Journeyman Electrician — Quick Reference

Key NEC Tables & Formulas · Based on NEC 2023

Common Conductor Ampacities (Table 310.16, 75 °C Column)

Wire Size	Ampacity — Copper	Ampacity — Aluminum	Common Uses
14 AWG	20 A	—	15A lighting circuits
12 AWG	25 A	20 A	20A general purpose
10 AWG	35 A	30 A	30A circuits, dryers
8 AWG	50 A	40 A	Ranges, sub-feeders
6 AWG	65 A	50 A	Sub-panels, large appliances
4 AWG	85 A	65 A	Feeders
3 AWG	100 A	75 A	100A sub-panels
2 AWG	115 A	90 A	Feeders
1 AWG	130 A	100 A	Large feeders
1/0 AWG	150 A	120 A	150A services
2/0 AWG	175 A	135 A	200A services
3/0 AWG	200 A	155 A	200A services
4/0 AWG	230 A	180 A	Large services
250 kcmil	255 A	205 A	Large commercial
350 kcmil	310 A	250 A	Large commercial
500 kcmil	380 A	310 A	Large commercial/industrial

Equipment Grounding Conductor (Table 250.122, Copper)

OCPD Rating (A)	Copper EGC	Aluminum EGC
15	14 AWG	12 AWG
20	12 AWG	10 AWG
30–60	10 AWG	8 AWG
100	8 AWG	6 AWG
200	6 AWG	4 AWG
400	3 AWG	1 AWG
600	1 AWG	2/0 AWG
800	1/0 AWG	3/0 AWG
1000	2/0 AWG	4/0 AWG
1200	3/0 AWG	250 kcmil

Motor Full-Load Current (Tables 430.248/250)

HP	115V 1-Ø	230V 1-Ø	208V 3-Ø	230V 3-Ø	460V 3-Ø
1	16 A	8 A	4.6 A	4.2 A	2.1 A
2	24 A	12 A	6.9 A	6.0 A	3.4 A
3	34 A	17 A	10.6 A	9.6 A	4.8 A
5	56 A	28 A	16.7 A	15.2 A	7.6 A
7.5	80 A	40 A	24.2 A	22 A	11 A
10	100 A	50 A	30.8 A	28 A	14 A
15	—	—	46.2 A	42 A	21 A
20	—	—	59.4 A	54 A	27 A
25	—	—	74.8 A	68 A	34 A
30	—	—	88 A	80 A	40 A
40	—	—	114 A	104 A	52 A
50	—	—	143 A	130 A	65 A

Key Electrical Formulas

Formula	Equation	When to Use
Ohm's Law (V)	$V = I \times R$	Voltage from current × resistance
Ohm's Law (I)	$I = V / R$	Current from voltage ÷ resistance

Ohm's Law (R)	R = V / I	Resistance from voltage ÷ current
Power — 1-Ø	P = V × I	Single-phase watts
Power — 3-Ø	P = V × I × 1.732 × pf	Three-phase with power factor
Single-Ø current	I = VA / V	VA to amps
Three-Ø current	I = VA / (V × 1.732)	VA to amps (3-phase)
VD — 1-Ø	VD = 2 × K × I × D / CM	K = 12.9 Cu, D = one-way ft, CM = circular mils
VD — 3-Ø	VD = 1.732 × K × I × D / CM	Same variables
% VD	% = (VD / V_source) × 100	NEC: ≤3% branch, ≤5% total
Motor conductor	Ampacity ≥ 125% × FLC	NEC 430.22
Motor feeder	125% × largest FLC + Σ others	NEC 430.24

Conduit Fill (Chapter 9, Table 1)

Number of Conductors	Maximum Fill %
1 conductor	53%
2 conductors	31%
3 or more	40%

GFCI / AFCI Required Locations

- GFCI (210.8): bathrooms, kitchens (within 6 ft of sink), outdoors, garages/sheds, unfinished basements, laundry, crawl spaces, boathouses.
- AFCI (210.12): dwelling bedrooms, living rooms, dens, kitchens, laundry, closets, hallways, similar rooms.
- OCPD limits (240.4(D)): #14 → 15 A · #12 → 20 A · #10 → 30 A.

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