



Using Constraints With CPM Scheduling Software

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Using Constraints With CPM Scheduling Software

By [Mark Nagata, PSP CDT](#)

There are many “bells and whistles” in modern CPM scheduling software. One of them is the ability to use constraints.

Sometimes, when there’s a contract completion date or a key turnover date, the scheduler will use the software to apply a constraint to that date. Typically, when used in conjunction with these kinds of dates, a constraint is applied to indicate that the project must finish by the contract-required date. There’s a real danger, however, with using constraints. There are different types of constraints you can apply to your schedule. Some of these constraints can override or render useless the logic of the schedule network.

The three types of constraints that I use sparingly when I develop CPM schedules are:

- Start On or After (Early Start Constraint): This limits when an activity can begin.
- Finish On or Before (Late Finish Constraint): This is used to represent a contract completion milestone and will cause negative float if the project is delayed beyond this date.

- As Late as Possible (Zero-Free Float): This is used to represent “just-in-time” delivery.

Early Start Constraint

An “early start” constraint is used to postpone or delay the planned start date of work later than it would be scheduled to begin. For example, I’ve often seen instances where the contract does not allow the contractor access to an area of the site until 90 days after notice to proceed. One way to represent this restriction is to constrain the start of the associated work to start no earlier than “day 90.” This can be done by applying an early start constraint to the activity.

Late Finish Constraint

Another constraint is what some software packages call the “late finish” constraint. That’s the type of constraint I would apply to a contract completion milestone. Without getting too technical, this type of constraint restricts the late finish date of the activity to the constrained date. Because the early finish date is not also restricted by this constraint, when the scheduled work is forecast to finish later than the constrained date, the result is negative float.

Zero-Float Constraint

The third constraint type I use, very sparingly, is called a “as-late-as-possible” constraint, or a “zero-free float” constraint. That is used to model just-in-time delivery of materials. For example, if you get approval of your landscaping design at the end of the first month of a multi-year project, you’re not going

to want to deliver that material right away. You're going to want to say, "Well, I'm going to install landscaping at the end of project after I've finished all the hardscape." You might apply a zero-float constraint to the delivery of that landscaping material, indicating that it should not be delivered until the day before you can install it.

Keep in mind that I use these constraints sparingly and I would advise you to do the same.

Also note that constraints are not necessary to properly schedule a construction project. The same outcomes described above could be achieved without constraints. However, these alternative solutions would be more time-consuming to implement, and constraints are a widely accepted solution to the problems associated with delayed access to portions of a project and just-in-time delivery.

Unfortunately, the convenience associated with constraints comes at a price. The price is that constraints affect the calculation of float. Sometimes, this effect is negligible. At other times, however, the effect can be significant, particularly when comparing the float on different paths of work.

Even more significant are the consequences associated with the overuse of constraints. When overused, constraints can become a crutch and a substitute of logic. Most up-to-date scheduling specifications address this issue by severely restricting the use of constraints.

The best advice is to use constraints only when it is necessary to accurately model the construction of the project. If you adhere to this guideline, you will use constraints rarely, if at all.

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