

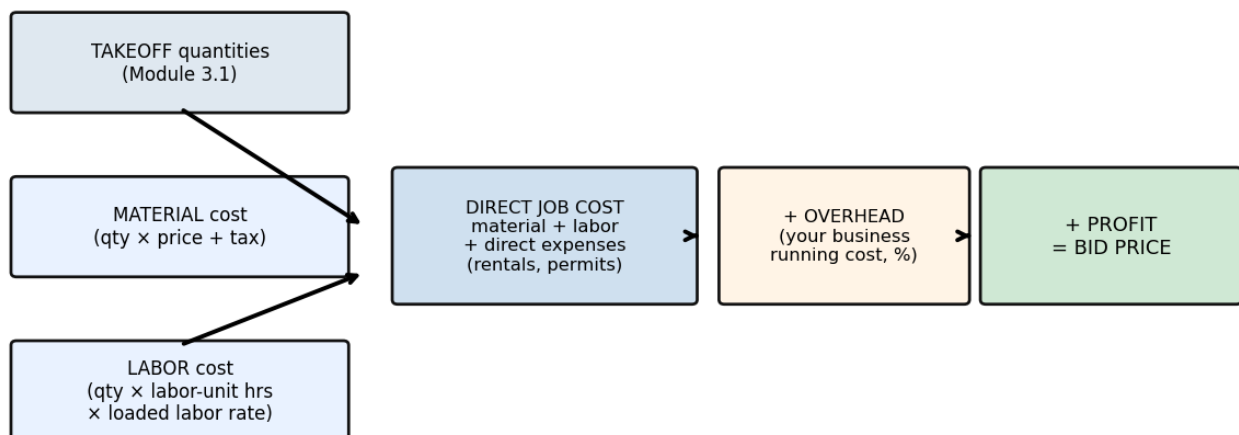
Module 3.2 — Labor Units, Pricing & Bid Assembly

From quantities to a price. Where labor units come from, the burdened labor rate, overhead, margin and markup, and a small bid priced line by line.

Why this module. The takeoff (Module 3.1) gave you quantities. This module turns those quantities into a price. The order never changes: material + labor + direct job expenses = direct cost, then overhead, then profit. Labor is the number that varies most between estimators, and overhead is the number most often guessed. Electrical contractors generally put 33 to 50 percent of a project's total budget into labor (ELECTRI International). This module shows where labor units come from and what they include, how to pick the right column and factors, how to build a burdened labor rate from real Birmingham wage data, and how overhead, margin and markup work with real numbers. It ends with a small tenant-improvement bid priced line by line to \$21,149.

Part A — The Bid Assembly

FROM TAKEOFF TO BID PRICE



Material + Labor + Direct Expenses = Direct Cost. Direct Cost + Overhead = Break-even. Break-even + Profit = your BID.

Material + labor + direct expenses = direct cost. Add overhead to reach break-even, then add profit to get your bid.

The cost stack, in the order an estimator builds it

1. **Adjust takeoff quantities to what you can buy.** Round 97 ft of conduit up to 100 ft, because you cannot buy part of a stick (Esticom).

2. **Send the bill of materials (BOM) out for firm quotes.** At a minimum, get quotes on lighting fixtures and switchgear. Send the fixture counts first because those quotes take the longest.
3. **Extend labor:** quantity $\times$ labor unit = hours for each line (Part B).
4. **Apply labor factors** for job conditions such as height, occupied space and overtime (Part B).
5. **Price labor:** adjusted hours $\times$ burdened labor rate = labor cost (Part C).
6. **Add lost time** only for risks specific to this job.
7. **Extend material** at quoted prices and add sales tax (Part E).
8. **Add direct job expenses** (DJE): permit, storage, dumpsters, temporary power, lifts. These belong to this job only and are different from company overhead (Part F).
9. **Sum to direct cost.** Then add overhead, then profit (Part D).

The bid summary (recap) layout

A bid summary, also called the recap, is the one page that rolls every number up to the price. The McCormick estimating manual carries material, labor, quotes, subcontracts, direct job expenses, equipment rental, tax, overhead and profit on it. Use this layout:

Line	Where the number comes from
Material (commodity)	Supply-house quote on the BOM
Quotes: lighting package, gear	Manufacturer's rep or distributor quotes (firm, not budget)
Sales tax	Local rate $\times$ taxable material
Escalation allowance	Copper and aluminum lines only
Labor hours (raw)	Sum of quantity $\times$ unit
Labor factors	Height, occupied space, overtime, and so on
Adjusted hours $\times$ burdened rate	Labor dollars
Subcontracts	Fire alarm, low voltage, trenching, core drilling
Direct job expenses	Permit, lift, temp power, dumpster, consumables, parking
Direct cost	Subtotal of the lines above
Overhead	Company overhead rate (Part D)
Break-even	Direct cost + overhead
Profit	Chosen margin
Bonds and special insurance	Premium on the final price
Bid price	

What published unit prices leave out

The Craftsman National Electrical Estimator lists costs its tables do not include. You add each one separately: electrical permits, special hoisting, freight the supplier does not absorb, utility company charges, special insurance and bonds, power equipment other than small tools, mobilization to remote sites, demobilization, nonproductive labor, nonworking supervisors, delivery, sales tax, and temporary power "when it's furnished at your expense." Craftsman's rule: "If these costs are significant and can be determined, add them to your estimate. If not, you should exclude them and specify clearly that they're not a part of your bid."

Part B — Labor Units (the heart of the estimate)

A **labor unit** is the labor-hours it takes to install one unit of material. The three units of measure used in NECA's sample pages and most estimating software are:

- **E** = each (boxes, devices, fixtures, fittings).
- **C** = per 100 (feet of conduit, or 100 items).
- **M** = per 1,000 feet (wire).

Craftsman writes its units as crew and hours, for example "L2@.250": a crew of two electricians, 0.25 labor-hours per unit. Units are in hundredths of an hour, not minutes. To see how many units one electrician installs in an 8-hour day, divide 8 by the unit: "8 divided by .250 equals 32 units per day."

What a NECA labor unit includes

NECA publishes the Manual of Labor Units (MLU). In NECA's words, its units "include normal material handling, drawing study, measurement and layout, material installation, and normal non-productive labor." Each item has three columns:

Column	NECA definition
Normal	"When all of the conditions associated with the installation of an item will permit the maximum productivity of the electricians on a project."
Difficult	"One or more of the conditions ... will permit less than maximum productivity."
Very Difficult	"One or more of the conditions ... will permit substantially less than maximum productivity."

Each column is about 25 percent more labor than the one before it (Kiper, EC&M). NECA's own sample page shows it: 1/2" EMT is 4.50, 5.60 and 6.70 hours per 100 ft. You may also pick a value between the columns, below Normal, or above Very Difficult.

Step by step: picking the column with the NECA score sheet

1. Get NECA's Labor Factor Score Sheet. It lists about 35 job conditions.

2. Score each condition from 1 (normal) to 5 (worst). Conditions include working height (10 ft or less, 10 to 20 ft, over 20 ft), new work vs. remodel vs. occupied, hours and shifts, crew density, schedule compression, clean-room rules, conduit type, escorted access, how complete the drawings are, when change orders arrive, coordination with other crafts, number of electrical contractors on site, and labor availability.
3. Add the scores. **36 to 75 = Normal. 76 to 134 = Difficult. 135 to 175 = Very Difficult.**
4. Write the total and the column on the bid summary so the next person can see why you picked it.
5. Use that one column for the whole job. Apply line-specific factors (below) on top.

Representative labor units from public samples

Item	Unit	Source	Notes
1/2" EMT	4.50 / 5.60 / 6.70 hr per C (Normal / Difficult / Very Difficult)	NECA sample p. 202	"Add 10% for colored conduit"
3/4" EMT	5.00 / 6.20 / 7.50 hr per C	NECA sample p. 202	
1-1/4" EMT	6.20 / 7.80 / 9.30 hr per C	NECA sample p. 202	
3/4" EMT set-screw connector	0.10 / 0.12 / 0.15 hr E	NECA sample p. 202	
3/4" EMT set-screw coupling	0.06 / 0.07 hr E (Normal / Difficult)	NECA sample p. 202	
1/2" EMT	3.25 slab or trapeze, 3.50 concealed, 3.75 exposed, hr per 100 ft	Craftsman NEE p. 17	Includes typical bending, layout, handling, waste; assumes 50-ft runs
4" x 4" square box	18.00 hr per C (0.18 hr each)	Mike Holt newsletter (NECA-based)	Box only; 1-gang ring 4.50 per C
Duplex receptacle, 20 A 125 V	19.00 hr per C (0.19 hr each)	Mike Holt newsletter	Device only; plate 2.50 per C
2x4 lay-in fixture (2-lamp fluorescent)	0.75 hr each	Mike Holt newsletter	No public LED troffer unit found; used here as a stand-in
#12 THHN copper	4.25 hr per M	Mike Holt newsletter	Per 1,000 ft of single conductor pulled
Panelboard, 100-225 A MLO, 3-phase 4-wire	9.6 hr (12 circuits or fewer); 16.0 (13-20); 17.6 (21-24)	NAVFAC P-405 Table 4-145	Seabee crew rate at 67% efficiency
Test receptacle, switch or fixture	0.08 hr each	NAVFAC P-405 Table 4-144	

Use one labor source per estimate. The same 100 ft of 1/2" EMT is 2.25 hours in an older NECA-based Holt table, 3.50 hours in Craftsman (concealed), 4.50 hours in the 2021 NECA Normal column, and 7.2 hours in NAVFAC P-405 (0.072 hr per ft). The sources disagree because they include different things: fittings, bending, layout, and the efficiency they assume. Taking the lowest unit from each book builds a bid nobody can install for that price. Pick one source, then calibrate it to your own job-cost history (Module 3.3). Mike Holt reports that more than 1,000 master electricians who estimated the same meeting room ranged "from a low of 40 hours to over 200 hours," against 82.84 hours by NECA units.

Adjusting factors with sourced percentages

Standard units assume good conditions. Craftsman defines good conditions as normal hours, work at 12 ft or less, 50 to 85 °F, 8 hours a day for 5 days, and materials and temporary power on site. When the job is worse, adjust:

Condition	Adjustment	Source
Height, conduit	Tables assume ladders or lifts to 12 ft; at 18 ft add 15% to conduit labor	Craftsman NEE p. 16
Height, fixtures	A fixture at 20 ft = 1.25 × the 10-ft labor, "according to NECA"	Esticom
High-time pay	Some labor agreements pay 1.5× for 20–50 ft and 2× above 50 ft; check the agreement	Craftsman NEE p. 16
Mostly exposed conduit	Add about 20%	Craftsman NEE p. 16
Parallel feeders on one trapeze	Reduce up to 40%	Craftsman NEE p. 16
Conditions minor-bad / very poor	Multiply labor by 1.10 / 1.50 or more	Craftsman NEE p. 6
Stacking of trades	10 / 20 / 30% (minor / average / severe)	MCAA factor 1
Crew size inefficiency	10 / 20 / 30%	MCAA factor 4
Beneficial occupancy (owner in the building)	15 / 25 / 40%	MCAA factor 9
Site access	5 / 12 / 30%	MCAA factor 11
Overtime	10 / 15 / 20%	MCAA factor 15
Season and weather	10 / 20 / 30%	MCAA factor 16
Explosion-proof work	3.0 ×	NAVFAC P-405 Table 4-145, note 1

- MCAA wrote its factor list for change orders and lost productivity (Module 3.3), but the same list works as a bid-day checklist of job conditions.

- Factors stack. Kiper: "Labor factor percentage adjustments are cumulative." With every factor applied, 2" rigid conduit ranged from 6.60 to 28.31 hours per 100 ft in his example.
- **Overtime, measured.** In the ELECTRI International study, crews on 5 days × 10 hours ran at 0.95 of normal productivity in week 2, 0.84 in week 4, 0.76 in week 6, and about 0.71 in weeks 9 to 11. A 6 × 10 project fell to 77 percent by week 16 and 55 percent at the end. The study still found overtime "more efficient than overmanning."
- **Crew size.** Price the smallest crew that can do the work, usually one journeyman. Feeder pulls and gear setting are the exceptions (Craftsman).
- **Converting Seabee units.** NAVFAC P-405 units assume a 67 percent efficient crew. Rate the job's production elements, average them, and divide 0.67 by that average to get a delay factor (DF). The handbook example: an 87 percent job gives $DF = 0.77$, so 6 labor-hours becomes 4.6.

Step by step: hours from the takeoff

1. Group takeoff lines by system (lighting, branch power, feeders, gear, fire alarm). This lets you price alternates and track job cost later.
2. Pick one labor source and one column (score sheet) for the whole job.
3. Extend each line: hours = quantity × unit. Convert C and M units first: 300 ft × 5.00 per 100 ft = 15.0 hours.
4. Apply line-specific factors (height, exposed, parallel runs) on the takeoff lines. Apply job-wide factors (occupied space, overtime, stacking) once, on the recap (Kiper).
5. Handle non-productive time on purpose. NECA units already include "normal non-productive labor." Craftsman units do not include nonworking supervisors. If the job has a nonworking foreman, add those hours as their own line. Add lost time only for a risk specific to this job. No published industry percentage for non-productive time was found, so derive yours from your own time cards (Module 3.3).
6. Total the adjusted hours. Sanity-check them as crew-days ($\text{hours} \div 8 \div \text{crew size}$) against the general contractor's schedule.

Part C — Build the Loaded Labor Rate

LOADED LABOR RATE		SAMPLE BID SUMMARY	
Base hourly wage	\$30.00	Material	\$ 41,200
+ Payroll taxes (FICA, FUTA, SUTA)	\$4.20	Labor (820 hrs × \$46)	\$ 37,720
+ Workers comp & GL ins.	\$3.60	Subcontractors (fire alarm)	\$ 6,500
+ Benefits (health, retire, PTO)	\$5.50	Direct job expenses (lift, permits)	\$ 3,100
+ Small tools / truck / consumables	\$2.70	Subtotal (direct cost)	\$ 88,520
= LOADED COST per hour	\$46.00	Overhead @ 12%	\$ 10,622
		Profit @ 10%	\$ 9,914
		TOTAL BID	\$109,056

You bill the LOADED rate, not the wage.

Left: wage + burdens = loaded hourly cost. Right: how it rolls up into a bid.

The **loaded (burdened) labor rate** is the base wage plus every cost the company pays because that person works: payroll taxes, insurance, benefits, paid leave and small tools. Labor priced at the bare wage loses money on every hour sold.

Local wage data (BLS, May 2025, Birmingham-Hoover metro area)

Occupation	10th pct	25th pct	Median	Mean	75th pct	90th pct
Electricians (2,780 employed)	\$18.69	\$22.84	\$27.23	\$27.62	\$30.69	\$37.77
Helpers, electricians	—	—	\$17.73	\$18.67	—	—
First-line supervisors, construction	—	—	\$34.27	\$36.43	—	—

For comparison, Alabama electricians have a median of \$26.78 and a mean of \$27.65 an hour. U.S. electricians have a median of \$30.38 and a mean of \$34.37. On federally funded work, a Davis-Bacon wage determination sets the minimum wage and fringe for each classification (dol.gov), so check the bid documents for one.

Burden items and their 2026 rates

Item	Rate	Source
Social Security, employer share	6.2% of wages up to \$184,500 (2026)	SSA
Medicare, employer share	1.45%, no cap	SSA
FUTA (federal unemployment)	6.0% on the first \$7,000, 0.6% net after the 5.4% state credit = \$42 per employee per year at most	IRS Topic 759
Alabama SUTA, new employer	2.70% on the first \$8,000 per employee = \$216 per year	Alabama Dept. of Labor
Alabama SUTA, experience-rated	0.20% to 6.80% (includes 0.06% ESA), by schedule	Workforce Alabama
Workers' comp	NCCI class 5190, "Electrical Wiring — Within Buildings & Drivers." Rate = loss cost × carrier multiplier × experience mod	Use the rate on the company's policy declarations page. Alabama loss costs change March 1 each year
General liability	Rated by the carrier on payroll or sales	Use the rate on the company's policy
Benefits benchmark	Construction, Q1 2026: wages \$35.54/hr, benefits \$15.69/hr (paid leave \$2.61, supplemental pay \$2.48, insurance \$3.87, retirement \$2.37, legally required \$4.36)	BLS Employer Costs for Employee Compensation

The BLS benchmark means the average construction employer pays benefits equal to 44 percent of wages ($15.69 \div 35.54$). Craftsman's 2023 example goes from a \$32.89 base to \$43.09 an hour, 31 percent over base.

Step by step: building the rate

1. Start with the base hourly wage for each classification (journeyman, helper, foreman).
2. Add FICA at 7.65 percent of wage ($6.2 + 1.45$).
3. Spread FUTA and SUTA dollars over hours actually worked. Both caps are reached early in the year, so a percentage of every paycheck overstates them. Example: $\$216 \text{ SUTA} \div 1,992 \text{ hours worked} = \0.11 an hour .
4. Add workers' comp and general liability at the rates on the company's policies. Ask the office for the current declarations pages and experience mod. Do not copy a rate from a website; published Alabama class 5190 figures disagree with each other.
5. Add the employer share of health insurance, divided by hours worked.
6. Add paid leave: $\text{paid hours off} \div \text{hours worked} \times \text{wage}$. Divide by hours worked, not by 2,080.
7. Add the retirement match and a small-tools allowance.

8. Decide whether truck cost goes in the labor rate or in overhead. Pick one and stay consistent, or it gets counted twice or not at all.
9. Rebuild the rate every January when tax bases change, and whenever a policy renews.

Worked example 1: a 2026 burdened rate (BLS medians; illustrative benefits of \$500 a month health, 11 paid days = 88 hours, 3 percent retirement match, 1,992 hours worked a year).

Item	Journeyman	Helper
Base wage (BLS median)	\$27.23	\$17.73
FICA 7.65%	2.08	1.36
FUTA \$42 ÷ 1,992 hr	0.02	0.02
SUTA \$216 ÷ 1,992 hr	0.11	0.11
Health \$6,000 ÷ 1,992 hr	3.01	3.01
Paid leave 88 ÷ 1,992 × wage	1.20	0.78
Retirement 3%	0.82	0.53
Small tools and consumable tools	0.75	0.25
Subtotal before workers' comp and liability	\$35.22	\$23.79
Workers' comp + general liability	policy rate × wage	policy rate × wage

This lesson's worked bid uses an illustrative insurance allowance of \$1.50 an hour for the journeyman and \$0.98 for the helper. That gives \$36.72 (35 percent over base) and \$24.77, and a blended rate for a one-journeyman, one-helper crew of \$30.75 an hour. Replace the allowance with the real policy rates before you price a real job.

Part D — Overhead & Profit (don't confuse them)

- **Overhead** is the cost of being in business whether or not this job is won: office, office staff, company management time not charged to jobs, trucks not charged to jobs, insurance not already in the labor burden, software, phones, advertising, accounting and interest.
- **Profit** is what is left after direct cost and overhead are paid. It is added on purpose, as its own line.

Step by step: computing the company overhead rate

1. From the last 12 months' profit-and-loss statement, total every cost not charged to a job.
2. Overhead as a percent of sales = annual overhead ÷ annual revenue. Example: \$300,000 ÷ \$1,500,000 = **20 percent of sales**.
3. The same money as a markup on direct cost = overhead ÷ direct cost = \$300,000 ÷ \$1,200,000 = **25 percent of cost**. Both numbers describe the same overhead. Use the one that matches your pricing formula.

4. Compare with the range: Mike Holt says overhead runs "between 20 and 40 percent of an electrical contractor's total sales." Craftsman warns that "routinely adding 10 percent for overhead is poor estimating practice. Overhead should be based on each user's built-in costs." Craftsman also notes that "many contractors add an additional 10 to 15 percent for profit."
5. Recompute every year. When revenue falls, the same overhead dollars become a bigger percentage.

Margin vs. markup, with numbers

- **Markup** is a percent of cost: $\text{price} = \text{cost} \times (1 + \text{markup})$.
- **Margin** is a percent of price: $\text{price} = \text{cost} \div (1 - \text{margin})$.
- Convert: $\text{markup} = \text{margin} \div (1 - \text{margin})$. $\text{Margin} = \text{markup} \div (1 + \text{markup})$.

Target margin	Markup on cost needed
10%	11.1%
20%	25.0%
25%	33.3%
28%	38.9%
30%	42.9%

Worked example 2. Direct cost is \$10,000. A 20 percent markup gives \$12,000, which is only a 16.7 percent margin. To earn a 20 percent margin, the price is $\$10,000 \div 0.80 = \$12,500$.

Know break-even before you bid. Break-even price = direct cost $\div$ (1 – overhead as a percent of sales). With overhead at 20 percent of sales and a direct cost of \$15,227, break-even is $\$15,227 \div 0.80 = \$19,034$. Any price below that loses money even though the job is "won."

Part E — Material Pricing and Sales Tax

1. **Send the BOM to two or three electrical distributors.** Ask for job pricing, how long the price is good, and lead times. Contractors buy from electrical distributors, not big-box stores (Craftsman).
2. **Use a price database for commodity items.** Trade Service (TRA-SER, from Trimble) is a subscription database that feeds estimating software, with supplier pricing and price histories.
3. **Get lighting and gear quoted by the manufacturer's rep through a distributor.** Ask for a firm quote with catalog numbers that match the fixture schedule. A budget quote ("about \$X") is for design-phase pricing only and does not belong in a hard bid.
4. **Check waste.** Craftsman material costs "include normal waste. If waste of materials or breakage is expected to exceed 3 to 5 percent," include a separate allowance.

5. **Cover copper.** Craftsman: "copper wire prices have been known to jump 10 percent or more in one month," so add a qualification that lets you "pass on a pricing increase (or decrease), based upon the actual materials pricing at the time of purchase," or carry an escalation allowance on wire lines.

6. **Add sales tax on all taxable material, including quoted packages.**

Alabama sales tax on contractors. In Alabama the contractor is the consumer of building materials: "Contractors or builders must pay either to the seller or directly to the department sales or use tax on ... All building materials attached by them to real property" (Ala. Admin. Code r. 810-6-1-.46). "Wire, electric cable ... electrical fixtures" are listed as building materials (r. 810-6-1-.27). Government-entity contracts awarded on or after January 1, 2014 can be exempt if the contractor follows r. 810-6-3-.77; document the exemption in the bid file. The state rate is 4 percent. Birmingham's combined rate is reported as 10 percent (4 percent state, 2 percent Jefferson County, 4 percent city); confirm the current rate for the job address with the Alabama Department of Revenue before you bid.

Part F — Direct Job Expenses

Direct job expenses are costs this job causes that are neither material nor installed labor. Price each one per job:

- Permit and inspection fees.
- Lift rental plus delivery and pickup. Aerial lift use falls under OSHA 29 CFR 1926.453; budget training time if the crew is not trained.
- Temporary power, if it is in your scope.
- Dumpster, storage container, consumables, parking and travel.
- Subcontracts such as core drilling and trenching.
- Equipment rental beyond small tools.

Check the list against the Craftsman exclusions in Part A. Anything you cannot price, exclude in writing on the proposal.

Part G — Bonds, Unit Prices and Alternates

- **Alabama public works.** The contractor "shall execute a performance bond, with penalty equal to 100 percent of the amount of the contract price," plus a payment bond of "not less than 50 percent of the contract price." Bonds are not required on contracts under \$100,000 (Ala. Code § 39-1-1; the threshold was raised from \$50,000 by Act 2023-497).
- **Federal work.** The Miller Act requires performance and payment bonds on federal construction over \$150,000.
- **Premium.** Surety premiums typically range "from 1.5% to 3.0% of the contract amount" (Congressional Research Service). The SBA guarantee fee for small contractors is 0.6

percent of the contract price on final bonds. Add the premium to the final price, not to direct cost, because it is computed on the contract amount.

- **Unit prices.** Unit price = (material + adjusted labor + share of DJE) ÷ (1 – overhead % – profit %). Price adds and deducts separately.
- **Alternates.** Price each one as a small separate estimate using the same rate and factors. State whether it adds to or deducts from the base bid.

Part H — The Proposal

Use this checklist when writing the proposal that goes with the price:

1. Project name, bid date, drawing and specification revisions, and every addendum by number.
2. Scope, listed by system.
3. Exclusions, such as utility charges, fire alarm, low voltage, trenching and patching, after-hours work, bonds and temporary power. Craftsman: if a cost cannot be determined, "exclude [it] and specify clearly."
4. Clarifications: normal working hours, working height, number of mobilizations, owner-furnished equipment.
5. Schedule and supplier lead times.
6. How long the price is valid, and the copper escalation clause.
7. Payment terms, retainage and change-order terms.
8. An acceptance block for signature.

Company rule: no license numbers on proposals or any outbound document. Write "licensed electrical contractor."

Part I — Common Mistakes

Mistake	What it costs on the Part J job	Fix
Adding markup on cost when you meant margin	28% markup on \$15,227 = \$19,491. After overhead at 20% of sales (\$3,898), the job earns about \$365 (1.9%) instead of \$1,692 (8%)	$\text{Price} = \text{cost} \div (1 - \text{OH}\% - \text{profit}\%)$
Labor priced at raw wage, burden forgotten	125.1 hr $\times$ \$22.48 raw blended wage = \$2,812 vs. \$3,846 burdened: \$1,034 short, 27% of labor	Build the rate per Part C every January
Budget gear or lighting quote in a hard bid	The package price can change at release	Firm quote with catalog numbers and a validity date
No copper escalation language	Copper can move 10% or more in a month	Escalation clause or allowance on wire lines
Mixing labor sources line by line	1/2" EMT runs 2.25 to 7.2 hr per 100 ft across four sources	One source, calibrated to job-cost history
Pricing labor below the burdened rate to win	Every hour sold loses money	The burdened rate is the floor; compete on hours, not on rate

Part J — Worked Example: A Small Tenant Improvement, End to End

Scope: a vacant tenant suite with a 9-ft lay-in ceiling, normal working hours. 30 2 $\times$ 4 LED troffers; 40 duplex receptacles on 4" square boxes plus 10 more 4" square boxes as lighting junction boxes; 300 ft of 3/4" EMT branch conduit; one 100 A, 24-circuit, 208Y/120 V 3-phase main-lug panel; a feeder 60 ft from the building switchboard.

Step 1: size the feeder (NEC 2026)

- 215.4(A)** (215.2(A) in 2023): feeder ampacity not less than the noncontinuous load "plus 125 percent of the continuous load," and the feeder "shall comply with 110.14(C)."
- 110.14(C)(1)(a):** terminations on circuits "rated 100 amperes or less" use 60 °C conductors, or higher-rated conductors at "the 60°C (140°F) ampacity," unless "the equipment is listed and identified for use with such conductors." Most 100 A breakers and panels are marked 60/75 °C; confirm it on the label.
- Table 310.16:** 3 AWG copper is 100 A at 75 °C and 85 A at 60 °C. With 75 °C terminations, use four #3 THHN copper. With 60 °C-only terminations, use #1 copper (110 A at 60 °C).
- Table 250.122:** a 100 A overcurrent device needs an 8 AWG copper equipment grounding conductor.

5. **408.36:** the panel must be protected by an overcurrent device "having a rating not greater than that of the panelboard." A 100 A breaker in the switchboard does that.
6. **Conduit fill (Chapter 9 Tables 4 and 5):** #3 THHN = 0.0973 in², #8 THHN = 0.0366 in².
 $4 \times 0.0973 + 0.0366 = 0.4258$ in². EMT at 40 percent fill: 1" = 0.346 in² (too small), 1-1/4" = 0.598 in² (passes). Use **1-1/4" EMT**.
7. **358.30(A):** fasten EMT within 3 ft of each box and at least every 10 ft. That support work is already inside the EMT labor unit.

Step 2: extend the labor

EMT and fittings use the NECA sample Normal column. Boxes, devices, plates, troffers and #12 wire use the Mike Holt NECA-based units. The panel and testing use NAVFAC P-405, converted with $DF = 0.67 \div 0.85 = 0.79$. Four lines have no public published unit; they are marked as illustrative allowances, and a real bid would take them from the company's own labor manual.

Line	Qty	Unit (hr)	Hours	Unit source
2×4 LED troffer (lay-in stand-in)	30	0.75	22.50	Holt
Fixture whip and connect	30	0.20	6.00	Illustrative allowance
4" square box	50	0.18	9.00	Holt
1-gang ring	40	0.045	1.80	Holt
4" square blank cover	10	0.06	0.60	Holt
Duplex 20 A	40	0.19	7.60	Holt
Plate, 1-gang	40	0.025	1.00	Holt
3/4" EMT	300 ft	5.00 per C	15.00	NECA p. 202
3/4" connector	60	0.10	6.00	NECA p. 202
3/4" coupling	30	0.06	1.80	NECA p. 202
#12 THHN (300 ft × 5 conductors + 10% makeup)	1,650 ft	4.25 per M	7.01	Holt
1-1/4" EMT feeder	60 ft	6.20 per C	3.72	NECA p. 202
1-1/4" connectors / couplings	2 / 6	0.16 / 0.08	0.80	NECA p. 202
#3 THHN (4 × 70 ft)	280 ft	3.0 per C	8.40	Illustrative allowance
#8 THHN	70 ft	1.4 per C	0.98	Illustrative allowance
100 A 24-circuit panel	1	17.6 × 0.79	13.90	P-405 Table 4-145
100 A 3-pole feeder breaker in switchboard	1	2.00	2.00	Illustrative allowance
Test and label	70	0.08	5.60	P-405 Table 4-144
Raw hours			113.7	
× 1.10 condition factor (minor-bad, Craftsman)			125.1	

Crew check: 125 hours ÷ (2 people × 8 hours) = 7.8 crew-days, about 1.5 weeks for a two-person crew. Compare that with the general contractor's schedule before you go further.

Step 3: price it

Material prices below are **illustrative**, used only to show the arithmetic. A real bid uses real quotes.

Line	Amount
Labor: 125.1 hr × \$30.75 blended (illustrative rate, Part C)	\$3,846
Commodity material (illustrative)	\$2,600
Lighting package quote (illustrative)	\$4,500
Panel and breakers quote (illustrative)	\$2,400
Extra waste, 3% on commodity	\$78
Sales tax 10% (Birmingham) on \$9,578 of material	\$958
Copper escalation allowance, 5% on commodity (illustrative)	\$130
DJE: permit \$450 (illustrative), consumables 3% of labor \$115, parking \$150	\$715
Direct cost	\$15,227
Break-even at 20% overhead (of sales): $\$15,227 \div 0.80$	\$19,034
Price at 20% overhead + 8% profit margin: $\\$15,227 \div 0.72$	\$21,149 (overhead \$4,230, profit \$1,692)

Worked example 3: what a 5-point overhead error does. Suppose the estimator assumed overhead was 15 percent of sales when it is really 20 percent. Price at 15 + 8 percent: $\$15,227 \div 0.77 = \$19,775$. Real overhead at 20 percent of that price is \$3,955. Profit left: $\$19,775 - \$15,227 - \$3,955 = \593 , which is 3.0 percent instead of 8.

Bid review checklist

1. All addenda acknowledged by number.
2. Specs read for minimum conduit size, spare stub-ups (one example spec: "one 3/4" conduit run for each three spare circuit breakers") and rules on where rigid steel changes to EMT.
3. Fixture schedule count equals the fixture takeoff count.
4. Lighting and gear on firm quotes, with scope matched to the schedule.
5. Labor column and factors written down with reasons.
6. Burdened rate current for 2026 tax bases and the current workers' comp rate and mod from the policy.
7. Sales tax on all taxable material, including quoted packages; any exemption documented.
8. Copper escalation clause or allowance present.
9. Direct job expenses checked against the Part A exclusions list.
10. Overhead and profit applied as margin, not stacked markups.
11. Bond premium included if the bid form requires bonds.
12. Alternates and unit prices filled in on the bid form.
13. A second person checks the extensions and compares \$/sq ft with past jobs.

NEC 2026 Checkpoints (2023 number in parentheses where it moved)

- **215.4(A)** (215.2(A) in 2023) feeder ampacity: noncontinuous load + 125% of continuous load, and comply with 110.14(C).
- **110.14(C)(1)(a)** terminations on circuits 100 A or less: 60 °C ampacity unless the equipment is listed for higher.
- **Table 310.16** ampacities • **Table 250.122** EGC size (100 A = 8 AWG Cu) • **408.36** panelboard overcurrent protection.
- **Chapter 9 Tables 4 and 5** conduit fill • **358.30(A)** EMT fastened within 3 ft of boxes and every 10 ft.

Hands-On Field Exercise

- Take your Module 3.1 takeoff. Score the job on the NECA Labor Factor Score Sheet, pick the column, and extend the hours from one labor source.
- Build a burdened rate for a journeyman and a helper using the steps in Part C and the company's real policy rates.
- Redo the Part J bid three ways: with the company's real rates, with the Difficult column ($\times 1.25$), and on a 6-week, 5×10 schedule (ELECTRI factor 0.76 in week 6). Write down how each change moves the price.
- Assemble a full bid summary: material, labor, subs, direct expenses, overhead, profit and bid price.
- Compute break-even, then show how a 5-point overhead error changes whether the job makes money.
- Write a one-page proposal for the Part J job using the Part H checklist, with exclusions and an escalation clause.

Sources used in this module (public documents)

- NECA, Manual of Labor Units product page, 2021-2022 MLU sample page 202, and Labor Factor Score Sheet: necanet.org
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- Mike Holt, Estimating Newsletter #13, and Illustrated Guide to Electrical Estimating, ch. 1 sample: mikeholt.com
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- MCAA, Change Orders, Productivity, Overtime: A Primer (2016): mcaa.org
- Hanna, Impact of Overtime on Electrical Labor Productivity, ELECTRI International (2011): electri.org
- Esticom, Inside Real-World Electrical Estimating: esticom.com. McCormick Systems, Standard Training Manual.
- BLS Occupational Employment and Wage Statistics, May 2025, and Employer Costs for Employee Compensation: bls.gov
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- Alabama Department of Labor: adol.alabama.gov. Workforce Alabama: workforce.alabama.gov
- Alabama Administrative Code r. 810-6-1-.46 and .27: admincode.legislature.state.al.us. Alabama Department of Revenue: revenue.alabama.gov
- Ala. Code § 39-1-1: law.justia.com. Alabama DCM memo on Act 2023-497: dcm.alabama.gov
- Congressional Research Service R42037, SBA Surety Bond Guarantee Program: congress.gov
- Trimble TRA-SER: trimble.com. DOL Davis-Bacon: dol.gov. OSHA 29 CFR 1926.453: osha.gov
- NFPA 70, National Electrical Code 2026 (free read-only access at nfpa.org)

Next: Module 3.3 — Productivity, Change Orders & Winning Work.