When Scheduling Constraints Override the Critical Path

A primer on CPM, scheduling constraints, and why the highlighted critical path may not reflect your real schedule driver

EXECUTIVE SUMMARY

The issue	Standard CPM (Critical Path Method) calculates float using only network logic — predecessor and successor relationships. When a scheduling constraint (such as "Start No Earlier Than") delays an activity beyond what the network alone would produce, that delay is not automatically reflected in the float calculation. The result: the tool highlights one set of activities as "critical" while a constraint-driven path is silently driving the true project end date.

Quick test	Temporarily remove the scheduling constraint. If the project finish date moves earlier, the constraint — not the highlighted critical path — is your real schedule driver. The activities downstream of that constraint deserve more management attention than the highlighted path suggests.

HOW CPM CALCULATES THE CRITICAL PATH

CPM uses a forward pass and a backward pass through the network to compute two key dates for every activity:

Early Start / Early Finish	Forward pass: the earliest an activity can start and finish, based purely on when its predecessors finish.
Late Start / Late Finish	Backward pass: the latest an activity can start and finish without delaying the project end date.
Total Float	Late Start minus Early Start. Activities with zero float are on the critical path — any delay on them delays the project.

WHERE CPM BREAKS DOWN WITH SCHEDULING CONSTRAINTS

Scheduling constraints — such as **Start No Earlier Than (SNET)**, **Must Start On (MSO)**, or **Must Finish On (MFO)** — impose calendar-based restrictions on when an activity can occur, independent of network logic. Here is the sequence of events that leads to a misleading critical path:

1	An activity with no predecessors has an SNET constraint set to a future date. From the network's perspective, this activity has zero predecessors and could theoretically start on Day 1 — so CPM assigns it an Early Start of Day 1 and a large positive float.
2	The scheduling engine respects the SNET constraint and correctly delays the activity's actual start to the constraint date. All downstream activities shift accordingly, and the path finishes later than the network-only critical path.
3	Because CPM computed float using the network-only Early Start (Day 1), not the constraint-adjusted start (the SNET date), the float values are overstated. The tool does not highlight these activities as critical, even though they are driving the project end date.
4	Two paths converge at a successor activity. Path A (network critical path, highlighted) finishes on date X. Path B (constraint-driven, not highlighted) finishes on date Y, where Y is later than X. The project cannot finish until both paths complete — so date Y is the true end date, and Path B is the real schedule driver.

WHAT THIS MEANS FOR PROJECT MANAGERS

Do not rely solely on highlighted CP	In projects with binding scheduling constraints, the highlighted critical path shows which activities have no network slack — not necessarily which activities are driving your end date. Treat it as one input, not the complete picture.
Identify constraint- driven paths	Trace every activity that has a binding SNET, MSO, or MFO constraint. Follow the dependency chain downstream. If that chain converges with the network critical path at any point, the constraint-driven path may be the true schedule driver.
Apply the quick test	Temporarily suppress the constraint and observe whether the project finish date changes. If it moves earlier, the constraint is binding and the downstream activities require the same management vigilance as critical path activities.
Communicate clearly to stakeholders	When presenting the schedule, note that the critical path reflects network logic only. Call out constraint-driven paths explicitly. Stakeholders who only see the highlighted path may underestimate risk on the constraint-affected work.

Technical note	The correct algorithmic fix is to run a second forward pass after applying all constraints, recompute Early Start dates using constraint-adjusted starts, then recalculate float from those adjusted dates. Activities with zero constraint-adjusted float would be highlighted as critical. Most scheduling tools — including MS Project in some configurations — do not implement this fully, which is why this behavior is common across the industry.

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