Building Ω: Working Solo

Working largely alone, Clay Yapp tackled everything from ICF foundations and advanced air-sealing details to dense-packed cellulose and exterior continuous insulation

By Amber Westerman , Clay Yapp | August 13, 2026



Over the past few years as a designer and construction coach, I've had the privilege of helping homeowners navigate the complex path to net-zero. In a previous article, we met Clay and Danielle in rural Wauzeka, Wisconsin (climate zone 5A), and discussed the design of their two-story 1536-sq. ft. home. In this second of three articles, we delve into the specific building assemblies they chose and the inventive ways they found to execute the work.

FPSF-inspired foundation

When we last left Clay and Danielle, the excavator had just broken ground. Down in the 12-ft.-deep hole, they gathered their tools to install Form-A-Drain, a DIY-friendly footing system that stays permanently in place after the concrete pour. These perforated plastic channels form the footing sides while simultaneously providing sub-slab groundwater

drainage and radon collection—eliminating the need to buy, strip, clean, or haul heavy wood forms.



The insulated footings and Form-A-Drain system

Most walkout basements in our northern climate utilize a stepped-down footing, but Clay and Danielle looked to code-approved building science for a more elegant, cost-effective solution. In southern Wisconsin, the code-mandated frost depth is 48 in. However, by consulting the NAHB's *Revised Builders Guide to Frost Protected Shallow Foundations*, they determined that a modified FPSF approach would allow them to lay out the entire footing on a single level, making forming and pouring significantly easier. They placed a level bed of gravel, topped it with a square outline of 2-in.-thick, 25-psi Type IV XPS sheet foam, staked the Form-A-Drain channels in place, and lined the inside face of the channels with 2-in.-thick sheet foam. By insulating the footing, they could reduce the height of the foundation wall at the walkout portion of the basement to just 18 in.

With everything square and level, they called for concrete; they also called for Pops (Clay's dad) to help—the first of many shifts he pulled for Omega. Working fast in the evening light, they floated the footings, rolled on a wet-set capillary break, and poked in rebar dowels. This solid, well-executed base boosted their confidence for the next big step ahead: the foundation itself.

Building with ICFs



Conventional poured foundations are heavy, labor-intensive, and best left to specialty crews. Insulated concrete forms (ICFs), on the other hand, lean directly into the tools and layout skills of a finish carpenter while instantly checking off the insulation phase. Clay chose Nudura's 18-in.-high by 8-ft.-long lightweight EPS panels. The advantages multiplied: concrete pours could wait for ideal weather rather than fit into a subcontractor's frantic schedule, the integral ties made attaching interior drywall a breeze, and the resulting R-24 thermal performance comfortably exceeds the current IRC baseline requirement for Climate Zone 5A.



Installing the ICF blocks

Before the pour, Clay inserted Burman ICF joist-hanger connectors into the inside face of the wall, allowing the floor trusses to sit below the top of the foundation for a seamless, one-step entry from finish grade.

Clay deployed a belt-and-suspenders approach to below-grade waterproofing. He applied a peel and-stick butyl membrane over a compatible primer on the outer face of the ICFs, then covered that work with a protective layer of dimple mat. The tough plastic dimple mat relieved any anxiety about puncturing the primary membrane during backfilling, particularly where the excavator utilized ¾-in. clear stone to prepare for future patio pavers. The exposed ICF wall above grade was left untreated and later finished with a synthetic stone veneer.



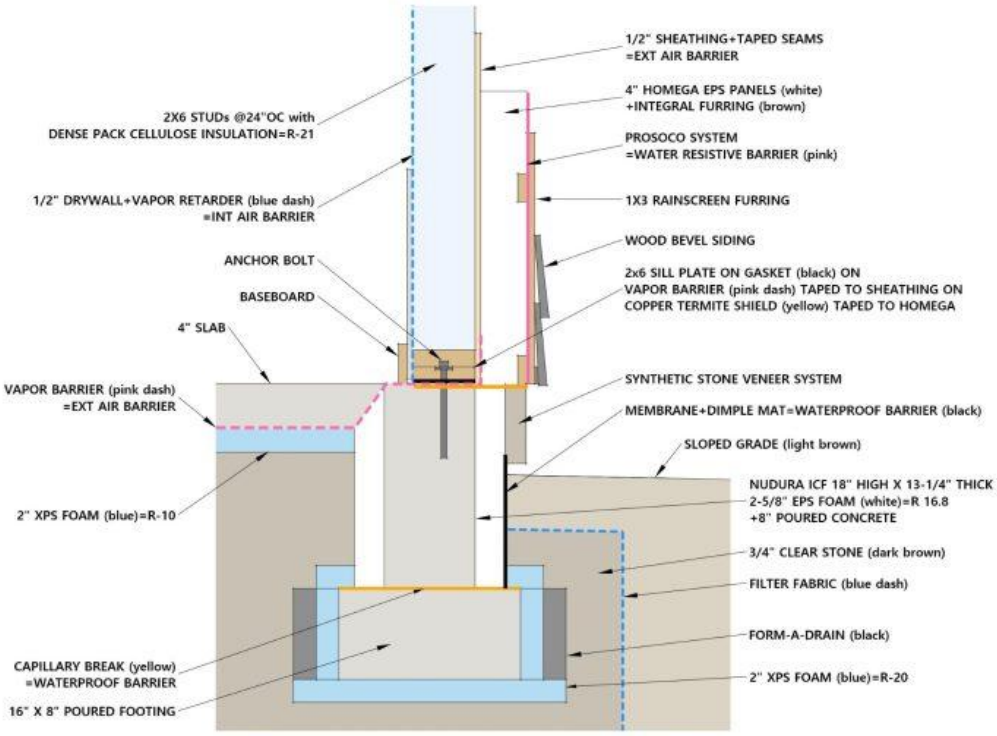
The finished ICF pour

> *The basement ICF forming was a dream—truly Legos for grownups. Kept track of level, plumb, and square at every course of blocks, braced the ever-loving shit out of them, and had zero blowouts or disasters of any kind on pour day.* —Clay Yapp

Sealing the foundation-to-wall connection

A foundation sill plate is the critical, high-stakes transition between concrete and wood framing. If it's not perfectly flat, square, anchored, and sealed, walls won't stand plumb, the structure can shift in high winds, and energy-sapping drafts, moisture, and pests will creep in.

While the conventional standard relies on a pressure-treated 2×6 plate dropped over wet-set anchor bolts with a thin foam gasket, Clay implemented a far more robust, airtight assembly. First, he ground the concrete top of the foundation wall perfectly smooth. He then dry-set the plates using temporary Tapcons and drilled holes for his alternate mechanical fasteners: Simpson Strong-Tie's Titen Heavy-Duty Screw Anchors. To maximize pull-out strength, he notched the plates to countersink square structural washers. For the primary air and moisture barrier, Clay chose Conservation Technology's EPDM synthetic rubber structural gaskets instead of standard foam sill seal. These thick, flexible gaskets feature dual compression bulbs, capable of permanently riding out seasonal wood movement and long-term settling.



The foundation assembly detail. Detail: Amber Westerman Illustration. Click here to enlarge.

He uninstalled the dry-fit plates, stapled the EPDM gaskets to the underside, and laid down a continuous bead of acoustical sealant along the concrete foundation. Over this he pressed a 12-in.-wide strip of 6-mil polyethylene sheeting, followed by a second bead of acoustical sealant and a roll of copper termite shield. The sill plate assembly was then dropped into place gasket-side down, and the Titen anchors were torqued home. Later, the overhanging 6-mil poly was folded up and securely taped to the exterior wall sheathing, ensuring an unbroken air and vapor barrier between foundation and frame wall.

> *Using Titen screws instead of conventional foundation anchor bolts made sealing the mudsill easier, which is good because, hoo-boy, did we seal that mudsill!* — Clay Yapp

Before backfilling the foundation, the walls had to be laterally braced. Clay popped the floor trusses directly into the prepositioned Burman ICF hanger connectors, securely locking the foundation walls plumb. With the house foundation buttoned up, he temporarily shifted focus to the garage. Because it was a standard, uninsulated garage, it utilized a conventional 4-ft. poured stem wall on a footing—saving money and simplifying the details. Framing this simpler structure first was the perfect level set for the more complex house framing ahead, and when completed, the garage became an essential storage, staging, and work area for the remainder of the build.



For high-performance homes, a detached or semi-detached garage is an excellent design choice. Linking the structures solely via a 10-ft.-wide breezeway roof provided protected passage from car to mudroom while entirely eliminating the risk of toxic fumes migrating into the living spaces. It also elegantly solved the issue of thermal bridging through shared foundation walls.

> *This past week was a big push to get the garage roof framed, sheathed, and covered before a predicted storm. I'm proud to say I was coming down my ladder for the last time as the first drops started. As it got dark, I set up shop lights, sawhorses, and workbenches. This will be my base of operations as I shift back over to framing the house walls and roof.* —Clay Yapp

Framing without a crew

Back on the house, Clay tackled the framing sequentially: laying down the OSB subfloor, erecting the first-story 2×6 load-bearing walls with plywood sheathing, stacking the second-story floor trusses, raising the second-story 2×6 walls, and finally capping it with the roof trusses and sheathing. All interior 2×4 partition walls were left for a rainy day. This strategy also kept the workspace wide open and made ceiling air-sealing easier.



Working entirely solo without a lift or crane required serious mechanical ingenuity. To stage the second-floor sheathing and framing lumber, Clay backed his truck up to the house and slid the sheets upward one by one. To hoist the second-story roof trusses, he rigged a ground-level pulley system attached to a temporary post extending above the second story top plates. A helper on the ground attached each truss, pulling it up to Clay, who swung them over the second-story wall and stacked them on the floor deck. Swiveling the trusses upright was made dramatically safer because Clay had installed Burman Hurricane Anchors along the top plates to act as receiving brackets. Because both the first- and second-story roof trusses were kept to a manageable 16-ft. length, the process remained highly controlled.

> *It was during the mad dash to get the roof sheathing and underlayment on that the wheels finally came off and winter decided to flex. I will always remember in painful detail the week of December 5, the Year of Our Lord 2022. I clipped into my safety rope, stepped out onto the roof and immediately fell on my ass and slid down the roof till my rope caught. Overnight, a "freezing fog" had settled into the river valley, coating the roof in an invisible skating rink. I couldn't stand, let alone nail down 80-lb. rolls of underlayment.* —Clay Yapp



Once the roof was watertight, attention turned to the exterior wall assembly. Before raising the walls, Clay had already cut out the rough openings and lined them with 10-in.-wide plywood window bucks, installed flush with the interior stud faces and projecting 4 in. past the exterior sheathing. Sealing these bucks and adjacent plywood seams on the ground saved hours of tedious ladder work; Clay achieved a robust air-barrier by applying Prosoco's Joint + Seam filler topped with 3M's 8067 flashing tape.

Installing continuous exterior insulation

Next, Clay attached 4-in.-thick Homega EPS foam insulation panels directly over the plywood sheathing using 6-in. screws driven into the studs. These 4×8 panels, another DIY-friendly time saver, feature shiplapped edges on all four sides and integral, flush-mounted vertical wood furring strips spaced 16 in. on center. With the panels installed horizontally, the built-in strips automatically created the structural fastening points for a rainscreen siding application.



Rated at R-15, these panels boost the total assembly to R-35. More importantly, this exterior continuous insulation provides a complete thermal break across the wood studs and other framing members, keeping the structural sheathing warm enough to prevent wintertime condensation—the primary driver of rot, mold, and the growth of pathogens.

However, adding 4 in. of exterior foam significantly slows outward vapor transmission, meaning the wall cavity cannot dry to the exterior if it gets wet. Consequently, the assembly must be allowed to dry toward the interior, which strictly precludes the use of conventional polyethylene vapor barriers behind the drywall. Up-to-date codes that reflect current building science would recognize that this particular wall assembly in this climate zone only requires ordinary interior latex paint for adequate vapor permeance. Wisconsin's outdated code doesn't. To satisfy the local code official while maintaining drying capacity, Clay installed CertainTeed's MemBrain, a vapor-variable retarder that remains closed during dry conditions but opens its pores to let the wall dry inward if humidity accumulates inside the cavity.

Creating a durable rainscreen

For bulk rainwater management and the primary exterior water-resistive barrier (WRB), Clay pivoted away from traditional housewrap toward a monolithic, fluid-applied system from Prosoco. He used FastFlash at fastener heads, mechanical penetrations, and panel seams—following up with a continuous, roller-applied skin of R-Guard Spray Wrap MVP directly over the Homega foam panels. On the inside, standard backer rod

and a tooled bead of AirDam sealant bonded the window frames directly to the plywood bucks for a flawless air-seal.

> *We're using a fluid-applied product that I've fallen in love with. It's applied with a gun, just like caulk, then spread with a knife or scraper into a thin continuous layer. It cures to a flexible, rubberized surface that sheds water like a boss.* — Clay Yapp

To balance performance with the budget, Clay and Danielle selected a modest package of Marvin Windows' dual-pane all-fiberglass Essential casement, awning, and sliding units. They splurged on a focal point: a 12-ft.-wide sliding patio door, upgrading to Marvin's aluminum-clad wood Ultimate line. For the remaining exterior doors, they scoured the salvage market and scored three second-hand Therma-Tru prehungs in excellent condition, netting an immediate savings of $6,000.

Because the exterior walls were wrapped in 4 in. of continuous foam, installing windows, doors, and siding required a few extra steps. The window units were detailed as "outies," with their nailing flanges mounted directly onto 1×3 face frames attached over the foam. The doors, conversely, were installed flush with the interior framing face. To prep for siding, vertical 1×3 wood furring strips were secured 16 in. on center over the horizontal strips embedded in the Homega foam panels, creating the crucial "rainscreen" gap needed to keep the wall dry and increase the longevity of the siding.



> *It’s been a big push, a mad dash, and at times a slog to get to this point. It’s taken longer than I’d have liked, but that doesn’t matter, ’cause we’re here. We’ve got walls and a roof—and windows. We’ve even got goddamn doors. We’re officially “dried in,” which means we’ve got a weatherproof envelope, and winter can kiss my ass.* —Clay Yapp

Reaching the upper levels to trim and side the home required rented scaffolding—one of the very few equipment outlays the couple deemed cost effective. To keep material costs down, they purchased utility-grade cedar lap siding at a deep discount from a regional supplier. To elevate and protect the budget-grade wood, they turned to shou sugi ban, a centuries-old Japanese method of wood preservation.

Danielle took charge of this process. Using a blowtorch, she charred the exterior-facing surface of each board to carbonize the wood cellulose, making it naturally resistant to rot, insects, and UV degradation. She followed up by applying an oil-based penetrating sealer. The resulting dark, textured aesthetic is rustic, and with minimal maintenance this traditional finish will weather gracefully and provide decades of service.



Dense-packing the walls

When it came to filling the stud cavities, there was no debate—the insulation had to be cellulose. Compared to spray foam, mineral wool, or fiberglass, cellulose is cost-effective, nontoxic, biodegradable, and locally manufactured in Wisconsin. When

properly installed, it stops air movement and provides moisture-buffering capacity. However, achieving those high-performance metrics requires the right equipment and an extra measure of owner-builder diligence.

While most lumberyards lend out a standard blower and hose with a bulk purchase, those machines are typically configured for loose-fill attic applications rather than the high-pressure, dense-pack installation required for walls and vaulted ceilings. Skeptical that a standard rental tool would come with a reliable pressure gauge, Clay built his own test apparatus and verified its accuracy by dense-packing a mocked-up 2-cu.-ft. box.



Testing the density of cellulose insulation

To guarantee they achieved the target density of 3.5 lb. per cubic foot, the couple double checked the equipment by weighing the exact number of bags destined for each individual stud and truss bay. Danielle did the math, tracked the weight, and kept the hopper consistently fed while Clay managed the hose inside.

Pops worked just ahead of the installation team, stapling an air-permeable fabric over the framing faces. Rather than a tight spacing of staples or lip-stitching, he simply tacked the fabric in place and then coated each stud face using watered-down wood glue applied with a trim roller. Once dry, the glue bonded the fabric to the wood, creating a rigid membrane that eliminated fabric sagging. Clay then attached a 2-in.-dia. rigid wand with a beveled end onto the lumberyard’s 3-in. hose, allowing him to punch



cleanly through the fabric, reach the back of the cavities, and achieve uniform density. Any minor bulges were flattened using a roller borrowed from his table saw stand.

The great room's vaulted ceiling required an extra step to maintain code-required roof ventilation. To create a closed insulation cavity and an unobstructed air channel beneath the roof deck, Clay tacked ½-in. fiberboard onto 1×2 furring strips installed at the top of each truss bay. While the initial target was an R-60 ceiling requiring 16 in. of insulation, the couple downsized the parallel chord trusses by 2 in. to ensure an adequate flashing transition below the second-floor windows, resulting in a still-impressive performance of R-53. The flat attic space over the second-story ceiling received standard loose-fill cellulose blown to a full R-60.



Meanwhile, local mechanical tradespeople were busy running lines and installing fixtures and equipment. With the high-performance shell complete, the stage was set to bring the house to life. In the final installment of this series, we will tour the mechanical systems that make this home net-zero and look at the dramatic blower-door test that proved their air-control strategies worked.