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FREE FIELD REFERENCE

FOR WORKING ELECTRICIANS

The Electrician's Field Pocket Reference.

The everyday code + sizing cheatsheet from Trade Template Co. — ampacity, voltage drop, conduit & box fill, and the calls you make on every job.

Ampacity & Wire Size

Voltage Drop

Conduit Fill

Box Fill

Code Quick-Hits

Get Paid Faster

Quick-reference only. The currently adopted NEC edition and your local AHJ always govern. Verify before installing.

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Conductor Ampacity & Wire Size

75°C column ampacities (THWN/THHN in conduit) for common copper and aluminum sizes, plus the small-conductor breaker caps electricians hit daily.

AWG / KCMIL	COPPER 75°C (A)	ALUMINUM 75°C (A)	TYPICAL USE
14	20	—	Lighting circuits
12	25	20	General receptacles
10	35	30	Small appliance / dryer taps
8	50	40	Range, sub-feeders
6	65	55	50A circuits, feeders
4	85	75	Feeders, EV chargers
3	100	85	Feeders
2	115	90	Feeders, small services
1	130	100	Feeders
1/0	150	120	100A services
2/0	175	135	125A services
3/0	200	155	150A services
4/0	230	180	200A services

• Small-conductor breaker caps — 240.4(D)

COPPER SIZE	MAX OCPD
14 AWG	15A
12 AWG	20A
10 AWG	30A

• Before you trust the table

Ampacity is the raw table value. Real jobs almost always need adjustment for:

- Ambient temperature correction
- Bundling / conductor-count derating
- Terminal temperature rating (60°C/75°C equipment)

Note: Verify against the currently adopted NEC edition + AHJ amendments. Derating and termination temperature limits may require upsizing beyond the table value.

Voltage Drop

The formula every electrician half-remembers, the 3% rule of thumb, and the run lengths that actually stay under it.

$$VD = 2 \cdot K \cdot I \cdot L / CM$$

Single-phase, one-way distance L (ft).

K = 12.9 copper · K = 21.2 aluminum

CM = circular mils of the conductor.

RULE OF THUMB: keep total VD ≤ 3% (branch circuits), ≤ 5% combined feeder + branch

- **Quick-pick:** max one-way run to stay under 3% VD

COPPER AWG	CIRCULAR MILS	MAX ONE-WAY RUN @ 20A / 240V
12	6,530	~90 ft
10	10,380	~140 ft
8	16,510	~230 ft
6	26,240	~365 ft
4	41,740	~580 ft
2	66,360	~925 ft

Reading it: Longer run or higher amperage than the table shows for that gauge? Size up before you pull wire — not after the customer complains about dimming lights.

Skip the math on the next job

Free Voltage Drop Calculator — any gauge, length, phase & voltage

tradetemplateco.com/voltage-drop-calculator

Conduit Fill

The fill percentages from NEC Chapter 9, plus a ready EMT + THHN quick table so you're not doing division in the truck.

• Fill rule by conductor count

CONDUCTORS	MAX FILL
1 conductor	53%
2 conductors	31%
3 or more	40%

• EMT internal area (sq in)

TRADE SIZE	TOTAL AREA
1/2"	0.304
3/4"	0.533
1"	0.864
2"	3.356

• Quick table — THHN conductors per EMT trade size (40% fill, 3+ conductors)

EMT TRADE SIZE	#14	#12	#10	#8	#6	#4	#2
1/2"	12	9	5	3	2	1	1
3/4"	21	16	10	5	4	2	1
1"	35	25	16	9	6	4	2
1-1/4"	61	44	28	16	11	7	5
1-1/2"	83	61	38	22	16	9	7
2"	138	100	63	36	26	16	11

Mixed conductor sizes in one run?

Free Conduit Fill Calculator handles any combination instantly

tradetemplateco.com/conduit-fill-calculator

Box Fill

NEC 314.16(B) volume allowances per conductor size, plus the counting rules that trip people up on rough-in.

- **Volume allowance per conductor — 314.16(B)**

AWG	CU IN PER CONDUCTOR
14	2.00
12	2.25
10	2.50
8	3.00
6	5.00

- **What counts as a "conductor" — the rules that trip people up**

ITEM	COUNTS AS
Each current-carrying conductor entering the box (not spliced through)	1 each, its own size
Each device (receptacle, switch — per yoke/strap)	2 (largest conductor to that device)
All equipment grounding conductors combined	1 total (largest EGC in box)
All internal cable clamps combined	1 total (largest conductor in box)
Conductors that originate and terminate within the box (pigtails to a fixture)	not counted

Worked example: Duplex receptacle, 12/2 in / 12/2 out, one cable clamp — that's 4 current-carrying conductors + 2 for the device + 1 for grounds + 1 for the clamp = $8 \times 2.25 = 18.0$ cu in required box volume.

Multiple devices, mixed cable sizes?

Free Box Fill Calculator does the counting for you

tradetemplateco.com/box-fill-calculator

Everyday Code Quick-Hits

The dozen rules that come up on almost every residential job, in plain English.

- 01 Receptacle spacing** — no point along a wall more than 6 ft from an outlet; no wall space 2 ft or wider without one (the "6-ft / 12-ft" rule).
- 02 Kitchen counter receptacles** — no point along the counter more than 24 in from an outlet; countertops 12 in+ wide need one.
- 03 GFCI locations** — kitchens, baths, garages, outdoors, unfinished basements, crawl spaces, laundry areas, and within 6 ft of a sink or wet bar.
- 04 AFCI protection** — required on most 120V, 15/20A circuits feeding living areas — bedrooms, family rooms, dining rooms, closets, hallways.
- 05 Tamper-resistant receptacles** — required in dwelling units essentially everywhere, indoors and out, regardless of height.
- 06 Working space — 110.26** — 36 in deep clearance, 30 in wide (or width of equipment), 6.5 ft headroom in front of panels and electrical equipment.
- 07 Equipment grounding conductor sizing** — sized per Table 250.122 based on the circuit's overcurrent device rating — not the same as service grounding electrode conductor sizing.
- 08 Service disconnect** — must be readily accessible, at a readily accessible location, and clearly marked as the service disconnect.
- 09 Panel labeling** — every circuit legibly identified as to its clear, specific purpose — "misc" or "outlets" won't pass.
- 10 Ceiling fan boxes** — outlet boxes supporting a ceiling fan must be listed/fan-rated for the load — a standard pancake box is not sufficient.
- 11 Bathroom receptacle** — at least one within 3 ft of the outside edge of each basin, GFCI protected.
- 12 Smoke/CO wiring** — interconnected, hardwired with battery backup in most new work and on many alteration triggers.

Caveat: These are common baseline rules. The adopted code edition and local amendments always govern — confirm specifics with your AHJ before you bid or build.

Get Paid Faster

The paperwork habits that separate contractors who chase invoices from contractors who don't.



Itemized invoice with a due date, deposit line, and late-fee clause

Vague invoices get vague payment timelines. Spell out labor, materials, due date, and what happens if it's late — before the job, not after.



Deposit collected before you buy material

Never float a customer's material cost on your own card. A deposit up front protects your cash flow and filters out non-serious leads.



Every change order in writing, signed, before work continues

"We'll figure out the price later" is how scope creep eats your margin. A one-line change order with a price stops the bleeding.



Scope of work documented before you start

A clear, written scope is the single best defense against disputes — and the fastest way to get paid without a back-and-forth.

Stop rebuilding these from scratch

Free contractor invoice template + scope-of-work generator

tradetemplateco.com/invoice-template

THE FULL TOOLKIT

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