ELECTRICAL FORMULAS: A QUICK-REFERENCE TABLE

USEFUL CALCULATIONS, IN A MINUTE.

Every calculation from this masterclass, in the order a designer uses them.

CALCULATION	FORMULA	USE IT WHEN…	WHERE
Design current (single-phase)	$Ib = P \div V$	You need the circuit's current from the load. V = the voltage present at the origin of the circuit (usually 230 V).	Power triangle
Design current (three-phase)	$Ib = P \div (\sqrt{3} \times V_L)$	Three-phase load. V_L = 400 V. Answer is per phase.	$\sqrt{3}$ = 1.73
Tabulated current needed	$It \geq In \div (Ca \times Cg \times Ci \ldots)$	Sizing a cable. Only use the factors happening at the same time.	BS 7671 App 4 · Tables 4B1, 4C1, 2.6
Cable size	table value ≥ It	Read down your cable's **A** table, in the column for your method.	BS 7671 Appendix 4 cable tables
Voltage drop	$VD = mV/A/m \times Ib \times L \div 1000$	Checking there's enough "push" left. Limits 3% / 5%.	B tables · Table 4Ab
R1 + R2 (designer)	$B1 \times B3 \times L \div 1000$	Designing for an earth fault (conductors at operating temperature).	GN3 Tables B1, B3
R1 + R2 (ring)	$(r1 + r2) \div 4$	Ring final circuits. r = single conductor end to end (the "dash" rows).	GN3 Table B1 (+ B3 or B2)
R1 + R2 (inspector)	$B1 \times B2 \times L \div 1000$	Correcting a measured value to the ambient temperature on the day. **Never** in a design.	GN3 Table B2 p.175
Earth fault loop	$Zs = Ze + (R1 + R2)$	Checking ADS. Ze by measurement, enquiry or calculation (or given).	Compare with max Zs (Ch 41)
Prospective earth fault current	$PEFC = U_0 \times Cmin \div Zs$	How many amps flow in an earth fault. Cmin = 0.95 (218.5 V).	Ohm's law, worst case
Ia / disconnection time	read from the curves	How fast the device operates at that PEFC (more amps = faster).	BS 7671 Appendix 3
Adiabatic	$S = \sqrt{(I^2 \times t)} \div k$	Checking the CPC can carry the fault current until the device operates.	k: Chapter 54 (Table 54.3 = 115)

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