

Hip And Valley Rafter Angles Are The Same As Crown Molding ?

The title to this page may seem strange but I would like to explore the similarities and differences between the two. A hip roof and a valley roofs are the same as an inside or outside corner for crown molding. When looking at the hip line from the ground and seeing the angle that it forms with the gutter line is the same as the miter on crown molding. The angle to cut the plywood on a 12/12 roof is the same as the miter you would set on the saw to cut 45/45 crown (35.26°). The angle to tilt the blade for 45/45 crown would be the same angle to set on the skillsaw to miter the plywood along that hip line for a 12/12 pitch roof (30°), and it is also the same angle back the hip rafter so it "planes" in with the common rafters. These are the similarities but the differences are why I calculate them differently.

The differences first off is the level of precision in roof framing needs to be stepped up many times more when doing crown molding. The next thing I can think of is that a roof slope is generally figured by inches of rise per foot of run which is horizontal or it is given in degrees of slope, again from the horizontal plane. Crown molding is usually distinguished by its "spring" angle which is an angle in degrees from the vertical plane. Commonly sold crown springs are 38/52 or 45/45. Another difference is that most of the time the corner of the building with which the hip sits on is usually 90 degrees, and when doing crown the corner you are mitering is rarely 90 degrees. These last two differences dictate how I go about figuring the angles. The framing square is my 1st choice to do rafter layout and other framing angle work, it has no equal for this type of work.

In the following explanation I will be using 12/12 pitch roof and comparing it against 45/45 spring angle crown molding. In each case they are both 45 degrees from the vertical and horizontal and all the computations come out the same.

To mark the hip line on a sheet of plywood for a 12/12 roof pitch you hold the length of the common rafter per ft. of run on one side of the square (16.97 or 17") and the run (12") on the other and mark the run side of the square. If you took a speed square to it it would read $35\frac{1}{4}$ degrees (refer to 1st paragraph). To find the blade tilt angle for the plywood mitering or the hip backing angle is just as easy with the framing square. Take the length of the hip per ft. of run on one side of the square (20.78"), and the rise of the roof pitch on the other and mark the rise side of the square (12"). Take a speed square and read the angle to set saw blade tilt (30°). (refer to 1st paragraph)

In most cases the hips top edge is not ripped at the backing angle but left square and just dropped by cutting the seat cut deeper to compensate. In doing it that way the framer saved a lot of time but when it is all done the bottom side of the plywood only gets support at the outer corners of the hip rafter.

This method is just as accurate as trig math except for one little problem, you can't possibly hold the framing square to the wood as precisely as the trig math will calculate it and the speed square is hardly a precision instrument to measure degrees. All I have described, so far with the framing square works very well for framing but does not translate well to crown molding.

Crown molding angles are so finicky, were 1/4 of a degree off makes a bad joint it only makes sense to use the most precise methods of calculation available. It does no good to have the best double leaning , all the bells and whistles miter saw if you can't figure the angles to set it. Trig formulas are the best way to go today with a hand held calculator, but now you are faced with a choice. Do I buy \$100+ dollar construction calculator or do I go online to figure these angles. Online is cheaper but a time waster. Committing two formulas to memory and a 12 dollar TI calculator is all it takes to break your dependence on calculators that do all the WORK for you. These do it all for you methods are very seductive and enticing but they promote dependence.

$$\text{Crown Miter Angle} = \text{ARCTAN} (\text{sine}(\text{spring angle}) \div \tan(1/2 \text{ wall angle}))$$

$$\text{Crown bevel Angle} = \text{ARCSINE} (\text{cosine}(\text{spring angle}) \times \text{cosine}(1/2 \text{ wall angle}))$$

Practice these formulas and confirm answers with online calculator till you get "it" then you have broken the dependence and you are FREE.