



FIELD MANUAL · VOLUME 01

Electrical Rough-In Standards.

Code-correct, code-exceeding line-voltage rough-in for
luxury residential and light-commercial construction.

PREPARED FOR

Licensed Electricians · Apprentices · Builders & GCs · AHJ & Inspectors · Owner's Reps

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PARTNER

Island Media Systems

Audio · Video · Network · Lighting · Shades
One team. One standard. One execution.



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MANIFESTO

Code-correct is the floor. We build above it.

This manual is the working standard for every line-voltage rough-in performed for or alongside Restrepo Innovations and Island Media Systems. It defines how we plan service, route branch circuits, set boxes, support cable, protect conductors, ground equipment, and document the work — at a level that exceeds the National Electrical Code and survives twenty years of homeowner ownership.

The NEC is a minimum safety standard. It is what an inspector enforces. It is not what we deliver. Our standard adds the dimensions the code does not measure: workmanship, serviceability, neat panels, square boxes, properly torqued lugs, accurate as-builts, and conductors that look as good behind the drywall as they do at the panel.

HOW TO USE THIS MANUAL

Read it once cover to cover. Keep a copy on every job. Reference the QC Checklist at every milestone. Photograph and document as you go. If a section in this book conflicts with field improvisation, the book wins until the lead engineer says otherwise in writing.

CALLOUT LEGEND

FIELD RULE	Non-negotiable rule for the field
BEST PRACTICE	Preferred method that exceeds the minimum
DO NOT	Forbidden method — cause for rework
INSPECTION STANDARD	What QC and PMs verify on walkthrough
SPECIFICATION	Technical or manufacturer requirement
NOTE	Reference or supporting context

CONTENTS

Table of Contents

Twenty-eight sections, organized by build phase: philosophy and craft, service and distribution, branch-circuit design, rough-in execution, protection and grounding, device-level standards, documentation, and quality control.

01	Project Partnership	p. 5
02	Installation Philosophy	p. 7
03	Craftsmanship & Ownership	p. 9
04	Approved Tools	p. 11
05	Prohibited Methods	p. 13
06	Service Entrance & Meter	p. 15
07	Panelboard Standard	p. 17
08	Conductor Integrity	p. 19
09	NM-B Support	p. 20
10	Routing Discipline	p. 22
11	MC Cable	p. 23
12	Conduit (EMT, ENT, PVC)	p. 24
13	Box Fill — NEC 314.16	p. 25
14	Box Setting & Plumb	p. 27
15	Physical Protection — NEC 300.4	p. 28
16	Firestop — NEC 300.21	p. 30
17	HV / LV Separation	p. 31
18	Receptacles — NEC 210.52	p. 32

19	GFCI Protection — NEC 210.8	p. 34
20	AFCI Protection — NEC 210.12	p. 35
21	Switching & Lighting Loads	p. 36
22	Grounding & Bonding — NEC 250	p. 37
23	OCPD & Conductor Sizing — NEC 240	p. 39
24	Labeling	p. 41
25	As-Built Documentation	p. 42
26	QC Checklist	p. 43
27	Standards & References	p. 46
28	Field Notes	p. 48



PART 1

Foundations

Sections 01–03 — partnership, philosophy, ownership

§ 01

Project Partnership

RESTREPO INNOVATIONS × ISLAND MEDIA SYSTEMS

Restrepo Innovations and Island Media Systems work as a single execution team across luxury residential and commercial projects. Crestron control, high-end audio and video, structured network, lighting, and shading are designed, rough-installed, terminated, programmed, and commissioned to a single shared standard — the standard documented here.

This is not two companies coordinating in parallel. It is one team, one standard, one execution quality. There are no split standards between trades, no two ways to support a vertical trunk, no two methods to land a Cat6A behind a display. What follows in this book is the way we do it. All technicians on either company's payroll — and any electrician, framer, or sub working alongside us — are expected to align with what's written here.

Operating principles

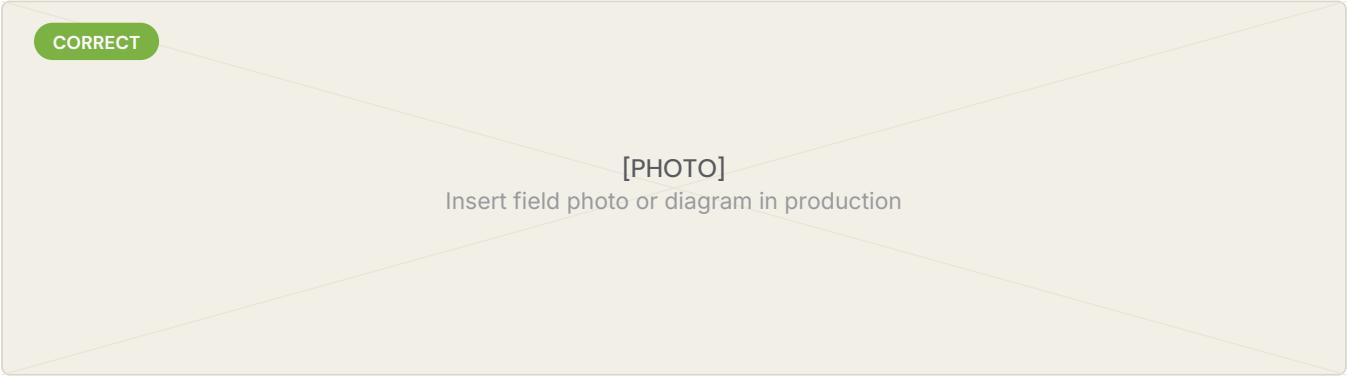
- One team. Restrepo and Island Media share a project plan, a punch list, and a QC checklist.
- One standard. Methods, materials, spacing, separation, and labeling are uniform from project to project.
- One quality. The deliverable is judged at the same level on every property regardless of price tier.
- No conflicting trade methods. If a method differs from this book, the lead engineer signs off in writing or it does not happen.
- Mutual ownership. Both teams own the entire installation as if their name is on it. Because it is.

FIELD RULE

Two logos, one product.

When a homeowner or builder opens a wall in five years, the work should look like it came from a single craftsman with a single signature — even if a dozen technicians were on site. That is the bar.





[PHOTO: Field documentation example — joint Restrepo / Island Media rack handoff]

§ 02

Installation Philosophy

CODE IS THE MINIMUM. STANDARD IS THE GOAL.

Code is the legal floor. It is what the AHJ enforces and what an inspector will pass. It is not what we deliver. Our standard sits above code in the dimensions that matter to the people who own and service these systems for the next two decades — performance, longevity, serviceability, and craftsmanship. A system installed to this manual will be faster to troubleshoot, easier to expand, more resistant to environmental and mechanical stress, and visually inspectable for years.

Why the rough-in defines the system

Most failure modes that show up after move-in are introduced during rough-in: crushed jackets, sharp bends that exceed cable manufacturer specs, kinks at corners, unsupported spans that sag and pinch, and tangled trunks that cannot be re-pulled. Termination quality cannot fix a damaged conductor. The trim cannot hide a poorly managed ceiling. The rough-in is where the signal-quality, network throughput, service life, and serviceability of the system are decided.

Build as if the walls stay open forever

Treat every cable run, every staple, every J-hook, every Velcro wrap as if a drone with a camera will pass through that bay tomorrow. Photograph it. Show it to the next tech. Hand it to the homeowner. If it does not pass that test, redo it before drywall closes. After close-up, the cost of repair is twenty times higher and the appearance can never be recovered.

BEST PRACTICE

Performance, longevity, serviceability, craftsmanship.

Every decision in the field — what staple, what hook, what wrap, what path — is weighed against those four words. If a method gets us to the closeout faster but loses even one of them, we don't use it.





[DIAGRAM: Layout example — code minimum vs. Restrepo / Island Media standard, side by side]

§ 03

Craftsmanship & Ownership

IF YOU SEE IT, YOU OWN IT.

Craftsmanship is the practical expression of caring about the work. On our jobs, ownership is the framework that makes craftsmanship reliable. We expect every technician on site, regardless of title, to operate by three rules.

If you see it, you own it

If you walk past a bad cable, a sagging J-hook, an unprotected conductor, a missing nail plate, an unsealed firestop — and you keep walking — you have just approved that work. Whoever installed it will tell the PM you saw it. The next person to inspect it will assume you signed off on it. The standard is: you fix it, you tag it for the lead, or you call the trade back to fix it. You do not walk past.

Own the work, own the problem

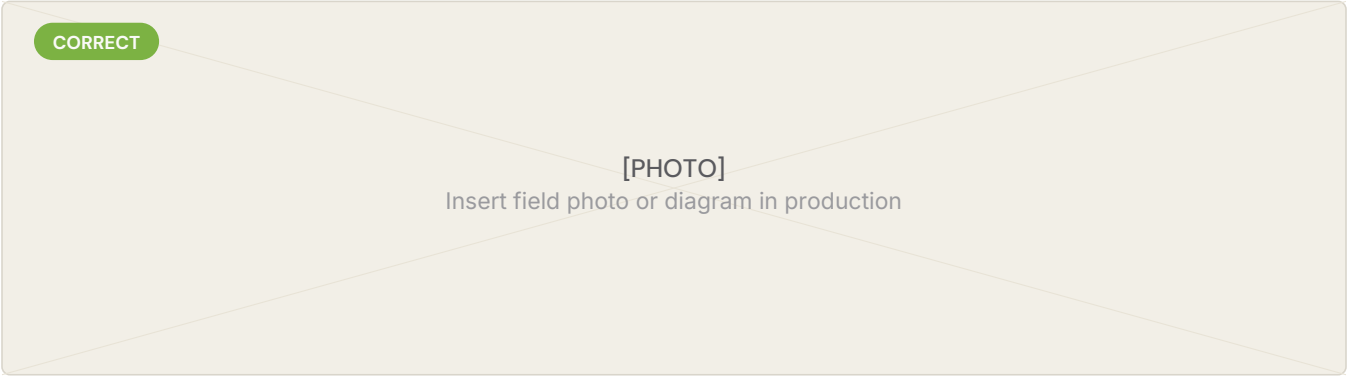
When something goes wrong, the question we ask first is not “whose fault.” It is “what did we miss as a team and how do we keep it from happening again.” But the inverse is also true: the technician closest to the work owns the outcome. If the cable you ran is the cable that fails, you own it — even if ten reasons exist for why. The error log (§24) exists to capture what we learned, not to assign shame.

Do not build over bad work

Never close a wall, button up a rack, terminate a panel, or trim out a room while bad rough-in remains underneath. Stop, fix it, photograph it, and continue. Building over bad work multiplies the cost of every later step, and ultimately it shows.

DO NOT**Do not stage drywall over an unverified rough-in.**

If anything in this manual is incomplete in a bay — supports, separation, protection, labeling, photographs — drywall does not close on that bay until it is.



[PHOTO: Field documentation example — clean, photographed bay ready for close-up]

§ 04

Approved Tools

THE RIGHT TOOL FOR THE RIGHT METHOD.

The tools below are the approved kit for line-voltage rough-in on Restrepo Innovations and Island Media Systems projects. Substitutes require written approval from the lead electrician or PM. The reason is simple: each tool, used correctly, supports a method documented in this manual. A different tool often forces a different method — and that method is not approved here.

Calibrated torque screwdriver / driver	Every termination — breaker lugs, neutral / ground bars, panel main lugs, device terminals — is torqued to manufacturer specification. NEC 110.14(D) requires it. Calibration is verified per manufacturer schedule, not by feel.
Klein / Fluke non-contact voltage tester	First check on every conductor before it is touched. Test the tester on a known-live source, test the conductor, retest the tester. No exceptions.
Insulated screwdrivers and pliers (1000 V rated)	All hand tools used at energized panels and devices are insulated and intact. Cracked or chipped insulation is removed from service immediately.
Megger / insulation resistance tester	Insulation resistance test on every branch circuit and feeder before energization. Results recorded on the as-builts.
Klein lineman's pliers and side-cutters	Clean, square cuts. No nicked conductors at terminations.
Cable strippers matched to conductor	Romex / NM-B stripper for jacket, T-stripper for individual conductors. Knife stripping is not acceptable on this team.
Hole saws and right-angle drill	Bored holes only — no notching unless field conditions require it. Bit selection matched to the cable count and the 1¼ in. setback rule.
Fish tape, glow rods, fish sticks	For conduit pulls and wall fishing. Steel fish tape is never used in any cavity that could share with energized conductors.
Digital multimeter (CAT III 1000 V minimum)	Voltage, continuity, resistance verification at termination and trim-out. CAT rating matched to the work being done.
Brady label printer	Panel directories, breaker labels, junction-box markings, conductor identification. Printed only — handwritten labels are not acceptable on closeout.



Listed nail plates and bushings	1/16 in. minimum steel plates per NEC 300.4(D). Listed bushings at every metal-stud cable opening.
Listed firestop kit	Putty pads, sealants, intumescent collars matched to the assembly rating and the penetrant. NEC 300.21. If you make the hole, you seal it.

SPECIFICATION

NEC 110.14(D) — torque is not optional.

Every connection at a breaker, lug, terminal bar, or device requires torque applied per manufacturer's listing. A torque wrench or calibrated screwdriver is the only acceptable means of compliance.

TOOL

[TOOL]

Insert field photo or diagram in production

[IMAGE: Tool example — calibrated torque screwdriver landing a 20A breaker]

§ 05

Prohibited Methods

CAUSE FOR REWORK, NO EXCEPTIONS.

These methods are not permitted on any Restrepo Innovations or Island Media Systems site. Each one creates a code violation, a safety hazard, or a long-term reliability problem that cannot be recovered after close-up. If you find one of these in place, document it, fix it, and log it in the error log (§25).

DO NOT

Back-stabbed receptacles and switches

Spring-tension stab connections fatigue, loosen, and arc over time. We land conductors on screw terminals or use back-wired clamp-screw devices exclusively. No spring-stab terminations on any device.

DO NOT

Bored-hole setback < 1¼ inches without a nail plate

NEC 300.4(A) violation. A drywall screw or cabinet anchor will find that conductor. Either re-bore in the center of the framing or install a 1/16 in. listed steel plate over the bay.

DO NOT

Hammered staples directly on NM-B without a depth gauge

Crushed jackets, deformed conductors, and AFCI nuisance trips after energization. Use a listed cable stapler or insulated staples driven by hand to a controlled depth — never overdriven.

DO NOT

Sharing a neutral across multiple-circuit dwellings without an MWBC

Shared neutrals require a multi-wire branch circuit handle-tied or common-trip per NEC 210.4(B). Improvised shared neutrals overload the neutral and defeat AFCI protection.

DO NOT

Aluminum conductors on standard CO/ALR-only-rated devices for 15/20 A circuits

On legacy aluminum branch wiring, only listed AL/CU connectors and CO/ALR devices are acceptable. We do not splice aluminum to copper without a listed connector.



DO NOT

Open conductors in service-entrance or panel-feed cavities

All ungrounded conductors are sleeved, supported, and protected. No exposed THHN inside framing cavities outside listed conduit.

DO NOT

Working a panel face-up or face-down

NEC 408.43 prohibits panelboard installation in a face-up or face-down position. The deadfront must be vertical.

DO NOT

Blocking the working space in front of a panel

NEC 110.26 working space — 36 in. deep, 30 in. wide, 6 ft. 6 in. high — is sacred. No HVAC plenums, plumbing, racks, or storage encroach. Panel doors must open to at least 90°.

What good looks like

Screw-terminal or clamp-screw devices, torqued.

Bored holes centered, plated where setback is short.

Listed cable staplers, depth controlled.

MWBCs handle-tied per NEC 210.4(B).

Panels plumb, vertical deadfront, 30 in. clear.

What we reject on QC

Back-stabbed devices on any circuit.

Bored holes < 1¼ in. with no nail plate.

Crushed NM-B at overdriven staples.

Improvised shared neutrals across circuits.

Tilted or obstructed panelboards.

§ 06

Service Entrance & Meter

THE FIRST TOUCH POINT. THE FIRST INSPECTION.

Service entrance is where the utility ends and the building begins. Every decision here — clearance, conduit type, raceway support, meter height, main bonding jumper, grounding electrode conductor — sets the standard the AHJ uses to judge the rest of the build. We treat the service as a finished deliverable visible from the street, not a back-of-house detail.

Standards

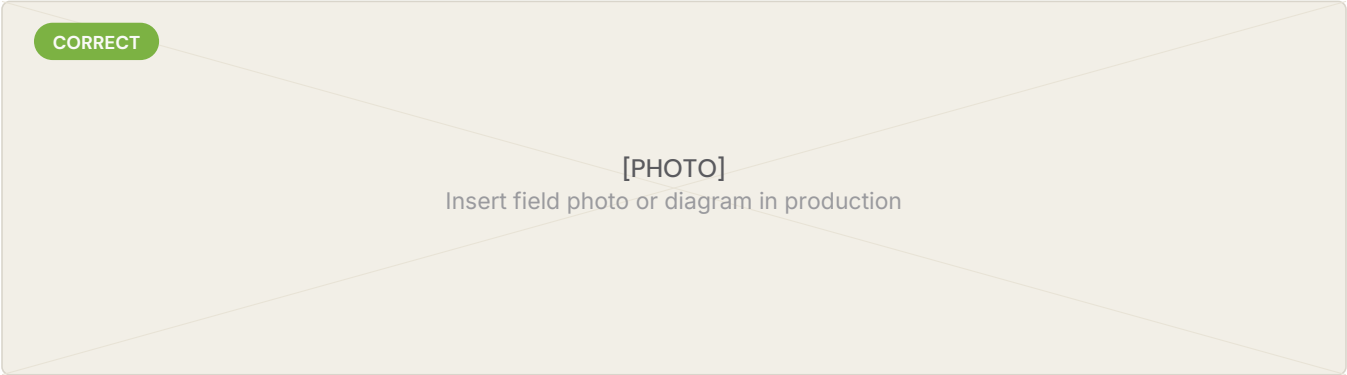
- Meter height per the serving utility — typically 5 ft. to 6 ft. to the center of the meter. Confirm in writing at job kickoff.
- Service-entrance conductors sized for the calculated load per NEC 220 with margin for documented future loads.
- Listed weatherheads, sealed against driving rain. Drip loops formed correctly so water does not migrate into the raceway.
- Service raceway supported per NEC 230.51 — within 12 in. of the weatherhead and at intervals not exceeding 10 ft.
- Main bonding jumper installed per NEC 250.28 — sized to Table 250.102(C)(1) — at the service disconnect, never downstream.
- Grounding electrode system per NEC 250 Part III — concrete-encased electrode where present, ground rods where required, water pipe bonded.
- Service disconnect labeled, accessible, and within sight of the meter where the AHJ requires.

INSPECTION STANDARD

First-rough inspection focuses here.

AHJ rough inspection commonly opens at the service: meter height, weatherhead drip loop, raceway support, grounding electrode conductor routing, and main bonding jumper presence. A clean service builds inspector confidence for everything inside.





[PHOTO: Field documentation example — service entrance with weatherhead, drip loop, supported raceway, and meter at correct

§ 07

Panelboard Standard

PLUMB, ACCESSIBLE, LABELED, TORQUED.

The panelboard is the most-photographed, most-inspected, most-serviced piece of electrical equipment in the building. Every detail of how we set, dress, and label it is judged by the AHJ at rough and trim, by the homeowner at every service call, and by every electrician who works on it for the next thirty years.

Mounting and orientation

- Panel face vertical. NEC 408.43 prohibits face-up or face-down installation.
- Top of the highest operable handle no higher than 6 ft. 7 in. above the finished floor (NEC 240.24(A)).
- Plumb and square to the wall — verified with a level at rough-in, not at trim.
- Recessed panels flush with finished surface; surface-mounted panels with consistent reveal.

Working space — NEC 110.26

- 30 in. wide minimum, 36 in. deep minimum, 6 ft. 7 in. high minimum clear in front of the panel.
- Working-space depth measured from the energized parts or enclosure front, whichever is greater.
- Doors and panels must open to at least 90°. Doors over 6 ft. wide require two egress paths.
- No storage, plumbing, HVAC plenums, or low-voltage gear in the working space — ever.
- Illumination provided at the working space, switched independent of the equipment served.

Wire dressing inside the can

- Every conductor combed, bent at right angles to the bus, and dressed to length before termination.
- No diagonal sweeps across the gutter. Conductors travel down one side, across the bottom, and up the other.
- Neutrals landed on the neutral bar in circuit order. EGCs landed on the ground bar in circuit order.
- Service-side neutral and ground bonded at the main only — main bonding jumper installed and torqued.
- Sub-panels — neutral bar isolated from the can; equipment grounding conductor lands on the dedicated ground bar.
- Every breaker lug and bus-bar connection torqued to manufacturer spec; torque marker applied where the manufacturer requires it.



SPECIFICATION

NEC 110.26 working space is non-negotiable.

30 in. wide × 36 in. deep × 6 ft. 7 in. high clear in front of any panelboard rated 1,200 A or less. The space is for the worker, not for storage. Equipment doors must swing to at least 90°.

CORRECT

[PHOTO]

Insert field photo or diagram in production

[PHOTO: Field documentation example — panel interior, conductors combed and dressed, torque markers visible on every breaker]



§ 08

Conductor Integrity

ROUND, INTACT, UNTENSIONED.

A NM-B, MC, or THHN conductor performs to its listing only when its geometry and insulation are intact. Crushed jackets, nicked strands, tensioned spans, and overdriven staples all reduce ampacity, raise impedance, and create the conditions for AFCI nuisance trips and long-term insulation failure.

Visible damage indicators

- Jacket whitening or ribbing — permanent stress on the polymer. Replace.
- Flattened cross-section at staples or supports — pairs deformed. Replace.
- Nicked or scored insulation on individual conductors — replace; do not tape.
- Visible copper at strip points beyond the termination zone — replace.
- Tensioned spans between supports — release and re-support. Tensioned NM-B creeps.

FIELD RULE

Damaged in rough-in is cheap. Damaged after trim is not.

Replacing a 50 ft. run before drywall is a 30-minute job. Tracing an intermittent fault behind finished walls is days of work and a service callback. Replace damage when you find it.

INCORRECT

[IMAGE]

Insert field photo or diagram in production

[IMAGE: Incorrect example — flattened, jacket-whitened NM-B at an over-driven staple]



§ 09

NM-B Support

12 INCHES OF EVERY BOX. 4½ FEET ON THE RUN. 18 INCHES TO THE NEAREST SUPPORT.

NEC 334.30 is the single most-cited rough-in violation on residential inspections. The rule is straightforward and the consequences of getting it wrong are visible from across the room. We treat it as a discipline: every NM-B run, every box, every transition, supported on the inch.

The three numbers

- Within 12 in. of every cabinet, box, or fitting the cable enters — measured along the cable, not as the crow flies.
- At intervals not exceeding 4½ ft. along the cable's length on framing.
- Cable length to the nearest support ≤ 18 in. at any free length.

How we apply it

- Listed cable staples or straps — never bare-wire ties or improvised supports.
- One cable per staple unless the staple is rated and listed for stacked NM-B.
- Staples driven to a controlled depth — round jacket, no deformation, slight cable rotation possible under the staple.
- Vertical drops into a panel or a box are supported within 12 in. of entry. Always.
- Where cable runs through bored holes, the holes themselves count as support per NEC 334.30(A).

SPECIFICATION

NEC 334.30 — supports.

NM cable shall be supported and secured at intervals not exceeding 4½ ft. and within 12 in. of every cabinet, box, or fitting. Where the cable is fished or supported by holes through framing, the holes constitute support.

Within box / cabinet 12 in.

Run interval 4½ ft.

Free length 18 in.



[DIAGRAM: Layout example — NM-B run with staples at 12 in. of box, 4½ ft. on center, 18 in. max free span]

§ 10

Routing Discipline

VERTICAL AND HORIZONTAL. ON FRAMING. PREDICTABLE.

Every cable on a Restrepo or Island Media electrical rough-in runs vertical or horizontal along framing. There are no diagonal shortcuts across joist bays, ceilings, or chases. Routing discipline is what makes the rough-in inspectable, expandable, and predictable to every trade that follows.

- Cables travel along framing — never freelance through a cavity.
- When a run turns, it turns at a supported corner — never diagonally.
- Bored holes are centered in framing members — keep the conductor away from screw zones.
- Plan with HVAC, plumbing, sprinkler, and LV — not against them. Stack drilling diagrams at coordination meetings.
- Spare conduits and pull strings left between major endpoint pairs — every project owes the next remodel an upgrade path.
- Every cable can be traced visually from panel to device without unrolling a single bundle.

BEST PRACTICE

Trunks travel framing lines.

If a homerun path can be drawn on the floor plan as a series of straight lines, rotating only at framing corners, that homerun passes routing discipline.

DIAGRAM

[DIAGRAM]

Insert field photo or diagram in production

[DIAGRAM: Layout example — vertical and horizontal NM-B runs only, with planned 90° turns at framing corners]



§ 11

MC Cable

WHERE LISTING REQUIRES IT. WHERE COMMERCIAL DEMANDS IT.

Metal-clad (MC) cable is the standard for commercial branch circuits and is required by NEC and AHJ in many residential applications — multi-family common areas, plenum spaces, and where physical protection demands a metallic armor. MC follows the same routing and support discipline as NM-B with armor-specific rules.

Standards

- Support per NEC 330.30 — within 12 in. of every box and at intervals not exceeding 6 ft.
- Listed anti-short bushings (red heads) at every termination. No exceptions.
- Connectors listed for MC and torqued — both at the box and at the locknut.
- Bend radius respected — minimum bending radius per cable manufacturer; never less than 7× the external diameter.
- Cuts made with a rotary armor cutter — not a hacksaw, not a bolt cutter. Clean square cuts only.
- EGC bonded continuously through every box; never relied on the armor alone for grounding unless specifically listed.

INSPECTION STANDARD

Anti-short bushings — every termination, every time.

AHJ inspectors check anti-short bushings on a sample basis. A missing red head is an automatic correction notice. We install one at every armor cut before the connector goes on.

CORRECT

[IMAGE]

Insert field photo or diagram in production

[IMAGE: Correct example — MC termination with anti-short bushing visible inside connector]



§ 12

Conduit (EMT, ENT, PVC)

SIZED FOR FILL. BENT FOR SWEEP. SUPPORTED FOR LIFE.

Conduit is the standard wiring method for commercial work, the right answer for service-entrance feeders and homeruns through unfinished spaces, and a standing requirement for upgrade-path planning on luxury residential. Conduit installed correctly is invisible after trim. Conduit installed wrong creates pull problems for the next decade.

Sizing and fill

- Conductor fill per NEC Chapter 9 Table 1 — 53% for one conductor, 31% for two, 40% for three or more.
- Calculate fill at the design stage — never field-stuff a conduit because the conductors will not fit.
- Future-pull capacity left in every conduit destined for a service location.

Bends and supports

- No more than 360° of bends total between pull points (NEC 358.26 for EMT, similar for other types).
- All bends sweep — listed elbows or hand-bent radii not less than the manufacturer's minimum.
- EMT supported within 3 ft. of every box and at intervals not exceeding 10 ft. (NEC 358.30).
- PVC supported per NEC 352.30 — within 3 ft. of every box and at intervals scaled to size and temperature.
- Expansion fittings on long PVC runs and on any run where temperature delta exceeds the manufacturer's threshold.

SPECIFICATION

360° rule.

Maximum 360° of bends between pull points across all raceway types. We design for 270° in practice so the next pull does not become a service call.

§ 13

Box Fill — NEC 314.16

VOLUME MATH, EVERY TIME, BEFORE DRYWALL.

Overfilled boxes cause damaged conductors at trim, AFCI nuisance trips after energization, and devices that will not seat in the mud ring. NEC 314.16 gives us volume per Table 314.16(B) and a counting method that we follow to the letter.

Volume allowances per conductor

- 14 AWG — 2.00 cu. in. per conductor.
- 12 AWG — 2.25 cu. in. per conductor.
- 10 AWG — 2.50 cu. in. per conductor.
- 8 AWG — 3.00 cu. in. per conductor.
- 6 AWG — 5.00 cu. in. per conductor.

Counting method

- Each ungrounded and grounded (neutral) conductor entering the box and not spliced through = 1 count.
- Conductors that pass through the box without splicing = 1 count each.
- All EGCs together = 1 count, sized to the largest EGC in the box.
- Each yoke / strap of a device (receptacle, switch, dimmer) = 2 counts based on the largest conductor on the device.
- Internal cable clamps = 1 count based on the largest conductor in the box.
- Each fixture-stud or hickey = 1 count.
- Each equipment-grounding bonding jumper or pigtail does not add a count if it does not leave the box.

SPECIFICATION

Mark the volume on every box.

Every device box on this team has its volume verified at rough-in against the count for the room. If the math does not work, the box is upsized before drywall closes — never after.

14 AWG	2.00 cu. in.
12 AWG	2.25 cu. in.
10 AWG	2.50 cu. in.

Device yoke 2 counts

All EGCs 1 count



[DIAGRAM: Layout example — single-gang box with two cables, one device, fill calculation shown]

§ 14

Box Setting & Plumb

SQUARE. FLUSH. LEVEL. SPEC'D TO THE FINISH.

Boxes set crooked, recessed, or proud will haunt every plate, every screw, every device, every photograph, and every walkthrough. We set boxes once, set them right, and verify before drywall.

- Box face flush with the finished surface — projection per the listing of the box and the finish thickness.
- Plumb and level to ¼ in. tolerance over the gang height. Devices that don't sit level are rejected.
- Receptacle outlets at consistent center heights — typical 16 in. AFF unless specified otherwise; ADA per applicable code.
- Switch outlets at consistent center heights — typical 48 in. AFF unless specified.
- Counter-side receptacles per NEC 210.52(C) — within 20 in. of countertop surface, accessible.
- Multi-gang boxes squared and aligned across the gang. Mud rings sized to the device count.
- Mounting screws torqued to box manufacturer's spec — not over-driven into the framing.

BEST PRACTICE

Set once, plumb forever.

A laser line at the gang height takes 90 seconds and saves an hour of shimming at trim. We use it. Always.

CORRECT

[PHOTO]

Insert field photo or diagram in production

[PHOTO: Field documentation example — gang box plumb on a laser line, flush to finished depth]



§ 15

Physical Protection — NEC 300.4

1¼ INCHES SETBACK. 1/16 INCH PLATE. NO EXCEPTIONS.

Once the wall closes, the most common mechanical threat to a conductor is a future drywall screw, picture nail, or cabinet anchor. NEC 300.4 directly addresses this. The rule is simple — and the field discipline is what actually keeps cable safe for the next thirty years.

The rule

- Bored holes: the edge of the hole is at least 1¼ in. from the nearest edge of the framing member (NEC 300.4(A)(1)).
- Notches: notched cable must be protected by a steel plate or bushing at least 1/16 in. thick, sized to cover the notch (NEC 300.4(A)(2)).
- Parallel runs: cable run parallel to framing follows the same 1¼ in. concept; protect with plate or bushing where the setback can't be held (NEC 300.4(D)).
- Metal framing: every cable opening in metal studs receives a listed bushing or grommet — sharp edges cut jackets as the building moves (NEC 300.4(B)).

Field discipline

- Bore in the center of the framing member where possible — keep the conductor far behind any screw zone.
- The instant the 1¼ in. distance can't be held, install a listed nail plate. No deliberation, no exception.
- Recess plates flush to the framing surface so drywall sits flat — do not let plates crown the surface.
- Keep the cable centered behind the plate, not pushed off to one side.
- When in doubt, plate it. The cost of a plate is nothing compared to a service call.

SPECIFICATION

NEC 300.4, applied as policy.

1¼ inch from framing edge in bored holes and parallel runs. 1/16-inch steel plate protection where the setback cannot be maintained, and at every notch. Bushings and grommets at metal-stud cable openings. Treat these as the minimum, not the goal.





[IMAGE: Correct example — recessed nail plate covering bored-hole offset, NM-B centered behind]

§ 16

Firestop — NEC 300.21

IF YOU MAKE THE HOLE, YOU SEAL THE HOLE.

NEC 300.21 requires that electrical installations not substantially increase the spread of fire or products of combustion through fire-rated assemblies. In practical terms, every penetration of a rated wall, floor, or ceiling that we make is sealed with a listed firestop system that restores the rating. This includes top and bottom plates of rated walls, floor penetrations, conduit sleeves, and rated trunk penetrations.

- Seal every penetration we make through a fire-rated assembly. No exceptions.
- Use only listed, rated firestop materials matched to the assembly and the penetrant.
- Top plates and bottom plates of rated walls are sealed.
- Conduit sleeves and trunks sealed at both faces of the assembly where the listing requires it.
- Photograph every firestop with the system tag visible. Add the photo to the as-builts.
- If we make the hole, we seal it. If another trade made the hole and left it open in our pathway, we seal that too — and log it.

FIELD RULE

Document every firestop.

Each firestopped penetration is photographed with location, system tag, and date captured. Without that record, no penetration is closed.

CORRECT

[PHOTO]

Insert field photo or diagram in production

[PHOTO: Field documentation example — properly firestopped conduit sleeve with system tag visible]



§ 17

HV / LV Separation

POWER RADIATES. SIGNAL RECEIVES. KEEP THEM APART.

Power conductors radiate. Signal conductors receive. Without separation, the result is induced noise on data lines, audible hum on audio runs, and reduced PoE thermal margin on category cabling. NEC 300.3(C) prohibits cables of different voltage classes from sharing a raceway without a barrier. Restrepo and Island Media share standards on both sides of this boundary — this section codifies what the electrical trade owes the LV team.

- Plan power and signal paths in different bays at the rough-in stage. Trade-coordinate before drilling.
- Where parallel runs are unavoidable, maintain physical separation on the order of inches and use opposing sides of the framing.
- Where power and signal cross, they cross at 90° — never run parallel through the crossing zone.
- Avoid placing branch circuits next to dimmer feeds, HVAC units, motors, transformers, and pump panels — those cavities go to LV trunks last.
- Keep ungrounded conductors away from low-voltage backboards and equipment racks. Rack circuits land in dedicated breaker pairs.

INSPECTION STANDARD

Crossings are visible and clean.

Inspectors and PMs verify each HV/LV crossing visually: 90° crossing, supported on both sides, no parallel run, no incidental contact. Photographs go in the as-built record.

DIAGRAM

[DIAGRAM]

Insert field photo or diagram in production

[DIAGRAM: Layout example — HV branch circuits and LV runs in adjacent bays, 90° crossings shown]

§ 18

Receptacles — NEC 210.52

6-FOOT RULE. 12-FOOT RULE. 18-INCH FLOOR RULE.

NEC 210.52 governs the placement of receptacle outlets in dwelling units. The geometry is exact — and the consequences of getting it wrong are an extension cord across the living-room floor for the rest of the house's life. We rough in to spec, with margin where the design allows.

General — 210.52(A)

- Every wall space 2 ft. or wider gets a receptacle.
- No point along the floor line is more than 6 ft. from a receptacle — measured horizontally, around corners and along usable wall space.
- Wall space is measured along the floor line, including space occupied by fixed panels in exterior walls.
- Floor receptacles count toward the requirement only if they are within 18 in. of the wall.

Kitchen counters — 210.52(C)

- Countertop spaces 12 in. or wider get a receptacle.
- No point along the countertop is more than 24 in. from a receptacle (24 in. = the 4-foot-spacing rule split in half because reach is two-sided).
- Island and peninsula counters get a receptacle per the current code cycle's specific rule — verify against the adopted NEC for the AHJ.
- All kitchen receptacles GFCI protected per NEC 210.8(A).

Bathrooms — 210.52(D)

- At least one receptacle within 36 in. of the outside edge of each basin.
- GFCI protected per 210.8(A).

Other required locations

- Hallways 10 ft. or longer — at least one receptacle.
- Foyers > 60 sq. ft. — at least one receptacle on each wall space 3 ft. or wider.
- Outdoor receptacles — front and back of dwelling, accessible at grade level (NEC 210.52(E)).
- Laundry, garage, basement — per 210.52(F), (G), and the adopted NEC.

SPECIFICATION

The 6-foot rule.

No point along the floor line of any wall space is more than 6 ft. from a receptacle outlet. Run the tape — every wall, every alcove. If a measurement fails, add a box before drywall.

DIAGRAM

[DIAGRAM]

Insert field photo or diagram in production

[DIAGRAM: Layout example — living room receptacle spacing, 6 ft. rule traced along walls and corners]



§ 19

GFCI Protection — NEC 210.8

WHERE WATER LIVES, GFCI LIVES.

Ground-fault circuit interrupter protection is the single most important personnel-safety device in a dwelling unit. The 2023 NEC expanded the list significantly — and the AHJ enforces every entry. We rough in with the protection scope built into the panel and circuit plan, not added as an afterthought.

210.8(A) — Dwelling units, 125 V to 250 V receptacles

- Bathrooms — every receptacle.
- Garages and accessory buildings — every receptacle.
- Outdoor receptacles — every receptacle.
- Crawl spaces at or below grade.
- Unfinished portions of basements.
- Kitchens — all 125 V to 250 V receptacles, not just countertop (2023 expansion).
- Sinks — receptacles within 6 ft. of the outside edge of the sink.
- Bathtubs and shower stalls — receptacles within 6 ft.
- Laundry areas — every receptacle.
- Indoor damp and wet locations.
- Boathouses and docks.

How we deliver it

- Plan GFCI as a circuit-level protection (breaker) in panels where multiple devices share a circuit — cleaner reset, single trip diagnostics.
- Use GFCI receptacles at line position where the design calls for downstream load-side protection of additional outlets.
- Every GFCI tested at trim with a calibrated GFCI tester. Trip times recorded.
- Labels: GFCI receptacles labeled at the device; GFCI breakers labeled in the panel directory and on the deadfront.

INSPECTION STANDARD

GFCI testing is part of trim.

Every GFCI in the dwelling is tested with a calibrated tester at trim, with trip-time results entered on the QC checklist. A GFCI that does not trip is replaced before close-out.



§ 20

AFCI Protection — NEC 210.12

EVERY HABITABLE SPACE. SERIES AND PARALLEL ARC DETECTION.

Arc-fault circuit interrupter protection detects the dangerous arcing conditions that conventional breakers miss. NEC 210.12 in the 2023 cycle covers every dwelling-unit branch circuit at 120 V, 15 A or 20 A — and now extends to 10 A circuits where used. The list of required locations covers virtually every habitable space.

210.12(A) — Dwelling units (2023)

- Kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens.
- Bedrooms, sunrooms, recreation rooms, closets, hallways.
- Laundry areas.
- Similar rooms or areas as defined by the AHJ.

Field discipline that prevents nuisance trips

- Tight, torqued terminations — loose connections cause series-arc trips.
- No back-stabbed devices on AFCI circuits — replace at trim if found.
- Damaged NM-B replaced, never taped — crushed jackets create the conditions AFCIs detect.
- Avoid sharing neutrals across circuits — improvised shared neutrals defeat AFCI protection and trip on imbalance.
- Surge protective devices and EV chargers per manufacturer compatibility — not all SPDs work upstream of every AFCI listing.

BEST PRACTICE

AFCI nuisance trips are usually craftsmanship signals.

When a homeowner reports recurring AFCI trips, the first inspection focus is termination torque, jacket integrity at staples, and shared-neutral conditions. AFCI is rarely the problem — the wiring discipline upstream usually is.

§ 21

Switching & Lighting Loads

PLAN THE LOAD. LAND THE CONDUCTORS. LABEL THE DEVICE.

Switches and lighting loads are where craftsmanship is most visible at trim — every switch height, every gang alignment, every dimmer compatibility, every neutral landed correctly is judged by the homeowner with their hand on the wall plate. The rough-in is where those outcomes are decided.

- Every switch box receives a neutral conductor per NEC 404.2(C) — required for occupancy sensors, smart switches, and Crestron / Lutron control devices.
- Three-way and four-way switching planned with the dimmer manufacturer's wiring diagram in hand at rough-in. Travelers run the correct conductor type.
- Lighting load calculated against dimmer rating with luxury-fixture inrush in mind. Magnetic low-voltage and electronic low-voltage on listed dimmers only.
- LED loads matched to the dimmer's published compatibility list. We do not guess on driver compatibility for high-end fixtures.
- Switch heights consistent throughout the dwelling — typical 48 in. AFF — laser-marked at rough-in.
- Multi-gang boxes set square; mud rings sized for the device count; covers selected at trim, not improvised.

SPECIFICATION

NEC 404.2(C) — neutral at the switch.

A grounded (neutral) conductor must be provided at switch locations except in narrow exceptions. For luxury control work, treat the rule as universal — every switch box gets a neutral. Period.

DIAGRAM

[DIAGRAM]

Insert field photo or diagram in production

[DIAGRAM: Layout example — three-way switching with neutral at every device]

§ 22

Grounding & Bonding — NEC 250

AN EFFECTIVE GROUND-FAULT CURRENT PATH. EVERY CIRCUIT, EVERY DEVICE.

NEC Article 250 establishes the grounding and bonding rules that make every other electrical system safe. The objective is an effective ground-fault current path from any fault point back to the source with low enough impedance to operate the overcurrent device quickly. Every part of the rough-in either supports that path or undermines it.

Grounding electrode system — 250 Part III

- Concrete-encased electrode (Ufer) where present — bonded with a grounding electrode conductor sized to NEC 250.66.
- Driven ground rods where required — minimum two, spaced ≥ 6 ft. apart, supplemented or sized to meet 25Ω resistance or by code presumption.
- Metal underground water pipe bonded within 5 ft. of entry per 250.52(A)(1).
- Metallic gas piping, structural steel, and other electrodes per 250.52 — all bonded together at the GES.
- GEC routed in a continuous run wherever possible; where spliced, only with listed irreversible connections.

Equipment grounding — 250 Part VI

- Every branch circuit installed with an EGC sized per NEC Table 250.122.
- Metal boxes, raceways, enclosures, and fixtures bonded continuously back to the panel.
- EGC connections torqued — every screw, every lug.
- Sub-panels: neutral isolated from the can; EGC lands on the dedicated ground bar. The neutral-to-ground bond exists at the service only.
- Pools, spas, and hydromassage tubs bonded per NEC 680 — equipotential bonding grid where required.

SPECIFICATION

Every device with a ground terminal is bonded.

If the device has a ground screw, it is bonded — by the EGC of the circuit, torqued to spec. There is no exception for convenience, finish, or speed.



[DIAGRAM: Layout example — service-entrance grounding electrode system with concrete-encased electrode, ground rods, and

§ 23

OCPD & Conductor Sizing — NEC 240

MATCH THE BREAKER TO THE CONDUCTOR, NOT THE LOAD.

Overcurrent protection is matched to the conductor it protects, not to the expected load. A 20 A breaker on 14 AWG is a fire waiting to start. NEC 240.4 gives us the small-conductor rule and Table 310.16 gives us the ampacity. We design conservatively, derate where the run demands, and never tolerate an undersized conductor on an upsized breaker.

240.4(D) — Small-conductor rule

- 14 AWG copper → 15 A maximum.
- 12 AWG copper → 20 A maximum.
- 10 AWG copper → 30 A maximum.
- Aluminum conductors derated per their separate row in 240.4(D).
- Exceptions exist for motor circuits and specific listed equipment — apply only with the listing in hand.

Ampacity adjustments

- Conductor ampacity per NEC Table 310.16 (or current code cycle's renumber) at the appropriate temperature column.
- Derate for ambient temperature per Table 310.15(B)(1).
- Derate for conductors in raceway / cable per 310.15(C)(1) when more than three current-carrying conductors share the pathway.
- Never select the conductor by load alone — apply the small-conductor rule, then size up if derating demands it.

INSPECTION STANDARD

The breaker protects the wire.

Every breaker on this team is sized to protect the smallest conductor on its circuit at the worst-case derated ampacity. The load is a separate calculation — the conductor is what gets protected.

14 AWG Cu	15 A
12 AWG Cu	20 A
10 AWG Cu	30 A
8 AWG Cu	Table

6 AWG Cu	Table
----------	-------

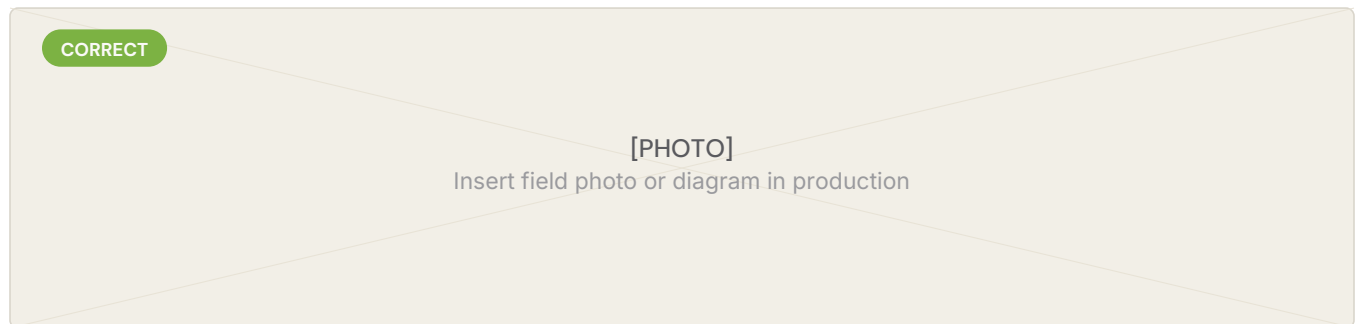
§ 24

Labeling

PANEL DIRECTORY. EVERY BREAKER. EVERY JUNCTION.

A labeled circuit is a serviceable circuit. An unlabeled panel is a future invoice and a safety hazard. The labeling standard is consistent across every Restrepo Innovations and Island Media Systems site.

- Panel directory: printed, comprehensive, every breaker described by load and area. Example: 15 — Kitchen GFCI, counter east.
- Breaker labels at the deadfront: AFCI, GFCI, MWBC, dedicated, tagged with the device or circuit identifier.
- Service disconnect: labeled with the available fault current and date marked per NEC 110.24.
- Sub-panels: labeled with feed source and the breaker number that protects them.
- Junction boxes: circuit identifiers inside every accessible J-box. Brady-printed.
- Conductor identification: hot, neutral, and EGC color-coded per code; phase identification on multi-phase systems.
- As-builts match labels exactly. If a label changes in the field, the as-built changes the same day.



[PHOTO: Field documentation example — completed panel directory printed and laminated, matched to deadfront labels and as-b

§ 25

As-Built Documentation

MATCH THE FIELD EXACTLY.

As-built documentation is the deliverable that lets a future electrician — possibly not us, possibly years from now — service the building without opening every wall. It is not an approximation of the design. It is a record of what is actually installed.

- Panel schedules: every breaker, every load, every conductor size, every termination torque.
- Single-line diagram of the service with feeder sizes and OCPD ratings.
- Branch circuit homerun map on the floor plan with circuit numbers at every device.
- GFCI / AFCI scope: every protected circuit listed, with line-side device identified.
- Grounding electrode system documented — electrode types, conductor sizes, bonding points photographed.
- Insulation-resistance (megger) test results captured per branch circuit and feeder before energization.
- GFCI and AFCI test results recorded at trim with calibrated testers.
- As-builts match the field exactly — not “close enough.”

FIELD RULE

If it doesn't match, fix the document or fix the field.

Discrepancies between the as-built and the field are resolved before closeout. We do not hand a homeowner or builder an approximate map.



§ 26

QC Checklist

WALKED AT EVERY MILESTONE.

This checklist is walked at the rough-in milestone, before drywall, and again before close-out and energization. Both columns must be satisfied: the YES items present and verified, the NO items absent. The electrician of record and the PM/QC sign the bottom of this page on every project.

VERIFY PRESENT	VERIFY ABSENT
☐ VERIFY Service entrance, weatherhead, drip loop, raceway supported.	☐ ABSENT Back-stabbed receptacles or switches anywhere.
☐ VERIFY GES bonded — Ufer, rods, water pipe; main bonding jumper torqued.	☐ ABSENT Bored holes < 1¼ in. from edge with no nail plate.
☐ VERIFY Panelboards plumb, vertical; NEC 110.26 working space clear.	☐ ABSENT Crushed NM-B at overdriven staples.
☐ VERIFY Every breaker, lug, and bus connection torqued to spec.	☐ ABSENT Shared neutrals without MWBC and handle-tie.
☐ VERIFY Panel directory printed; matches deadfront and as-builts.	☐ ABSENT Untorqued breaker or lug connections.
☐ VERIFY NM-B per 334.30 — 12 in. of box, ≤ 4½ ft., ≤ 18 in. free.	☐ ABSENT Panel face-up or face-down (408.43).
☐ VERIFY Bored holes ≥ 1¼ in. from edge or 1/16 in. nail plate.	☐ ABSENT Working space obstructed by HVAC, plumbing, racks.
☐ VERIFY Box fill calculated per 314.16; every box compliant.	☐ ABSENT Al-to-Cu splices without listed AL/CU connectors.
☐ VERIFY Neutral at every switch box (404.2(C)).	☐ ABSENT Sub-panel neutral and ground bonded together.
☐ VERIFY Receptacle layout meets 210.52 — 6-foot rule walked.	☐ ABSENT Receptacle layout failing 6-foot or counter rule.
☐ VERIFY GFCI tested per 210.8; AFCI per 210.12.	☐ ABSENT Missing GFCI on bath, kitchen, garage, outdoor.
☐ VERIFY Conductors sized per 240.4 and Table 310.16.	☐ ABSENT Missing AFCI on circuits required by 210.12.
☐ VERIFY EGC per 250.122; sub-panel neutral isolated.	☐ ABSENT Missing neutral at any switch box (404.2(C)).
☐ VERIFY Firestop tagged; megger results recorded.	☐ ABSENT Unsealed penetrations of fire-rated assemblies.

PROJECT / AREA

DATE

ELECTRICIAN OF RECORD · SIGNATURE

PM / QC · SIGNATURE

Status: ☐ Pass ☐ Pass with notes ☐ Fail — rework required

§ 27

Standards & References

WHAT THIS MANUAL ALIGNS WITH.

This standard is designed to align with the National Electrical Code, the AHJ requirements common to New Jersey and the surrounding region, and the manufacturer documentation for the equipment we routinely specify. The specific authorities below are referenced throughout the manual; the citations are summarized here for convenience.

NEC 110.14(D) — Terminal torque

Tightening torque values for connections required to be applied as specified in the equipment listing or instructions. Calibrated torque tools required. [Mike Holt 110.14 reference](#).

NEC 110.26 — Working space

Clear working space in front of electrical equipment: 30 in. wide, 36 in. deep, 6 ft. 7 in. high; doors must open at least 90°. [NEC 110.26 summary](#).

NEC 210.4 — Multiwire branch circuits

MWBCs require a means to disconnect all ungrounded conductors simultaneously — handle ties or common-trip breakers. [Mike Holt MWBC reference](#).

NEC 210.8 — GFCI protection

Ground-fault circuit-interrupter protection scope expanded in the 2023 cycle to cover all 125 V to 250 V receptacles in dwelling kitchens, plus laundry and additional areas. [NEC 210.8 summary](#).

NEC 210.12 — AFCI protection

Arc-fault circuit-interrupter protection required on dwelling-unit branch circuits in 14 listed locations. The 2023 cycle expanded coverage to include 10 A circuits. [NEC 210.12 summary](#).

NEC 210.52 — Receptacle outlets

Spacing requirements in dwelling units — the 6-foot rule, kitchen counter 12 in. rule, and floor-receptacle 18 in. rule. [Captain Code 210.52 walkthrough](#).

NEC 240.4 — Conductor protection

Small-conductor rule: 14 AWG → 15 A, 12 AWG → 20 A, 10 AWG → 30 A copper. [Mike Holt 240.4 reference](#).

NEC 250 — Grounding and bonding

Effective ground-fault current path required from any fault point back to source. GES, EGCs, and bonding throughout. [Nassau National 250 summary](#).

NEC 300.4 — Protection from physical damage

1¼-inch setback in bored holes and parallel runs; 1/16-inch steel plate where the setback can't be maintained; bushings/grommets at metal-stud openings. [ExpertCE 300.4 summary](#).

NEC 300.21 — Spread of fire

Penetrations of fire-rated assemblies must be sealed using listed firestop systems. [ExpertCE firestop guide](#).

NEC 314.16 — Box fill

Volume per Table 314.16(B); device yokes count as 2× the largest conductor; all EGCs count as one allowance. [NEC 314.16 summary](#).

NEC 334.30 — NM cable support

NM cable supported within 12 in. of every box and at intervals not exceeding 4½ ft.; free-length to nearest support ≤ 18 in. [NEC 334.30 summary](#).

NEC 408.43 — Panelboard orientation

Panelboards shall not be installed in the face-up or face-down position. [NEC 408.43 summary](#).

NEC 404.2(C) — Switch neutrals

A grounded conductor must be provided at switch locations except in narrow exceptions — required for occupancy sensors and smart-switch loads.

NOTE

What this manual is — and isn't.

This document captures our installation standards. It is not a substitute for the National Electrical Code, the AHJ's adopted edition, or manufacturer instructions. Where any field condition conflicts with code, code wins. Where any field condition conflicts with this manual, this manual wins until the lead engineer documents an exception.

§ 28

Field Notes

SITE-SPECIFIC NOTES, OPEN ITEMS, SIGN-OFFS.

Use this page on site for project-specific notes, open items, deviations approved by the lead engineer, AHJ inspector comments, and end-of-day sign-offs. Photograph this page at each site visit and store it with the as-builts.

FIELD NOTES — CONTINUED

Lined area for field notes.