

Module 3.3 — Productivity, Change Orders & Winning Work

Protecting the price that was bid: productivity factors, the overtime trap, change orders from notice to payment, job costing, pay applications and closeout.

Why this module. An estimate assumes normal conditions. Real jobs have overtime, crowding, weather, occupied buildings and a steady stream of changes, and each one uses up labor hours that were already sold at a fixed price. This module shows how the industry measures those losses (MCAA and ELECTRI International), how overtime eats productivity week by week, how to handle a change order from the day you spot it to the day it is paid, and how to keep the daily records that get the company paid. It walks step by step through a priced 40-hour change order, a weekly labor report, a pay application, Alabama payment and lien deadlines, and closeout.

Part A — The Factors That Eat Your Labor

The Mechanical Contractors Association of America (MCAA) publishes a list of 16 "Factors Affecting Labor Productivity." The list has been unchanged since 1971, and in May 2020 NECA endorsed the MCAA primer "as being applicable to the electrical trade." Each factor has a loss percentage at three levels of intensity:

FACTORS THAT KILL PRODUCTIVITY (MCAA-style)

- Overtime / fatigue
- Stacking of trades (crowding)
- Out-of-sequence work
- Frequent rework / changes
- Poor site access / logistics
- Weather / temperature
- Crew size changes / dilution
- Morale / turnover

*Each can add 10-30%+ to labor hours.
Price them when conditions are bad.*

PRICING A CHANGE ORDER

Added material	\$ 640
Added labor (hrs × loaded rate)	\$ 920
Productivity impact on EXISTING work	\$ 300
Subtotal	\$ 1,860
Overhead + profit (22%)	\$ 409
CHANGE ORDER TOTAL	\$ 2,269

Get it in WRITING and approved BEFORE you do the work.

Left: the conditions that add hours. Right: a change order priced right — material, labor, AND impact on existing work, plus markup.

#	Factor	Minor	Average	Severe	What it means
1	Stacking of trades	10%	20%	30%	Trades crowded into limited space; the best crew size can't be used
2	Morale and attitude	5%	15%	30%	Hazards, overtime, over-inspection, many changes
3	Reassignment of manpower	5%	10%	15%	Crews moved off and back on because of changes or expediting
4	Crew size inefficiency	10%	20%	30%	Added workers break up the team; hurts the base work too
5	Concurrent operations	5%	15%	25%	Stacking your own crews
6	Dilution of supervision	10%	15%	25%	Foreman pulled off to plan, order and re-sequence for the change
7	Learning curve	5%	15%	30%	Getting oriented to changed work; crew turnover
8	Errors and omissions	1%	3%	6%	Work done on a crash basis or out of sequence
9	Beneficial occupancy	15%	25%	40%	Owner's people or production nearby; badging, noise and dust rules
10	Joint occupancy	5%	12%	20%	Other trades in the area that the bid did not expect
11	Site access	5%	12%	30%	Poor access, poor man-lift management
12	Logistics	10%	25%	50%	Owner-furnished material, rehandling, no control of material flow
13	Fatigue	8%	10%	12%	Unusual physical exertion; carries into base work
14	Ripple	10%	15%	20%	Other trades' changes alter your schedule
15	Overtime	10%	15%	20%	Fatigue and attitude
16	Season and weather	10%	20%	30%	Very hot or very cold

Step by step: applying the MCAA factors

1. **Write the facts first:** the condition, the area, the dates, and who saw it. MCAA says to rely on the foremen's "contemporaneously written records," meaning notes written at the time, not reconstructed later.
2. **Pick only the factors that apply,** at an intensity you can defend with those records.
3. **Remove overlaps.** Stacking, overtime, fatigue and reassignment already include a morale loss, so do not add factor 2 on top of them.

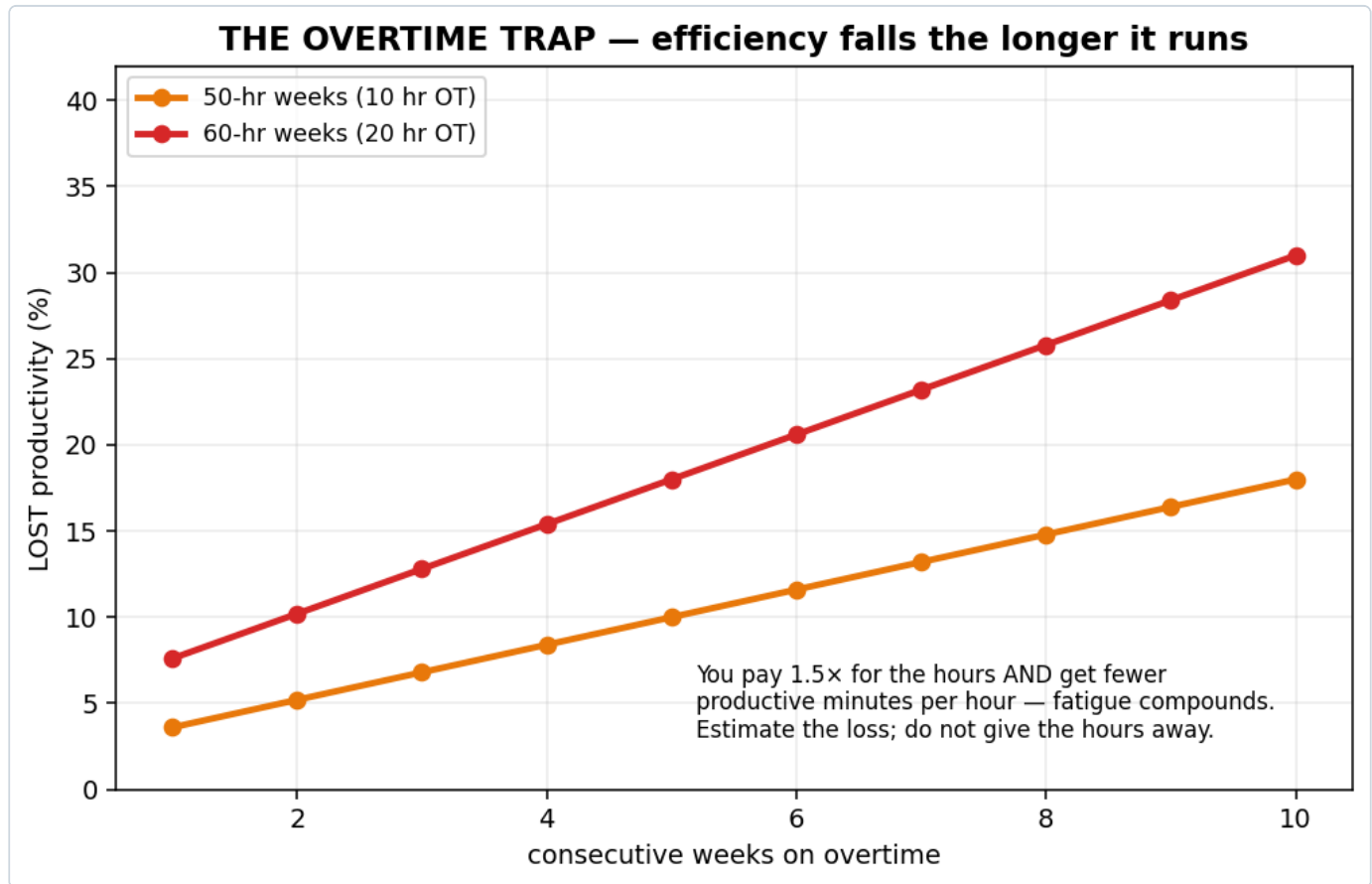
4. **Add the percentages and multiply by the estimated change hours.** MCAA's example: 2,000 hours $\times$ (10% + 10% + 5%) = 500 hours, for 2,500 total.
5. **Price the slowdown of base work as its own line,** on the base hours the change affects. MCAA's Labor Summary Sheet has separate columns for "affected MHRS of current contract" and "manhours of proposed change."
6. **After the fact, divide instead of multiplying.** If 17,700 hours were actually spent and the agreed factor is 30 percent, the hours that should have been spent are $17,700 \div 1.30 = 13,615$, so 4,085 hours were lost to inefficiency.

ELECTRI International (NECA's research foundation) has studied the same problem for electrical work: shift work, overmanning, owner-furnished items, beneficial occupancy, stacking of trades and cumulative impacts. ELECTRI puts labor at 33 to 50 percent of an electrical contractor's project budget, which is why a 10 percent loss on labor can erase the profit on a job.

Field practices that protect productivity

1. **Three-week look-ahead.** ELECTRI's look-ahead model has four steps: a multi-week plan built from field work packages; a weekly plan holding only the packages "made fully ready and committed to by the foreman"; a daily plan with clear assignments that also serves as the record; and tracking of every missed commitment to find its root cause. In field terms: week 1 is committed work, week 2 is make-ready (material on hand, RFI answers back, the prior trade finished, lift and inspection booked), and week 3 is the heads-up for long-lead items.
2. **Daily huddle.** Before tools come out, each worker gets an assignment and a cost code (ELECTRI step 3).
3. **Prefab and kitting.** NECA 5-2022 is the recommended practice for prefabrication of electrical installations. Common shop items are fixture whips, pre-wired boxes, conduit racks and temporary-power skids. Put prefab on its own cost code so its savings can be measured. One contractor's vice president reported "15 percent or better labor savings" on shop assemblies (Electrical Contractor magazine). Plan it carefully: in one EC&M case, cable spools wound for capacity instead of pull order had to be re-spoiled in the laydown yard.
4. **Laydown and material flow.** Stage material in the work zone a shift before the crew needs it. MCAA lists changed laydown areas, moved tool lockers and unplanned protection of finished work as losses that can be priced.
5. **Lift planning.** Book shared lifts on the general contractor's schedule a week ahead. Factor 11 names "poor man-lift management." Lift operation must follow OSHA 29 CFR 1926.453.
6. **Avoid trade stacking.** Raise schedule collisions at the coordination meeting and in writing. If stacking happens anyway, it is factor 1 (10, 20 or 30 percent), and the written record supports the claim.
7. **Size crews from required progress.** MCAA compares the "required crew size at the planned rate" with the size "at the actual rate." Planned overtime is more efficient than overmanning (ELECTRI), but only for a short time (Part B).

Part B — The Overtime Trap



Sustained overtime loses efficiency the longer it runs — by week 6 of 60-hour weeks you can lose 20%+ of each hour.

Scheduled overtime costs twice: the crew is paid 1.5 times the wage for hours over 40, and the crew produces less per hour as fatigue builds week after week. MCAA averaged the overtime studies of the Business Roundtable, NECA, H.R. Thomas and the U.S. Army Corps of Engineers into a Productivity Index (PI). A PI of 1.00 is normal output. Loss = 1.00 – PI.

Consecutive OT week	50 hr/wk	54-56 hr/wk	60 hr/wk	63 hr/wk	70-72 hr/wk	84 hr/wk
1	0.95	0.94	0.91	0.89	0.86	0.75
2	0.93	0.90	0.88	0.84	0.80	0.70
3	0.92	0.86	0.85	0.78	0.73	0.65
4	0.91	0.83	0.81	0.73	0.68	0.60
6	0.86	0.75	0.72	0.62	0.58	0.50
12	0.71	0.64	0.59	0.50	0.47	0.40

At week 6 of 60-hour weeks the PI is 0.72, a 28 percent loss on every hour worked that week.

Rules for using the table (MCAA)

- When pricing ahead of time, apply the loss percentage to **all** hours the overtime crew works that week, straight time and overtime.
- After the fact, use payroll to find who actually worked over 40 hours, and divide rather than multiply (Part A, step 6).
- The "overtime week" count starts over at week 1 once the crew goes back to 40-hour weeks.
- NECA's tables have Low, Average and High levels. High fits overtime imposed without notice.

For a whole project with scattered overtime, ELECTRI's study of 50 projects (averaging 37.5 to 58.1 hours a week) gives productivity factor = $-2.38 \times (\text{average hours per week}) + 196.4$, expressed in percent. The report's example: 51.65 hours a week gives 73.5 percent, so $43,666 \text{ hours} \times 0.265 = 11,571 \text{ hours lost}$. Do not use this formula above 58 hours a week or for a short burst. The same survey found that 18.9 percent of projects used extended overtime, 5×10 was the most common schedule (41 percent), and only 31.3 percent of contractors had an overtime policy.

Worked example 1: a 4-week, 60-hour acceleration

Six workers, 60 hours a week for 4 weeks, \$30.00 base wage and \$38.15 burdened rate (both **illustrative**; see Part C). That is 360 hours a week, 1,440 hours total, of which 480 are overtime hours.

Week	PI (60 hr)	Loss	Lost hours (360 × loss)
1	0.91	9%	32.4
2	0.88	12%	43.2
3	0.85	15%	54.0
4	0.81	19%	68.4
Total		13.75% average	198.0

- Overtime premium: $480 \text{ hours} \times \15.00 (the half in time-and-a-half) = \$7,200, plus payroll tax on it.
- Lost productivity: $198 \text{ hours} \times \$38.15 = \$7,554$.
- Total cost of the acceleration: about \$14,750 before overhead and profit. The crew is paid for 1,440 hours and produces about 1,242 hours of work.

Part C — Change Orders: Where Margin Is Won or Lost

A change order (CO) is a signed change to the contract's scope, price or time. Done right, it captures the new material and labor **and** the impact on work already planned: rework, out-of-sequence disruption and schedule loss.

What the standard contract says (AIA A201-2017, Article 7)

The AIA A201 General Conditions are used on many commercial jobs. The standard text:

Section	What it says
7.1.1	Three tools: Change Order, Construction Change Directive (CCD), and order for a minor change.
7.2.1	A CO is "signed by the Owner, Contractor, and Architect" and states the change, the price adjustment and the time adjustment. Get the days written in.
7.3.1- 7.3.2, 7.3.6	A CCD is signed by the owner and architect only, issued "prior to agreement on adjustment," "in the absence of total agreement." The contractor "shall promptly proceed" and states whether it agrees with the pricing method.
7.3.3	Pricing by itemized lump sum, unit prices, cost plus an agreed fee, or the 7.3.4 method.
7.3.4	With no agreement, the architect prices it on "reasonable expenditures and savings" plus overhead and profit "as set forth in the Agreement, or ... a reasonable amount." Allowed costs: labor with payroll taxes, fringes and workers' comp; materials with transportation; rented equipment (not hand tools); bond, insurance, permit and tax premiums; supervision "directly attributable to the change." The contractor keeps "an itemized accounting together with appropriate supporting data."
7.3.8, 7.3.9	On a mixed add and deduct, overhead and profit go on the net increase only. CCD work can be billed at the architect's interim figure.
7.4 (new in 2017)	If a "minor change" would affect price or time, "notify the Architect and shall not proceed." Proceeding without notice "waives any adjustment."
15.1.3.1, 1.6.2	Claims within 21 days after the event or after first recognizing it, whichever is later. Notice goes in writing by certified or registered mail or courier with proof of delivery.
3.7.4	Concealed conditions: notice before disturbing them and within 14 days.

Subcontracts (often AIA A401) pass these terms down to the electrical contractor, usually with shorter deadlines. Read the subcontract for its own day counts. ConsensusDocs 200, as summarized by MCAA, uses written notice within 14 days, documentation within 21 days after notice, and an owner answer within 14 days, with 50 percent of the estimated cost paid while an unpriced directed change is open.

Owners edit A201. A public school district's version caps the fee on self-performed change work at "not more than 10%," says the fee covers "impact on unchanged Work ... and delay and impact costs of any kind," excludes overtime premium unless approved first, and limits equipment to Blue Book rental rates. A university version says that missing written notice "shall result in the waiver of any and all claims." Read the general conditions and the subcontract before the job starts, so you know the fee cap, the notice clock and what impact costs are allowed.

Two rules for every change: (1) Price what the contract allows, and reserve rights in writing on the rest. That means added material, added labor, the productivity hit to existing work, and overhead and profit wherever the contract permits them, plus a written reservation of rights on any cost the contract bars. (2) Get it approved in writing **before** the work is done. Under A201 7.4, a minor change done without notice waives the price and time adjustment.

Step by step: the change-order process

1. **Recognize it.** Changes come as direct orders and as "constructive" changes: defective drawings, over-inspection, re-sequencing, unanswered RFIs and other trades' actions. MCAA: verbal direction "can sometimes be viewed as a change ... follow up in writing."
2. **Call the project manager before starting.** MCAA's field form: "get approval from your Project Manager before starting ANY" extra work. Know what the work is, who pays, who authorized it, how long it takes, what material it needs, and whether you will get a purchase order or a signed daily sheet.
3. **Send written notice within the contract clock** (A201: 21 days, 14 for concealed conditions; ConsensusDocs: 14; the subcontract is often shorter). Record the date found, who found it, a description, supporting documents, and the date and person notified.
4. **Open a separate cost code** for the change. If that is not possible, note the impact daily in the logs and on the time cards.
5. **Price it:** labor units, factors on the change hours and on the affected base hours, burdened rate, supervision, material with tax and freight, equipment, small tools, overhead and profit per the contract, bond, and the time impact. MCAA warns that not raising time and productivity at the time of the change "can result in a waiver."
6. **Submit the pending change order (PCO)** with backup, and log it.
7. **Get written approval before the work:** a signed CO, a CCD, or a work authorization. If directed to proceed before a price is agreed, track it as time and material (T&M).
8. **Fill out T&M tickets daily.** MCAA: "COMPLETE A SEPARATE DAILY WORK ORDER FOR (1) EACH JOB AND (2) EACH DAY." List everything, including truck stock, consumables, delivery trips and all equipment except hand tools. Foremen write hours, not dollar rates. If the ticket is not signed, write why (could not reach the rep, phone authorization, record only, disputed).
9. **Keep the CO log.** MCAA calls its Change Order Status Sheet "the key document in controlling change order activity." Columns: PCO number, date found, notice date, date submitted, dollars and days requested, status, CO number, approved dollars, pay application number.
10. **If it is denied,** give notice of intent to claim and follow the contract's disputes clause.

Worked example 2: a 40-hour change order, priced end to end

The change adds four 20 A circuits and 12 devices in a finished, occupied office wing. Lines marked (illus.) are **illustrative** company numbers; replace them with the real rates and costs.

Line	Basis	Amount
Base wage	\$30.00/hr (illus.)	
FICA	7.65% (IRS)	\$2.30
FUTA and SUTA	(illus.)	\$0.45
Workers' comp and general liability	policy rates (illus. allowance)	\$2.40
Fringes	(illus.)	\$3.00
Burdened rate	A201 7.3.4.1 allows these costs	\$38.15/hr
Change hours	From labor units (Module 3.2)	40.0 hr
Impact on change hours	MCAA #9 minor 15% + #6 minor 10% = 25%	10.0 hr
Impact on base work	MCAA #3 minor 5% × 120 affected base hours	6.0 hr
Labor	56.0 hr × \$38.15	\$2,136.40
Supervision	4 hr × \$45.00 (illus.); A201 7.3.4.5	\$180.00
Material	\$1,250 + 10% tax (illus.)	\$1,375.00
Lift, 1 day	(illus.)	\$250.00
Consumables	3% of labor (illus.)	\$64.09
Direct subtotal		\$4,005.49
Overhead 10% (illus.)		\$400.55
Profit 10% (illus.)	On cost + overhead	\$440.60
Bond 1.5% (illus.)		\$72.70
Total PCO	Plus 1 working day, or rights reserved on time	\$4,919.34

A quick price of "40 hours × \$30 + \$1,250 material" comes to \$2,450, which leaves out \$2,469 of real cost. If the contract is an owner-edited A201 like the school-district version above, drop the 16 impact hours, show one fee line at the cap, and reserve rights on the impact in writing.

Documentation that gets the company paid

- **Daily report:** date, weather, crew by name and cost code, hours, work by area, equipment, deliveries, inspections, delays and who caused them, and instructions received (who, what, when).
- **Dated photos** of conditions that slow the work, and of work before it is covered up.
- **MCAA's minimum change record:** daily reports, meeting minutes, letters and phone logs, payroll, equipment reports, invoices, photographs and impacted schedules.
- **RFI and submittal logs** with sent and answered dates. An incomplete RFI answer is one of MCAA's listed constructive changes.
- **Delay notice** per A201 15.1.6.1, with "an estimate of cost and of probable effect of delay." A weather claim must show conditions "abnormal for the period of time" (15.1.6.2).

Delay basics

A201 8.3.1 extends the contract time for acts of the owner or architect, ordered changes, labor disputes, fire, "unusual delay in deliveries," and documented abnormal weather. An **excusable** delay gives time only, which relieves the contractor of liquidated damages for those days. A **compensable** delay also pays extended general conditions. If the contractor and the owner each caused the same 30 days on their own, the result is 30 days excusable and non-compensable. Proving a compensable delay takes a critical-path (CPM) schedule analysis (MCAA).

Part D — Winning the Right Work

- **Bid work that fits the company's crews and strengths.** Being low bidder on a job priced below break-even (Module 3.2) loses money on every hour.
- **Check the bid spread.** ELECTRI threw out projects whose two low bids differed by more than 10 percent, because a spread that wide distorted the data. A spread over 10 percent on bid day is a reason to recheck scope.
- **Read the general conditions before bidding.** Fee caps, notice-waiver language, overtime-premium exclusions and "no impact" clauses change what the job is worth.
- **Relationships bring repeat commercial work.** General contractors and owners call back the contractor who shows up, works clean and prices honestly.
- **Follow up on every bid.** Ask why the bid won or lost, and use the answer on the next one.

Part E — Close the Loop: Job Costing

Job costing compares the hours and dollars estimated with the hours and dollars spent, by cost code, while the job is running and after it closes. It is how labor units get accurate. Three terms:

- **Earned hours** = budget hours × percent complete for the cost code (MCAA "completed hours").
- **Productivity factor (PF)** = earned ÷ actual. Above 1.00 is ahead of budget; below 1.00 is behind. ELECTRI uses the inverse and defines percent lost efficiency = (actual – earned) ÷ actual × 100, so check which convention a report uses.
- **Estimate at completion (EAC)** = budget ÷ PF to date. Hours on approved change orders are added to the budget and earned hours.

Step by step: job costing

1. **Set cost codes** from the estimate's breakdown, each tied to an area you can walk. Give every change order its own code.
2. **Fill out the daily time card by cost code**, with quantity installed or percent complete for each code. Do not move hours from a losing code to a good one. MCAA says this "balancing" "renders the LPR information suspect and unreliable," and notes that bonuses for hours saved invite it.

3. **Run a weekly labor report:** budget, earned and actual hours, hours this week, variance in hours and percent, effective crew size, percent complete and progress this week.
4. **Act on the trend.** Walk the area, ask the foreman, and sort the cause: changed condition, unanswered RFI, another party, or self-inflicted. If another party caused it, it becomes a notice (Part C, step 3).
5. **Close out the job cost:** estimated vs. actual by code, fed back into the company's labor units.

Worked example 3: weekly labor report, week 9

Cost code	Budget	% done	Earned	Actual	PF	EAC	Over (+) / under (–)	This week: actual / earned / PF
26-05 Feeders	300	60	180	210	0.86	350	+50	52 / 45 / 0.87
26-10 Branch rough-in	450	50	225	240	0.94	480	+30	70 / 54 / 0.77
26-20 Lighting	200	20	40	34	1.18	170	–30	30 / 30 / 1.00
26-30 Gear and terminations	150	30	45	50	0.90	167	+17	20 / 15 / 0.75
Total base	1,100	44.5	490	534	0.92	1,199	+99	172 / 144 / 0.84
CO-001	40	100	40	52	0.77			

The job projects 99 hours (9 percent) over budget. This week's PF of 0.84 is below the to-date 0.92, so the trend is getting worse. Branch rough-in dropped to 0.77 this week, so the foreman goes there first. If CO-001's 52 hours had been charged to 26-10, that code would show PF 0.77 and an EAC of 584, and the change order's 12-hour overrun would be hidden inside base work.

Part F — Pay Applications and Alabama Payment Law

The AIA pay application

- **G702** is the summary page: original contract sum, net change orders, work completed and stored to date, retainage, earned less retainage, previous certificates, current payment due, and balance to finish.
- **G703** is the continuation sheet. Each schedule-of-values (SOV) line shows scheduled value, previous, this period, materials stored, total, percent, balance and retainage. Each approved change order gets its own G703 line.
- Under A201, the SOV is submitted before the first pay application (9.2). Each application goes in at least ten days before the payment date, with subcontractor waivers if required (9.3.1). Stored materials are payable if suitably stored, and off-site storage needs the owner's approval (9.3.2).

Alabama private work (Ala. Code § 8-29-3)

- The owner pays the contractor per the agreed terms, or within 30 days if no terms are set.
- The general contractor pays the subcontractor per the agreed terms, or within seven days after receiving the owner's payment.
- Late payments carry interest of 1 percent per month.
- Retainage held on a subcontractor may not exceed the retainage the owner holds on the general contractor.
- The owner releases retainage within 60 days after the contractor's work is done or after substantial completion, whichever comes first, with certificates of occupancy issued.

Alabama public work (Ala. Code § 39-2-12)

- Monthly partial payments, no later than 35 days after acceptance, with a 10-day review.
- Retainage of "not more than five percent," and "after 50 percent completion has been accomplished, no further retainage shall be withheld." No retainage on ALDOT road and bridge contracts.
- **Worked example 4:** a \$250,000 contract at 56 percent complete (\$140,000) holds \$6,250 retainage (5 percent of the first \$125,000), not \$7,000.
- Public property cannot be liened. Unpaid claims on public work go against the payment bond (Module 3.2, Part G).

Alabama liens on private work

Who	File the verified statement in the county probate office within
Original contractor (contract with the owner)	6 months after last work
Everyone else (subcontractors, suppliers)	4 months after last work
Journeyman and day laborers	30 days after last work

Filing is under Ala. Code § 35-11-213, the deadlines are in § 35-11-215, and a contractor who did not contract with the owner must give the owner written notice first (§ 35-11-218). Alabama has no statutory lien-waiver form. Give conditional waivers with each pay application, and unconditional waivers only after the funds have cleared.

Part G — Closeout

1. **Punch list.** Under A201 9.8.2–9.8.3, the contractor submits "a comprehensive list of items to be completed or corrected," and the architect inspects for substantial completion.
2. **Labels on the punch walk.** NEC 2026 **408.4(A)**: "Every circuit and circuit modification shall be provided with a legible and permanent description." NEC 2026 **110.22(A)**: each disconnect "legibly marked to indicate its purpose" unless the purpose is evident.

3. **As-builts.** Record documents "marked currently to indicate field changes," delivered at completion (A201 3.11). Mark them during the job, not from memory at the end.
4. **Operation and maintenance manuals,** as listed in Division 01 of the project specifications.
5. **Final payment paperwork** (A201 9.10.2): bills-paid affidavit, insurance certificate, surety consent, "documentation of any special warranties," and lien releases if required.
6. **List every open claim before accepting final payment.** Accepting final payment waives claims "except those previously made in writing and identified ... as unsettled" (A201 9.10.5).
7. **Correction period:** one year after substantial completion (A201 12.2.2.1).
8. **Close the job cost** and update the labor units (Part E, step 5).

Common Mistakes

Mistake	Result	Source
Verbal OK, no paper	A minor change done without notice waives price and time	A201 7.4
T&M not written up daily	Material can't be billed; hours disputed	MCAA field forms
Change-order hours charged to base codes	The CO looks profitable and base work looks worse	MCAA
Late notice	Claim waived	A201 15.1.3.1; owner-edited A201
No photos or daily logs	No way to connect cause and effect	MCAA
Adding morale (factor 2) on top of overtime or stacking	Double-counted loss that won't hold up	MCAA
Final payment accepted with open items not listed	Claims waived	A201 9.10.5
Missing the lien deadline	Lien rights lost (4 months for a subcontractor)	Ala. Code § 35-11-215

NEC 2026 Checkpoints (both numbers unchanged from 2023)

- **408.4(A)** every circuit and circuit modification gets a legible and permanent description in the panel directory.
- **110.22(A)** each disconnecting means legibly marked to indicate its purpose, unless the purpose is evident.

Estimating and contract checkpoints

- MCAA factors: pick only what applies, remove overlaps, price base-work impact on its own line • overtime: use the PI table by week and hours.
- Change orders: notice within the contract clock (A201 21 days, 14 for concealed conditions; subcontract often shorter) • price what the contract allows and reserve rights in writing on the rest • written approval before work.
- Alabama: owner pays in 30 days and GC pays sub in 7 days absent terms (§ 8-29-3) • public retainage 5% max, none after 50% (§ 39-2-12) • lien 6 / 4 months / 30 days (§ 35-11-215).

Hands-On Field Exercise

- Add MCAA productivity factors to a bid for an occupied-space, after-hours job. Write down each factor, its intensity, and why.
- Price a change order that adds two 20 A circuits in a finished area, using the Worked example 2 layout, including the impact on existing work. Then reprice it under a contract that caps the fee at 10 percent and bars impact costs, and write the reservation-of-rights sentence.
- Estimate the lost productivity for a 4-week, 60-hour acceleration (Worked example 1) and add it to the bid.
- Fill out a T&M ticket and a daily report for one day of change work.
- Build a weekly labor report for a running job by cost code, find the worst code this week, and name the cause.
- Fill out a G703 line for an approved change order and compute the retainage on a public job at 56 percent complete.
- After a job, compare estimated and actual hours by code and propose one labor-unit correction.

Sources used in this module (public documents)

- MCAA, Change Orders, Productivity, Overtime: A Primer for the Construction Industry (2016), posted at tiac.ca; MCAA, How to Use the MCAA Labor Productivity Factors (2020) and Project-Specific Loss of Productivity Analysis Methodologies (2021): mcaa.org
- ELECTRI International: Impact of Overtime on Electrical Labor Productivity (2011); Factors Affecting Labor Productivity for Electrical Contractors (2007); Effective Look-ahead Scheduling for Electrical Contractors (2013): electri.org
- AIA A201-2017 General Conditions, public copy at tctc.edu; G702/G703 guide at learn.aiacontracts.com
- Faegre Drinker, Changes in Article 7 of AIA A201-2017: faegredrinker.com. Lexology, claims under the new A201: lexology.com
- Owner-modified A201-2017 examples: Medford School District (finalsite.net) and University of Wisconsin System (wisconsin.edu)
- ConsensusDocs: consensusdocs.org
- Electrical Contractor magazine, Prefabrication Trends: ecmag.com. EC&M prefabrication articles (NECA 5-2022): ecmweb.com

- Conest, Full-Cycle Job Costing: conest.com. LookAheadWall, 3-week look-ahead: lookaheadwall.com
- IRS Topic 751: irs.gov. OSHA 29 CFR 1926.453 Aerial lifts: osha.gov
- Code of Alabama § 8-29-3: alison.legislature.state.al.us; § 39-2-12 and § 35-11-215: law.justia.com; Alabama lien statutes reprint: nascla.org
- Levelset, Alabama prompt payment: levelset.com. Siteline, Alabama mechanic's lien guide: siteline.com. LienDone, Alabama lien waivers: liendone.com
- NFPA 70, National Electrical Code 2026 (free read-only access at nfpa.org): 408.4(A), 110.22(A)

End of the core program. Bonus masterclasses: Materials, Lighting, Legacy.