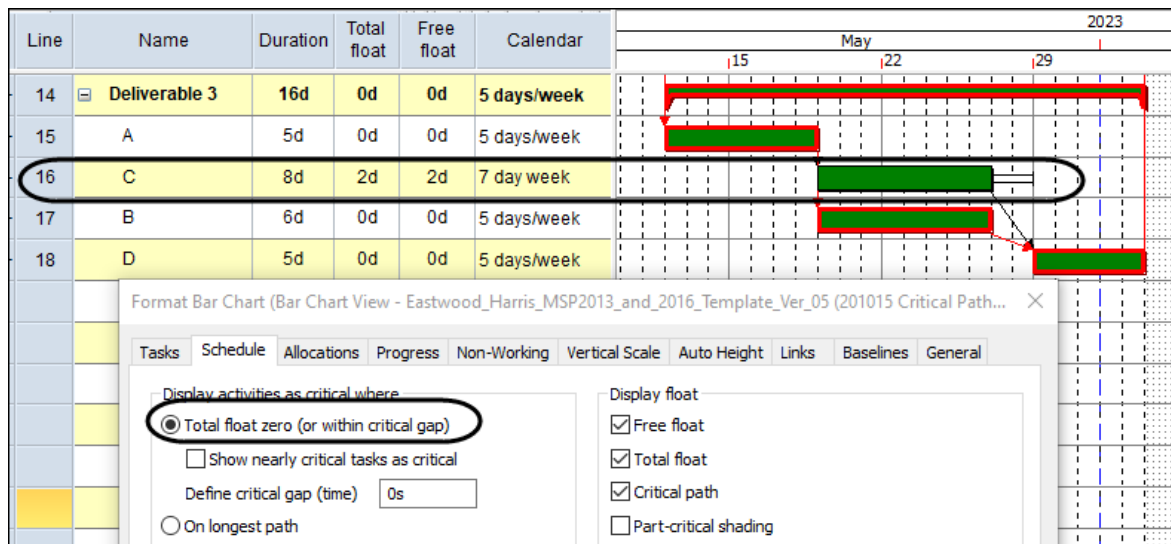
5 Format Bar Chart, Schedule Options

5.1 Display activities as critical where

This form has similar options to P6 and allows criticality to be displayed based on either:

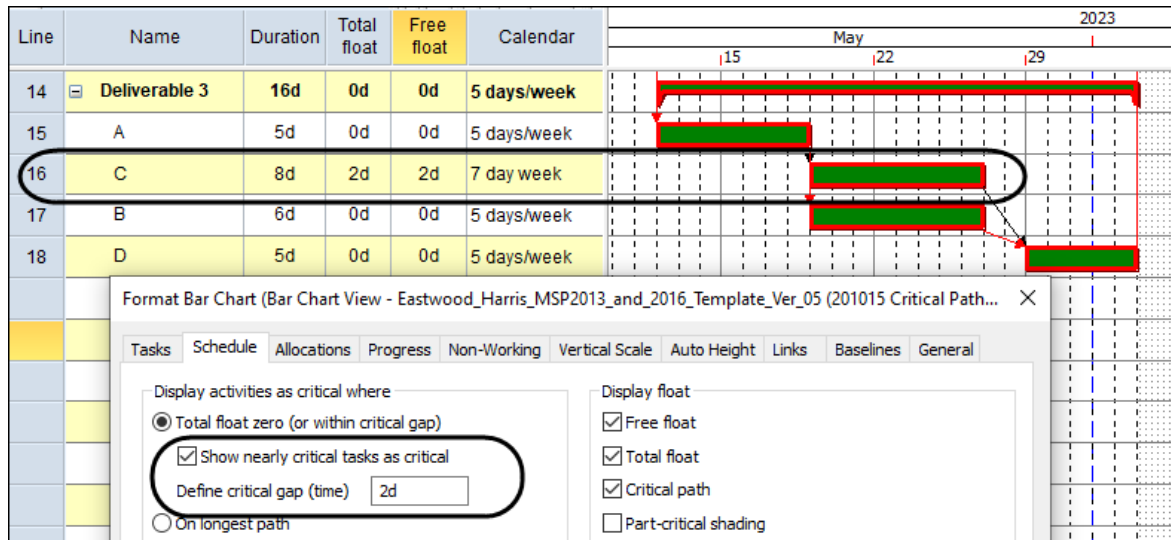
- A user defined **Critical path value** or
- The **Longest path**. This option is calculated differently to the P6 option on you should read the help file carefully to understand how this calculates.

- In the picture below the critical path is defined as tasks with zero total float and task 16 is not on the critical path and has 2 days free and total float:

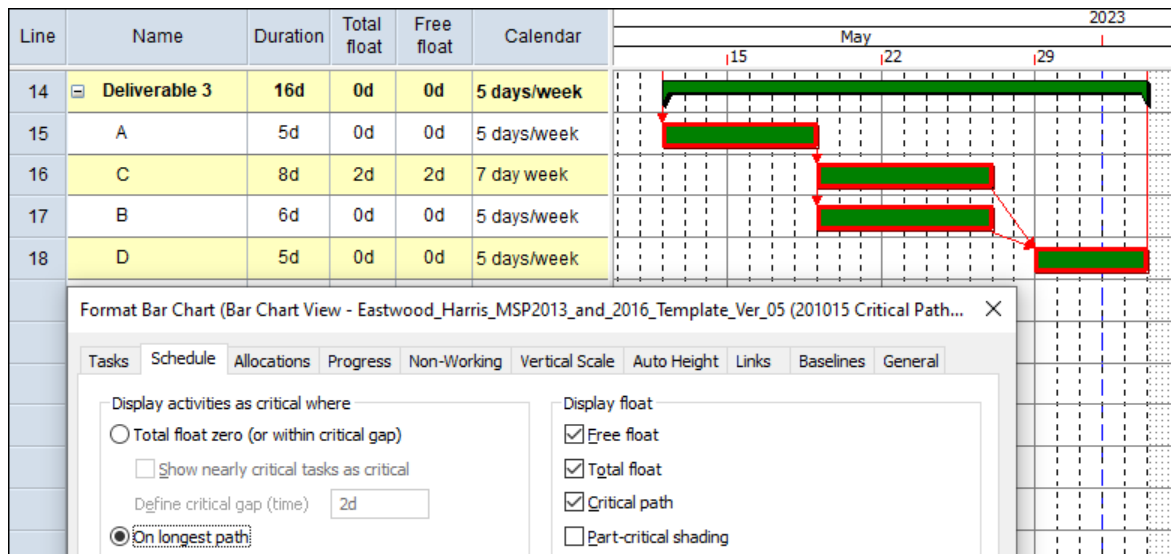




- In the picture below Task 16 is displayed as critical because the critical path is now defined as **Define critical gap (time)** as 2 days.

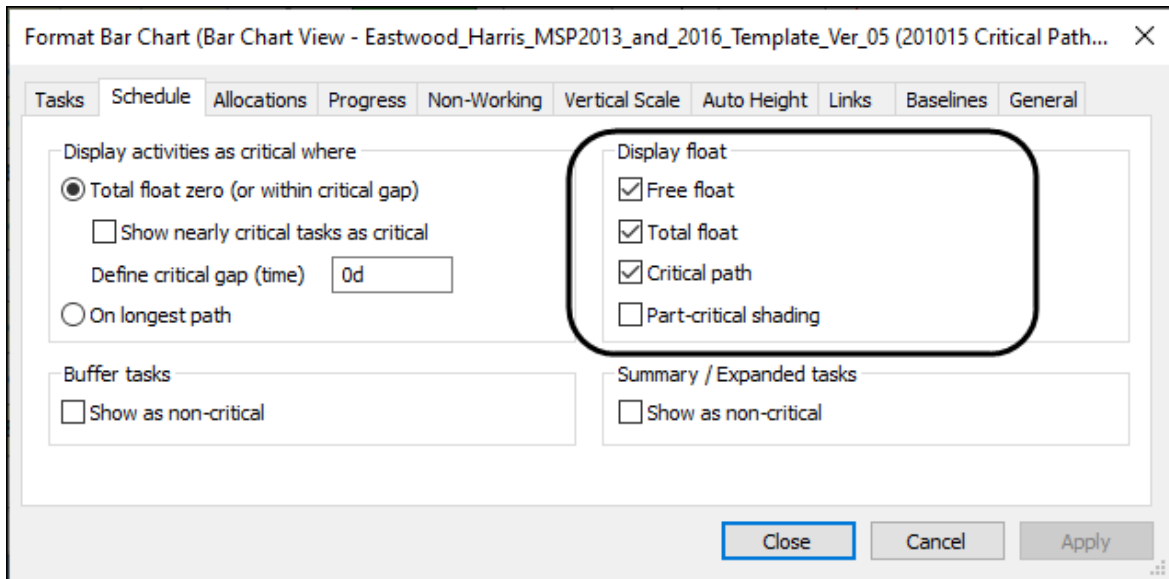


- In the picture below Task 16 is displayed as critical because the critical path is now defined as **On longest path**:



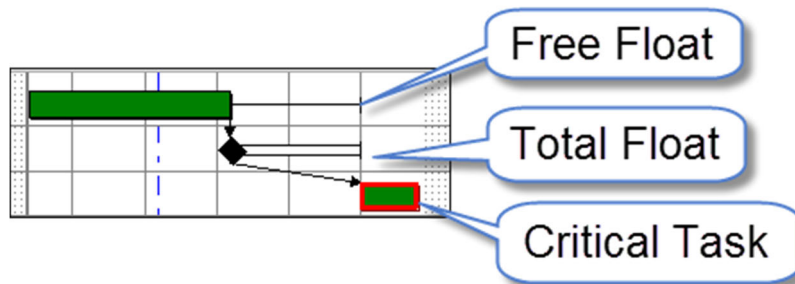
Comment: When you have multiple calendars with a different number of working days per week it is usually best to use the **On longest path** option.

5.2 Display Float



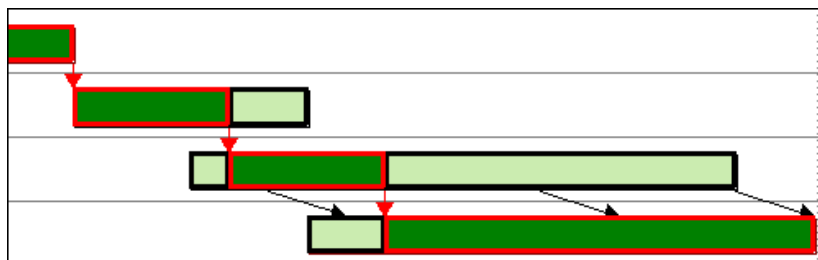
5.2.1 Free float, Total float and Critical path

- Powerproject displays float and critical task as follows:



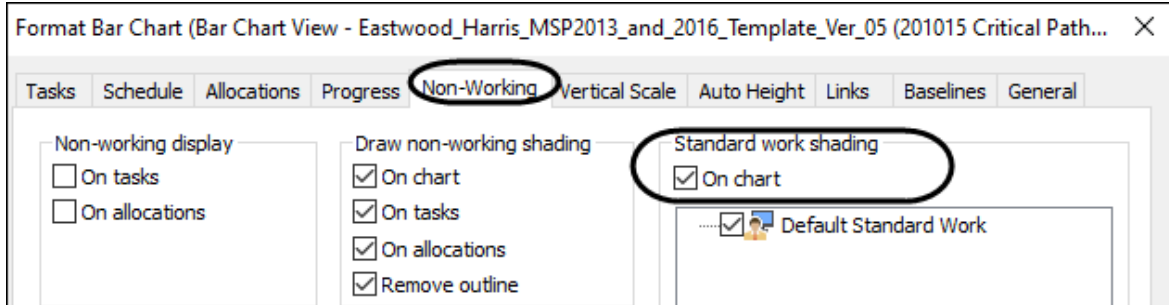
5.2.2 A Partial Critical Path

A Partial Critical Path identifies critical and non-critical portions of a task,

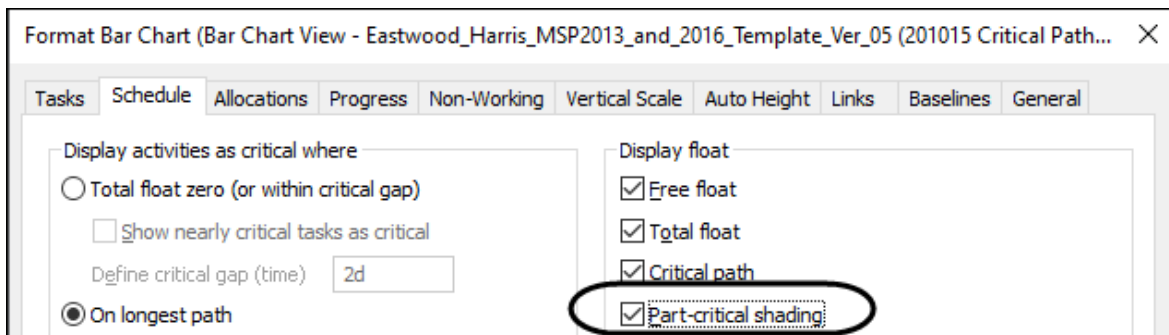




- A **Partial Critical Path** may be displayed when **Mid Links** are used,
- To display a **Partial Critical Path** two conditions must be met in the **Format Bar Chart** form:
 - The **Non-Working** tab, **On tasks** unchecked, and



- The **Schedule** tab, **Partial critical shading** checked.



Paul E Harris
 Director Eastwood Harris Pty Ltd
 1 November 2021

