Garage & EV Workshop Reference Card

Field Manual · Volume 21 · v1.0 · 2026 · Charge · Lift · Slab · Subpanel · One-Page Clinical Summary

Restrepo Innovations · Franklin Lakes, NJ
Internal & client distribution

CODE IS THE FLOOR. STANDARD IS THE CEILING.

Scope: Residential garage and EV workshop electrical, EV charging, vehicle lift power, compressed air, dust collection, lighting, networking, and floor coordination — sequenced, stubbed, and signed before the slab pours. Smart-home integration via Crestron Home, Lutron RA3, and Control4. Owner-grade, residential-only, NJ Climate Zone 4A.

§01 OPERATING PRINCIPLES

- Six-pillar garage suite — EV charging, subpanel & load, vehicle lift power, compressed air & dust, HVAC, and slab & floor — each a one-shot rough-in discipline; residential-only posture throughout; NEC Article 511 hazardous-location wiring and in-ground lifts explicitly excluded.
- Stub before slab — all conduit penetrations, trench drain formwork, lift anchor zone markings, and ground rod locations set in formwork and photographed before the concrete truck arrives; no corrective core-drilling after the polyaspartic topcoat is applied.
- Code-first — NEC 2023 Articles 210.8, 215, 220, 230.67, 250.32, 408, 422, 511, and 625; NJ UCC NJAC 5:23; IRC 2021 R302.5/R309/R314/R315/R506; ANSI/ALI ALCTV-2017 (lift certification); ASTM F2170 (slab moisture) — these are the floor, not the ceiling.
- NJ Climate Zone 4A — winter design temperature 13°F (Bergen County); EVSE cold-weather operating temperature confirmed ≥22°F for all specified chargers; slab vapor barrier per IRC R506.2.3; mini-split selected to operate at 14°F minimum per Mitsubishi MSZ-FH guide specs.
- Spare hardware ≥5% delivered + labeled — EVSE mounting hardware, subpanel breakers, conduit fittings, lift disconnect fuses, and floor coating patch kit delivered in labeled bins at closeout.
- One-line diagram and as-built conduit schedule archived with owner before final payment; Crestron/Lutron RA3 configuration committed to cloud and local media; NJ Charge Up $250 rebate and applicable PSE&G Smart Charge NJ incentives confirmed and filed.

§02 EV CHARGING EQUIPMENT

- Tesla Wall Connector Gen 3 (part 1457768-00-E) — 48A / 11.5 kW at 240V on dedicated 60A two-pole circuit; #6 AWG THHN copper; NEMA 3R; operating temperature −40°F to 122°F; native SAE J3400 (NACS) connector; Group Power Management links up to six units on a shared circuit; Dynamic Power Management requires CT meter at house panel per NEC 625.42(A) EMS provision.
- ChargePoint Home Flex CPH50-NACS-L23 — 50A / 12 kW at 240V; adjustable 16–50A via app; NEMA 3R; UL 2594, UL 2231, ENERGY STAR; built-in 20 mA CCID satisfies NEC 625.47 personnel protection; hardwire circuit is non-GFCI breaker (external GFCI conflicts with integral CCID per ChargePoint datasheet); eligible for NJBPU Charge Up $250 rebate.
- Wallbox Pulsar Plus 48A hardwire — Type 4 per UL 50E (IP55); 16–48A via seven-position rotary switch; 25 ft cable; SAE J1772 with Tesla-to-J1772 adapter (P/N 1800778-00-A) for NACS vehicles; UL 2594, UL 2231, ENERGY STAR; #6 AWG maximum at field terminal rated 105°C; 60A two-pole dedicated circuit.
- Three-car load sizing — three individual 60A circuits (one per bay) at 48A continuous = 43.2 kVA; NEC 220.57 (2023) adds EVSE at greater of 7,200 VA or 100% nameplate; NEC 220.87 actual-demand method with Tesla Dynamic Power Management EMS typically validates existing 200A residential service without upgrade.
- NEC 625.40 — each EVSE greater than 16A or 120V on individual branch circuit; exception only with listed EMS per NEC 750.30; NEC 625.42 continuous load — circuit sized at 125% of EVSE output; NEC 625.47 integral CCID (20 mA) satisfies GFCI personnel protection; NEC 210.8(A)(2) GFCI required on all 125V convenience receptacles in garage.
- ENERGY STAR and NJBPU incentives — Tesla TWC Gen 3, ChargePoint CPH50, Wallbox Pulsar Plus, and Emporia Classic 48A are NJBPU Charge Up eligible ($250 residential rebate); federal IRS Form 8911 Alternative Fuel Refueling credit (30%, residential cap $1,000); PSE&G Smart Charge NJ $1,500 bill credit available for qualifying installs.

§03 GARAGE SUBPANEL & LOAD

- 200A main-breaker subpanel — Square D QO130M200PG (200A, 30-space, Plug-on Neutral, ground bar) or Eaton CHSUR200P (200A, 30-space, factory SPD, split neutral/ground bars); 4-wire feeder (two hots, one neutral, one #4 AWG copper EGC) per NEC 250.32(B); minimum 4/0 AWG aluminum or 2/0 AWG copper THWN-2 hots in 2-inch Schedule 80 PVC conduit stub through slab.
- NEC 250.32(B) ground/neutral separation — in attached garage subpanel, remove green bonding screw; neutral bar floats; EGC bar bonds to enclosure and homeruns to main panel EGC; floating neutral prevents neutral current on equipment grounding path; 4-wire feeder required by all current AHJs in Bergen County NJ.

§06 WORKSHOP HVAC & MAKE-UP AIR

- Mitsubishi MSZ-FH24NA / MUZ-FH24NA mini-split — 24,000 BTU/H; 208–230V / 1Ph / 60 Hz; dedicated 240V 15A circuit (confirm MCA and MOP on installation manual); heating operation floor 14°F outdoor; maintains approximately 79% rated capacity at 17°F; SEER 22+; HSPF 12+; R410A (transitioning to R454B on WX series); keeps garage at 50°F year-round for EV battery pre-conditioning, hydraulic fluid viscosity, and polyaspartic floor cure windows.
- Make-up air for attached garage — IRC R302.5.1 requires fire-rated separation (1/2-inch Type X gypsum on garage side of shared walls and ceiling per IRC R302.6); in an all-electric attached garage with no combustion appliances, dedicated make-up air supply is not required; if a gas heater is later added, coordinate with Vol 09 HVAC for dedicated outdoor air per IRC M1503 to prevent depressurization.
- Vehicle exhaust ventilation — install through-wall exhaust fan (Broan-Nutone QTXE110S equivalent, 110 CFM, 120V) for warm-up and EV battery-conditioning exhaust; minimum 1.5 air changes per hour for attached garage; fan wired to 120V 15A circuit with wall switch at vehicle entrance; do not rely on mini-split airflow for combustion gas dilution.
- Garage IDF thermal management — wall-mount network rack in an unconditioned or semi-conditioned bay will see ambient temperatures approaching 100°F in August; mini-split circuit location and rack position must be coordinated so the IDF is within the mini-split cooling zone; Ubiquiti UniFi USW-Pro-24-PoE switch rated to 104°F — confirm rack ambient stays below this with building envelope per Vol 17.
- NJ Climate Zone 4A sizing rationale — winter design 13°F (Bergen County ASHRAE 2021); MSZ-FH24NA maintains ≈79% rated heating at 17°F; for peak worst-case nights, Daikin Aurora FTXB24WVJU / RXB24AXVJU (-13°F rated) is alternate; IECC 2021 Zone 4A requires R-20 walls and R-49 roof deck for the garage envelope (coordinate with Vol 17 Building Envelope).
- Crestron Home HVAC integration — Mitsubishi MSZ-FH series supports Crestron two-way driver via MHK2 wireless controller or Mitsubishi MelCloud cloud bridge; scene Workshop Mode activates mini-split to 65°F cooling target; scene Departure Mode sets mini-split to 55°F standby; all scenes execute locally on LAN without cloud dependency.

§07 SLAB, DRAINS & EPOXY COORDINATION

- Slab specification per IRC R506 — minimum 4-inch unreinforced concrete (3,000 PSI at 28 days); 4-inch compacted gravel base (IRC R506.2.4); 10-mil virgin polyethylene vapor retarder (IRC R506.2.3; 6-mil is code minimum, 10-mil is Restrepo standard); 12-inch laps sealed with Tyvek tape; turned up 6 inches at perimeter walls; vapor barrier critical in Bergen County clay-rich soils to prevent coating delamination.
- Slab slope and drainage — IRC R309.3 requires garage floor sloped to facilitate liquid movement to drain or door; minimum 1/8 inch per foot (1% grade); preferred 1/4 inch per foot (24 ft deep garage = 3-inch drop to threshold); trench drain alternative: NDS Mini Channel 3-inch HDPE (Part 500, 62.8 GPM at 1%) with brass or cast-iron grate for luxury finish; trench drain formwork set to finished-floor elevation before pour.
- ASTM F2170 moisture test — drill holes at 40% slab depth (1.6 inches for 4-inch slab); insert sleeve; cap and seal; 24-hour equilibration; measure with calibrated RH probe; minimum 3 probes per first 1,000 sq ft; one probe within 3 ft of each exterior wall; acceptable threshold ≤75% internal RH for standard epoxy; Penntek PT 300 polyaspartic tolerates up to 95% RH; test no sooner than 28 days after pour.
- Surface preparation — diamond grind to ICRI CSP 3–4 (ICRI Technical Guideline 310.2R-2013) using 600+ lb walk-behind diamond grinder; peak-to-valley 0.04–0.08 inches; Roklin PolyFlex DS polyurea crack filler for cracks up to 1/4 inch (rapid set, color-matched); re-grind crack repairs flush before base coat; CSP 3–4 required for Penntek polyurea/polyaspartic system.
- Penntek PT 300 polyaspartic topcoat system — aliphatic polyaspartic polyurea, 93% solids; tensile strength 6,000 PSI (ASTM D412); compressive strength 9,400 PSI (ASTM D695); zero VOC; UV stable (FadeLock); resists hot tire pickup; three formulations (Summer/Winter/X-treme Heat) for NJ climate; typical three-coat system: polyurea basecoat + color flake broadcast + PT 300 topcoat; single-day application; 24-hour return to vehicle traffic.
- Pre-slab conduit coordination — ALL conduit stub-ups set before pour: three 1-inch Schedule 80 PVC

§10 SMART-HOME INTEGRATION & SCENES

- Crestron Home + Lutron RA3 primary platform — Crestron CP4/MC4 controls Lithonia ZL1D fixtures via Lutron RadioRA 3 Plug-on Neutral dimmers; Tesla TWC Gen 3 Dynamic Power Management EMS feeds Crestron load-monitoring driver via TCP/IP; Control4 driverCentral modules for LiftMaster MyQ (garage door status and open/close) and Mitsubishi MelCloud bridge; all scenes execute locally on LAN without cloud dependency.
- Five locked scenes — • Departure Mode (lights to 100%, EVSE charge schedule set, mini-split to 55°F standby, garage doors confirmed closed, security cameras armed) • Arrival Mode (lights to 80% 5000K, EVSE ready, mini-split to 65°F, garage door open on vehicle arrival geofence secondary trigger) • Workshop Mode (lights to 100% 5000K, mini-split to 68°F, Oneida dust collector interlock armed, EVSE in economy mode) • Charge Schedule (off-peak charging 11 PM–7 AM, EV load shed if home demand spikes, TWC Dynamic Management active) • Lockdown (all garage doors confirmed closed, exterior cameras recording, EVSE sessions paused, CO alarm status confirmed).
- Lighting scene archive — all Lutron RA3 zone assignments, dimmer preset levels, and schedule programs archived in Lutron Designer file and cloud backup; RadioRA 3 firmware version and keypad button assignments documented at closeout; ZL1D 0–10V dimming wired to Lutron RA3 ELV+ or 0–10V dimmer per fixture driver specification; RA3 VCRX visor control enables in-car Departure Mode trigger from driveway.
- EVSE load management integration — Tesla TWC Gen 3 Dynamic Power Management CT clamp wired to main residential panel (cable P/N 1133339-00-A); Crestron driver monitors TWC app API for session state, energy delivered, and fault alerts; ChargePoint CPH50 Crestron module polls Energy API for session data; Charge Schedule scene activates off-peak pricing window via Crestron scheduler; EVSE load shed sequence confirmed in Crestron program notes.
- Security and access integration — Aiphone IXG video intercom driver in Crestron Home; LiftMaster MyQ garage door status (open/close/fault) displayed on Crestron touch panel and sent as push notification; Lockdown scene triggers MyQ close command to all doors, arms cameras, and sends push alert; geofencing used as secondary Arrival Mode trigger only — primary trigger is calendar + driveway camera detection.
- Notification matrix — push alerts for: EVSE session fault or CCID trip, subpanel SPD indicator change, CO alarm trigger, heat detector trigger, garage door open >30 min, Oneida dust collector circuit fault, mini-split alarm code, camera offline, and Crestron LAN loss to any garage IP device; notification matrix documented in Crestron program notes and owner closeout archive.

§11 WITHOUT WRITTEN DIRECTION

- BX/MC cable in any in-slab or buried garage conduit run — default to Schedule 80 PVC for all slab penetrations and underground runs; armored cable in any buried or slab-encased conduit is without written direction from the engineer of record.
- EVSE circuit shared with any other load — Restrepo Innovations standard is one dedicated circuit per EVSE position; sharing an EVSE circuit with lighting, receptacles, lift, compressor, or any other load is without written direction and inconsistent with NEC 625.40 individual branch circuit requirement.
- Neutral bonded to ground at garage subpanel — NEC 250.32(B) requires the green bonding screw to be removed and the neutral bar to float at a subpanel in an attached garage; bonding neutral to ground at the subpanel with a 4-wire feeder is without written direction and creates a code-non-compliant parallel path for neutral current.
- In-ground lift installed without NEC 511 evaluation — any true in-ground hydraulic lift with a below-grade cylinder pit constitutes a Class I hazardous location per NEC 511.3; installing an in-ground lift in a residential attached garage without a formal NEC 511 classification study, explosion-proof wiring, and AHJ approval is without written direction; this volume covers surface-mount and pit-style above-grade lifts only.
- Floor coating applied without ASTM F2170 moisture test — applying polyaspartic, polyurea, or epoxy coating on a slab that has not been tested per ASTM F2170 and confirmed below the coating manufacturer's RH threshold (95% for Penntek PT 300; 80% for standard epoxy) is without written direction and voids the manufacturer warranty.
- Conduit stub-ups added after slab pour — core-drilling through a poured and finished polyaspartic slab to add conduit penetrations omitted during pre-slab coordination is a maintenance patch, not an

QC GATE — VERIFY BEFORE CLOSE-IN

- ☐ EVSE installer test report filed — rated amperage verified, CCID trip test passed, continuous load confirmed, and serial numbers recorded for all installed units
- ☐ GFCI on all 125V receptacles per NEC 210.8(A)(2) — every 15A and 20A garage receptacle tested, tamper-resistant (TR) and weather-resistant (WR) where required, AFCI on applicable circuits

practical feeder lands at 150–200A; confirm with Bergen County AHJ.

- NEC 110.26 working clearance — minimum 36 inches in front of panelboard; 30-inch minimum width

- Pre-slab verification walk — ALL conduit stubs, pull strings, trench drain formwork, lift anchor zone markings, ground rod location, and vapor barrier laps confirmed by field walk and timestamped photo

ends capped; photos timestamped and labeled by bay and system; filed in closeout archive before concrete truck departs site.