STUDENT STUDY GUIDE · BOOK ONE OF TWO

The Thirty *Topics*

Planning, Primavera P6 & Earned Value

Thirty terms every planner must command, in four movements: the foundations, the CPM engine and its float, the discipline of the live schedule, and the arithmetic of earned value. Each topic carries a full explanation, its home in Primavera P6, the key values and formulas, and a worked example from a real construction setting. When you have worked through them, sit the assessment online and get your result the moment you submit. Every one of these topics, and a great deal more, is taught live in the next P6 Masterclass.

PREPARED FOR

September 2026 Cohort

INSIDE THIS GUIDE

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Contents

Thirty topics, each with a worked example - followed by assessment access at the appropriate stage of the programme.

Read the guide first. Assessment access is issued later to enrolled learners.

FOREWORD

From Dr Francis' Desk.

Dear Pathfinder,

Every profession has its vocabulary, and in planning the vocabulary is the profession. When you can say precisely what total float is - and what it is not - you can defend a programme in a progress meeting. When you know why the data date matters, you will never again submit an update with work stranded in the past. These thirty topics are the conversations I have had most often across my years in construction planning.

Use this guide in a deliberate rhythm: read each topic, find the value in Primavera P6 yourself, work through the example, and record anything that still feels unclear. Knowledge you have located and tested is knowledge you keep. When your cohort is ready, the team will issue the correct assessment access and instructions through the official learner channel.

Your pod and the live sessions are your first ports of call when a topic will not sit still. Bring the question, show your working and use the feedback to improve.

This guide is a map, not the territory. Every topic in it - and a great deal more, including delay analysis, claims awareness, resource levelling and the full DCMA health check - is taught live and hands-on in Primavera P6 during the masterclass.

Plan well, and check your logic twice.

Dr Francis Osadare

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At a glance

ITEM	DETAIL
Topics	30, in four parts - each with a definition, P6 location and worked example
Pod topics	September community pod names are flagged on their topic cards
Assessment	Access and instructions are issued later to enrolled learners
Preparation	Read all thirty topics and bring questions to the live teaching
Standards	AACE International RPs · PMI scheduling guidance · DCMA 14-Point
Going deeper	All topics, and much more, are taught live in the P6 Masterclass

I

PART ONE

Scheduling Foundations

The building blocks every planner must command before logic and float make sense.

TOPIC 01 / PART ONE / POD TOPIC

No. 01

Gantt Chart

A horizontal bar chart that plots activities against a calendar timescale, showing when each activity starts and finishes and how activities relate to one another. In P6 the Gantt view is the default Activities layout and remains the industry's universal language for communicating a programme.

Reading a Gantt chart properly is a discipline of its own. Check the timescale first — a chart squeezed to fit one page can make a three-week slip look like a pixel. Find the data date line, because everything left of it is history and everything right of it is forecast. Then read the colours: completed work, remaining work and critical activities each carry their own bar style, and the thin relationship lines between bars show why each activity sits where it does. The most important habit: never judge a programme healthy because the bars 'look right'. Bars are outputs. If the logic behind them is wrong, the picture is a fiction drawn to a calendar.

WHERE TO FIND IT IN P6

Activities window — the bar area to the right of the columns. Format bars via View › Bars; the timescale via View › Timescale.

Key values and formulas

1. Bar start = Early Start (or Actual Start once progressed)
2. Bar finish = Early Finish (or Actual Finish)
3. Red bars (default) = critical activities; green = remaining work; blue = actuals

WORKED EXAMPLE

On a ten-storey frame, 'Erect steelwork — Level 3' shows as a bar from 5 to 16 May. Its predecessor, the Level 2 pour, slips four days. Nobody touches Level 3 — yet after pressing F9 its bar now reads 11 to 22 May. No date was typed; the logic moved the bar. That is the difference between a schedule and a drawing.

TOPIC 02 / PART ONE / POD TOPIC

No. 02

Work Breakdown Structure (WBS)

A hierarchical decomposition of the total scope of work into deliverable-oriented levels, from the project down to work packages. The WBS is the skeleton on which every activity, cost and resource in P6 hangs — if scope is not in the WBS, it is not in the project.

A good WBS decomposes the project top-down: the project, then its major phases or systems, then the deliverables inside each, then the work packages that a single team can own and a single line of cost can measure. Three to five levels is typical for construction. Two rules keep it honest: the 100% Rule — every level must capture all of its parent's scope, no more and no less — and mutual exclusivity, so no scope lives in two branches at once. In P6 the WBS is also the reporting skeleton: dates, cost and progress roll up each branch, which is why a well-built WBS makes month-end reporting almost automatic.

WHERE TO FIND IT IN P6

Projects › WBS window (or the WBS grouping band in the Activities view). Each P6 activity must belong to exactly one WBS node.

Key values and formulas

1. WBS levels (typically 3–5 for construction)
2. 100% Rule — child elements must capture 100% of the parent's scope
3. WBS summary dates roll up from the earliest start and latest finish of activities beneath them

WORKED EXAMPLE

For a battery-storage project: Level 1 'TTC-BESS' (the project) Level 2 '3.0 Civils and Structures' Level 3 '3.2 Foundations and Plinths' activities beneath it: 'Excavate plinth bases', 'Fix rebar', 'Pour plinths'. The £86,000 plinth budget and its progress roll up branch 3.2, then 3.0, then the project.

TOPIC 03 / PART ONE / POD TOPIC

No. 03

Milestone

A zero-duration activity that marks a significant point in the programme — a start, a completion, a contractual obligation or an interface handover. Milestones consume no time and no resources; they exist purely to be measured against.

Milestones are the programme's contractual skeleton. A Start Milestone marks a point where something may begin — access granted, notice to proceed. A Finish Milestone marks a point where something must be done — sectional completion, practical completion, power-on. Because they carry no duration, they cannot be 'worked on'; they either happen on a date or they do not, which is exactly what makes them measurable. Mature programmes carry a milestone dictionary: each milestone's definition, its evidence of achievement, and the contract clause it answers to. Liquidated damages are usually pinned to milestones, so their variance columns are read by lawyers as well as planners.

WHERE TO FIND IT IN P6

Activity Type field: 'Start Milestone' or 'Finish Milestone'. Filter with Activity Type equals Milestone.

Key values and formulas

1. Duration = 0 by definition
2. A Start Milestone carries only a start date; a Finish Milestone only a finish date
3. Contract milestones are typically constrained and tracked for variance against the baseline

WORKED EXAMPLE

'Grid Connection & Take-Over' is a Finish Milestone with a contractual date of 12 November. The baseline shows it achieved on 12 November; after a delayed transformer delivery the current schedule forecasts 20 November. Variance – BL Project Finish Date reads –8 days — the single number the client's board will ask about first.

TOPIC 04 / PART ONE / POD TOPIC

No. 04

Baseline

A frozen, approved copy of the project plan captured at a point in time, against which actual progress is measured. In P6 a baseline is a complete snapshot of the project database — dates, logic, resources and costs — not merely a set of dates.

Think of the baseline as the ruler the project is measured with. Until one is set, 'late' and 'early' have no meaning — there is nothing to be late against. In P6, Maintain Baselines copies the entire project into storage, and Assign Baselines chooses which copy the variance columns compare against. Projects commonly hold an original contract baseline plus re-baselines approved through change control. The discipline matters more than the mechanics: a baseline changed casually is a ruler that stretches whenever the answer looks bad, and every variance report after that is worthless.

WHERE TO FIND IT IN P6

Project › Maintain Baselines to create/attach; Project › Assign Baselines to choose which baseline compares. Show as yellow bars via the Bars dialogue.

Key values and formulas

1. BL Project Start / BL Project Finish columns
2. Variance – BL Project Finish Date (in days)
3. P6 allows a Project Baseline plus up to three user baselines per project

WORKED EXAMPLE

Baseline completion: 12 November. After three months of updates the current forecast reads 26 November — Variance −10 working days. The team may not re-baseline to hide this; they must either recover the ten days or process a formal change (an extension of time) that creates a new, approved ruler.

TOPIC 05 / PART ONE / POD TOPIC

No. 05

Data Date

The 'time-now' line: the date up to which actual progress has been recorded and from which all remaining work is scheduled. Everything to the left of the data date is history; everything to the right is forecast.

The monthly update cycle runs in a fixed order: collect progress from site, enter actual starts, actual finishes and remaining durations, advance the data date to the agreed cut-off, then press F9. Skip a step and the schedule lies. The classic failure is statusing progress but leaving the data date behind — or moving the data date but leaving un-progressed work stranded in the past, where P6 shows work scheduled for weeks that have already gone. A clean schedule has no remaining work to the left of the data date, ever.

WHERE TO FIND IT IN P6

Project › Schedule (F9) dialogue shows the current Data Date; also in Projects window, Dates tab. Displayed as a vertical blue line on the Gantt chart.

Key values and formulas

1. Data Date = the re-scheduling reference point, not 'today' by accident
2. Remaining durations are calculated forward from the data date
3. A schedule updated monthly should show data dates advancing in monthly steps

WORKED EXAMPLE

Update for 1 September: 'Fix rebar' actually started 18 August and has 5 of 12 days remaining. The planner records the actual start, sets remaining duration to 5, moves the data date to 1 September and reschedules. P6 now plots those 5 remaining days forward from 1 September — not from the original planned dates.

TOPIC 06 / PART ONE

No. 06

Calendars

The rule-set defining when work can occur — working days, hours per day, holidays and exceptions. P6 supports Global, Project and Resource calendars, and every activity's dates and float are computed through its assigned calendar.

P6 holds calendars at three levels — global (shared by all projects), project and resource — and every activity computes its dates through whichever calendar it is assigned. Hours-per-day settings matter as much as working days: if the calendar says 8 hours equals one day, a 40-hour activity displays as 5 days. Mixed calendars are the commonest source of float values that look wrong: float is reported in the units of the activity's own calendar, so a 7-day-calendar activity can show different float from a 5-day neighbour on the very same path. When float looks odd, check the calendar before doubting the logic.

WHERE TO FIND IT IN P6

Enterprise › Calendars. Assign per activity in the General tab. The activity's calendar drives its date arithmetic.

Key values and formulas

1. Hours/day conversion factors (e.g. 8h = 1 day) set in the calendar
2. A 5-day vs 7-day calendar can shift a finish date by weeks over a long programme
3. Float is reported in the units of the activity's calendar — mixed calendars produce 'odd' float values

WORKED EXAMPLE

Two 10-day activities both start Monday 1st. On the 5-day calendar the finish lands Friday 12th — weekends skipped. On the 7-day commissioning calendar the finish lands Wednesday 10th. Same duration, same start, two-day difference in elapsed time — calendars alone.

TOPIC 07 / PART ONE

No. 07

Activity Types

The P6 setting that controls how an activity's dates are calculated: Task Dependent (follows its own calendar), Resource Dependent (follows resource calendars), Level of Effort (spans between its predecessors and successors), WBS Summary, and Start/Finish Milestones.

The default for construction work is Task Dependent: the activity follows its own assigned calendar. Resource Dependent lets each assigned crew work to its own calendar — useful when a specialist works weekends. Level of Effort is the quiet hero for preliminaries: its duration is calculated to span from its predecessors to its successors, so site supervision, scaffolding hire or hoarding stretch automatically as the work they cover moves. Milestones mark points; WBS Summary activities mirror a WBS band. The trap to avoid: LOE and WBS Summary activities never belong on the critical path, and P6 keeps them off it — if a 'supervision' activity is driving your completion, its type is wrong.

WHERE TO FIND IT IN P6

Activities window › General tab › Activity Type field.

Key values and formulas

1. Task Dependent — the construction default
2. Level of Effort — duration is derived, never typed; ideal for supervision/prelims
3. LOE and WBS Summary activities never appear on the critical path

WORKED EXAMPLE

'Site management & supervision' is set as Level of Effort spanning from 'Site establishment' to 'Reliability run'. When commissioning slips three weeks, the LOE activity silently grows three weeks longer — and its time-related cost grows with it, exactly as prelims behave on a real site.

TOPIC 08 / PART ONE

No. 08

Percent Complete Types

The setting that determines what 'X% complete' actually measures: Duration % (time elapsed vs original duration), Physical % (assessed progress entered manually) or Units % (resource units actually expended vs budgeted).

The three types answer different questions. Duration % answers 'how much time has gone?' — it is arithmetic, not achievement. Units % answers 'how much effort has been booked?' — it tracks spend, not output. Physical % answers the only question the client cares about: 'how much of the thing is built?' — assessed against rules of credit (for a pipe run: 30% erected, 60% welded, 80% tested, 100% insulated). Earned value computed on Duration % rewards sitting still while the clock runs; computed on Physical % it rewards finished work. Choose deliberately, per activity, before the first update — not after.

WHERE TO FIND IT IN P6

Activities window › General tab › Percent Complete Type; the % Complete column then reads from the chosen type.

Key values and formulas

1. Duration % = (Original Duration − Remaining Duration) ÷ Original Duration × 100
2. Physical % = planner's/engineer's assessment, independent of time or cost
3. Units % = Actual Units ÷ At Completion Units × 100

WORKED EXAMPLE

A 20-day activity has consumed 15 days, but the engineer assesses only 40% of the physical scope complete. Duration % reports 75%; Physical % reports 40%. Report 75% and the S-curve flatters the project by a third of the activity's value — until the last 60% of work must somehow fit into the last 25% of time.

II

PART TWO

CPM Logic & Float

How Primavera P6 calculates dates — and where the numbers on screen actually come from.

TOPIC 09 / PART TWO / POD TOPIC

No. 09

Logic Links (Relationships)

The dependencies connecting activities, telling P6 the order in which work must occur. Four types exist: Finish-to-Start (FS), Start-to-Start (SS), Finish-to-Finish (FF) and Start-to-Finish (SF). Logic — not dates — is what makes a schedule dynamic.

Choose the relationship by asking what the successor is actually waiting for. Waiting for the predecessor to finish before it can start: Finish-to-Start, the workhorse. Able to begin once the predecessor has merely begun: Start-to-Start, usually with a lag — trenching can follow excavation after a five-day head start. Unable to finish until the predecessor finishes: Finish-to-Finish — commissioning cannot complete until testing completes. Start-to-Finish is almost never right and usually signals the link was drawn backwards. A healthy network is at least ninety per cent FS, and every activity between the first and last carries at least one predecessor and one successor.

WHERE TO FIND IT IN P6

Activities window › Relationships tab, or draw directly on the Gantt. Review via the Schedule Log and Predecessors/Successors columns.

Key values and formulas

1. FS is the default and should dominate (~90% of links in a healthy schedule)
2. SF is rare and usually a modelling smell
3. Every activity except the first and last needs at least one predecessor and one successor

WORKED EXAMPLE

Concrete: 'Pour slab' FS 'Strike formwork' — striking waits for the pour to finish. Earthworks: 'Bulk excavation' SS+5d 'Blinding' — blinding follows five days behind the diggers. Commissioning: 'System testing' FF 'Commissioning dossier' — the dossier closes only when testing closes. Three site relationships, three link types.

TOPIC 10 / PART TWO / POD TOPIC

No. 10

Lag & Lead

Lag is a mandatory waiting period imposed on a relationship (e.g. FS+3d for concrete curing); a lead is negative lag, overlapping the successor into the predecessor (FS−2d). Lag consumes time but is invisible as an activity and carries no resources or ownership.

Lag is invisible time. It appears on no bar, carries no resource, is owned by nobody and cannot be statused — when a three-day lag becomes a five-day reality, the schedule cannot show it. That is why good practice models significant waits as real activities ('Cure slab, 3 days') that can be progressed, and reserves lag for short mechanical offsets. Leads — negative lag — are worse: they overlap a successor into work that has not happened yet, and the DCMA benchmark for leads is simply zero. If an overlap is genuinely intended, model it honestly with a Start-to-Start plus lag instead.

WHERE TO FIND IT IN P6

Entered against the relationship in the Relationships tab (Lag column). Lag calendars are set in Schedule Options.

Key values and formulas

1. Lag can be positive (delay) or negative (overlap/lead)
2. DCMA guidance: leads (negative lag) should be 0%; lags below ~5% of relationships
3. Prefer a real activity ('Cure slab, 3d') over hidden lag where the wait matters

WORKED EXAMPLE

'Pour plinths' FS+3d 'Set containers': three days' curing hidden in the link. Winter arrives and curing takes six days — but the lag cannot be progressed or reported, so the slip surfaces only when container setting fails to start. Replace the lag with a three-day 'Cure' activity and week two's update shows 'Cure — 3 days remaining' in plain sight.

TOPIC 11 / PART TWO / POD TOPIC

No. 11

Constraints

Date restrictions imposed on activities that override or restrict pure CPM logic — such as Start On or After, Finish On or Before, or the notorious Mandatory Start/Finish. Constraints model external realities (access dates, contractual completions) but each one weakens the schedule's ability to calculate freely.

Constraints come in two temperaments. Soft constraints — Start On or After, Finish On or Before — bend with the logic: they hold a boundary but let CPM calculate inside it. Hard constraints — Mandatory Start, Mandatory Finish — pin dates absolutely: the activity stops listening to its predecessors, logic is severed, and float on the path turns fictional. Legitimate uses exist: an access date granted by a third party, a contractual completion. But every constraint should be an entry in a justification log, because each one is a place where the schedule has stopped calculating and started asserting. A programme stitched together with constraints is a wish list wearing a Gantt chart.

WHERE TO FIND IT IN P6

Activities window › Status tab › Constraints. Constrained dates show an asterisk (*) in date columns.

Key values and formulas

1. 'Finish On or Before' commonly creates negative float when logic pushes past it
2. Mandatory constraints break logic — dates stop responding to predecessors
3. DCMA: hard constraints on no more than ~5% of incomplete activities

WORKED EXAMPLE

'Grid Connection & Take-Over' carries Finish On or Before 12 November — the contract date. A transformer delay pushes the driving path to 26 November. The constraint holds the late dates at 12 November, so the path shows Total Float of −10 days: the schedule's way of saying the promise and the forecast no longer agree.

TOPIC 12 / PART TWO

No. 12

Forward Pass (Early Dates)

The first half of the CPM calculation: P6 works from the project start, left to right, computing the earliest possible start (ES) and finish (EF) of every activity. Early dates answer the question 'how soon could this happen?'

The forward pass answers one question for every activity: how soon can it happen? P6 starts at the project start and sweeps left to right. Each activity's Early Start is fixed by the most demanding of its predecessors — all of them must be satisfied, so the latest requirement wins. Early Finish is then Early Start plus duration, counted through the activity's calendar. At merge points, where several paths flow into one activity, the forward pass is where delays propagate: one late feeder holds everything downstream. The project's Early Finish — the earliest the whole job can complete — is simply the largest Early Finish in the network.

WHERE TO FIND IT IN P6

Early Start and Early Finish columns; recalculated every time you press F9.

Key values and formulas

1. EF = ES + Duration (through the activity's calendar)
2. An activity's ES = the latest early constraint imposed by all its predecessors
3. Project Early Finish = the earliest date the whole project can complete

WORKED EXAMPLE

Activity C (6 days) has two predecessors, both FS: A finishes day 10, B finishes day 14. C cannot start until both are done, so ES = day 14 — B governs, not the average and not the earlier one. EF = 14 + 6 = day 20. If B slips two days, C's window slides to 16–22 with it.

TOPIC 13 / PART TWO

No. 13

Backward Pass (Late Dates)

The second half of the CPM calculation: P6 works from the project finish, right to left, computing the latest allowable start (LS) and finish (LF) each activity may have without delaying project completion. Late dates answer 'how late could this go?'

The backward pass answers the opposite question: how late can each activity go without breaking the finish? Starting from the project completion (or an imposed late date), P6 sweeps right to left. Each activity's Late Finish is fixed by its most demanding successor — the earliest late requirement wins, the mirror image of the forward pass rule. Late Start is Late Finish minus duration. The two passes together produce the four dates every planner should be able to compute by hand on a small network, because the gap between the pairs — Late minus Early — is where float comes from, and float is where every commercial argument about delay begins.

WHERE TO FIND IT IN P6

Late Start and Late Finish columns; recalculated on every F9.

Key values and formulas

1. LS = LF – Duration (through the activity's calendar)
2. An activity's LF = the earliest late requirement imposed by all its successors
3. Total Float is born here: TF = LS – ES (or LF – EF)

WORKED EXAMPLE

Continuing the same network: C's only successor needs C finished by day 25, so LF = 25 and LS = 25 – 6 = day 19. C's early dates were 14–20; its late dates are 19–25. Total Float = 19 – 14 = 5 days: C can absorb five days of trouble before the completion date feels anything.

TOPIC 14 / PART TWO / POD TOPIC

No. 14

Critical Path

The longest continuous chain of logically-linked activities through the network, which determines the earliest possible project completion. Any delay to a critical activity delays the project, day for day. Conventionally identified as the path with the lowest (typically zero) total float.

Critical does not mean important, expensive or difficult — it means zero room. A £150 door schedule review can be critical while a £2 million transformer sits on eight weeks of float. The path is also not a fixed feature: progress, change and re-logic move it, sometimes every update, so 'what is critical this month?' is a question to re-ask, not a fact to remember. Two cautions for practice: more than one path can be critical at once, and on constrained or multi-calendar schedules the float-based definition (TF 0) can mislead — which is why the Longest Path topic follows this one.

WHERE TO FIND IT IN P6

Critical activities show red by default. Filter: Total Float 0, or use the Longest Path option in Schedule Options (F9 › Options).

Key values and formulas

1. Critical activities: Total Float = 0 (or the project's critical threshold)
2. The critical path can shift as progress and change are absorbed — check it every update
3. There may be more than one critical path simultaneously

WORKED EXAMPLE

A 1,000-activity distribution centre programme has 42 critical activities running through groundworks frame envelope services commissioning. Groundworks lose 3 days to flooding: completion moves 3 days, day for day. The £1.8m racking package, sitting on 25 days of float, could slip a month before the completion date noticed.

TOPIC 15 / PART TWO / POD TOPIC

No. 15

Longest Path

The chain of driving relationships that actually determines the project finish, calculated by tracing driving predecessors backwards from the completion activity. On multi-calendar or constrained schedules, Longest Path is more reliable than float-based criticality, because constraints and calendars distort float values.

Longest Path asks a cleaner question than float does: which chain of driving relationships actually determines the finish date? P6 traces driving predecessors backwards from the completion activity, ignoring float arithmetic altogether. This matters because float can be distorted — a Finish On or Before constraint mid-programme creates its own float regime, and a 6-day-calendar activity measures float in different working days from its 5-day neighbours. On such schedules, filtering for TF 0 can light up activities that do not drive completion and miss ones that do. Major-project reporting standards therefore mandate Longest Path as the critical definition, with Multiple Float Paths used to rank the second and third most driving chains.

WHERE TO FIND IT IN P6

Schedule Options (F9 › Options) › 'Define critical activities as: Longest Path'; also the Longest Path column/filter, and Float Path analysis for near-driving paths.

Key values and formulas

1. Longest Path = driving-logic criticality; Total Float = float-based criticality
2. With multiple calendars, zero float may appear off the true driving path
3. Multiple Float Paths (Advanced tab) ranks the 2nd, 3rd… most driving chains

WORKED EXAMPLE

Commissioning runs on a 6-day calendar and shows Total Float of 2 days; a constrained interim milestone elsewhere shows 0. The float filter paints the milestone path red and leaves commissioning white — yet delay commissioning one week and completion moves a week. Switch Schedule Options to Longest Path and the true driving chain, commissioning included, is the one that highlights.

TOPIC 16 / PART TWO / POD TOPIC

No. 16

Total Float

The amount of time an activity can be delayed without delaying the project completion date (or violating a late constraint). Total float is shared along a path — one activity spending it leaves less for everyone downstream.

Total float belongs to the path, not the activity — that is the property everything else flows from. Eight days of float shared along a chain is a single budget of eight days: the first activity to slip spends it for everyone downstream. This is why float ownership is fought over in contracts. NEC4 gives terminal float to the contractor but treats path float as first come, first served; delay analysts argue over who consumed it and when. For the planner the daily use is triage: float tells you which of today's hundred problems can wait, and which one cannot.

WHERE TO FIND IT IN P6

Total Float column; TF = Late Start − Early Start = Late Finish − Early Finish.

Key values and formulas

1. TF = LS − ES = LF − EF
2. TF = 0 critical (conventionally); TF < 0 forecast breach of a completion or constraint
3. Float ownership is a contractual battleground — 'who owns the float?'

WORKED EXAMPLE

Four activities share a path with Total Float of 8 days. The first, 'Procure louvres', slips 8 days — still 'on time' by its own late dates. But the remaining three now show TF = 0: the whole path has gone critical, and the subcontractor at the end of it inherited a zero-margin programme through no act of their own.

TOPIC 17 / PART TWO / POD TOPIC

No. 17

Free Float

The amount of time an activity can be delayed without delaying the early start of any successor. Unlike total float, free float belongs to the individual activity alone — spending it harms nobody downstream.

Free float is the polite kind: the delay an activity can absorb without touching even the early start of its successor. It appears mainly at merge points — where two paths flow into one activity, the non-driving path holds free float equal to the gap between its finish and the driving path's requirement. Free float is always less than or equal to total float, and it is the planner's favourite tool for quiet housekeeping: work can be shifted within its free float to smooth a crew's histogram or dodge a weather window at precisely zero downstream cost, no permission required.

WHERE TO FIND IT IN P6

Free Float column. FF = earliest successor ES − activity EF (through calendars and relationship types).

Key values and formulas

1. Free Float Total Float, always
2. FF appears where paths merge — the non-driving path into a merge holds the free float
3. Useful for resource smoothing: shift work within free float at zero downstream cost

WORKED EXAMPLE

'Fit handrails' finishes day 30; its successor 'Snagging' cannot start before day 36 because the driving path (lift commissioning) governs. Free Float = 6 days. Push the handrail crew four days to release them to another block: Snagging still starts day 36. Nobody downstream knows anything happened.

TOPIC 18 / PART TWO

No. 18

Negative Float

A total float value below zero, meaning the current forecast cannot meet a required date — usually a constrained completion or contractual milestone. Negative float is the schedule shouting that recovery action or formal change is required.

Negative float is a forecast breach written in schedule language: the network needs more time than an imposed date allows. It cannot be 'fixed' by deleting the constraint — that only deletes the message. The professional protocol runs: filter TF < 0, trace the failing path to the constraint that anchors it, quantify the shortfall, then choose between genuine recovery (resequencing, compression) or a formal change to the date. One rule is absolute: a baseline programme issued with negative float is a plan that admits, on day one, that it cannot be done — no client should accept it and no planner should submit it.

WHERE TO FIND IT IN P6

Total Float column showing negative values; typically driven by a 'Finish On or Before' or project Must Finish By date. Filter TF < 0 to isolate the failing path.

Key values and formulas

1. TF = −10d means the activity must be accelerated by 10 working days to meet the imposed date
2. Trace the negative-float path back to its driving constraint before acting
3. A baseline programme should never be issued with negative float

WORKED EXAMPLE

The completion path shows TF = −10 days against the 12 November constraint. Options on the table: overlap container setting with plinth cures (SS+5, recovers 4 days), add a second termination crew (recovers 6 days, +£22,000), or seek a 10-day extension. What is not on the table: removing the constraint so the report turns green.

TOPIC 19 / PART TWO

No. 19

Near-Critical Activities

Activities whose total float is above zero but within a defined threshold (commonly 5–10 working days, or ~10% of remaining duration on major projects). They are one supplier slip away from becoming critical, so mature reporting always watches the near-critical band, not just the red bars.

The near-critical band is where next month's crisis is rehearsing. A threshold is set — commonly 5 to 10 working days, or about 10% of remaining duration on major projects — and every path inside it is watched alongside the critical path itself. The metric that matters is the trend: an activity whose float reads 22, then 14, then 8 across three updates is bleeding roughly seven days a period, and simple arithmetic says it goes critical before the next report lands. Mature dashboards therefore show float erosion, not just float: the direction of travel is the early warning, the value is only the position.

WHERE TO FIND IT IN P6

Filter: Total Float > 0 and threshold. The project's critical threshold is set in Schedule Options; Multiple Float Paths ranks near-driving chains.

Key values and formulas

1. Typical threshold: TF 5–10 days (contract or reporting standard dependent)
2. Watch the trend: a path bleeding float 3–4 days per update will go critical — predictably
3. Report critical AND near-critical counts each period

WORKED EXAMPLE

'HV cable delivery' shows Total Float of 22d in June, 14d in July, 8d in August — inside the 10-day band and eroding at 7d a month. Intervention now (expedite, or resequence terminations) costs a phone call and a variation; discovering it at TF = 0 in September costs a critical-path delay.

TOPIC 20 / PART TWO

No. 20

Open Ends (Dangling Activities)

Activities missing a predecessor, a successor, or both — leaving them logically disconnected so the CPM engine cannot properly drive or restrain their dates. Open ends inflate float and corrupt the critical path silently.

An activity with no successor has nothing to push against, so P6 grants it float all the way to the project finish — float that is pure fiction. An activity with no predecessor floats free of everything before it, ready to be 'achievable' on any date the Gantt happens to show. Every open end is a hole in the network through which the critical path can silently leak. The Schedule Log written at every F9 lists them by name; reading it should be as routine as pressing the key. The standard is exact: two open ends per project — the start milestone with no predecessor, the finish milestone with no successor — and not one more.

WHERE TO FIND IT IN P6

Schedule Log (F9 run report) lists activities without predecessors/successors; also filterable via the Predecessors and Successors columns.

Key values and formulas

1. A healthy schedule has exactly 2 open ends: project start (no pred) and finish (no succ)
2. DCMA 14-Point: missing logic on no more than 5% of activities
3. A missing successor gives an activity float to the project end — meaningless float

WORKED EXAMPLE

'Install handrails' was never linked to snagging. It shows Total Float of 60 days — to the project finish — so it is deprioritised for months. When someone finally notices that snagging cannot complete without it, the 'sixty days of float' evaporate overnight and a supposedly comfortable activity is suddenly two weeks from driving the handover date.

III

PART THREE

Progress, Updating & Schedule Health

What happens after the baseline: statusing, sequence breaks, compression and quality checks.

TOPIC 21 / PART THREE / POD TOPIC

No. 21

Retained Logic vs Progress Override

The two main P6 rules for scheduling out-of-sequence work. Retained Logic keeps the original relationships — remaining work still waits for its predecessors. Progress Override discards the broken logic and lets remaining work continue from the data date. The choice can move a forecast completion by months.

When site breaks the planned sequence, P6 must decide what the broken logic now means, and Schedule Options offers three answers. Retained Logic keeps the original relationships: remaining work still waits for its predecessors — conservative, and the default position in contractual analysis. Progress Override discards the violated links: remaining work carries on from the data date — often faster, sometimes recklessly optimistic, and capable of hiding a real sequencing problem. Actual Dates is a third variant rarely appropriate. The genuinely professional answer is neither radio button: it is to re-logic the network so it describes how the work is now actually being built, and then the setting barely matters.

WHERE TO FIND IT IN P6

Schedule Options (F9 › Options) › 'When scheduling progressed activities use:' Retained Logic / Progress Override / Actual Dates.

Key values and formulas

1. Retained Logic = conservative, contractually defensible default
2. Progress Override = often optimistic; can hide real sequence problems
3. Best practice: correct the logic to reflect the new sequence rather than rely on either setting

WORKED EXAMPLE

Cladding started three weeks early, out of sequence, before the frame inspection it was meant to follow. Under Retained Logic its remaining 15 days wait for the inspection — forecast finish 12 November. Under Progress Override the same 15 days run straight from the data date — forecast 5 October. One radio button, five and a half weeks apart. Which is true? Neither, until the planner asks site how the rest of the cladding will really proceed and re-links it accordingly.

TOPIC 22 / PART THREE

No. 22

Out-of-Sequence Progress

Work reported as started or finished before its predecessors are complete — the site has broken the planned sequence. P6 flags it in the Schedule Log, and it must be resolved by correcting logic, because it means the network no longer describes how the work is actually being built.

Out-of-sequence progress is not a software problem — it is the site telling the planner the plan no longer matches reality. Sometimes the sequence break is sensible opportunism (an area became free early); sometimes it is a warning (a gate was bypassed that existed for a reason). Either way the response is the same triage: read the Schedule Log after every F9, list each out-of-sequence activity, talk to the site team about how the remaining work will actually flow, and repair the logic to match. A programme carrying persistent out-of-sequence progress loses its float integrity — and with it, its credibility in any delay analysis, where the opposing expert will find the log even if nobody else reads it.

WHERE TO FIND IT IN P6

Schedule Log (F9) — 'Activities with out-of-sequence progress' section.

Key values and formulas

1. Every out-of-sequence item is a logic-repair task, not just a warning
2. Persistent out-of-sequence progress invalidates float and critical-path reporting
3. Delay analysts scrutinise it when testing a programme's credibility

WORKED EXAMPLE

The September Schedule Log flags ES1080 'Install battery modules' as started although ES1020 'Procure battery modules' shows 10 days remaining — a partial delivery let installation begin early. The fix is not a setting: the planner splits the procurement, links the delivered batch SS+0 to installation and keeps the balance FS to the remaining modules. The network now tells the truth again.

TOPIC 23 / PART THREE

No. 23

Schedule Compression (Crashing & Fast-Tracking)

The two recognised techniques for shortening a programme: crashing adds resource or cost to reduce critical durations; fast-tracking overlaps activities previously planned in sequence. Both apply only to the critical path, and both trade time against cost or risk.

Compression starts from one filter: the critical path — shortening anything else spends money to buy nothing. Crashing buys time with resource: second crews, longer days, weekend working. Its costs rise steeply, so the discipline is to rank critical activities by cost-per-day-saved and buy the cheapest days first. Fast-tracking buys time with risk: sequences planned in series are overlapped, and the price is the chance of rework — start fit-out before the roof is watertight and you may fit out twice. Both techniques also compress float out of the programme, so a crashed schedule is a more brittle one. The professional habit is to present compression as a costed menu of options, never a silent edit.

WHERE TO FIND IT IN P6

Modelled in P6 by reducing durations/adding resources (crashing) or converting FS links to SS/FF with lag (fast-tracking), then re-running F9 and comparing against the baseline.

Key values and formulas

1. Crashing: cost rises for time saved — crash the cheapest critical day first
2. Fast-tracking: risk rises (rework) for time saved
3. Compressing non-critical work saves nothing — it only burns float and money

WORKED EXAMPLE

Four weeks must be recovered. The menu: crash HV terminations with a second jointing crew — 10 days saved, £18,000 (£1,800/day); fast-track container setting SS+5 behind plinth cures — 8 days saved, £0 cash but rework risk if a cure fails early testing; weekend working on commissioning — 6 days, £9,600. The planner recommends the fast-track plus the crash, prices the risk, and lets the project director choose with open eyes.

TOPIC 24 / PART THREE

No. 24

DCMA 14-Point Schedule Health Check

The US Defense Contract Management Agency's fourteen quantitative checks of schedule quality — covering logic completeness, leads, lags, relationship types, hard constraints, high float, negative float, high duration, invalid dates, resources, missed activities, the critical path test, CPLI and BEI. It has become a de-facto global benchmark for programme integrity.

The DCMA 14-Point Assessment is a screen, not a verdict — a schedule can pass all fourteen checks and still be a bad plan, but a schedule that fails them is almost certainly untrustworthy. The first eleven checks are structural (logic completeness, leads, lags, relationship types, constraints, float and duration limits, invalid dates, resources, missed activities); the last three are performance tests — the Critical Path Test (break the path, see if completion moves), the Critical Path Length Index, and the Baseline Execution Index measuring delivery against the plan. Run it before every major submission, because if you do not, the client's schedule reviewer will.

WHERE TO FIND IT IN P6

No native P6 report — assessed via filters/exports, P6 add-ins (e.g. Acumen Fuse, ScheduleReader) or structured Excel checks.

Key values and formulas

1. Missing logic 5% · Leads = 0% · Lags 5% · FS relationships 90%
2. Hard constraints 5% · High float (>44d) 5% · Negative float = 0
3. High duration (>44d) 5% · Critical Path Length Index (CPLI) 0.95 · Baseline Execution Index (BEI) 0.95

WORKED EXAMPLE

A 500-activity tender programme is screened: 12 leads (target 0), lags on 9% of links (target 5%), FS share 78% (target 90%), 31 hard constraints (target 5% 25). Two days of re-logic later — leads converted to SS/FF, waits modelled as activities, constraints justified or removed — the programme passes screening and goes out with the bid. The alternative was the client's reviewer finding the same numbers.

IV

PART FOUR

Resources & Earned Value

Turning the schedule into a performance-measurement machine.

TOPIC 25 / PART FOUR / POD TOPIC

No. 25

Resource Curve (Distribution Profile)

The profile describing how a resource's units or costs are spread across an activity's duration — linear, front-loaded, back-loaded, bell or a custom curve. Resource curves shape the histogram and the cash-flow forecast without changing any dates.

The default linear spread almost never matches how work actually flows: crews mobilise, reach full production, then demobilise — a bell. Earthworks and structure tend to front-load; testing and commissioning back-load. Choosing honest curves matters twice over. First, the resource histogram is the sum of every assignment's curve, and level histograms are what let a site actually man the job. Second, the cost-loaded curves aggregate into the project cash-flow — the S-curve the quantity surveyor and the funder both read — so a lazy linear assumption misstates the monthly valuations the whole commercial cycle runs on.

WHERE TO FIND IT IN P6

Resources tab > Curve column on the assignment; curve library under Enterprise > Resource Curves. View results in the Resource Usage Profile.

Key values and formulas

1. Default = linear (uniform) spread
2. A bell curve concentrates ~60%+ of effort mid-activity — realistic for most trades
3. The aggregate of all curves = the project resource histogram and cost S-curve

WORKED EXAMPLE

Groundworks: 1,000 labour-hours over 10 weeks. Linear says a flat 100 hours every week and a phantom cliff-edge at each end. A bell curve books 40 in week one, climbing to 160 at the peak in weeks five and six, tapering to 40 at the end — and the aggregate histogram peak drops from 12 operatives to 8, a figure the site can actually house, feed and park.

TOPIC 26 / PART FOUR / POD TOPIC

No. 26

S-Curve

The cumulative plot of planned, earned and actual values (cost, units or progress %) over time, named for its characteristic slow-fast-slow shape. The S-curve is the single most used senior-management view of project health: three lines that tell the whole story.

Every project traces the same lazy-S: a slow start while the site mobilises, a steep middle where the money pours, a long tail of commissioning and closing-out. The power of the S-curve is that three cumulative lines — planned value, earned value, actual cost — compress the whole project's story into two vertical gaps readable at a glance. Earned below planned: behind programme, in value terms. Actual above earned: paying more than the work is worth. The shape itself also warns: a curve that needs to steepen near the end is a forecast that demands the site's most productive weeks occur when it is most tired — history's least likely bet.

WHERE TO FIND IT IN P6

P6: Resource Usage Profile with cumulative display ticked, or Activity Usage Profile comparing baseline vs current; commonly exported to Excel for reporting.

Key values and formulas

1. Planned (PV) curve from the baseline · Earned (EV) from progress · Actual (AC) from cost collection
2. Vertical gap EV−PV at time-now = schedule position in value terms
3. Vertical gap EV−AC = cost position

WORKED EXAMPLE

Month 6 of 12: Planned Value £2.4m, Earned Value £2.1m, Actual Cost £2.3m. The EV line sits £300k below PV — about five weeks of planned production behind. It sits £200k below AC — the work performed has cost £200k more than it earned. One chart, ten seconds, and the board meeting knows both truths before a single word of commentary.

TOPIC 27 / PART FOUR / POD TOPIC

No. 27

Earned Value Management (PV, EV, AC)

A performance-measurement method integrating scope, schedule and cost through three base values: Planned Value (the budgeted cost of work scheduled), Earned Value (the budgeted cost of work actually performed) and Actual Cost (what that work really cost). Every EVM metric derives from these three numbers.

Earned value works only if three foundations exist: a cost-loaded baseline (so Planned Value has a source), Physical % complete honestly assessed (so Earned Value measures output, not optimism), and a cost-collection system that books Actual Cost to the same structure the budget lives in. Get those right and the three values render performance in one currency — money — so schedule and cost can finally be compared on the same axis. The discipline to remember: PV never changes with performance (it is the plan), EV moves only with physical achievement, and AC is whatever the ledger says it is, however uncomfortable.

WHERE TO FIND IT IN P6

P6 columns: Planned Value Cost, Earned Value Cost, Actual Cost (calculation rules under Admin/Project Settings › Earned Value, driven by % complete type and baseline).

Key values and formulas

1. PV = BAC × planned % complete (from the baseline)
2. EV = BAC × actual % complete (Physical % recommended)
3. AC = actual cost booked to the data date

WORKED EXAMPLE

BAC £500,000. At the data date the baseline said 40% should be done: PV = £200,000. The engineer's assessment says 30% is physically achieved: EV = £150,000. The ledger says £180,000 has been spent: AC = £180,000. Three numbers, one glance: £50,000 of planned work not done, and the work that was done cost £30,000 more than it earned.

TOPIC 28 / PART FOUR

No. 28

Schedule Variance & Cost Variance (SV, CV)

The two headline earned-value gaps. Schedule Variance (SV = EV − PV) measures how much planned work has not been done, in money terms. Cost Variance (CV = EV − AC) measures whether the work performed cost more or less than budgeted. Negative is bad, in both.

The two variances split performance into its two honest questions. SV = EV − PV: in money terms, how much planned work has not been done? CV = EV − AC: did the work performed cost more than it was worth? The four combinations form a quadrant every project lives in, and the pairing prevents the classic self-deceptions — 'we're under budget' (because nothing has been built), or 'we're on programme' (because money is being burned to stay there). One caveat keeps EVM humble: SV is blind to the critical path. A project can show SV = 0 while its critical path runs late, because float-path work earned value that the driving path did not.

WHERE TO FIND IT IN P6

P6 columns: Schedule Variance and Cost Variance (Earned Value column group), or computed from the three base values.

Key values and formulas

1. SV = EV − PV (negative = behind schedule in value terms)
2. CV = EV − AC (negative = over budget)
3. SV in £ is not days — a project can show SV = 0 yet be late on the critical path (EVM is blind to float)

WORKED EXAMPLE

From the worked figures: SV = 150 − 200 = −£50,000 — behind programme by a quarter of the planned period's work. CV = 150 − 180 = −£30,000 — every pound spent bought 83 pence of progress. Bottom-left quadrant: behind and over. The site agent's 'we're only a bit behind' now has a price tag attached.

TOPIC 29 / PART FOUR

No. 29

Performance Indices (SPI & CPI)

The ratio versions of the variances, which normalise performance for comparison across projects of any size. SPI = EV ÷ PV (schedule efficiency); CPI = EV ÷ AC (cost efficiency). A value of 1.0 is on-plan; below 1.0 is under-performing.

Divide instead of subtract and the variances become indices that travel: SPI = EV ÷ PV, CPI = EV ÷ AC. Because they are ratios, a £50k package and a £50m programme can be read on the same scale, RAG-coded on the same thresholds, and trended month against month. CPI carries the hardest truth in project controls: decades of research on hundreds of programmes (Christensen's defence-project studies) show cumulative CPI stabilises by roughly 20% completion — a project overrunning early almost never earns it back. That is why an experienced reviewer looks at CPI at month three with the seriousness most people reserve for month twelve.

WHERE TO FIND IT IN P6

P6 columns: Schedule Performance Index and Cost Performance Index; also reportable in the Earned Value report group.

Key values and formulas

1. SPI = EV ÷ PV · CPI = EV ÷ AC
2. CPI = 0.83 means every £1 spent earns only £0.83 of budgeted work
3. Research (Christensen): cumulative CPI stabilises by ~20% completion — early overruns rarely recover

WORKED EXAMPLE

SPI = 150 ÷ 200 = 0.75: the project is earning three weeks of progress for every four it plans. CPI = 150 ÷ 180 = 0.83: each £1 spent buys 83p of budgeted work. Against a RAG of 0.95 green, 0.85–0.95 amber, <0.85 red, this project shows red on both axes — at 30% complete, with the research saying the ratios are now set in concrete unless something structural changes.

TOPIC 30 / PART FOUR

No. 30

Forecasting (EAC, ETC & VAC)

The earned-value forecast set. Estimate at Completion (EAC) predicts final cost; Estimate to Complete (ETC = EAC − AC) is the cost of remaining work; Variance at Completion (VAC = BAC − EAC) is the forecast final overrun or underrun. The standard EAC assumes current cost efficiency continues: EAC = BAC ÷ CPI.

Forecasting turns the indices into a completion story. The standard Estimate at Completion assumes current efficiency persists: EAC = BAC ÷ CPI. Other formulas suit other facts — AC + (BAC − EV) when the overrun was a one-off; AC + (BAC − EV) ÷ (CPI × SPI) when schedule pressure will keep inflating cost. ETC = EAC − AC prices the road remaining; VAC = BAC − EAC is the overrun headline. The sharpest tool in the set is TCPI = (BAC − EV) ÷ (BAC − AC): the efficiency the remaining work must achieve to land on budget. When TCPI demands markedly better performance than the project has ever produced, the honest word for the original budget is 'gone' — and the professional act is to re-forecast, not to hope.

WHERE TO FIND IT IN P6

P6 Earned Value columns: Estimate at Completion, Estimate to Complete, Variance at Completion (formula options under Earned Value calculation settings).

Key values and formulas

1. EAC = BAC ÷ CPI (typical case) · alternatives: AC + (BAC − EV) or AC + (BAC − EV) ÷ (CPI × SPI)
2. ETC = EAC − AC · VAC = BAC − EAC (negative VAC = forecast overrun)
3. TCPI = (BAC − EV) ÷ (BAC − AC): the efficiency now required to finish on budget

WORKED EXAMPLE

BAC £500k, CPI 0.83: EAC = 500 ÷ 0.83 £600,000, so VAC −£100,000 and ETC = 600 − 180 = £420,000. TCPI = (500 − 150) ÷ (500 − 180) = 350 ÷ 320 1.09: the team that has run at 83% efficiency all project must now run at 109% to save the budget. The forecast overspend is not a risk — on today's evidence it is the destination, and the report should say so.

V

PART FIVE

The Assessment

Thirty questions, one per topic. Sat online, marked the moment you submit, with a full review of every question.

WHEN YOU ARE READY

Assessment access during the programme.

Work through all thirty topics first. The online assessment opens to enrolled learners at the appropriate point in the six-week programme. Dr Francis and the team will confirm access in class and through the official learner channel.

Prepare before you attempt it

1. Read each topic and work through its example.
2. Record any terms or formulae that still feel unclear.
3. Bring those questions to the live teaching and Saturday clinic.
4. Use the issued assessment link only when your cohort is invited.

ADVANCE-READING EDITION

The public quiz link is intentionally withheld from this edition. This protects cohort records and ensures every learner receives the correct assessment instructions.

WHAT COMES NEXT

Beyond the thirty.

These thirty topics are the vocabulary. The fluency - building a full programme from a blank project, baselining it, breaking it, recovering it, and defending it in front of a client - is what the next P6 Masterclass teaches, live and hands-on in Primavera P6. Every topic in this guide is covered in depth there, alongside delay analysis, claims awareness, resource levelling, reporting dashboards and the DCMA health check in full.

RESERVE YOUR SEAT

Details, dates and registration for the September 2026 six-week P6 Masterclass are available on the P6 Mastery website.

P6MASTERY.THETRUETROOP.COM