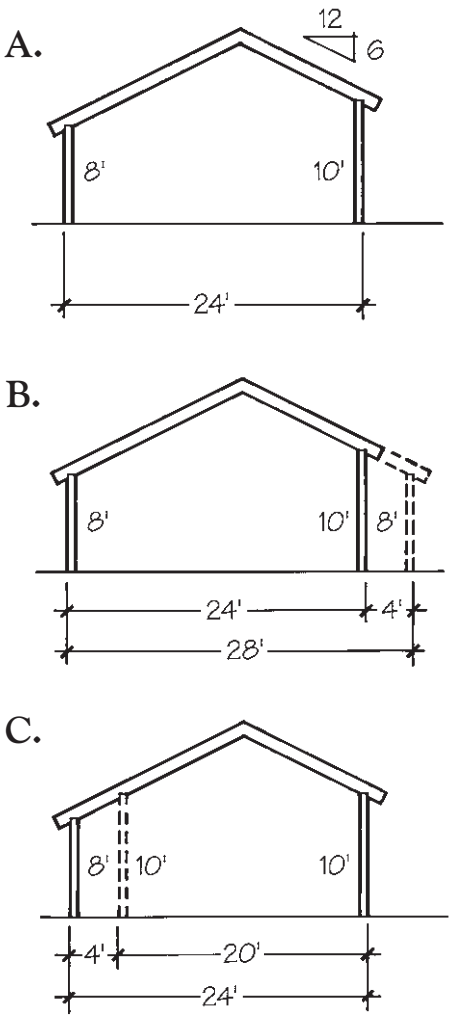
Rafter Framing With Unequal Wall Heights

Q. *How do you figure rafter lengths for a gable roof when one wall is 10 feet high, and the other is 8 feet high (illustration A)? The span of the building is 24 feet. We want the roof pitch to be the same on both sides.*

A. *Will Holladay responds:* Using a sample roof pitch of 6/12, the first step is to calculate the rafter run for the 2-foot difference in rafter heights. This is done by dividing the difference in inches (24) by the rise ratio of 6/12 (.5), to arrive at a 48-inch run (24 ÷ .5 = 48).



To find the rafter lengths for a building with two different wall heights (A), the author first figures each side separately, using "phantom" spans (B and C).

Next, add 48 inches to the 24-foot span to create a phantom 8-foot-high wall outside the 10-foot wall, as shown in illustration B. Now, figure the rafter lengths for the 8-foot wall using the 28-foot span.

The rafters on the 10-foot-high side can be most easily figured by "installing" a 10-foot-high phantom wall 48 inches in from the real 8-foot-high wall (illustration C), and calculating the rafter lengths for a 20-foot span.

Will Holladay, a longtime framer, is the author of A Roof Cutters Secrets to Framing the Custom House (W&H Publishers, P.O. Box 3618, Santa Barbara, CA 93130).

Metal Roofs in High Winds

Q. *We build along the coast in North Carolina, which is considered a high-wind zone with gusts up to 120 mph. We're interested in using standing-seam metal roofing panels, but we are concerned about blow-offs. Can you tell us what details and panel specifications we should require from our roofing subs before accepting a bid?*

A. *Rob Haddock responds:* Metal roofing can hold up surprisingly well in high wind. I went to South Dade County two days after Hurricane Andrew to study the performance of steep-slope steel roofing in hurricane-force winds. I am happy to report that I saw less damage to steep-slope, standing-seam steel roofing than to any other roofing type.

When it comes to wind resistance, metal roofing has some distinct advantages over conventional roofing materials. After all, a metal panel is a structural element; its behavior under load can be calculated and tested. In addition to being predictable, metal stays consistent as it ages; its behavior does not change significantly over time the way asphaltic, synthetic, and wood roofing does. In other words, metal roofing panels are engineered systems that can be designed to withstand any wind pressure. A panel's resistance to blow-off depends on the panel gauge, sectional geometry, and frequency and method of attachment.

As wind passes over a house, it typically tries to *suck* the roof off. This "uplift" effect is more pronounced in certain areas of the roof than in others. The roof's edges and particularly corners (for example, the junction between the eaves and the rake) are especially at risk. On steeply sloped roofs, the area along the ridge is also subjected to greater uplift pressures. In Dade County, the few failures I saw were at the juncture of the ridge and rake at the peak.

Conform to test specs. Metal panel systems are tested or engineered to meet specific requirements. When they are tested, the most widely accepted test procedure is Underwriters Laboratories' UL-580. For this test, the panel assembly — including the metal panels, fasteners, and substrate — is placed in a 10x10-foot chamber. Pressure is then applied — cycling between positive pressures (blowing) and negative pressures (sucking). Depending on how the assembly responds, the panel is designated as UL Class 30, UL Class 60, or UL Class 90. (These are comparative levels of performance; the numbers do not correspond to any performance criteria.) Class 90 is the highest rating; these panels survive test cycles that expose them to as much as 105 pounds per square foot (psf) of positive and negative pressure.

Since this is the best measure of a panel's true resistance to blow-off, it is important that the assembly is constructed in the field the way that it was tested. The exact specifications may be available from the manufacturer. To be sure, check the *UL Building Materials Directory* (available for about $16 from Underwriters Laboratories, Publications Stock, 333 Pfingsten Rd., Northbrook, IL 60062; 708/272-8800). This book comes out periodically, and shows the

details of the roof constructions for each classification.

Another test procedure has been recently drafted by the American Society for Testing and Materials (ASTM). This test, designated ASTM E-1592, uses a larger test specimen. But it is not yet widely used or recognized, and there is still some disagreement within the industry as to how the test results should be interpreted and used.

Get manufacturer's support. The other approach is to engineer the system. As a rule, wind resistance can be increased by increasing the panel gauge, decreasing the panel width, and increasing the fastening schedule. In any case, the panel manufacturer should be able to give you some direction in specifying the gauge, profile, and fastening. Most panel manufacturers have a registered structural engineer on staff who can make recommendations in specific applications.

As a general contractor, you should require your subs to conform to the test standard. Better yet, provide them with an engineer-stamped set of drawings from the panel manufacturer. Also, get a letter of certification from the panel manufacturer that verifies that the product and installation is designed and engineered to meet a specific wind speed or model code specification.

Rob Haddock is the director of the Metal Roof Advisory Group in Colorado Springs, Colo., and a former roofing contractor.

Mortar or Stucco?

Q. *We blocked over a couple of basement windows in a stuccoed stone foundation wall. What's the best way to patch the stucco? Can a simple bagged mortar mix be used to cover the block, or do we need to use stucco?*

A. *Steve Thomas responds:* Several things make this type of job very challenging: It can be difficult to finish the wall on the same plane as the existing stucco. You'll undoubtedly wind up with shrinkage cracking around the perimeter of the old opening. And most challenging of all, it's extremely difficult to match the color and texture of existing weathered stucco with a new mix.

It's likely the existing coating on the foundation is a multi-layer cement parge coat, and not true stucco. True stucco contains white waterproof cement, lime, and silica sand, and is applied over metal lathe. Each coat is mixed to different strengths, starting with the scratch coat, which has the highest cement content for the highest strength. Each layer outwards gets increasingly weaker, with the finish coat being the weakest and least brittle to minimize cracking.

Instead of using a bagged mortar mix, repair the parge coat with a product such as Monocouche (Parex, P.O. Box 189, Redan, GA 30074; 800/537-2739). This can be applied in one coat (just add water). It's incredibly strong; you can build it up to about 2 1/4 inches thick without it checking or cracking. Also, like true stucco, Monocouche has a white base, so it can be tinted with iron-oxide pigments to closely match the existing finish. ■

Steve Thomas is a former stucco contractor in Columbus, Ohio.