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Primavera Project Planner (P3)

■ Version 3.1

Survival Guide for Using Constraints

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A constraint is a restriction imposed on the schedule to control the results (such as Start and Finish dates, and Floats). Therefore, it is very important to understand the characteristic of each constraint so that you can control the calculation results effectively. This article will show you how to use Constraints correctly.

Characteristics of the Constraints

In general, P3 provides the two types of constraints, date constraints and float constraints. Use date constraints when a particular date controls an activity or network. Use float constraints when you do not know the actual duration of an activity but you do know relationships or dates will govern its calculation. The below is a complete list of constraints:

Early Constraints

Early start ¹ Early finish ³

Late Constraint

Late start ⁴ Late finish ²

Start on

Start on ⁵

Expected Finish

Expected finish ⁶

Mandatory

Start ⁷ Finish ⁸

Float Constraints

Zero total float ⁹ Zero free float ¹⁰

1. Early Start Constraint

	Affects	Hint
Logic Calculation	Only affect the early dates, P3 applies it only during the forward scheduling calculation	Only affect EARLY dates
Calculated Start Date	1. Will move early start date to the right based on the imposed date only when the imposed date is later than the pre-imposed calculated late finish date. 2. If the imposed date is earlier than the pre-imposed calculated early start date, the constraint has no effect on the schedule calculation.	E ⇒ Use this constraint to move calculated early dates to the RIGHT .
Calculated Finish Date	Will be calculated according to early start date for the activity type of Task.	E ⇒
Total Float	If the constraint affects the early date of any activities, the total float is reduced .	⇓
Common Usage	To ensure the activity is not going to start earlier than a specific date.	START NO EARLY THAN
If imposed date is a nonworkperiod	If the imposed date is a nonworkperiod, P3 imposed a calculated early start date that is one workperiod after this constraint date.	AFTER

Note:

1. The early start constraint has no effect on the schedule calculation once an actual start is applied.

2. Late Finish Constraint

	Affects	Hint
Logic Calculation	Only affect the late dates, P3 applies it only during the backward scheduling calculation	Only affect LATE dates
Calculated Start Date	Will be calculated according to late finish date for the activity type of Task. It will be shown BLANK if the activity type is a Finish Milestone activity.	⇐L
Calculated Finish Date	1. Will move late finish date to the left based on the imposed date only when the imposed date is earlier than the pre-imposed calculated late finish date. 2. If the imposed date is later than the pre-imposed calculated late finish date, the constraint has no effect on the schedule calculation.	⇐L Use this constraint to move calculated late dates to the LEFT .
Total Float	If the constraint affects the late date of any activities, the total float is reduced .	↓
Common Usage	Often used to set intermediate completion dates or "finish no later than" milestones.	FINISH NO LATER THAN
If imposed date is a nonworkperiod	If the imposed date is a nonworkperiod, P3 imposed a calculated late finish date that is one workperiod before this constraint date.	BEFORE

3. Early Finish Constraint

	Affects	Hint
Logic Calculation	Only affect the early dates, P3 applies it only during the forward scheduling calculation	Only affect EARLY dates
Calculated Start Date	Will be calculated according to early finish date for the activity type of Task.	E⇒
Calculated Finish Date	1. Will move early finish date to the right based on the imposed date only when the imposed date is later than the pre-imposed calculated late finish date. 2. If the imposed date is earlier than the pre-imposed calculated early finish date, the constraint has no effect on the schedule calculation.	E⇒ Use this constraint to move calculated early dates to the RIGHT .
Total Float	If the constraint affects the early date of any activities, the total float is reduced .	⇓
Common Usage	Same as the early start date, instead, the constraint is imposed on the finish date. However, most people will use the early start constraint.	START NO EARLY THAN with finish date imposed
If imposed date is a nonworkperiod	If the imposed date is a nonworkperiod, P3 imposed a calculated early finish date that is one workperiod after this constraint date.	AFTER

Note:

1. Some people called this constraint "Finish No Earlier Than", which does not really make any sense. Just remember that the early finish constraint function exactly like an early start constraint, except that it is applied to the calculated early finish date of the activity.

4. Late Start Constraint

	Affects	Hint
Logic Calculation	Only affect the late dates, P3 applies it only during the backward scheduling calculation	Only affect LATE dates
Calculated Start Date	1. Will move late start date to the left based on the imposed date only when the imposed date is earlier than the pre-imposed calculated late start date. 2. If the imposed date is later than the pre-imposed calculated late start date, the constraint has no effect on the schedule calculation.	←L Use this constraint to move calculated late dates to the LEFT .
Calculated Finish Date	Will be calculated according to late start date for the activity type of Task.	←L
Total Float	If the constraint affects the late date of any activities, the total float is reduced .	↓
Common Usage	Same as the late finish date, instead, the constraint is imposed on the start date. However, most people will use the late finish constraint.	FINISH NO LATER THAN with start date imposed.
If imposed date is a nonworkperiod	If the imposed date is a nonworkperiod, P3 imposed a calculated late start date that is one workperiod before this constraint date.	BEFORE

Note:

1. Some people called this constraint "Start No Later Than", which does not really make much sense. Just remember that the late start constraint function exactly like a late finish constraint, except that it is applied to the calculated late start date of the activity.
2. The late start constraint has no effect on the schedule calculation once an actual start is applied.

5. Start on Constraint

	Affects	Hint
Logic Calculation	The start on constraint acts as an early start and late start constraint with the same imposed date as specified.	Can affect EARLY or LATE dates
Calculated Start Date	<p>1. Will move early start date to the right based on the imposed date only when the imposed date is later than the pre-imposed calculated late finish date.</p> <p>2. If the imposed date is earlier than the pre-imposed calculated early start date, the constraint has no effect on the schedule calculation.</p> <p>3. Will move late start date to the left based on the imposed date only when the imposed date is earlier than the pre-imposed calculated late start date.</p> <p>4. If the imposed date is later than the pre-imposed calculated late start date, the constraint has no effect on the schedule calculation.</p> <p>5. Based on the definition, this constraint should affect either early or late dates, not both at the same time.</p>	<p>E ⇒ or ⇐ L</p> <p>Use this constraint to move calculated early dates to the RIGHT or calculated late dates to the LEFT.</p>
Calculated Finish Date	Will be calculated according to early or late start date for the activity type of Task.	E ⇒ or ⇐ L
Total Float	If the constraint affects the calculated date of any activities, the total float is reduced .	⇓
Common Usage	I seldom use this constraint. However, I use this constraint on one occasion with the expected finish constraint. Please see the note 1 under expected finish constraint.	
If imposed date is a nonworkperiod	If the imposed date is a nonworkperiod, P3 imposed a calculated early start date that is one workperiod after this constraint date, and a calculated late start date that is one workperiod before this constraint date.	Can be AFTER or BEFORE

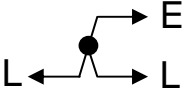
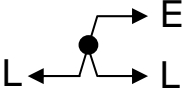
6. Expected Finish Constraint

	Affects	Hint
Logic Calculation	The expected finish constraint is used to update the schedule based on an estimate of an activity's expected finish and will definitely change the original and remaining durations.	Can affect EARLY dates, ORIGINAL and REMAINING durations
Calculated Start Date	Will be calculated according to early finish date for the activity type of Task. However, there is no effect on the early (or actual) start of the activity that the constraint is imposed upon.	E ⇒
Calculated Finish Date	<p>1. P3 will set the early finish date equal to the imposed expected finish date, and calculate the original duration as: <u>Expected finish date – calculated early start date.</u></p> <p>2. You can't set the expected finish date earlier than the scheduled early start, otherwise the original duration for the activity will be set to zero.</p> <p>3. For activities underway, P3 calculates the durations as: <u>Remaining Duration = Expected finish date – Data date</u> <u>Original Duration = (Data Date - Actual Start) + Remaining Duration</u></p> <p>4. Use caution when you undo the constraint as it will not undo your very first original and remaining durations.</p>	<p>E ⇒</p> <p>Use this constraint to forecast calculated early finish dates for activities in progress.</p>
Total Float	If the constraint affects the calculated date of any activities, the total float can be reduced or increased depending on the imposed finish date.	↓ or ↑
Common Usage	This constraint is often used to forecast the finish dates of the activities in progress.	
If imposed date is a nonworkperiod	If the imposed date is a nonworkperiod, P3 imposed a calculated early finish date that is one workperiod after this constraint date.	AFTER

Note:

1. The combination of the start on and expected finish constraints can be used to “place” an activity bar on any place you want in the schedule without any logic. The duration will be calculated like a Hammock activity according to the imposed constraint dates. The early dates will be equal to the late dates and the total float will be zero.
2. Since you will lose the data of the original and remaining durations after you apply the expected finish constraint, you should always record those data in the log notes for the future reference.

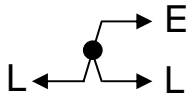
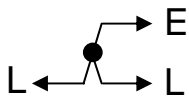
7. Mandatory Start Constraint

	Affects	Hint
Logic Calculation	The mandatory start constraint sets both the early and late start dates equal to the specified date. This constraint will absolutely overwrite all calculated results in the schedule.	Affect both EARLY and LATE dates
Calculated Start Date	<ol style="list-style-type: none"> 1. This constraint will set the early dates equal to the late dates (e.g., early start = late start; early finish = late finish). 2. It is important to remember that an imposed mandatory start sets the early dates for all paths leading from an activity and the late dates of all paths leading to it. 3. Use caution when you apply this constraint as it can violate network logic and cause an activity's dates to be earlier than those of its predecessor(s). 	
Calculated Finish Date	Will be calculated according to early or late start date for the activity type of Task.	
Total Float	If the constraint affects the calculated date of any activities, the total float will be set to zero, which can be reduced or increased from the pre-imposed calculated total float.	TF=0 ↓ or ↑
Common Usage	Don't know. I never use this constraint.	AVOID
If imposed date is a nonworkperiod	Avoid imposing a mandatory start constraint date that occurs on a nonworkperiod such as a holiday or a weekend.	AVOID

Note:

1. The mandatory start constraint has no effect on the schedule calculation once an actual start is applied.

8. Mandatory Finish Constraint

	Affects	Hint
Logic Calculation	<p>The mandatory finish constraint function exactly like a mandatory start constraint, except that it is applied to the calculated finish date of the activity.</p> <p>The mandatory finish constraint sets both the early and late finish dates equal to the specified date. This constraint will absolutely overwrite all calculated results in the schedule.</p>	Affect both EARLY and LATE dates
Calculated Start Date	Will be calculated according to early or late finish date for activity type of Task.	
Calculated Finish Date	<p>Will be calculated according to early or late start date for the activity type of Task.</p> <p>1. This constraint will set the early dates equal to the late dates (e.g., early start = late start; early finish = late finish).</p> <p>2. It is important to remember that an imposed mandatory start sets the early dates for all paths leading from an activity and the late dates of all paths leading to it.</p> <p>3. Use caution when you apply this constraint as it can violate network logic and cause an activity's dates to be earlier than those of its predecessor(s).</p>	
Total Float	If the constraint affects the calculated date of any activities, the total float will be set to zero, which can be reduced or increased from the pre-imposed calculated total float.	TF=0 ↓ or ↑
Common Usage	Don't know. I never use this constraint.	AVOID
If imposed date is a nonworkperiod	Avoid imposing a mandatory finish constraint date that occurs on a nonworkperiod such as a holiday or a weekend.	AVOID

Note:

1. The mandatory finish constraint has no effect on the schedule calculation once an actual finish is applied.

9. Zero Total Float Constraint

	Affects	Hint
Logic Calculation	When you impose a zero total float constraint, P3 sets the late dates for the activity equal to its early dates, giving it zero total float. Therefore, creating a critical path through the imposed activity.	Only affect LATE dates
Calculated Start Date	1. The Late dates will be equal to the Early date, not the other way around. 2. Per the definition, this constraint has no effects if the total float is already zero or negative.	If TF>0 LATE=EARLY
Calculated Finish Date	See above	
Total Float	If the constraint affects the calculated date of any activities, the total float will be set to zero, which is reduced from the pre-imposed calculated total float.	TF=0 ↓
Common Usage	People often use this to suppress positive floats of the activities. They need to be avoided in a schedule requiring a critical path method analysis.	AVOID
If imposed date is a nonworkperiod	Not Applicable	N/A

10. Zero Free Float Constraint

	Affects	Hint
Logic Calculation	The zero free float constraint allows an activity to start as late as possible without delaying its successors, by using its available free float.	Only affect EARLY dates
Calculated Start Date	<p>1. When the total float is positive and use the relationship of FS=0. (e.g., lag=0), the Early dates will be equal to the Late date, not the other way around.</p> <p>2. Any other situation, P3 will move the early date to the right according to the availability of the free float and the lag.</p> <p>3. Per the definition, this constraint has no effects if the free float is already zero.</p> <p>Note: P3 dose not define a negative free float.</p>	<p>1.If TF>0 EARLY=LATE</p> <p>2. If TF<0 or Lag>0 E ⇒ according to the free float and lag</p>
Calculated Finish Date	See above	
Total Float	If the constraint affects the calculated date of any activities, the free float will be set to zero, and the total float will be also reduced from the pre-imposed calculated total float.	FF=0 TF ↓
Common Usage	<p>People often use this to push the material delivery activities to the right so that the finish date of the delivery will be immediately before the successor activity.</p> <p>Please see Note 1 for more detail.</p>	Constrain Delivery Activities for drop-dead date
If imposed date is a nonworkperiod	Not Applicable	N/A

Note:

- As I mentioned before, we often use the free float constraint to push the delivery activity to the right so that the finish date of the delivery will be immediately before the successor activity by using the relationship of FS=0.

However, you may also use the Float Constraint – Zero Free Float with the relationship of FS=lag to the successor activity to achieve the concept of “Several days before the installation.” However, P3 does not provide a consistent result with the lag value. P3 will calculate the early dates and move the finish date of the delivery activity numbers of days (per the specified lag) earlier before the successor activity when the value of the

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free float is more than the Lag. Also, the constraint has no effect to the schedule when the free float is already zero, especially for these installation activities are on the critical path of a Baseline schedule.

2. It is possible to have a positive free float while the total float is negative. It depicts a situation such as "I am running late, but I am not the last one yet."
3. In a Baseline schedule (where there are no activities with a negative total float), those activities on the critical path (TF=0) should also have a zero free float.

Limitations of the Constraints

An activity can have a maximum of one early date constraint, one late date constraint, and one duration or float constraint. You can only assign certain types of constraints to each type of milestone. I have summarized the limitations for your reference as below.

Activity Type	Constraint Can be Assigned	Remarks
Start Milestone	A Start Constraint and A Zero total or Free Float	A start constraint such as Early Start, Late Start, Start on, Mandatory Start.
Finish Milestone	A Finish Constraint and A Zero total or Free Float	A finish constraint such as Early Finish, Late Finish, Mandatory Finish. You can't assign the expected finish constraint.
Flag (Start and Finish)	No constraint can be assigned	P3 will reject the constraints.
Hammock	No constraint can be assigned	P3 will either reject the constraints or remove them automatically after the calculation.

Final Words

I have seen many occasions that schedulers misuse the constraints in P3. Hopefully, this article will help you understand more about the constraints.