

FIELD MANUAL · VOLUME 16

Sized. Sited. Signed.

Power is a framing decision. Sized, sited, and signed before drywall.

PREPARED FOR

Operators · Project Managers · Designers · Integrators · Owner's Reps

CONTACT

Restrepo Innovations

Franklin Lakes, NJ · mike@restrepoinnovations.com
restrepoinnovations.com · Phone on file with PM

PARTNER

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MANIFESTO

Power is a framing decision. Sized, sited, and signed before drywall.

Vol 16 governs the design and installation of residential energy systems across battery storage, solar photovoltaic arrays, smart electrical panels, geothermal heat pumps, EV charging, and standby generation. Every kilowatt-hour, conduit, and ground rod specified in this volume is sized to the home, sited to the structure, and signed off before drywall closes. The energy stack is not an upgrade path. It is a framing decision.

SCOPE

Residential-only. Applies to whole-home battery backup, grid-tied and hybrid solar, smart panels, geothermal ground-source heat pumps, EV charging, and standby generators inside Restrepo Innovations luxury residential builds. Specifies pre-rough-in pathways, equipment selection, code compliance, permitting sequence, and commissioning. Cross-references Vol 02 (Electrical Rough-In) for branch wiring discipline and Vol 13 (HT Calibration) for load-aware cinema power.

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PART 1

Storage & Generation

Sections 01–04 — Why Energy Now, Battery Storage, Solar PV, Smart Panels

§ 01

Why Energy Now

PART I — STORAGE & GENERATION

The Restrepo energy stack is residential infrastructure first, technology second. PSE&G; and JCP&L; outage data for the New Jersey / New York metro corridor shows multi-hour interruption events every storm season, and the 2023 IRA Section 25D 30% federal tax credit on battery, solar, and geothermal installations has made the economics defensible at the luxury tier. The mandate is not green virtue. The mandate is uninterrupted comfort, predictable monthly cost, and a clean interface for the homeowner.

Three premises drive this volume. First, energy is a framing decision: conduit, battery pads, solar pathways, and geothermal headers are sized and located before drywall, not patched in. Second, every system must answer to a single audited spec — manufacturer, model, capacity, location, code reference. Third, the home is residential; we apply NEC, NFPA, UL, and AHJ requirements with luxury-grade discipline, never commercial assumptions.

THE FOUR PILLARS

Pillar	What It Provides	Pre-Rough-In Trigger
Battery Storage	Whole-home or partial-home backup; load shifting; grid services	Pad location, ventilation, conduit to MSP and ATS
Solar PV	On-site generation; SuSI / net-meter revenue; battery recharge in extended outage	Roof penetrations, conduit chase, rapid-shutdown pathway
Smart Panel	Per-circuit metering, load shedding, app control, microgrid coordination	Service entry, working space, auxiliary panel real estate
Geothermal HP	Heating + cooling at 4–6 COP; lowest lifecycle energy cost	Loop field, header trench, mechanical-room slab penetration

NOTE

Vol 16 is residential.

Every reference in this volume is a single-family or estate residence. Multi-family, commercial, and utility-scale installations are explicitly out of scope and require a separate engineering package.

FIELD RULE

The energy stack is a framing decision.

Battery pad, solar conduit, smart-panel chassis, and geothermal loop pathway are located before drywall. We do not patch energy systems into a finished home.

§ 02

Battery Storage

PART I — STORAGE & GENERATION

Battery selection is a function of three variables: usable capacity in kWh, continuous output in kW, and inverter topology (AC-coupled vs DC-coupled). All four products specified below are LFP (lithium iron phosphate) chemistry — thermally stable, long cycle life, and currently the only chemistry we accept for residential whole-home storage in the Restrepo standard.

PRIMARY PRODUCTS

Product	Usable kWh	Cont. kW	Topology	Notes
Tesla Powerwall 3	13.5	11.5	DC-coupled w/ integrated solar inverter	20kW PV input; Backup Gateway 3
FranklinWH aPower 2	15	10	AC-coupled	aGate hub; whole-home Smart Circuits
Enphase IQ Battery 5P	5.0 (modular)	3.84	AC-coupled (microinverter)	Stack to 80kWh; IQ8 series compatible
Generac PWRcell 2	9–18 (modular)	9	DC-coupled	PWRmanager load mgmt; Mobile Link

SPECIFICATION

Tesla Powerwall 3.

13.5 kWh usable, 11.5 kW continuous, 185A LRA motor start. Integrated 11.5 kW solar inverter accepts up to 20 kW DC PV input across six MPPT channels. NEMA 3R-rated for outdoor install down to -4 °F continuous, -22 °F intermittent. Six units max per Backup Gateway 3 (81 kWh / 69 kW).

SPECIFICATION

FranklinWH aPower 2.

15 kWh usable LFP, 10 kW continuous, 15 kW peak (10 s). aGate hub mediates grid, battery, solar, generator, and EV charging. Smart Circuits provide per-circuit load shedding without a separate smart panel. -4 °F to 122 °F operating range.

SPECIFICATION**Enphase IQ Battery 5P.**

5.0 kWh usable per unit, 3.84 kW continuous, 7.68 kW peak. Microinverter architecture means each battery has its own grid-forming inverter — modular, redundant, and the natural pairing for IQ8 microinverter solar arrays. Stackable to 80 kWh per Combiner.

SPECIFICATION**Generac PWRcell 2.**

Modular DC-coupled storage from 9 to 18 kWh. PWRmanager intelligent load management module sheds non-critical loads automatically during outage. Pairs with Generac PV-Link optimizers and Guardian standby generators in a unified stack.

PLACEMENT — INDOOR vs GARAGE vs OUTDOOR

NFPA 855 governs ESS placement. Default Restrepo siting for NJ / NY metro: conditioned garage on an exterior wall opposite living space, with 3 ft working clearance, on a non-combustible pad, with a fire-rated separation from interior occupied rooms. Outdoor pad is acceptable when the unit is rated for the climate envelope and the AHJ accepts the install location.

DO NOT**Do not stack ESS units in a closet without ventilation.**

NFPA 855 limits aggregate residential ESS to 20 kWh per dwelling unit before sprinkler and ventilation triggers escalate. Closet installs without dedicated ventilation, thermal sensors, and an exterior wall typically fail review.

INSPECTION STANDARD**Battery commissioning verify.**

Confirm: nameplate matches submitted spec; BMS firmware current; rapid shutdown / anti-islanding tested; battery-to-Gateway communications verified; outage drill demonstrates clean transfer; manufacturer monitoring app activated and shared with Restrepo and homeowner.

§ 03

Solar PV Arrays

PART I — STORAGE & GENERATION

New Jersey averages 4.0–4.4 peak sun hours per day annualized — sufficient for 1,200–1,400 kWh per installed kW per year on south-facing roofs at 25–35° pitch. Module selection is driven by warranty, efficiency, aesthetics, and available roof real estate. Inverter topology is a separate decision, set by the battery and rapid-shutdown stack.

MODULE TIERS

Module	Power	Efficiency	Warranty	Notes
REC Alpha Pure-RX	470 W	22.6%	25 yr product, 25 yr power	HJT cells, lead-free, all-black
Maxon 7	440 W	22.8%	40 yr product / 40 yr power	IBC architecture, premium aesthetic
Q.TRON BLK M-G2+	430 W	22.5%	25 yr product, 25 yr power	N-type TOPCon, US-assembled
Panasonic EverVolt 410	410 W	21.7%	25 yr full coverage	Black-on-black, anti-soiling

INVERTER STRATEGY

Three accepted topologies in the Restrepo standard. Microinverter (Enphase IQ8 series) — every module has its own grid-forming inverter; best for shaded or complex roofs; pairs natively with IQ Battery storage. String inverter — single or dual MPPT per array; lowest cost; only acceptable on clean unshaded roofs. DC-optimized string (SolarEdge) — module-level optimization with central inverter; monitoring per panel. Tesla Powerwall 3 integrates a 11.5 kW string inverter, eliminating a separate solar inverter when paired with PW3.

FIELD RULE

NEC 690.12 — Rapid Shutdown.

All rooftop residential PV must reduce conductors inside the array boundary to ≤30V within 30 seconds of shutdown initiation, and conductors outside the array boundary to ≤30V within 30 seconds. Module-level shutdown devices (SunSpec-certified) are the standard implementation. Microinverters and DC optimizers comply natively.

MOUNTING & ROOF INTERFACE

IronRidge XR rail or Unirac SolarMount with flashed L-foot attachments at every rafter on standard pitched composition shingle. Standing-seam metal uses S-5 or AceClamp non-penetrating clamps. Tile roofs use tile hooks with manufacturer-approved flashing. Every penetration is photo-documented before solar deck close.

INSPECTION STANDARD**Solar AHJ inspection sequence.**

NJ residential solar requires three inspections: (1) electrical rough — conduit, transition, raceway grounding before drywall; (2) structural — attachment spacing, flashing, fire setbacks; (3) final — interconnection, rapid-shutdown test, labeling, monitoring activation. Schedule these in series, not parallel.

NOTE**NJ SuSI program.**

Successor Solar Incentive (SuSI) under SREC-II provides a fixed \$/MWh payment for 15 years on residential solar in NJ. Combined with federal 30% ITC and net metering at retail rate, payback for a 12 kW residential array commonly lands at 6–8 years.

§ 04

Smart Panels & Load Management

PART I — STORAGE & GENERATION

A smart panel replaces or supplements the main service panel with per-circuit metering, app control, and dynamic load management. The premise: when the home runs on battery during an outage, the panel decides which circuits stay live based on remaining state of charge — automatically, predictably, without the homeowner triaging breakers in the dark.

Panel	Service Rating	Circuits	Notable Capability
SPAN Panel	200A	32	Per-circuit kWh metering; app-defined backup priority; PowerUp Drive integration
Lumin Smart Panel	60A subpanel	12 (controllable)	Retrofit overlay; sits next to existing MSP; controls 12 critical circuits
Schneider Square D Energy Center	200A	42	Microgrid Interconnect Device (MID) handles transfer; integrates Wiser app
Leviton Smart Load Center	200A	42	Per-circuit smart breakers; energy monitoring; modular retrofit

SPECIFICATION

SPAN Panel.

200A main breaker, 32 branch positions, integrated current and voltage sensing on every circuit at 1 Hz sample rate. App defines four backup priority groups: Must Have, Nice to Have, Non-Essential, and Off. Compatible with Tesla Powerwall, Enphase IQ Battery, FranklinWH, and Generac PWRcell.

SPECIFICATION

Schneider Square D Energy Center.

200A main panel with 42 branch positions and integrated Microgrid Interconnect Device (MID) that mediates grid, battery, solar, and generator. Wiser Energy app provides per-circuit visibility. Pairs natively with Schneider Boost+ battery system.

WORKING SPACE — NEC 110.26

Every electrical panel — smart or conventional — requires 36 in deep clear working space, 30 in or panel-width minimum lateral clearance, and 6 ft 6 in headroom. Door swings into the working space are not allowed. Garages, mechanical rooms, and dedicated electrical closets are acceptable; bedrooms,

bathrooms, and clothes closets are not.

DO NOT**Do not pair a smart panel with a non-compatible battery without confirmation.**

Smart panel ↔ battery interoperability is firmware-dependent. Confirm the exact battery model is on the panel manufacturer's compatibility list at time of order, not at time of spec — the lists update quarterly.

BEST PRACTICE**Sub-panel strategy for theaters, kitchens, and EV.**

Even with a smart main panel, dedicate sub-panels to high-load zones: home theater (Vol 12), kitchen (range, induction, appliances), and EV charging. Sub-panels keep the main panel breaker count manageable and isolate inrush events from sensitive audio and AV ground references.

PART 2

Mechanical & Mobility

Sections 05–07 — Geothermal Heat Pumps, EV Charging & Generators, Service Entry & Grounding

§ 05

Geothermal Heat Pumps

PART II — MECHANICAL & MOBILITY

Ground-source heat pumps (GSHP) move heat between the home and the earth, where soil temperature stays at 50–55 °F year-round in NJ. The result is a heating and cooling system that operates at COP 4–6 — meaning four to six units of thermal energy delivered per unit of electricity consumed. No on-site combustion. No outdoor condenser visible. Lowest lifecycle energy cost of any HVAC topology.

LOOP TOPOLOGIES

Loop	Description	NJ Suitability
Vertical closed	Boreholes 200–400 ft deep with HDPE U-tube; ~150–200 ft per nominal ton	Default for NJ — limited yard area, deep frost line
Horizontal closed	Trenches 4–6 ft deep with HDPE pipe loops; ~400–600 ft per ton	Estate-scale lots only; requires excavation acreage
Pond / lake closed	Submerged HDPE coils on the bottom of an on-site pond ≥8 ft deep	Rare in NJ — only viable with a sustained-depth waterfeature
Open loop	Pump-and-dump from a high-yield well; 1.5–3 GPM per ton	AHJ-permitting only; aquifer protection scrutiny

PRIMARY HEAT PUMPS

Heat Pump	Tons	Cooling EER	Heating COP	Notes
WaterFurnace 7 Series	2–6	41 (closed loop)	5.3	IntelliZone2 zoning; Symphony app
ClimateMaster Trilogy 45	3–6	45 (Q-Mode)	5.0	Variable-speed inverter; integrated DHW
Bosch Greensource CDi	2–6	30	4.9	Two-stage scroll compressor

SPECIFICATION

WaterFurnace 7 Series.

Variable-speed compressor and ECM blower, AHRI-rated 41 EER closed-loop / 5.3 COP. IntelliZone2 supports up to 8 zones with motorized dampers. Symphony app integrates monitoring and remote thermostat control.

SPECIFICATION**ClimateMaster Trilogy 45 Q-Mode.**

First residential GSHP to break 45 EER. Dual-capacity scroll compressor with inverter drive. Integrated desuperheater prioritizes domestic hot water during cooling cycles, recovering 30–40% of typical DHW load at zero marginal cost.

LOOP DESIGN — IGSHPA STANDARD

Loop sizing follows IGSHPA Closed-Loop / Geothermal Heat Pump Systems standard: Manual J calc establishes home load → tonnage; loop length follows soil-conductivity tables for NJ regional geology (typical $k = 1.3 \text{ BTU/hr-ft-}^{\circ}\text{F}$ for clay-loam glacial till). Pressure-test loop at 100 PSI for 30 minutes minimum before closing trench.

INSPECTION STANDARD**Geothermal commissioning verify.**

Confirm: pressure test passed and logged; antifreeze type and concentration on label; circulation pump amp draw within spec; entering / leaving water temps logged at design conditions; backup heat lockout temperature set; warranty registered with WaterFurnace, ClimateMaster, or Bosch.

NOTE**Loop fluid for NJ.**

Standard fill is 20% propylene glycol (food-grade, non-toxic) for freeze protection to 15 °F entering water — adequate for vertical loops in NJ. Methanol is more thermally efficient but requires AHJ approval and additional permitting; we default to propylene glycol on residential builds.

§ 06

EV Charging & Generators

PART II — MECHANICAL & MOBILITY

EV charging and standby generators are the two most common owner-driven additions to the energy stack. Both interact with the main service panel and battery, and both are commonly under-sized at the spec phase. The discipline here is to size for the home's eventual fleet and outage profile, not the day-of-handover load.

EV CHARGING — NEC 625

NEC Article 625 governs EVSE installation. Continuous load rating: 125% of nameplate. A 48A EVSE on a 60A breaker draws 11.5 kW continuous — equivalent to running an induction range at full output round the clock. For a two-EV household, plan two independent 60A circuits or an EVSE pair with on-board load sharing.

EVSE	Max Output	Connector	Notes
Tesla Wall Connector (Gen 3)	48A / 11.5 kW	Tesla NACS	Power-share up to 6 units; CT-clamp load mgmt
ChargePoint Home Flex	16–50A / 12 kW	J1772	Wi-Fi, EnergyStar, ENERGY STAR-rated
Wallbox Pulsar Plus	40A / 9.6 kW	J1772 / NACS	myWallbox app; bidirectional roadmap
Emporia EV Charger	48A / 11.5 kW	J1772	Lowest cost smart EVSE; integrates w/ Vue panel monitor

FIELD RULE

Load calc allowance — NEC 220.57.

EV charging may use 220.57 (Optional Calc) which permits a 7,200 W minimum demand for the EVSE branch. For a panel that is approaching 200A capacity, this matters. When a second EVSE pushes the calc over service rating, a service upgrade or load management device is required before issuing a permit.

STANDBY GENERATORS

Generators remain in scope when battery + solar cannot cover the worst-case outage profile — typically week-long winter events with snow on the array. Default Restrepo spec is a natural-gas air-cooled unit 16–22 kW for whole-home or a propane unit on rural properties without gas service.

Generator	kW (NG)	Transfer	Notes
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Generac Guardian 22kW	22	200A ATS	Mobile Link Wi-Fi; 5-yr limited warranty
Kohler 14RESA	14	100A or 200A ATS	OnCue Plus monitoring
Cummins QuietConnect RS20A	20	200A ATS	Quietest in class at 65 dBA at 23 ft
Briggs & Stratton 20kW	20	200A ATS	InfoHub remote monitoring

INSPECTION STANDARD

Generator commissioning verify.

Confirm: ATS transfer time ≤ 10 s on simulated outage; generator runs for 30 min minimum under $\geq 75\%$ load; oil and coolant levels logged; gas pressure verified at regulator inlet under load; weekly self-test scheduled and confirmed via app.

§ 07

Service Entry & Grounding

PART II — MECHANICAL & MOBILITY

The service entrance is the single most consequential decision in residential energy design. Once it is set, every downstream decision — panel size, battery topology, solar interconnection, EV count — is constrained by it. Default Restrepo spec is 200A overhead or underground service to a 200A main panel for new construction up to 6,000 ft²; 320A or 400A service for estates above that or with anticipated EV / pool / theater loads.

LOAD CALCULATION

NEC 220 governs service sizing. The Optional Calc (220.83) is the most efficient method for residential: 100% of first 10 kVA general lighting, 40% of remainder, plus the largest of HVAC heating or cooling, plus 25% continuous loads. Final demand must include all four energy stack components and any pool, hot tub, or outbuilding subpanels.

SPECIFICATION

Grounding electrode system — NEC 250.

Two ground rods minimum, 8 ft each, 6 ft apart, bonded with bare #6 Cu. Concrete-encased electrode (Ufer ground) where slab is poured — bond a 20 ft #4 rebar or #4 bare Cu in the footing before pour. Bond cold-water service entrance and structural steel. Single common grounding electrode conductor to main service neutral / equipment ground bar.

INSPECTION STANDARD

Service entrance verify.

Confirm: utility service drop sized; meter base mfg matches utility spec; main breaker rating matches load calc + 25% margin; neutral / ground bond exists at main service only; ground rod resistance $\leq 25\Omega$ measured (or two rods installed); Ufer ground photographed before slab pour.

DO NOT

Do not bond neutral and ground at sub-panels.

Neutral-to-ground bond exists only at the main service disconnect. Sub-panels have isolated neutral and ground bars. This is a top-three reason new-construction panels fail final inspection.



PART 3

Pathways & Coordination

Sections 08–10 — Conduit & Pre-Wire, Monitoring & Controls, Code · Permitting · Incentives

§ 08

Conduit & Pre-Wire

PART III — PATHWAYS & COORDINATION

Every energy system that reaches the home — solar from roof, battery from garage, geothermal from yard — must transit the framing on conduit pathways that are located, sized, and pulled before drywall closes. Adding conduit to a finished home is expensive at best and impossible at worst. The Pre-Power Rough-In Standard (sidecar to this volume) defines pathways in detail; this section is the inline summary.

STANDARD PATHWAYS

Pathway	Origin	Destination	Conduit
Solar DC string	Combiner box on roof	Inverter or PW3	1 in EMT or LFMC, with #6 Cu THWN-2
Solar AC output	Inverter	Production meter / panel	1 in EMT, #6 or #4 Cu
Battery to MSP	Battery / Gateway	Main service panel	1.25 in EMT, #2/0 Cu
Battery to ATS	Battery / Gateway	Generator ATS or smart panel	1 in EMT, #6 Cu
EVSE branch	Subpanel or MSP	EVSE location	3/4 in EMT, #6 Cu (60A)
Geothermal control	Heat pump	Smart thermostat / panel	Cat6 + 18/2 thermostat

FIELD RULE

BX / MC framing — without written direction.

Branch wiring uses MC (metal-clad) cable in the Restrepo standard for residential concealed spaces. BX (armored) cable is permitted when the AHJ requires it or the engineer of record specifies it in writing. Without that written direction, BX is not used — the standard is MC.

NOTE

Conduit fill — NEC Chapter 9 Table 1.

Maximum 40% fill for three or more conductors, 31% for two, 53% for one. Energy system conductors are large (#6 to 4/0 Cu). Always size conduit one trade size up from minimum to leave pull-through margin and future capacity.

BEST PRACTICE**Stub-up to attic + sleeve to basement.**

On every Restrepo new build, install a 2 in stub-up from main service panel to attic and a 2 in sleeve to basement / garage ceiling. Costs \$40 in materials at rough-in; saves \$4,000 in retrofit when the homeowner adds solar, EV, or battery in year three.

§ 09

Monitoring & Controls

PART III — PATHWAYS & COORDINATION

Monitoring is the spine of the energy stack. A homeowner cannot manage what is invisible. The Restrepo standard mandates whole-home metering plus per-system monitoring, with a single dashboard if the manufacturer supports it (SPAN, FranklinWH, Enphase) or a parallel app per system if it does not.

MONITORING TIERS

Tier	Tool	Granularity
Whole-home	Sense Home Energy Monitor	Service-entry CT, ML disaggregation
Whole-home	Emporia Vue Gen 3	16 circuit-level CTs, \$0.05/kWh resolution
Battery	Tesla / Enphase / FranklinWH / Generac apps	Per-pack SoC, output, lifetime kWh
Solar	Enphase Enlighten / SolarEdge mySolarEdge / Tesla app	Per-module or string production
Smart panel	SPAN / Wiser / myLeviton	Per-circuit kWh, app-defined priority groups
Geothermal	Symphony (WaterFurnace) / ClimateMaster Connect	Loop temps, runtimes, COP

SPECIFICATION

Restrepo monitoring baseline.

Every Vol 16 install ships with: (1) manufacturer app activated for each system and shared with Restrepo monitoring credentials; (2) one whole-home tool — SPAN, FranklinWH aGate, Enphase IQ Combiner, or Sense; (3) PDF energy summary report to homeowner monthly for the first year, then on demand.

NOTE

Control integration — Crestron / Lutron.

Whole-home control systems can read SPAN / Lumin / Enphase status via REST or Cloud API. We do not put the energy stack on the control bus directly — the manufacturer app is the system of record. Crestron and Lutron get read-only views and may trigger scenes (away mode, vacation mode) but do not write to battery or panel state.

§ 10

Code · Permitting · Incentives

PART III — PATHWAYS & COORDINATION

Energy systems live at the intersection of NEC, NFPA, UL, AHJ, and federal incentive programs. The codes change. The incentives change faster. Every Restrepo project verifies code edition and incentive status at the date of submittal — not the date of design.

CODE STACK

Reference	Scope
NEC 2023 (NFPA 70) Article 706	Energy storage systems — listing, install, ventilation, signage
NEC 2023 Article 690	Solar PV — module, inverter, conductor pathways, rapid shutdown
NEC 2023 Article 408	Switchboards and panelboards — main lug, working space, overcurrent
NEC 2023 Section 110.26	Working space at panels, inverters, ATS, disconnects
NEC 2023 Article 625	EV power transfer — EVSE install, GFCI, disconnect
NFPA 855	Stationary ESS — separation distance, fire protection, commissioning
UL 9540 / 9540A	ESS listing standard / thermal runaway propagation test
UL 1741	Inverters, converters, controllers, interconnection equipment

INCENTIVE PROGRAMS — CURRENT AT V1.0

Program	Coverage	Notes
IRA Section 25D	30% federal credit on solar, battery, geothermal	Through 2032; verify with CPA
IRA Section 30C	Up to 30% / \$1,000 EV charger credit	Eligibility map; verify zip
NJ SuSI / SREC-II	\$/MWh fixed payment for 15 years on residential solar	NJ Clean Energy admin
NJ Net Metering	1:1 retail-rate credit for export solar	Cap at 100% of consumption
NJ Storage Incentive	\$/kWh on battery (program rules updating)	Verify with NJBPU

NOTE**Verify incentive status at submittal.**

Federal credits are statutory and change with congressional action. State programs change with each NJBPU board order. Always run a fresh check against IRS Section 25D and the NJ Clean Energy Program portal before submitting the project package to the homeowner — the year-old incentive sheet is a liability.

PART 4

Discipline & Closeout

Sections 11–13 — Without Written Direction, Pre-Power Rough-In, QC · Commissioning · Closeout

§ 11

Without Written Direction

PART IV — DISCIPLINE & CLOSEOUT

This section catalogues the practices we do not perform on a Restrepo energy install without written direction from the engineer of record or the AHJ. None of these are prohibited universally — many are common in other markets. They simply require explicit, written direction in advance.

FIELD RULE

BX / MC cable — without written direction.

Branch wiring uses MC. BX (armored) is allowed only when the engineer of record or AHJ specifies it in writing for the project.

FIELD RULE

Closet ESS install — without written direction.

We do not site batteries inside an unventilated closet, even with NFPA 855 exemptions on paper. Without written direction approving a specific ventilated closet design, we site to garage or exterior pad.

FIELD RULE

Open-loop geothermal — without written direction.

Open-loop (pump-and-dump) systems require AHJ approval and aquifer protection review. We default to closed-loop vertical. Open loop only with an engineer-of-record loop design in writing.

FIELD RULE

Service downsize — without written direction.

We do not downsize main service to 100A on a luxury build, even when load calc permits it. The cost delta to 200A is marginal; the future-proofing value is substantial. Downsize only with written direction and a signed homeowner acknowledgment.



FIELD RULE

Roof penetration in fire setback — without written direction.

NJ residential code mandates 18 in fire setback at ridge and gable ends. We do not place modules or penetrations in setback without a written variance from the AHJ.

§ 12

Pre-Power Rough-In

PART IV — DISCIPLINE & CLOSEOUT

The Pre-Power Rough-In Standard (Vol 16 sidecar) defines exact pad locations, conduit sizes, ground references, and labels required before drywall closes. This section is the inline coordination summary; the sidecar is the binding field document.

COORDINATION CHECKLIST — BEFORE DRYWALL

- ☐ **VERIFY** Service entrance located, sized, photographed; meter base set
- ☐ **VERIFY** Battery pad / wall location framed, blocked, conduit stubbed
- ☐ **VERIFY** Solar conduit pathway pulled from roof to inverter location
- ☐ **VERIFY** Smart panel rough-in: chassis location, working space, AUX feed
- ☐ **VERIFY** Geothermal loop header sleeves through foundation, pressure-tested
- ☐ **VERIFY** EVSE branch conduit and box rough at every planned EV bay
- ☐ **VERIFY** Generator pad poured, fuel line stubbed, ATS conduit pulled
- ☐ **VERIFY** Grounding: two rods + Ufer photographed before pour
- ☐ **VERIFY** Conduit stub-ups to attic and basement / garage installed
- ☐ **VERIFY** Energy room sub-panel feed pulled and labeled

INSPECTION STANDARD

Pre-Power Rough-In gate.

Drywall does not close until every item above is verified, photographed, and signed by the project manager and electrical lead. The Pre-Power Rough-In Standard (sidecar) is the document of record.



§ 13

QC · Commissioning · Closeout

PART IV — DISCIPLINE & CLOSEOUT

Commissioning is the bridge between an installed system and a warranted, supported, owner-operated home. Every Vol 16 system passes through the same closeout sequence: verify, document, register, train, deliver. Nothing leaves Restrepo's hands until all five gates close.

CLOSEOUT GATES

- ☐ **VERIFY** All systems registered with manufacturer; warranties activated; homeowner email on file
- ☐ **VERIFY** AHJ final sign-off on file (electrical, structural, mechanical as applicable)
- ☐ **VERIFY** Utility interconnection agreement signed; net-meter or PTO letter on file
- ☐ **VERIFY** Monitoring apps installed on homeowner devices and demonstrated end-to-end
- ☐ **VERIFY** Outage drill performed: simulate utility loss, verify clean transfer, restore
- ☐ **VERIFY** Spare hardware pack delivered: ≥5% of installed breakers, fuses, BMS modules, labeled
- ☐ **VERIFY** As-built drawings and photo documentation delivered as PDF
- ☐ **VERIFY** Commissioning report signed by Restrepo lead, electrical lead, homeowner
- ☐ **VERIFY** Maintenance schedule delivered: annual inspection date for every system
- ☐ **VERIFY** First-year remote monitoring agreement activated by Restrepo and homeowner

INSPECTION STANDARD

Final QC gate.

All ten closeout items verified and signed. Restrepo monitoring credentials confirmed. Homeowner training completed. Spare hardware delivered and labeled. The home is energy-ready and Restrepo-supported. The energy stack is signed off.

CLOSING

Power is a framing decision. We size the loads, site the equipment, and sign the drawings before drywall. We do not patch energy systems into a finished home. Vol 16 is the standard. Vol 16 is the discipline. Vol 16 is what we deliver.



Sized. Sited. Signed.

Restrepo Innovations · Island Media Systems

