Q My crew often has questions about nailing studs when we build walls. For starters, the code is specific about the number and size of nails for end-nailing wall plates to studs but doesn't specify the size of the studs. Do the same number of nails apply for 2x4 and 2x6 studs? How about for 2x8s in fat walls? Also, what's the correct angle for toenailing studs to plates? Is the goal to drive the nail through the center of the end of the stud or near the far corner?

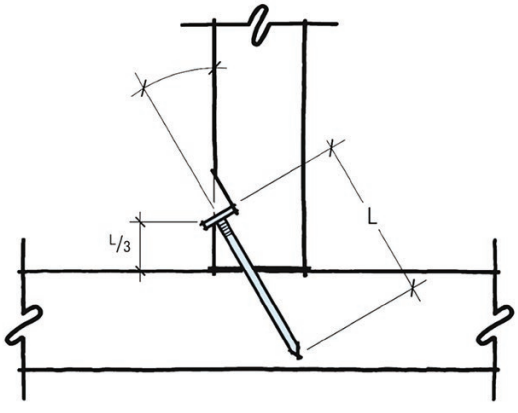
A *Don Dunkley, a former framing contractor and longtime JLC contributor responds:* It's true, Table R602.3(1), which specifies the fastening schedules for wall construction in the International Residential Code, does not differentiate between 2x4 and 2x6 studs. Whenever I'm dealing with the code, I am careful to not assume anything beyond what is written. Since the stud size is not called out, the column "Number and Type of Fastener" implies both sizes of studs are included in the fastening schedule because they are not individually called out in the "Description of Building Elements" column. (For comparison, refer to Table R602.3(5) in the same code chapter, where it does differentiate between 2x4, 3x4, 2x5, and 2x6 for determining the height and spacing of wood studs. Here, the stud size is critical for lateral strength. Nails in stud-to-plate connections primarily resist against uplift and, frankly, they don't provide a great deal of resistance, particularly with nails into end grain. When uplift and shear resistance matter in high-wind and seismic zones, code looks to sheathing-to-framing connections and to hold-downs, tension ties, and other framing hardware. And jurisdictions in these zones mostly require engineered solutions that go beyond any prescriptive measures.)

It's worth noting, a similar situation applies to the "Floor Joist" column for number and type of fastener, also called out in Table R602.3(1). The nailing schedule shown is the same for all common-width joists, since no particular joist width is being defined or called out in the "Description of Building Elements" column. Here, as with studs, the table implies the number and size of the fasteners applies regardless of the size of the joist.

Concerning specialty walls, end-nailing into 2x8 and larger width studs isn't covered specifically so if your jurisdiction doesn't require stamped engineering details on the building plans for these, drive in a few extra nails as a best practices rule of thumb.

For the question on toenailing, a nail driven at an angle coming out the bottom of the stud close to its center will provide the strongest connection. This is what the American Wood Council tests to determine the strength of toenail connections in the National Design Specification. Nails that exit the far corner may not penetrate the plate deep enough to provide sufficient holding power.

My personal preference for toenails is hand-nailing with 8d sinkers (2 1/2-in. x 0.113-in.). I find they are the easiest to place and start for a roughly 45-degree exit at the center. (The angle would need to be steeper with a longer nail, as shown in the illustration, below). Practice makes perfect for speed and accuracy.



Proper toenailing. When toenailing, place the nail away from the end of the board at a distance that's equal to one-third the length of the nail. With a 2 1/2-inch nail (such as an 8d sinker), start 7/8 to 3/4 inch up from the end and drive it at around a 45-degree angle to exit the center of the stud section. A longer nail (as shown above) would be driven at a steeper angle to exit the center of the stud.

Illustration: Tim Healey

Q What is the difference between SEER, HSPF, and COP, and what should we be looking for when recommending heat pumps for whole-house heating and cooling? All the equipment installed on our jobs recently lists SEER2. What does this mean? Is it different from SEER?

A *Connor Dillon, quality manager at the Building Science Institute, a firm offering training and quality control to home energy raters, responds:* SEER, HSPF, and COP are three efficiency units used with HVAC equipment like air conditioners, air-source heat pumps, and ground-source (or geothermal) heat pumps. SEER represents the cooling efficiency of air conditioners and air-source heat pumps. HSPF represents the heating efficiency of air-source heat pumps, while COP is typically used for ground-source heat pumps in heating mode.

When you're assessing heat pumps to be installed, you need to know that the higher the number, the more efficient the system is. A 15 SEER, 9 HSPF air-source heat pump will perform better than a similarly sized system with 14 SEER and 8 HSPF. And all manufacturers are required to meet minimum efficiencies set for equipment by the federal government. This creates the "floor" of efficiency for HVAC equipment. And speaking of the federal government ...

At the beginning of 2023, two important updates were made by the Department of Energy:

First, the federal minimum efficiencies for split-system air conditioners and heat pumps were increased for the first time since 2015. The ratings vary by region, but broadly speaking, they were raised by 1 SEER and roughly 0.6 HSPF for all regions.

Second, the calculations for the efficiency units like SEER and HSPF were modified. This created a "new" unit of measurement, represented as SEER2 and HSPF2—COP was not affected by the new calculations. So the "old" SEER and HSPF calculations are now called SEER1 and HSPF1, respectively.

These new calculations typically lowered the number (but not relative efficiency) of HVAC equipment. Most 14 SEER1 systems are now calculated as 13.4 SEER2, for example. As you can imagine, this caused some confusion—in appearance, "lowering" the efficiency of a piece of equipment while simultaneously requiring that same system meet a higher minimum.

However, most manufacturers are now producing systems using the new efficiency calculation, while meeting the higher equivalent efficiency requirements. If you receive an Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Certificate, you will likely find the SEER2 or HSPF2 label on it. The same principle mentioned above applies today—the higher the value, the more efficient the system is. SEER2 still covers cooling efficiencies and HSPF2 still does the same for heating efficiencies.

When making recommendations, you'll want to make sure the system meets any local or state requirements for minimum efficiency. Check with your local energy department. You'll also want to look into rebates. Some utilities, jurisdictions, and the Inflation Reduction Act include funding for system replacements. If you're pursuing a rebate, make sure the system you recommend meets those requirements.

One more thing: If you are working in a cold region, the Northeast Energy Efficiency Partnership (NEEP) hosts a cold-climate air-source heat pump (ccASHP) product list. If you are building or remodeling in a predominantly heating-dominated climate, you'll want to make sure the equipment you have installed is verified to operate correctly in the low temperatures the home will experience.

When assessing heat pumps to be installed, you need to know that the higher the number, the more efficient the system is. This holds true whether it's SEER, HSPF, or COP.