

Hip and Valley Framing III

HAWKINDALE resumed. This series of articles began in issue #17 with the a traditional French geometric layout of a hip roof. The second installment (in #19) outlined a modern trigonometric approach to framing a valley using the Hawkindale Angles developed by Rees Acheson at Benson Woodworking to detail four different joints: jack rafter to valley, purlin to valley, valley foot to principal rafter, and valley peak to header. By convention the tenoned piece is listed first, the mortised piece second. In this chapter, we add to the Hawkindale catalog additional angles for the connections of valley peak to principal purlin and post to hip or valley foot.

Valley Peak to Principal Purlin

- R2 At the valley peak, 90 minus R2 marks the side cut on the valley.
- R3 The shoulder line on the valley bottom where it joins the principal purlin (compare R4). Note that 90 minus R3 traces the purlin path on the bottom of the valley, while 90 minus P2 is the corresponding angle taken on the main backing. Thus R3 equals P2 rotated by C5.
- R7 The seat housing angle projected onto the short (uphill) side of the valley, viewed from the side of the valley (cognate with R6).
- P3 The layout of the valley seat cut on the face of the principal purlin (compare R5m, P6m).
- P6 On the principal purlin, the valley seat housing angle seen from the end of the purlin (compare R5a).
- C2 90 minus C2 is the angle between the downslope face of the principal purlin and the bottom of the valley rafter, also the saw bevel for the lower shoulder of the valley.

Formulas

$$R2 = \text{Arctan} [\text{Sin } S \times \text{Cos } S \times \text{Cos } D \div \text{Tan } D]$$

$$R3 = \text{Arctan} [\text{Sin } S \times \text{Cos } S \times \text{Cos } D \div \text{Sin } R1]$$

$$R7 = \text{Arctan} [\text{Tan } C2 \times \text{Cos } R3]$$

$$P6 = \text{Arctan} [\text{Tan } C5 \times \text{Cos } (90 - P2)]$$

$$P3 = \text{Arctan} [\text{Cos } D \times \text{Sin } R1 \times \text{Cos } R1 \div \text{Cos } S]$$

$$C2 = \text{Arctan} [\text{Tan } R2 \times \text{Cos } R3]$$

Post to Hip or Valley Foot

- R4 The angle between the bottom surface of the hip or valley and the plumb faces of the post. Main R4 is developed by post faces running parallel to the main common rafters, adjacent R4 by those parallel to the adjacent commons.
- R5 Developed on the top of the post by the bottom of the hip or valley. Main R5 is found on faces paralleling the main ridge, adjacent R5 on those running with the adjacent ridge.
- A5 The angle for the upslope housing on the top of the post. 90 minus A5 is the bevel for the downslope housing on the bottom of the hip or valley. A5m is used for housings parallel to the main common rafters, A5a for those parallel to the adjacent commons.

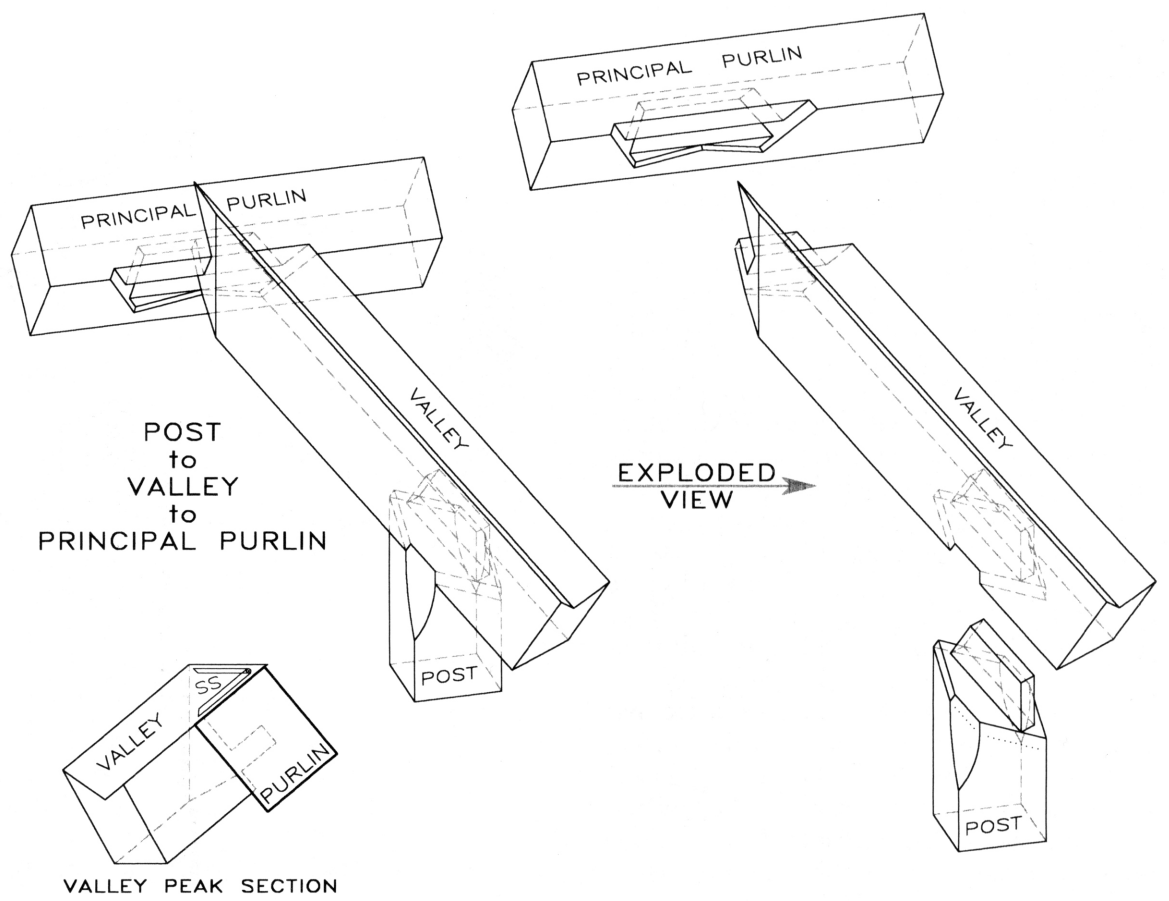
Formulas

$$R4 = \text{Arctan} [\text{Tan } P2 \div \text{Cos } C5]$$

$$R5 = \text{Arctan} [\text{Tan } R1 \times \text{Cos } D]$$

$$A5 = \text{Arctan} [\text{Tan } R1 \times \text{Sin } R4]$$

—ED LEVIN



Drawings Ed Levin

