Using a Single Top Plate

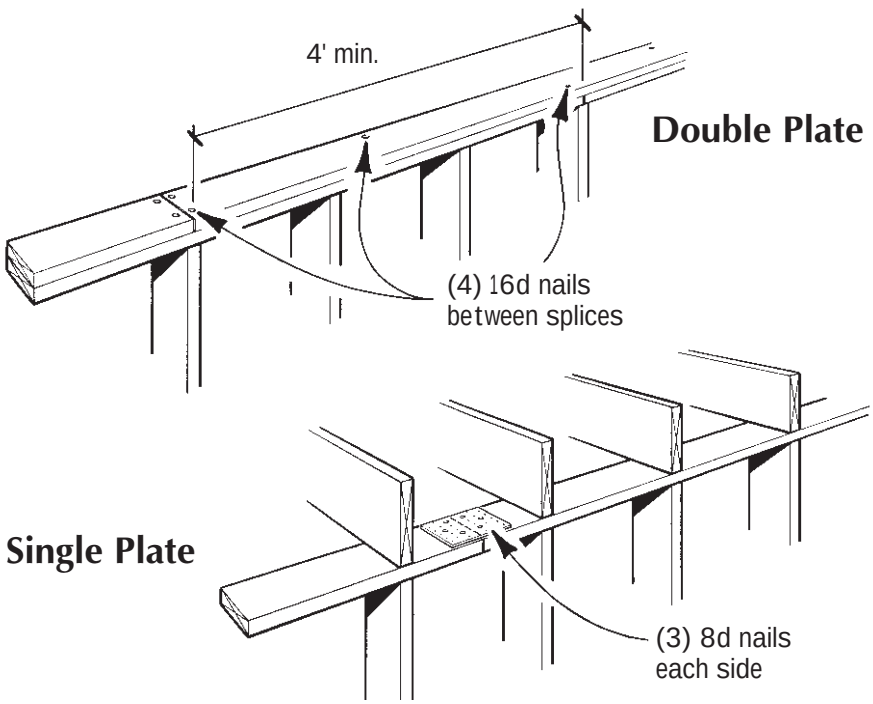
Q. *Our local energy utility recommends framing exterior walls with a single top plate to cut down thermal conduction. We follow the CABO code when we do this, making sure we line up trusses and/or joists directly over the studs. We splice the top plate joints with Simpson TP37 straps for 2x4 walls and TP47s for 2x6 walls, using three Teco nails on each side of the splice (the code actually calls for three 8d nails on each side). Even though the single top plate is approved, I still get comments from subs and carpenters that it doesn't look strong enough. I wonder, from an engineering standpoint, whether this method is as strong as using the traditional double top plate?*

A. *Robert Bouchet responds:* Actually, a double top plate, correctly lapped and nailed, is considerably stronger than a single plate and a TP connector. For example, one of the forces acting on the top plate is the lateral force from wind or an earthquake. As the wall racks from this force, tension develops at the splices in a double top plate. The CABO code allows you to place top plate splices a minimum of 4 feet apart (see illustration), and requires two 16d nails at the splice and another 16d nail every 24 inches. So at the very least, you would have four 16d nails between splice points resisting this tension force. Compare that to the three 8d nails on each side of the TP connector plate and there's no question which is stronger.

So far I've talked only about tension. The bending and shear strength of the double top plate would also greatly exceed the strength of the single plate. It should be noted, however, that the added strength of a double plate may not be necessary for a particular structure. If in doubt, check with your code inspector or an engineer.

Be careful using terms like "Teco" and penny-weights for nails, especially when installing load-rated metal connectors:

Double vs. Single Top Plate



The performance of a specific connector depends on using nails of the proper length and diameter.

Robert Bouchet *is an engineer with the Simpson Strong-Tie Co. in Pleasanton, Calif.*

Painting & Staining PT Wood

Q. *How should paints and stains perform on pressure-treated wood? I haven't had a lot of luck painting the PT wood decks I build: The paint seems to fail after only two or three years. Is this because pressure-treated lumber is so wet, or do the chemicals used to treat the wood cause the paint to come off?*

A. *William Feist responds:* It's not surprising that the paint on your pressure-treated wood decks is failing in two or three years. Normally, decks should *not* be painted, but should be finished regularly (annually or biannually) with a penetrating semitransparent stain or a penetrating clear finish (especially those finishes designed for use on decks). Paints and solid-color stains simply cannot hold up to the severe exposure of a deck surface. As small cracks develop on the deck's surface from exposure to sun and water, water passes through and the paint soon peels. Penetrating finishes cannot fail in this way because they do not form a film, so they are much more suitable for decks. In addition, the wood species used for pressure treating is usually southern pine, which does not hold paint well because it tends to expand and contract a lot.

Studies at the U.S. Forest Products Laboratory in Madison, Wis., have shown that semitransparent stains and clear finishes will actually last longer on pressure-treated wood (CCA, or chromated copper arsenate). This is because the chromium in the treatment protects the wood surface from ultraviolet degradation. Paints and solid-color stains will perform well on pressure-treated wood that is used in an upright position (on fences, for instance), but only when the wood has been cleaned and is thoroughly dry before painting.

William Feist *is a consultant and teacher on wood weathering and exterior wood finishing. He was a research chemist at the Forest Products Lab in Madison, Wis., for 30 years.*

Metal Roof Over Asphalt?

Q. *I am bidding a job where the owner wants to install a new metal roof over a double layer of asphalt shingles. The roof has solid lumber rafters and plywood sheathing. Should I install 1x4 horizontal purlins over the asphalt and attach the metal roof to those? Should the purlins be pressure-treated?*

A. *David Keener responds:* To answer your first question: Purlins are always a good idea over asphalt shingles, for a couple of reasons. They allow you to create a flat roof plane, and ensure that you have solid wood to screw into where you need it. Also, asphalt shingles can be corrosive to metal roofs, so it's a good idea to separate the two materials.

Make sure you find a roof panel that is designed for use over purlins; some panels have to be installed directly over a plywood deck. Space the purlins according to the manufacturer's recommendations.

As for the size of the purlins, 2x4s are the best choice. Their $1\frac{1}{2}$-inch thickness gives the screws a greater pullout resistance, making the roof much stronger against high winds. If you use 1x4s, you're getting only half as much screw penetration. Whatever purlin you use, it must be adequately attached to the roof deck and rafters.

It's probably not necessary to use pressure-treated purlins except in very hot, moist environments. But because most preservatives are corrosive to metal, if you do use pressure-treated wood, you must install a layer of roofing felt between the wood and the metal.

David Keener *is an engineer with Fabral, a manufacturer of metal roofing and siding based in Lancaster, Pa.*