

CODE IS THE FLOOR. STANDARD IS THE CEILING.

Scope: ERV/HRV ventilation, air sealing, spray foam, vapor control, and high-performance windows for luxury residential builds. Zehnder ComfoAir Q · Panasonic Intelli-Balance · Renewaire EV Premium · ASHRAE 62.2-2019 · IRC M1505 · IRC R316 · IRC N1102 · Climate Zone 4A · Energy Star Indoor airPLUS · PHIUS.

§01	OPERATING PRINCIPLES
- Envelope is a one-shot trade — once foam is sprayed, the wall is closed for the life of the home. - Air sealing precedes insulation — ACH50 target locked at design, verified at pre-drywall blower door. - Code-first — ASHRAE 62.2-2019, IRC M1505, IRC R316, IRC N1102 are the floor. - Pre-foam wiring discipline — every cable, conduit, and box set, photographed, and signed before spray. - Climate Zone 4A posture — ERV default, Class II vapor retarder, rainscreen on premium claddings. - Tight ≤ 2.0 ACH50 Restrepo target — well below IRC 2021 maximum of 3.0 ACH50.	

§02	MECHANICAL VENTILATION — ERV VS HRV
- NJ Climate Zone 4A default: ERV — transfers latent heat, manages summer humidity and winter dryness. - HRV: sensible heat only — reserved for indoor pool, basement-only, or extreme-dehumidified specs. - ASHRAE 62.2-2019 governs minimum dwelling-unit ventilation — sized by floor area + occupants. - IRC M1505 (2021) mandates whole-house mechanical ventilation — NJ adopted Sept 6, 2022. - Tight envelope = mandatory mechanical — infiltration alone fails ASHRAE 62.2 below 3 ACH50. - Filter floor: MERV 13 supply — MERV 11 minimum per ASHRAE 62.2-2025; HEPA on owner-elect.	

§03	ERV/HRV PRODUCT TIER
- Zehnder ComfoAir Q350/Q450/Q600: Passive House Certified, up to 93% sensible, ComfoConnect LAN C. - Panasonic Intelli-Balance 100/200: 30-100 CFM independent supply/exhaust, ASHRAE 62.2-ready. - Renewaire EV Premium M/L/XH: cellulosic core, no halogen retardants, MERV 13 outdoor filter option. - Broan Al Series 160 HRV / 210 ERV: entry tier for secondary suites and ADU ventilation. - Lifebreath MAX 155/205/267: Canadian-built HRV/ERV with cold-climate frost defrost cycle. - Aprilaire E100/E130: dehumidifiers — not ventilation; pair with ERV, never substitute.	

§04	AIR SEALING & BLOWER DOOR TARGETS
- IRC 2021 N1102.4.1.2 maximum: 3.0 ACH50 — NJ code floor. - Restrepo target: ≤ 2.0 ACH50 — luxury baseline, supports Energy Star Indoor airPLUS. - Passive House (PHIUS): ≤ 0.6 ACH50 — reserved for certified PH projects. - Pre-drywall diagnostic test — mandatory; smoke pencil + IR camera on every penetration. - Final code-compliance test — third-party RESNET/HERS rater, results filed with closeout. - Critical seal points: top plate, bottom plate, rim joist, can lights, dropped soffits, attic hatches.	

§05	TAPES, SEALANTS, AND MEMBRANES
3M 8067 All Weather Flashing Tape: window/door rough opening four-sided flash. - SIGA Wigluv 60: exterior airtight tape — sheathing seams, board-to-board joints. - SIGA Fentrim: interior/exterior corner and transition tape — high-tack, paintable. - ProClima Tescon Vana: interior air barrier seam tape — vapor-open systems. - OSI Quad Max sealant: window perimeter caulk — paintable, 50-year warranty. - Tremco Acoustical Sealant: top/bottom plate to subfloor — non-skinning, permanent flex.	

§06	SPRAY FOAM SELECTION
- Closed-cell (2 lb): R-6.5/inch, structural, vapor retarder — rim joists, basements, roof decks. - Open-cell (0.5 lb): R-3.7/inch, sound dampening, vapor permeable — interior partitions, attics with vented assembly. - Manufacturers: Huntsman/Icynene, Lapolla, Demilec/Heatlok, BASF Walltite, SES Foam, Johns Manville Corbond. - ESR/ICC listing required — verify current report number; manufacturer acquisitions have changed product lines. - IRC R316 thermal/ignition barrier: 1/2 in gypsum or DC315 intumescent coating over all exposed foam. - Re-entry: 24 hours minimum after spray — longer for high-humidity or low-temperature cures.	

§07	NEC · WIRING IN FOAM
- NEC 334.80: NM-B (Romex) ampacity de-rated when surrounded by thermal insulation including foam. - Closed-cell over NM-B: heat-trap risk on continuous-duty circuits — upsize conductors or use conduit. - ENT (smurf tube) per NEC 362: Carlon Resi-Gard 1/2 in or 3/4 in — future-proof low-voltage runs in foam. - Service loops: minimum 12 in coiled at every device box — foam locks position, no second pull. - Pull strings: every conduit gets jet line — labeled at both ends, taped to junction box. - BX/MC in foam: without written direction — default to ENT or rigid for any foam-encapsulated low-voltage path.	

§08	PRE-FOAM WIRING DISCIPLINE
- One-shot principle — every cable, conduit, and box set before insulator arrives on site. - Box depth: deep boxes (4 11/16 sq) on every smart device — foam fills behind, not inside. - Smurf tube homeruns: speaker, network, lighting bus — stubbed to AV closet with 12 in service loop. - Cat6A backbone: every AP, camera, panel — labeled BLUE-N, photographed in place pre-foam. - Crestron CresNet, Lutron QS, Ketra D4 Net: each on dedicated ENT path — never share with line voltage. - Rough-in photo doc: every wall, every elevation — archived to project knowledge base before spray.	

§09	VAPOR & MOISTURE CONTROL
- Climate Zone 4A: Class II vapor retarder on warm side — IRC R702.7 governs. - CertainTeed MemBrain: smart vapor retarder — closes in winter, opens in summer for drying. - ProClima Intello Plus: variable permeance — 10x range, vapor-open in summer. - WRB layer: Tyvek HomeWrap, Henry Blueskin VP100 (self-adhered), or ZIP System sheathing. - Rainscreen: 1/4 in minimum air gap behind cladding — cedar, stone, fiber cement on premium spec. - Window flashing: four-sided pan flash, sill back-dam, head flap drainage — 3M 8067 tape standard.	

§10	WINDOWS & DOORS
- Marvin Ultimate: U-factor 0.27-0.30 — Energy Star v7 NJ-zone compliant. - Pella Reserve Traditional/Contemporary: triple-pane option, U-factor 0.20-0.27. - Andersen E-Series: aluminum-clad wood, custom sizes, U-factor 0.27-0.32. - Schuco AWS 75.SI+: aluminum thermally broken, U-factor 0.16-0.18 — Passive House grade. - Internorm HF410: triple-pane uPVC/aluminum, U-factor 0.13-0.16 — European luxury benchmark. - Door air seal: continuous compression weatherstrip, automatic door bottom, threshold sweep.	

§11	PENETRATION & CONDUIT SEALING
- Plumbing penetrations: fire-rated putty pad + intumescent caulk — every floor and ceiling pass. - Electrical penetrations: low-expanding foam (Froth-Pak) at sheathing — not at finish layer. - Conduit duct-seal: every ENT and EMT crossing the envelope — mastic at exterior face. - Dryer vent: rigid metal, gasketed wall cap, backdraft damper — no flex within wall cavity. - Bath fan and range hood: rigid duct, insulated through unconditioned space, exterior backdraft hood. - ERV/HRV intakes: 10 ft separation from exhaust, dryer, plumbing vent per IRC M1504.3.	

§12	WITHOUT WRITTEN DIRECTION
- BX/MC encapsulated in spray foam: default to ENT conduit or rigid raceway path. - Open-cell foam in below-grade walls: closed-cell required by code in NJ basements and rim joists. - Skipping pre-drywall blower door: every project gets diagnostic test before insulation closes. - Window install without four-sided flash: pan, jamb, head flap mandatory regardless of sill type. - ERV substituted with dehumidifier: ASHRAE 62.2 ventilation requirement is independent of dehumid. - Foam over un-photographed wiring: every cavity photographed and signed before insulator starts.	

§13	QC · AUDIT · CLOSEOUT
- Pre-drywall blower door — ACH50 result archived, IR scan documented, leaks tagged + repaired. - Final blower door — third-party rater, results filed with NJ HERS index for closeout. - ERV/HRV commissioning — supply/exhaust airflow balanced, ASHRAE 62.2 compliance verified. - Spray foam SDS + ESR report archived — product lot, install date, applicator certification. - Photo doc package — every wall pre-foam, signed by GC + integrator, owner-archived. - Owner walkthrough — ventilation controls, filter schedule, blower door report, warranty registration.	

QC GATE — VERIFY BEFORE CLOSE-IN

☐ ASHRAE 62.2 sizing on file — ERV/HRV CFM matched to floor area	☐ Pre-drywall blower door passed — ≤ 2.0 ACH50, IR scan archived	☐ Final blower door filed — third-party HERS rater, results in closeout	☐ Spray foam ESR report archived — closed/open-cell per spec, lot #, ESR report	☐ IRC R316 thermal barrier verified — 1/2 in gypsum or DC315 over all exposed foam
☐ Pre-foam wiring photo doc complete — every wall, every elevation	☐ Smurf tube and pull strings labeled — every low-voltage path served	☐ Window four-sided flash inspected — sill pan, jamb, head flap on every window	☐ ERV/HRV airflow balanced — supply/exhaust within ±10% at commissioning	☐ Closeout package — ASHRAE calc, blower door, foam SDS, photo doc, warra