



FREE FIELD REFERENCE • 2026 EDITION

Construction Project Management Calculators

Essential Formulas & Practical Examples

16

calculators

6

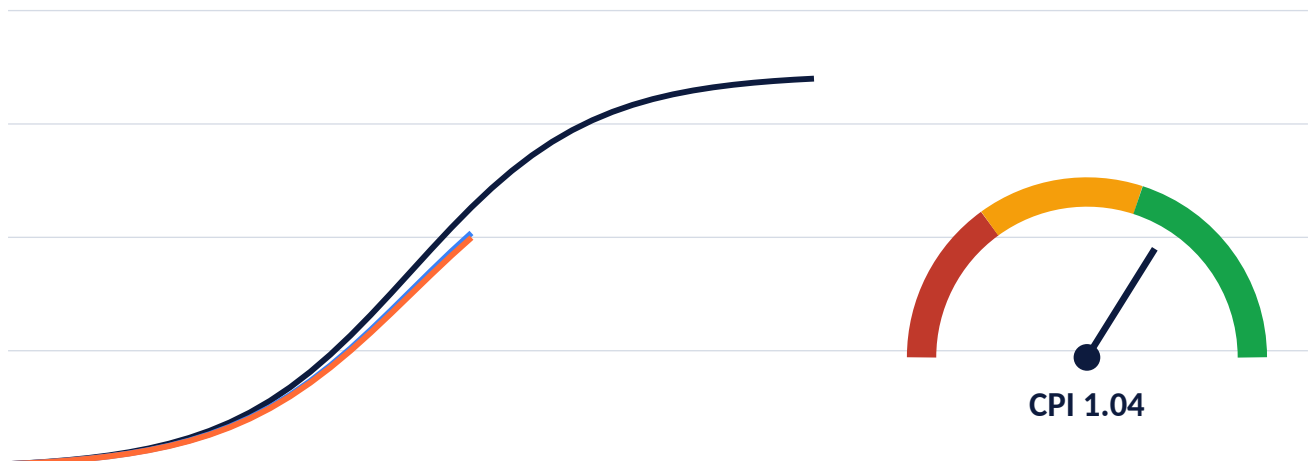
categories

16

worked examples

1

quick-reference sheet



$$\text{CPI} = \text{EV} \div \text{AC}$$

$$\text{EAC} = \text{BAC} \div \text{CPI}$$

$$\text{TF} = \text{LS} - \text{ES}$$

$$\text{Exposure} = \text{P} \times \text{I}$$

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How to use this guide

Sixteen calculators, one monthly rhythm

Every calculator in this guide matches a free tool on trianglepmo.org. Each section follows the same pattern: the **formula** and its variables, a **worked example**, **how and when** to use the result, and the **common mistakes** that make the number lie.

The calculators work as a chain. Measured progress feeds earned value, earned value feeds the forecast, the forecast is tested against risk and contingency, and the whole picture rolls up into one health score.

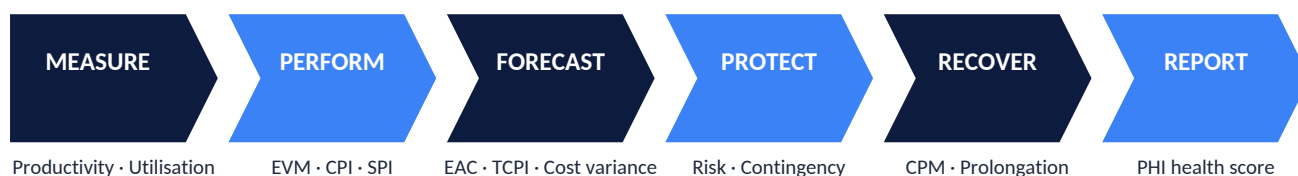


Figure 1 — How the calculators connect across a monthly reporting cycle

Question you are asking	Start with	Then check
Are we getting value for the money spent?	02 CPI	06 Cost Variance
Are we on programme?	03 SPI	08 CPM (critical path)
What will this job finally cost?	04 EAC	05 TCPI · 12 Contingency
Is the recovery plan realistic?	05 TCPI	13 Productivity
What is this delay worth?	09 Prolongation	08 CPM (entitlement)
Is the contingency big enough?	11 Risk Exposure	12 Contingency Reserve
How do I brief the board in one number?	16 PHI	01 EVM summary

FIELD NOTE

Worked examples follow one generic project: **[Project] — a four-storey commercial building**, \$2.4M contract, 12-month programme, reported at Month 7 unless stated. Figures are illustrative and shown in generic \$ — every formula works in any currency.

CATEGORY 1

Earned Value & Performance

Is the work done worth what it cost — and what was planned by now?

01 EVM • 02 CPI • 03 SPI • 04 EAC • 05 TCPI

01

Earned Value Management (EVM)

One status date, three numbers, eight answers

EVM compares three values at the same status date: the work you **planned** to have done, the work **actually done** (valued at budget rates) and what it **actually cost**. Every cost and schedule indicator a client, board or lender asks for comes from those three plus the budget.

FORMULAS

COST VARIANCE

$$CV = EV - AC$$

COST PERFORMANCE INDEX

$$CPI = EV \div AC$$

ESTIMATE AT COMPLETION

$$EAC = BAC \div CPI$$

VARIANCE AT COMPLETION

$$VAC = BAC - EAC$$

SCHEDULE VARIANCE

$$SV = EV - PV$$

SCHEDULE PERFORMANCE INDEX

$$SPI = EV \div PV$$

ESTIMATE TO COMPLETE

$$ETC = EAC - AC$$

TO-COMPLETE PERFORMANCE INDEX

$$TCPI = (BAC - EV) \div (BAC - AC)$$

THE VARIABLES

Input	Meaning	Where it comes from on site
BAC	Budget at Completion — total approved budget	Cost budget including approved variations
PV	Planned Value — budgeted value of work scheduled to date	Cost-loaded baseline programme
EV	Earned Value — budgeted value of work actually completed	Measured progress × budget
AC	Actual Cost — what the completed work has cost	Cost ledger plus accruals

WORKED EXAMPLE — [PROJECT], MONTH 7 OF 12

BAC \$2,400,000. The programme says \$1,150,000 of work should be in place; the QS measures \$1,035,000; the ledger plus accruals shows \$1,125,000 spent.

Metric	Calculation	Result	What it says
CV	$1,035,000 - 1,125,000$	-\$90,000	Work done cost \$90k more than its budget value
SV	$1,035,000 - 1,150,000$	-\$115,000	\$115k of planned work not yet in place
CPI	$1,035,000 \div 1,125,000$	0.92	Each \$1 spent delivers 92c of work
SPI	$1,035,000 \div 1,150,000$	0.90	Progressing at 90% of the planned rate
EAC	$2,400,000 \div 0.92$	\$2,608,696	Forecast final cost at current efficiency
ETC	$2,608,696 - 1,125,000$	\$1,483,696	Still to spend
VAC	$2,400,000 - 2,608,696$	-\$208,696	Forecast overrun at completion
TCPI	$1,365,000 \div 1,275,000$	1.07	Efficiency needed to finish on budget

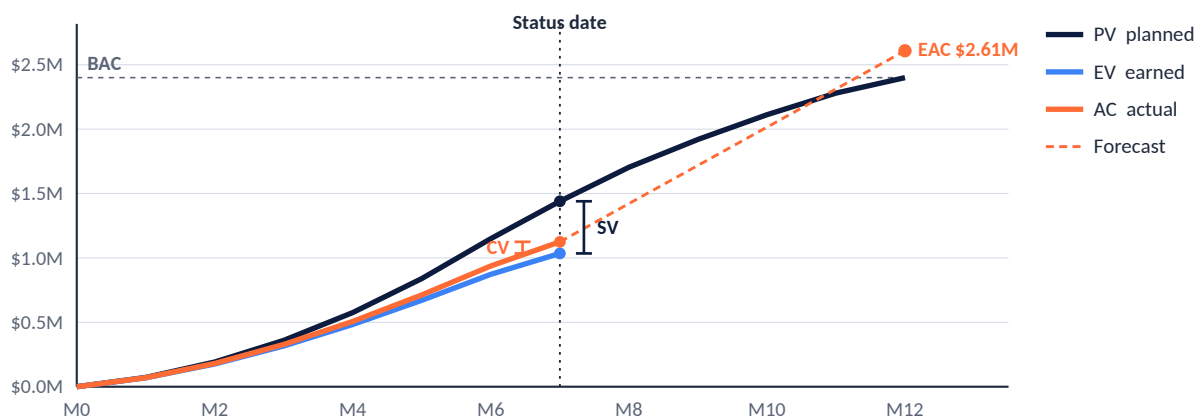


Figure 2 — The S-curve at Month 7: SV is the gap PV→EV, CV is the gap EV→AC, the dashed line is the EAC

HOW AND WHEN TO USE THE RESULT

- **Monthly, one cut-off.** Run EVM on the same status date as the programme update and cost report.
- **Lead the monthly report with it.** CV, SV, CPI, SPI and EAC are the five numbers a client reads first.
- **Agree measurement rules up front.** Weighted milestones or BoQ quantities — most EVM disputes are measurement disputes.

COMMON MISTAKES TO AVOID

RED FLAG

- **AC without accruals** — unbilled subcontract work flatters CPI.
- **EV by time or spend** — “60% of the month gone, so 60% earned” is not earned value.
- **A stale BAC** — approved variations must be added to BAC and PV or every index is distorted.
- **Mismatched cut-offs** — progress to the 25th against costs to the 31st.

02

Cost Performance Index (CPI)

How much work each dollar is buying

FORMULA

$$\text{CPI} = \text{EV} \div \text{AC}$$

EV = earned value to date • AC = actual cost to date (with accruals). CPI 1.00 = on budget; below 1.00 = each dollar buys less than a dollar of work.

WORKED EXAMPLE — THE TREND, NOT THE MONTH

Month	4	5	6	7
CPI	0.97	0.95	0.93	0.92
Reading	Watch	Watch	Act	Act

Month 7 CPI = $1,035,000 \div 1,125,000 = 0.92$. One month at 0.92 is a question; four months falling from 0.97 is a pattern — the cost recovery plan is overdue.

HOW AND WHEN TO USE THE RESULT

- **Below 0.95 for two months:** issue a cost recovery plan and revise the EAC.
- **Run it per package** (frame, façade, services) to find which trade is losing money.

COMMON MISTAKES TO AVOID

RED FLAG

- **Reacting to one month** — late invoices or accrual timing can swing a single CPI by ± 0.05 .
- **Front-loaded claims** — when payment claims are measured as progress, EV is inflated.

03

Schedule Performance Index (SPI)

Value delivered against value planned

FORMULA

$$SPI = EV \div PV$$

EV = earned value · PV = planned value at the status date. Month 7: $1,035,000 \div 1,150,000 = 0.90$ — the project has delivered 90% of the work it planned to.

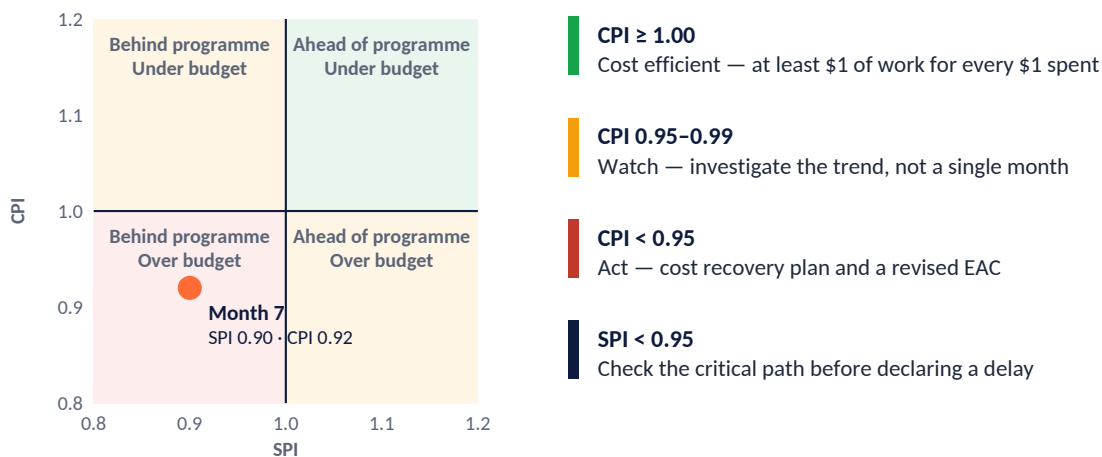


Figure 3 — CPI/SPI quadrant: [Project] is behind programme and over budget

HOW AND WHEN TO USE THE RESULT

- **Use SPI as an alarm, not a verdict.** Confirm any delay on the critical path (Section 08) before reporting days late.
- **Plot CPI against SPI each month** — movement towards the bottom-left quadrant needs escalation.

COMMON MISTAKES TO AVOID

RED FLAG

- **Reading SPI as days** — an SPI of 0.90 does not mean 10% late on time.
- **Trusting SPI late in the job** — SPI drifts back to 1.00 at completion, even on a late project.
- **Ignoring what is behind** — non-critical work can drag SPI down with no effect on completion.

04

Estimate at Completion (EAC)

What the job will finally cost

FORMULAS

TYPICAL — CURRENT EFFICIENCY CONTINUES

$$EAC = BAC \div CPI$$

COST AND SCHEDULE BOTH BITE

$$EAC = AC + (BAC - EV) \div (CPI \times SPI)$$

ATYPICAL — OVERRUN WAS A ONE-OFF

$$EAC = AC + (BAC - EV)$$

THEN

$$ETC = EAC - AC \cdot VAC = BAC - EAC$$

The online calculator uses the **typical** formula. The other two give you a range — report the one that matches what is actually causing the variance, and say why.

WORKED EXAMPLE — THREE FORECASTS FOR [PROJECT]

Step	Calculation	Result
Typical (BAC ÷ CPI)	$2,400,000 \div 0.92$	\$2,608,696
Atypical	$1,125,000 + (2,400,000 - 1,035,000)$	\$2,490,000
CPI × SPI	$1,125,000 + 1,365,000 \div (0.92 \times 0.90)$	\$2,773,551
ETC (typical)	$2,608,696 - 1,125,000$	\$1,483,696
VAC (typical)	$2,400,000 - 2,608,696$	-\$208,696

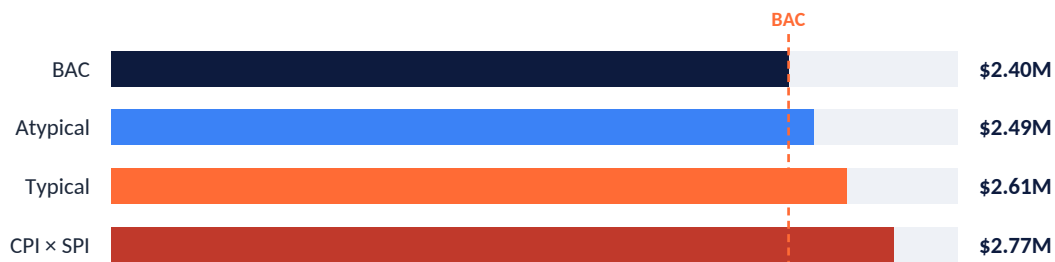


Figure 4 — The EAC range: \$2.49M to \$2.77M against a \$2.40M budget

HOW AND WHEN TO USE THE RESULT

- **Report a range, recommend one.** “EAC \$2.61M (range \$2.49M–\$2.77M); the frame overrun is systemic.”
- **Reconcile with the commercial forecast** (Section 06) — a large gap means one of them is wrong.

COMMON MISTAKES TO AVOID

RED FLAG

- **Choosing the atypical formula because it looks better** — it assumes the problem has stopped.
- **Forecasting from the first two months** — early CPI is unstable; give it 15–20% completion.

05

To-Complete Performance Index (TCPI)

Can the remaining work really land on budget?

FORMULA

$$\text{TCPI} = (\text{BAC} - \text{EV}) \div (\text{BAC} - \text{AC})$$

$$= \text{work remaining} \div \text{money remaining}$$

TCPI is the CPI you must achieve **from now to completion** to finish on the BAC. Compare it with the CPI you have actually achieved.

WORKED EXAMPLE — [PROJECT], MONTH 7

Step	Calculation	Result
Work remaining	2,400,000 – 1,035,000	\$1,365,000
Money remaining	2,400,000 – 1,125,000	\$1,275,000
TCPI	1,365,000 ÷ 1,275,000	1.07
Gap to current CPI	1.07 – 0.92	0.15



Figure 5 — TCPI bands used in the online calculator

Reading the result. A TCPI of 1.07 sits in the “challenging” band, but the team is currently achieving 0.92. Lifting efficiency by 0.15 for the rest of the job is very unlikely. The honest answer is a revised EAC, not a promise to recover.

HOW AND WHEN TO USE THE RESULT

- **TCPI more than 0.05–0.10 above current CPI:** stop targeting the BAC; agree a new EAC with the client.
- **Use it to test recovery plans** — if the plan cannot show the TCPI efficiency, it is not a plan.

COMMON MISTAKES TO AVOID

RED FLAG

- **Reading TCPI in isolation** — 1.05 is easy if CPI is 1.04, near impossible if CPI is 0.88.
- **Using a TCPI above 1.10 as a target** — it sets the team up to fail and hides the real forecast.

CATEGORY 2

Cost Control

Where is the money going — and what are variations doing to the contract?

06 Cost Variance • 07 Variation Impact

06

Cost Variance — budget vs forecast

The monthly cost report in one table

FORMULAS

VARIANCE PER LINE

Variance = Budget – Forecast at completion

VARIANCE %

Var % = Variance ÷ Budget × 100

Budget = approved cost budget per line • **Actual to date** = cost incurred plus accruals • **Forecast at completion (FAC)** = actual to date plus the cost still to come. A positive variance means under budget; a negative variance is an overrun.

WORKED EXAMPLE — [PROJECT] COST REPORT, MONTH 7

Line item	Budget	Actual to date	Forecast (FAC)	Variance	Var %
Preliminaries	290,000	175,000	305,000	-15,000	-5.2%
Substructure	260,000	262,000	268,000	-8,000	-3.1%
Structural frame	520,000	410,000	545,000	-25,000	-4.8%
Envelope & façade	480,000	190,000	512,000	-32,000	-6.7%
Services	560,000	70,000	548,000	12,000	+2.1%
Fit-out	290,000	18,000	290,000	0	+0.0%
Totals	2,400,000	1,125,000	2,468,000	-68,000	-2.8%

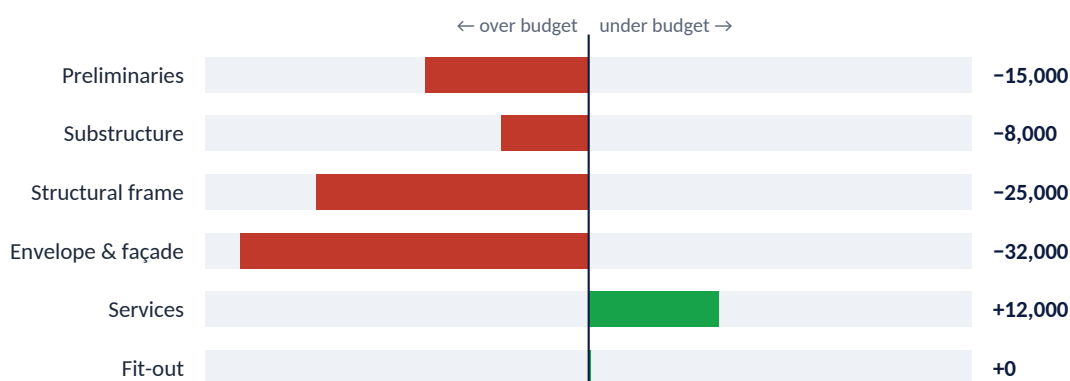


Figure 6 — Variance by line: the frame and façade drive the overrun

Reading the result. The bottom-up forecast is \$2,468,000 — an overrun of \$68,000. The EVM forecast (Section 04) is \$2,608,696. The \$140,696 gap tells you either the FAC is optimistic on the frame and façade, or the EVM measurement is understating progress. Resolve it before the report goes out.

HOW AND WHEN TO USE THE RESULT

- **Update every forecast every month** — the FAC column is the early-warning indicator, not the actuals.
- **Explain every line over ±2%** with cause, owner and action.

COMMON MISTAKES TO AVOID

RED FLAG

- **Forecast = budget until the line is finished** — the classic way to hide an overrun until it is too late.
- **Leaving known changes out of the FAC** because the variation is not yet priced — include an estimate.

07

Variation Impact

What instructed change is doing to cost, time and margin

FORMULAS

REVISED CONTRACT SUM

Total = Original contract + Cumulative variations

MARGIN AT STAKE

Margin pressure = Variations × Margin %

SCOPE GROWTH

Scope creep % = Variations ÷ Original × 100

Original contract = contract sum at award · **Cumulative variations** = value of all instructed variations (approved and pending) · **Margin %** = the margin in the tender. Margin pressure is the margin tied up in the variations — what you lose if they are agreed at cost or not agreed at all.

WORKED EXAMPLE — [PROJECT] AT MONTH 10, 14 VARIATIONS INSTRUCTED

Step	Calculation	Result
Revised contract	2,400,000 + 186,000	\$2,586,000
Scope creep	186,000 ÷ 2,400,000 × 100	7.75%
Margin pressure	186,000 × 6%	\$11,160

Axis starts at \$2.0M to show the movement

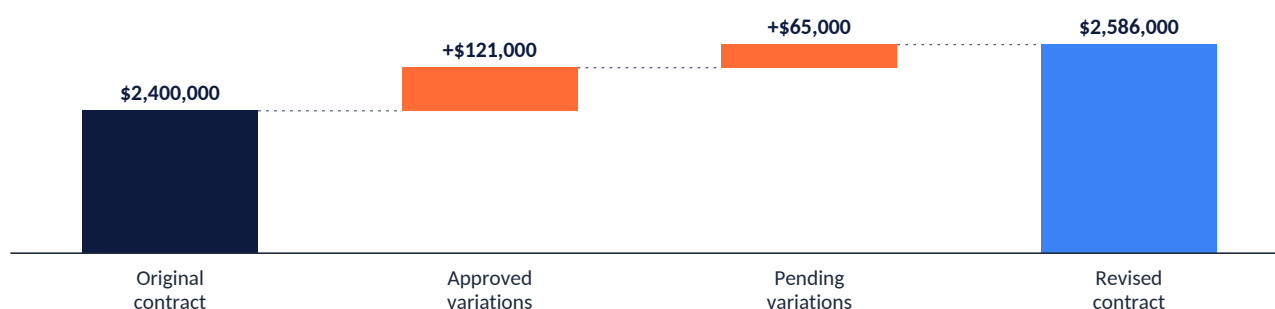


Figure 7 — From original contract to revised contract sum

HOW AND WHEN TO USE THE RESULT

- **Above 5% scope creep** — review the programme: variations this size rarely come without time.
- **Track pending value separately** — \$65k pending is cash and margin you do not have yet.
- **Notify time with cost.** Many contracts time-bar claims, so give notice when the variation is instructed.

COMMON MISTAKES TO AVOID

RED FLAG

- **Doing the work before the instruction is in writing** — it is the weakest variation position there is.
- **Pricing variations without time-related cost** — the prolongation (Section 09) is often worth more than the work.

CATEGORY 3

Schedule & Delay

Which activities drive the finish date — and what is lost when it moves?

08 CPM · 09 Prolongation Cost

08

Critical Path Method (CPM)

Find the longest path — that is your finish date

CPM calculates the earliest and latest dates each activity can start and finish without moving completion. The difference is **float**; activities with zero total float form the **critical path**.

FORMULAS

FORWARD PASS — EARLY START

$$ES = \max(EF \text{ of predecessors})$$

BACKWARD PASS — LATE FINISH

$$LF = \min(LS \text{ of successors})$$

TOTAL FLOAT

$$TF = LS - ES = LF - EF$$

FORWARD PASS — EARLY FINISH

$$EF = ES + D$$

BACKWARD PASS — LATE START

$$LS = LF - D$$

CRITICAL PATH

Every activity with $TF = 0$

D = duration in working days. Convention (as in the online tool): the project starts at day 0, links are finish-to-start with zero lag, and ES = 10 means the activity starts at the end of day 10.

WORKED EXAMPLE — [PROJECT] SUBSTRUCTURE TO HANDOVER

ID	Activity	D	Pred.	ES	EF	LS	LF	TF
A	Site establishment & excavation	10	—	0	10	0	10	0
B	Foundations	10	A	10	20	10	20	0
C	In-ground services	6	A	10	16	14	20	4
D	Ground-floor slab	7	B, C	20	27	20	27	0
E	Structural frame (4 levels)	20	D	27	47	27	47	0
F	Roof	10	E	47	57	52	62	5
G	Façade and cladding	15	E	47	62	47	62	0
H	Services and fit-out	25	F, G	62	87	62	87	0
I	Commissioning and handover	8	H	87	95	87	95	0

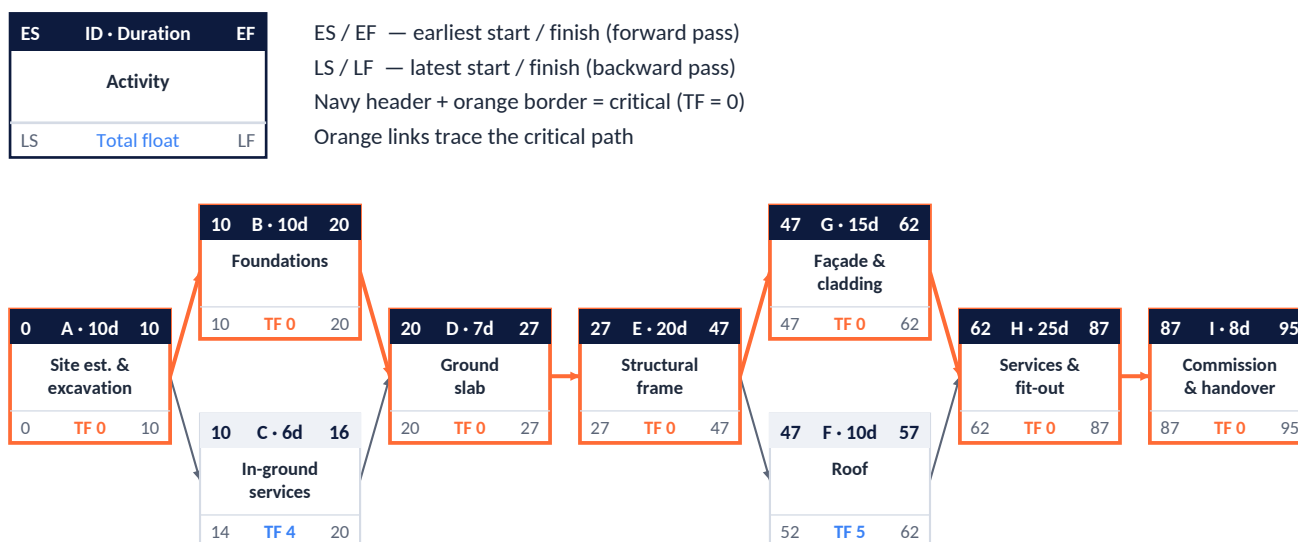


Figure 8 — Activity-on-node network. Critical path A → B → D → E → G → H → I = 95 working days

Reading the result. 95 working days. Services (C) carry 4 days of float; the roof (F) carries 5. A 10-day façade delay moves completion 10 days; a 10-day roof delay moves it only 5 — the first 5 are absorbed by float.

HOW AND WHEN TO USE THE RESULT

- **Before accepting or claiming a delay**, show whether the delayed activity is critical.
- **Every update**, watch near-critical work (TF ≤ 5 days) and accelerate only critical activities.

COMMON MISTAKES TO AVOID

RED FLAG

- **Open ends and hard constraints** — both create false float and hide the real critical path.
- **Hidden lags and mixed calendars** — model curing or lead time as activities; keep one calendar per chain.

CONTRACT LINK

Under FIDIC and NZS 3910 forms an extension of time generally turns on the effect on the completion date, so a delay must normally be shown to affect the critical path. Keep every programme update and its narrative — and check the clause in your contract.

09

Prolongation Cost

What an extension of time is worth in time-related cost

When the employer causes a compensable delay, the contractor can usually recover the extra **time-related** cost of being on site longer: site preliminaries, unrecovered head-office overhead and, in some cases, financing.

FORMULAS

SITE TIME-RELATED COST

Site = Weekly time-related cost × EOT weeks

HEAD OFFICE — EMDEN / HUDSON

HO = (HO % + Profit %) × Contract sum ÷ Original weeks × EOT weeks

HEAD OFFICE — EICHLEAY

HO = (Contract ÷ Company billings) × Company HO ÷ Original weeks × EOT weeks

FINANCING (AS IN THE ONLINE TOOL)

Fin = (Site + HO) × Rate × EOT weeks ÷ 52

TOTAL

Prolongation = Site + HO + Financing

Emden uses the contractor's **audited** HO and profit %; **Hudson** uses the % in the **tender**; **Eichleay** allocates actual company overhead by the contract's share of turnover.

WORKED EXAMPLE — 3-WEEK COMPENSABLE EOT ON [PROJECT]

Step	Calculation	Result
Site preliminaries	3,800 / wk	
Site staff	4,600 / wk	
Plant & equipment	1,400 / wk	
Insurance, bonds, security	450 / wk	
Site time-related cost	10,250 × 3 weeks	\$30,750
Head office (Emden)	(6% + 4%) × 2,400,000 ÷ 52 × 3	\$13,846
Financing at 7% p.a.	(30,750 + 13,846) × 7% × 3 ÷ 52	\$180
Total prolongation	Site + HO + Financing	\$44,776



Figure 9 — Head-office overhead for the same 3-week delay under three formulas (Eichleay: \$2.4M of \$18M company billings, \$1.62M HO)

HOW AND WHEN TO USE THE RESULT

- **Only for compensable delay** — an EOT for neutral events (e.g. weather) gives time but usually no money.
- **Price from records, not tender rates** — timesheets, hire dockets and invoices for the delay period.
- **Use the formula your contract or jurisdiction accepts**, and check the SCL Delay and Disruption Protocol.

COMMON MISTAKES TO AVOID

RED FLAG

- Using peak-period prelims — price the resources actually on site during the delay, not at peak.
- Claiming HO with no proof it went unrecovered — most tribunals want evidence of lost opportunity.
- Ignoring concurrency — contractor-caused delay running in parallel can wipe out the money.

CATEGORY 4

Risk & Contingency

Which risks matter most — and is there enough money to cover them?

10 Risk Matrix · 11 Risk Exposure · 12 Contingency

10

Risk Score Matrix (5×5)

Rank the register in one consistent language

FORMULA

Risk score = Probability (1–5) × Impact (1–5)

Score	1	2	3	4	5
Probability	< 10%	10–30%	30–50%	50–70%	> 70%
Impact — cost	< \$10k	\$10–50k	\$50–100k	\$100–250k	> \$250k
Impact — time	< 2 days	2–5 days	1–2 weeks	2–4 weeks	> 4 weeks

Example scales — calibrate them to the size of your project at the first risk workshop.

WORKED EXAMPLE — [PROJECT] TOP FIVE RISKS

ID	Risk	P	I	Score	Rating
R1	Cladding system lead time	4	4	16	Critical
R2	Unforeseen ground conditions	2	5	10	High
R3	Services coordination clashes	3	3	9	Medium
R4	Wet-weather days above allowance	3	2	6	Medium
R5	Late client fit-out decisions	4	3	12	High

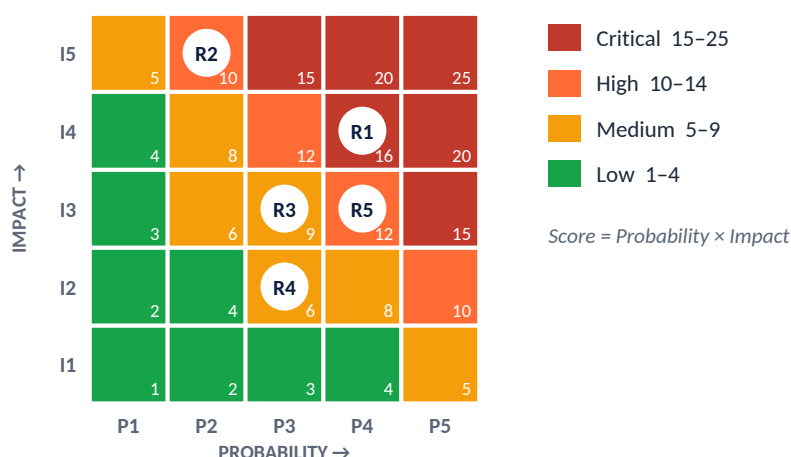


Figure 10 — Heat map: bands as in the online tool (Low 1–4, Medium 5–9, High 10–14, Critical 15+)

HOW AND WHEN TO USE THE RESULT

- **Critical and High** need a named owner, a response and a date — reviewed at every project meeting.
- **Re-score after every response** and track the movement; a register that never changes is not being used.

COMMON MISTAKES TO AVOID

RED FLAG

- **Scoring a cause, not a risk** — “weather” is a cause; “weather days exceed the allowance” is a risk.
- **Treating a 4×4 like a 2×8** — same score, different response; read probability and impact separately.

11

Risk Exposure

Turn probability and impact into money

FORMULA

Risk exposure (EMV) = Probability (0–1) × Cost impact if it occurs

Probability = best estimate of the chance it happens, as a decimal · **Cost impact** = most-likely cost if it does, including time-related cost. Exposure is the risk-weighted value — the amount the risk is “worth” to the budget.

WORKED EXAMPLE — EXPOSURE FOR THE FIVE RISKS

ID	Probability	Cost impact	Exposure
R1	0.40	\$120,000	\$48,000
R2	0.15	\$180,000	\$27,000
R3	0.30	\$45,000	\$13,500
R4	0.30	\$25,000	\$7,500
R5	0.45	\$60,000	\$27,000
Total			\$123,000

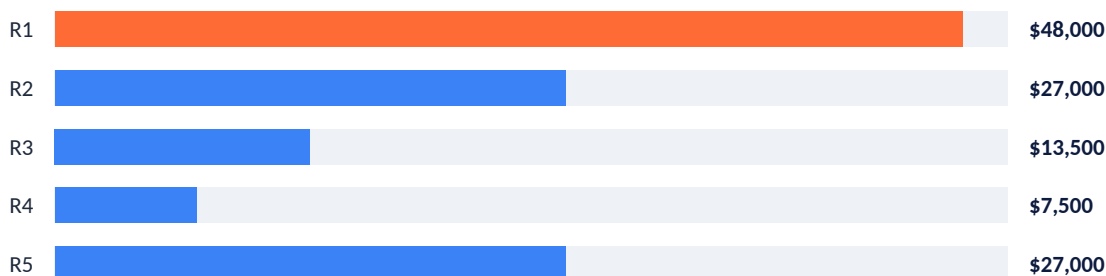


Figure 11 — R1 dominates the exposure; R2 and R5 are worth the same despite different matrix scores

HOW AND WHEN TO USE THE RESULT

- **Sum the exposures** to size the risk part of contingency (Section 12).
- **Rank responses by exposure reduced per dollar spent** — that is where mitigation money goes first.

COMMON MISTAKES TO AVOID

RED FLAG

- **Adding full impacts** — summing \$430k of impacts instead of \$123k of exposure over-states contingency.
- **Leaving out time** — a 3-week delay risk must include its prolongation cost (Section 09).

12

Contingency Reserve

Risk-weighted, not a round-number guess

FORMULA

$$\text{Contingency} = \text{Total risk exposure} + (\text{Base estimate} \times \text{General buffer \%})$$

Total risk exposure = sum of EMVs from the register · **General buffer** = an allowance for risks not yet identified. For [Project]: \$123,000 + (\$2,400,000 × 2%) = **\$171,000**, which is **7.1%** of the base estimate.

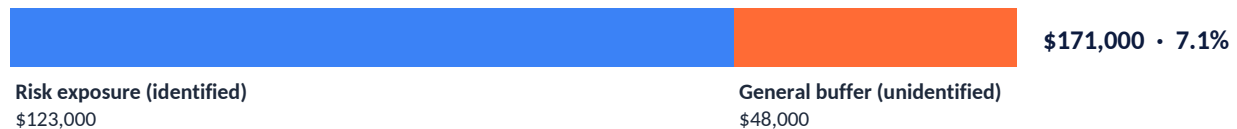


Figure 12 — Contingency built from the register, plus a small buffer

HOW AND WHEN TO USE THE RESULT

- **Draw down against named risks** and log every drawdown — the remaining balance is a monthly KPI.
- **Re-size at each stage gate**; on larger or complex jobs, use a Monte Carlo P50/P80 range instead.

COMMON MISTAKES TO AVOID

RED FLAG

- **A flat 10% “because we always do”** — it is either too much to win the tender or too little to survive the job.
- **Spending contingency on scope change** — variations are funded by the client, not the risk reserve.

CATEGORY 5

Productivity & Resources

Are crews producing at the planned rate — and are they working or waiting?

13 Productivity · **14 Utilisation**

13

Labour Productivity

Output per hour, against the rate in your estimate

FORMULAS

ACTUAL RATE

Rate = Output (units) ÷ Labour hours

GAP AGAINST TARGET

Gap % = (Actual – Target) ÷ Target × 100

Output = installed quantity (m², m³, tonnes, units) · **Labour hours** = paid hours booked to that activity · **Target rate** = the rate in the estimate or the programme.

WORKED EXAMPLE — SUSPENDED-SLAB FORMWORK, LEVELS 1-2

Step	Calculation	Result
Actual rate	940 m ² ÷ 520 h	1.81 m ² /h
Gap vs target 2.00	(1.81 – 2.00) ÷ 2.00	-9.6%
Extra hours, Levels 3-4	1,880 ÷ 1.81 – 1,880 ÷ 2.00	100 h
Cost if not fixed	100 h × \$68/h	\$6,800

A 10% gap on two floors becomes about 100 extra hours on the next two. Found now, it is a crew-planning fix; found at the end, it is part of the overrun.

HOW AND WHEN TO USE THE RESULT

- **Weekly on high-value repetitive activities** — formwork, rebar, blockwork, drylining, cabling.
- **Feed the rate into the forecast** — the actual rate, not the estimate rate, drives the remaining cost.

COMMON MISTAKES TO AVOID

RED FLAG

- **Hours not booked to the right activity** — rates are only as good as the timesheet coding.
- **Comparing first-floor rates to typical floors** — allow for the learning curve before calling a gap.

14

Resource Utilisation

How much of the paid time is productive

FORMULA

$$\text{Utilisation \%} = \text{Productive hours} \div \text{Available hours} \times 100$$

A crew of six on a 45-hour week has 270 available hours. Daily diaries show 216 productive hours; the rest was lost to waiting for materials (22 h), rework (12 h), weather (10 h) and permits (10 h). Utilisation = $216 \div 270 \times 100 = 80\%$.

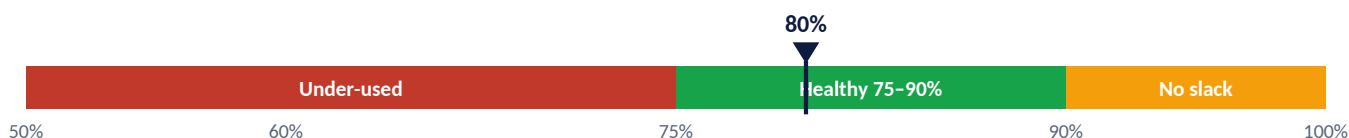


Figure 13 — Utilisation band used in the online calculator

HOW AND WHEN TO USE THE RESULT

- **Below 75%:** look at the causes of lost time — they are usually supply and coordination, not effort.
- **Above 90%:** no slack for weather, rework or fatigue; overtime and safety risk follow.

COMMON MISTAKES TO AVOID

RED FLAG

- **Counting presence as productive** — being on site is not being on task.
- **Chasing 100%** — a crew at 100% has no buffer; the first disruption hits the programme.

CATEGORY 6

Procurement & Project Health

What did the buying save — and how healthy is the project overall?

15 Procurement Savings · 16 Project Health

15

Procurement Savings

Show the value of the procurement process

FORMULAS

SAVINGS

Savings = Baseline price – Negotiated price

SAVINGS %

Savings % = Savings ÷ Baseline × 100

Baseline = the benchmark you are measuring against — the budget or pre-tender estimate, not an inflated first quote
 · **Negotiated price** = the final agreed subcontract sum. Façade package: budget \$480,000, agreed \$452,000 after clarifications → savings \$28,000 = 5.8%.



Figure 14 — Façade package: baseline vs negotiated price

HOW AND WHEN TO USE THE RESULT

- **Report savings against the budget line** and decide whether they go to contingency or to the bottom line.
- **Check the scope is equal** before calling it a saving — use a scope matrix across tenders.

COMMON MISTAKES TO AVOID

RED FLAG

- **A saving that is really a scope gap** — exclusions bought back later cost more than the saving.
- **Benchmarking against the highest bid** — it inflates the saving and erodes credibility.

16

Project Health Quick Score (PHI)

Seven categories, one board-ready number

FORMULA

$$PHI = \sum (\text{Category score } 0-100 \times \text{Weight})$$

Weights in the Triangle PM tool: Safety 20%, Schedule 20%, Cost 20%, Quality 15%, Risk 10%, Client 10%, Contractor 5%. Bands: **80–100 Healthy** · **60–79 Watch** · **40–59 At risk** · **0–39 Critical**.

WORKED EXAMPLE — [PROJECT], MONTH 7

Category	Weight	Score	Points	Points lost
Safety	20%	92	18.40	1.60
Schedule	20%	68	13.60	6.40
Cost	20%	66	13.20	6.80
Quality	15%	81	12.15	2.85
Risk	10%	60	6.00	4.00
Client satisfaction	10%	78	7.80	2.20
Contractor performance	5%	72	3.60	1.40
PHI	100%		74.8	WATCH

Reading the result. 74.8 sits in **Watch**. The biggest points lost are cost (6.8) and schedule (6.4) — consistent with the CPI of 0.92 and SPI of 0.90. The board sees one number; the table shows where to act.

COMMON MISTAKES TO AVOID

RED FLAG

- **Scoring without evidence** — base each score on data (CPI, SPI, TRIFR, NCRs), not opinion.
- **Letting a strong safety score hide a cost problem** — always read the weakest category, not just the total.

QR

Quick-Reference Formula Sheet

Every formula in this guide on one page

#	Calculator	Formula	Healthy signal
01	Cost / schedule variance	$CV = EV - AC \cdot SV = EV - PV$	≥ 0
02	CPI	$EV \div AC$	≥ 1.00 · act below 0.95
03	SPI	$EV \div PV$	≥ 1.00 · confirm on critical path
04	EAC (typical)	$BAC \div CPI$	$\leq BAC$
04	EAC (atypical)	$AC + (BAC - EV)$	One-off variance only
04	EAC (CPI × SPI)	$AC + (BAC - EV) \div (CPI \times SPI)$	Upper end of range
04	ETC · VAC	$EAC - AC \cdot BAC - EAC$	$VAC \geq 0$
05	TCPI	$(BAC - EV) \div (BAC - AC)$	≤ 1.00 · above 1.10 unlikely
06	Cost variance per line	Budget – Forecast at completion	Explain lines beyond ±2%
06	Variance %	$Variance \div Budget \times 100$	$\geq 0\%$
07	Revised contract	Original + Cumulative variations	—
07	Scope creep	$Variations \div Original \times 100$	Review time above 5%
07	Margin pressure	$Variations \times Margin \%$	Recover in variation pricing
08	CPM forward pass	$ES = \max(EF \text{ pred.}) \cdot EF = ES + D$	—
08	CPM backward pass	$LF = \min(LS \text{ succ.}) \cdot LS = LF - D$	—
08	Total float	$LS - ES = LF - EF$	Critical path TF = 0
09	Site time-related cost	Weekly cost × EOT weeks	Priced from records
09	HO — Emden / Hudson	$(HO\% + Profit\%) \times Contract \div Weeks \times EOT$	Audited % / tender %
09	HO — Eichleay	$(Contract \div Co. billings) \times Co. HO \div Weeks \times EOT$	—
09	Financing	$(Site + HO) \times Rate \times EOT \text{ weeks} \div 52$	—
10	Risk score	Probability (1–5) × Impact (1–5)	Low 1–4 · Med 5–9 · High 10–14 · Crit 15+
11	Risk exposure (EMV)	Probability (0–1) × Cost impact	Covered by contingency
12	Contingency reserve	$\Sigma \text{ Exposure} + \text{Base} \times \text{Buffer } \%$	Tracked monthly
13	Productivity	$Output \div Labour \text{ hours}$	Gap $\geq 0\%$ vs target
13	Productivity gap	$(Actual - Target) \div Target \times 100$	—
14	Utilisation	$Productive \text{ hrs} \div Available \text{ hrs} \times 100$	75–90%
15	Procurement savings	$Baseline - Negotiated \div Baseline \times 100$	Like-for-like scope
16	PHI	$\Sigma (Score \times Weight)$	≥ 80 Healthy · 60–79 Watch

BAC budget at completion · PV planned value · EV earned value · AC actual cost · EAC / ETC estimate at / to complete · VAC variance at completion · ES/EF, LS/LF early and late start/finish · TF total float · EMV expected monetary value · HO head-office overhead · EOT extension of time.



Keep the numbers working

A formula on paper is only the start. The value comes from running it every reporting period, on your own numbers, and acting on what it tells you.

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