BY RACHEL WAGNER

Double-stud walls

Energy-conscious builders pioneered double-stud walls after the oil-price shocks of the 1970s. This relatively low-tech method of building energy-efficient walls uses common materials and familiar assemblies. These walls have several benefits in addition to their high R-value: Thick cellulose-insulated walls are quiet, and many homeowners appreciate the deep window stools. In addition, the framing method virtually eliminates thermal bridging within the wall assembly, although there still can be thermal bridges at sills, top plates, and window and door openings.

The basic strategy is simple: An exterior wall is built from two parallel stud walls. Both stud walls and the space between them are filled with continuous insulation. The exterior is sheathed and finished conventionally, although a rain-screen siding detail is recommended (sidebar, facing page). Of course, there are some important design and construction considerations, starting with the appropriate thickness.

One size does not fit all

You can vary the thickness of double-stud walls for each project or climate to achieve an overall R-value that fits. The R-value of dense-packed cellulose (the most common insulation used in double-stud walls) is about 3.7 or 3.8 per inch, so a 12-in. double-stud wall has an R-value of about 45.

Both the design of the building and your performance goals affect the optimum thickness of your walls. The walls might be 16 in. thick for a Passive House in Vermont, but only 10 in. thick for a low-energy house in Iowa. A bigger or more complicated building usually warrants thicker walls (with a higher R-value) than a small, simple building.

Wall construction can vary depending on the type of foundation, the type of floor system, and the preference of the builder or designer. For a slab on grade, a 2x6 outer wall allows the outer stud wall to be situated so that the framing bears on the slab and also extends past the slab edge to cover the vertical rigid insulation at the slab. With a basement, the double-stud wall sits on the floor framing, so both walls usually can be framed with 2x4s.

Studs can be either 16 in. or 24 in. on center; be sure that the interior finish materials and the siding are compatible with the stud spacing.

One sill plate or two?

Separate stud walls with individual sill plates will be easier to construct and more energy efficient, but a shared bottom plate can be useful when framing on an insulated slab foundation. A shared top plate isn't required, but installing a continuous ¾-in. plywood top plate can meet fire-blocking requirements and make it easier to install floor or roof trusses.

Most framers erect the outer wall separately and first; this approach most resembles conventional stud-wall construction. When framing the inner wall, it is important to align window and door openings perfectly; the openings will be joined later using plywood box frames, like big gussets. The studs in the two walls can be either parallel or staggered, but they must line up at the openings. Parallel studs are nice for insulation netting and draft-stopping; of course, the studs won't be parallel at the corners. Some builders like to construct double-stud wall trusses using plywood gussets; in this case, the walls go up together.

Air-sealing still matters

Lots of insulation does not guarantee better energy performance. It's also essential to minimize air leaks within wall construction. This enhances energy performance and reduces the risk of moisture intrusion into the wall.

Be sure to define the interior air barrier, which can be drywall if you're using the airtight-drywall approach, a product such as MemBrain (www.certainteed.com), a layer of OSB under the drywall, or even polyethylene if you're building in a very cold climate. Continuously seal all joints and connections at seams, corners, floors, ceilings, and window and door openings. Seal around all electrical boxes, wire and conduit, and duct penetrations.

What about window and door details?

This question will be addressed in the next issue's "Energy-Smart Details."

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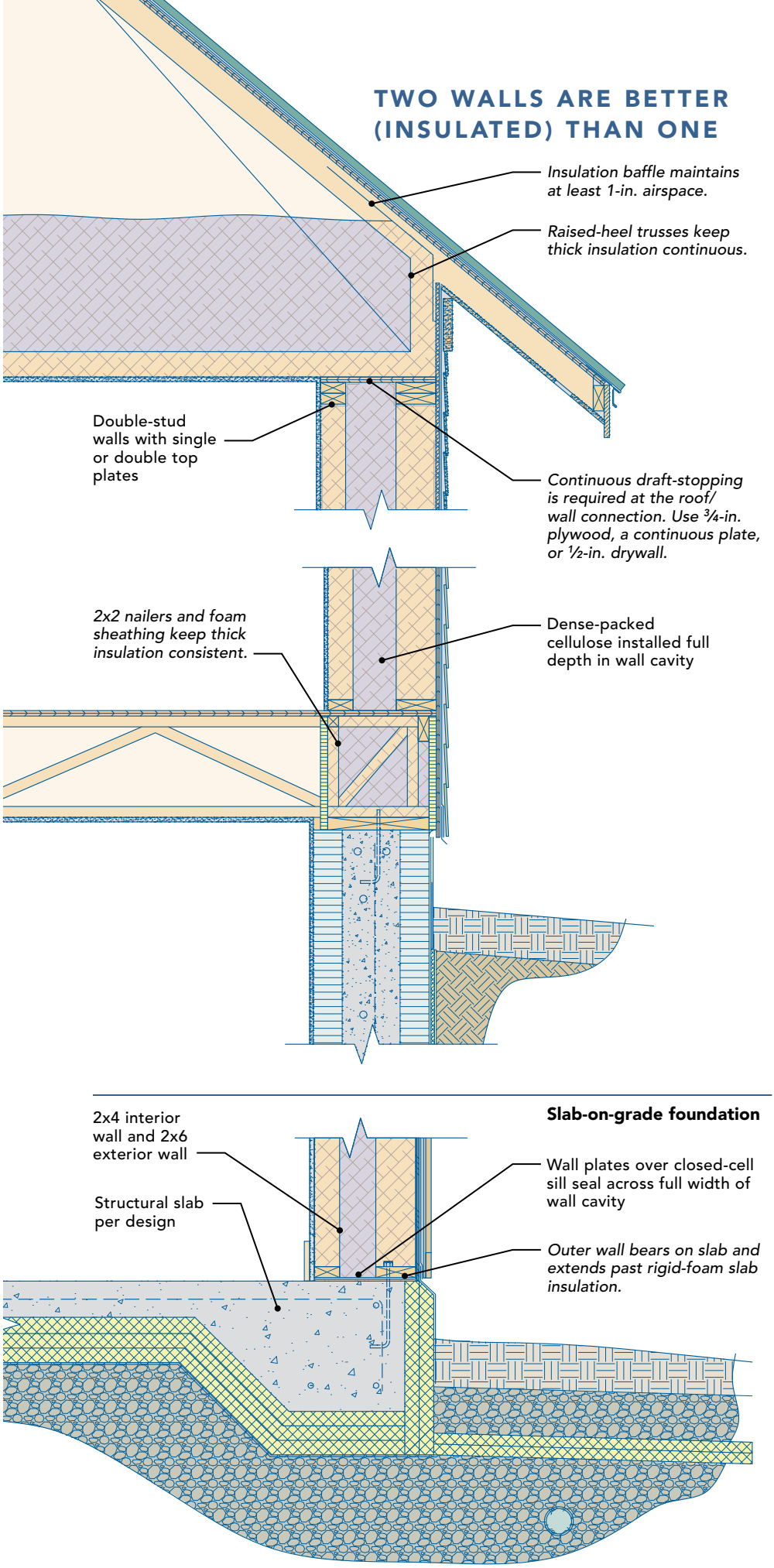
Drawings: Elden Lindamood, courtesy of Wagner Zaun Architecture



Performance requirements for double-stud walls

Fire blocking. The International Residential Code (IRC section R302.11) requires draft-stopping in double-stud assemblies every 10 ft. (minimum) along the length of the wall, from bottom plate to top plate and covering the full depth of the double cavity, using ½-in. gypsum drywall or ¾-in. plywood. (Drywall is easier to cut and fit into place.) The code also requires fire blocking to keep the top of the wall assembly separate from the floor framing or attic spaces above. If you're not using a full-depth top plate that spans across both stud walls, install ½-in. drywall or ¾-in. plywood between the top plates, and fire-caulk the joints.

Insulation. Current practices favor dense-packed cellulose or fiberglass blown through fabric into the wall. With thick cavities not fully divided into neat individual bays, it's important to maintain the required density of the insulation to prevent it from settling, which would leave an uninsulated gap at the top of the assembly. Some builders "net" each bay, fastening filter fabric across the depth of the two studs essentially to create individual full bays. Then they fasten the fabric across the front of the wall assembly, as is typical for dense-packing, and blow the insulation into each bay as they would for a single-stud wall. (If you want to use this technique, you must align the studs in both walls.) Another technique uses the horizontal draft-stopping as the containment for the insulation, although it is placed at intervals of 8 ft. on center instead of 10 ft. Filter fabric is then used only at the face of the framing.

Moisture. A double-stud wall slows heat loss from the building better than a single-stud wall, so the exterior sheathing will be colder and potentially wetter in winter than it would be in a typical single-stud wall. In most climates where a double-stud wall will be used, the code requires a vapor retarder on the warm side of the wall; vapor-retarder paint can satisfy this requirement. Plywood or structural fiberboard sheathing will give the wall a better chance to dry outward than OSB, and installing the siding over furring strips also helps the sheathing to stay dry.