ESTIMATING ROOFING—

WITHOUT LEAVING THE GROUND

Complex roofs like this are the hardest to estimate. The trick is to divide them up into simple shapes

With these techniques, you never have to climb a ladder to get fast, accurate estimates

BY MAUREEN RUSSELL

Professional roofing estimators have to come up with estimates fast. But even if you do only an occasional roof, you can cut down your bidding time by borrowing some of their estimating techniques. With these, you won't have to climb on the roof to get an accurate waste-free estimate. You do all your measuring and calculating from the ground.

This system is based on measuring the building's "footprint" and converting it to a "roofprint" by using factors for slope and pitch. You gauge slope and pitch from the ground, as well, either by direct measurement or by using special measuring jigs.

You'll only need simple math. But make sure your measurements are accurate. The easiest way to keep track of your measurements is to use scaled graph paper. Make a drawing as you measure.

Roof Slope

A roof's incline is usually expressed as its "slope." Slope is the ratio of rise to horizontal run, usually expressed as inches of rise per 12 inches of run. For example, if the total run of a roof is 12 feet, (24-foot span) and the rise is 8 feet, the slope is 8:12 (see Figure 1).

To measure slope, you can use one of the estimators' jigs often supplied by roofing manufacturers or distributors as promotional items (Figure 2). they let you identify the roof slope by comparing it to a triangular shape with the slope labeled. Other information is often provided too. For example, the jig shown in Figure 3 tells you how many squares are required and gives prices. If you do a lot of roofing, jigs can cut your estimating time significantly.

As an alternative you can use a folding rule. Stand away from the building and form the rule into a triangle with the 6-inch joint at the apex and the 12-inch joint at one side of the horizontal base line. Holding the rule at arm's length, line up the sides of the triangle with the roof, as shown in Figure 4. Be sure to keep the base of the triangle horizontal. Then, with the zero point of the rule aligned with the Center of the base, read the intersection of the zero point with the base.)If you read off the top or bottom edge of the rule, your slope measurement will be off.) In the sample shown in Figure 4, the reading point occurs at the 22-inch mark. Next, locate the "Rule Reading" number that is closest to the one you read in the field. Directly under it, read the slope of the roof. For the example, the slope is 8 inches per foot.

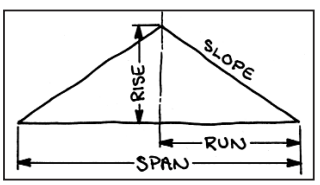

Figure 1: *The slope of a roof equals the rise divided by the run. It is usually expressed as inches of rise per 12 inches of run.*

Projected Horizontal Area

No matter how complicated a roof may be, you'll have a much easier time

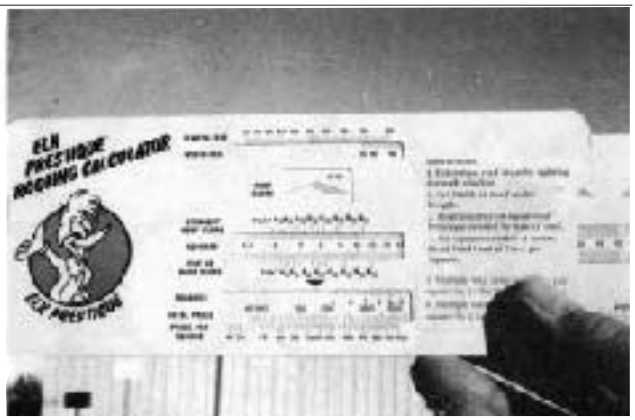

Figure 2. *In the 1940s, Johns-Manville made this pocket jig to simplify estimating. You can clip it out and glue it to cardboard if you want your own pocket estimator.*

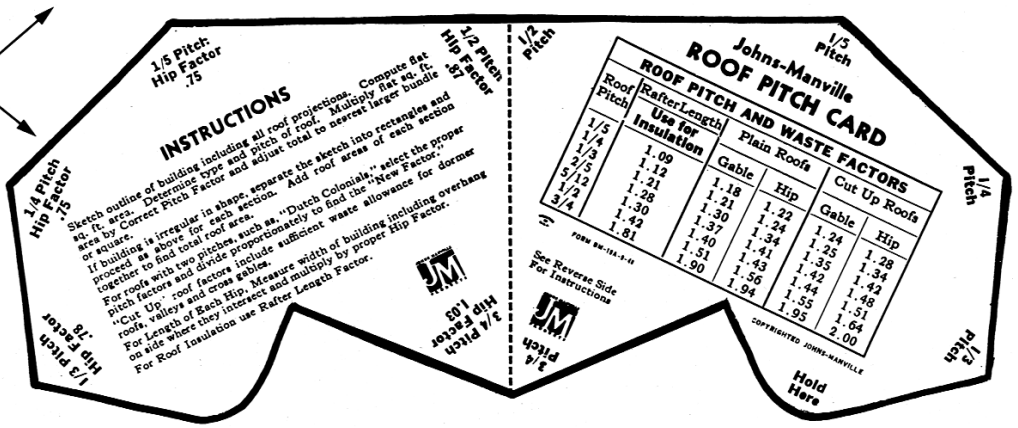

Figure 3. *A roofing company used this estimating slide rule to promote its product. You look through the triangle to find the roof slope.*

calculating the area if you can "flatten" it out: into a plan drawing or "footprint." You do this by "projecting" the roof onto a horizontal plane, like projecting a three-dimensional image onto a movie screen. Once you have the roof plan draw, you can easily define the total surface area the roof covers.

Figure 5 illustrates a typical complicated roof with valleys, dormers, and multiple ridges at different elevations. At floor level, inclined surfaces appear flat. Dormers and wings show up as straight lines. You don't have to worry about slope yet. Just measure the building accurately and put the numbers down on graph paper to keep track.

You can get your measurements from the plans, from the ground, or from inside the attic. Once the measurements are made, draw the "roofprint" of the building to scale. Now you're ready to begin the estimate. Start by finding all the areas with the same slope. You add these areas together to make groups. When you have figured out the area for each group, you add up the areas with different slopes to get the total combined area for the roof. Here's how it works:

You'll have a much easier time calculating the area if you can "flatten it out" into a plan drawing or "footprint." You do this by "projecting" the roof onto a horizontal plane, like projecting a 3-D image onto a movie screen.

We'll start with the main wing of the house in Figure 5. The slope is 9:12 and the dimensions are 26x30 feet and 19x30 feet for the two sections of the main wing. The horizontal area under the 9-inch-slope roof is:

26 x 30 = 780
19 x 30 = 570
Total = 1,350 square feet

From this gross figure, you deduct the area of the chimney and the triangular area of the ell roof that overlaps the main wing. Notice that the ell has a different slope than the main roof. If it had the same slope, you wouldn't have to deduct it.

chimney 4x4 = 16
ell roof 1/2 (16x5) = 40 (triangular area)
56 square feet

The net projected area of the main roof is:

1,350 - 56 = 1,294 square feet

Next, look at the ell. The horizontal area under the 6-inch-slope roof is:

20 x 30 = 600
1/2 (16 x 5) = 40
640 square feet

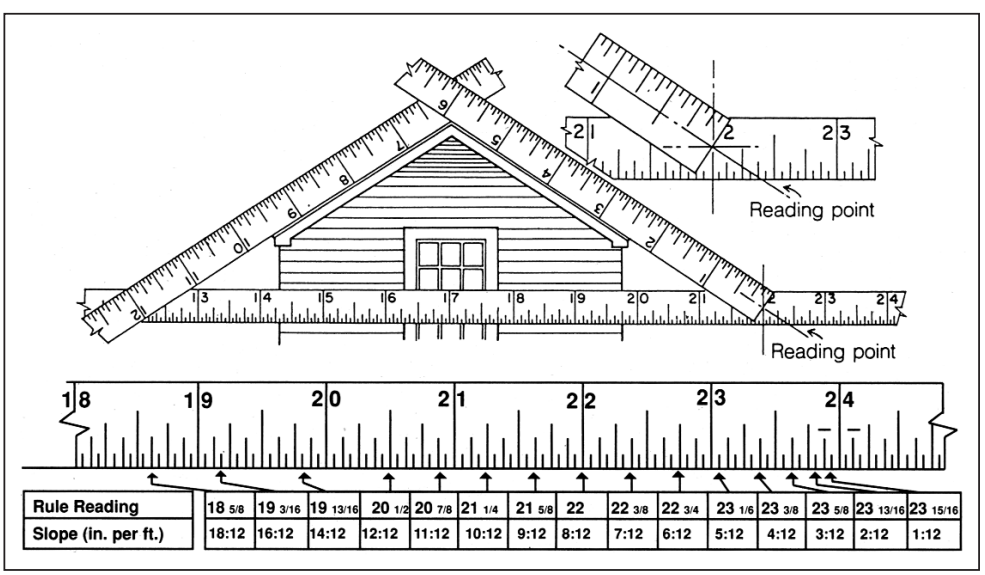

Figure 4. *You can find the pitch or slope with a carpenter's folding rule but make sure you take the reading at the mid-point of the ruler—not the top or bottom edge. Use the table to convert the reading point to pitch or slope.*

Duplications. Portions of higher roof surfaces often project over roof surfaces below them. But the horizontal projections don't show the overlap. You have to add these duplicated areas to the total horizontal area.

In the example in Figure 5, you'll spot an overlap in the following areas:
(1) On the 6-inch-slope roof where the dormer eaves overhang the ell roof;
(2) On the 9-inch-slope roof where the main roof eaves overhang the ell section;
(3) Where the main roof eaves overhang the smaller section of the main roof in the rear of the building.

If the eaves extend 4 inches beyond the structure, you add in these areas:
(1) Two eaves overhangs: 2x(5x4/12) = 3-1/3 square feet;
(2) Two eaves overhangs: 2x(7 x 4/12) = 4-2/3 square feet;
(3) The overhang covers only half of the 19-foot-wide section: 9.5 x 4/12 = 3-1/6 square feet.

Item (1) should be added to the area of the 6-inch-slope roof and items (2) and (3) to the 9-inch-slope roof. Thus,

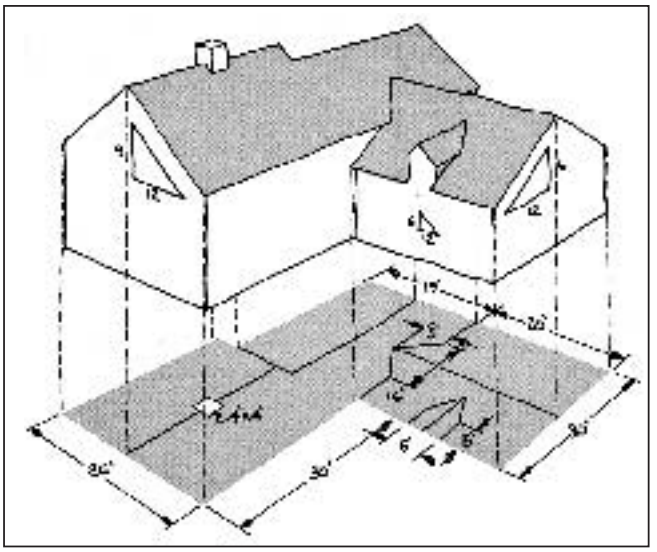

Figure 5. *At ground level, you'll see the roofprint, or horizontal projection of a complex roof.*

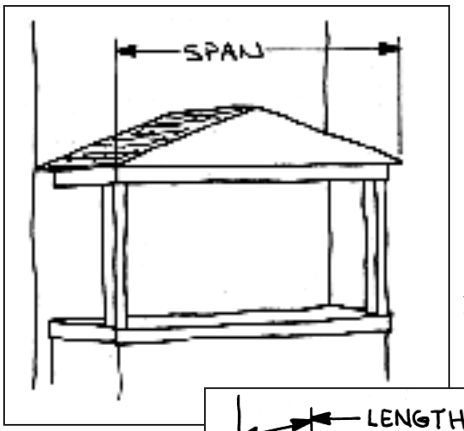

Figure 6. *To estimate flashing for a porch with a gable roof use the span measurement.*

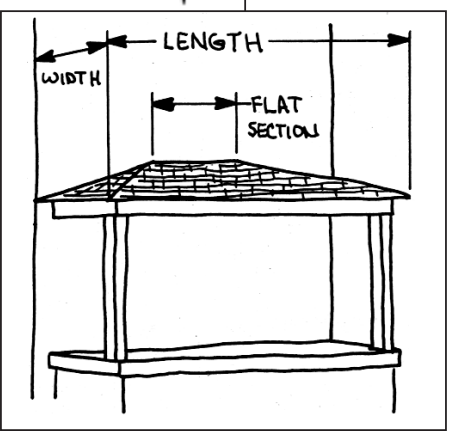

Figure 7. *To estimate flashing for a hip roof, you need the span measurement and a measurement of porch width.*

for the 6-inch-slope roof, the adjusted total is 640 + 3 = 643 square feet. For the 9-inch-slope roof, the area is 1,294 + 8 = 1,302 square feet. (Round off your fractions to the nearest foot.)

Conversion to Actual Area

Now you have calculated the total projected horizontal areas for each roof slope. You're going to convert these horizontal areas to the actual areas with the aid of Table 1.

Table 1: Area/Rake Conversion Table

Slope (inches per foot)	Area/Rake Factor
4	1.053
5	1.083
6	1.118
7	1.157
8	1.202
9	1.250
10	1.302
11	1.356
12	1.414

To use the table, just multiply the projected horizontal area by the conversion factor for the appropriate roof slope. You end up with the area of the roof.

For example, for the 9-inch slope:

Horizontal area	x	Conversion factor	=	Actual area
1,302 sq. feet	x	1.250	=	1,628.5 sq. feet

For the 6-inch slope:

Horizontal area	x	Conversion factor	=	Actual area
643 sq. feet	x	1.118	=	718.8 square feet

After the horizontal areas have been converted to actual areas, you can add them together. This will give you the total area of roof to be covered: 1,628 + 719 = 2,347 square feet.

Now add in an allowance for waste (let's assume a 10 percent waste allowance) and the total area of roofing material required is 2,582 square feet.

If you take it step by step, estimating even a complicated roof isn't that hard. If you break a roof down into separate sections, and keep the slopes grouped together, the roof shape won't matter.

Additional Material Estimates

To finish your estimate, you have to calculate the starter strips, drip edges, hip and ridge shingles, and valley strips. To do this, you'll need length measurements for the eaves, rakes, hips and ridges and valleys.

Drip edge. Determine the length of a rake the same way you calculated sloped roof area. First measure its projected horizontal distance. Then multiply by the appropriate factor in Table 1. The result is the actual length of the rake. Let's work an example.

For the house in Figure 5, the rakes at the ends of the main house have horizontal distances of 26 feet and 19 feet. There is another rake in the middle of the main house where the higher roof section meets the lower. Its horizontal distance is 13 + 3.5 = 16.5 feet. Adding all these horizontal distances gives a total of 61.5 feet. From Table 1 for the 9-inch slope roof:

Horizontal length	x	Conversion factor	=	Actual length
61.5 feet	x	1.250	=	76.9 feet

You follow the same procedure for the ell section with its 6-inch sloped roof and dormer. The total length of rakes is 39.1 feet.

You don't have to convert the eaves' measurements. They don't have any slope. Just measure them. Now add the rake and eaves measurements together to estimate the quantity of drip edge required for the job.

Ridge shingles. The quantity of ridge shingles required is estimated directly from the drawing since ridge lines are true horizontal distances. Just make sure your drawing is accurate.

Hips and valleys. Hips and valley again involve sloped distances. So you have to use the conversion factors in Table 2 to get the actual lengths.

Table 2: Hip/Valley Conversion Table

Slope (inches per foot)	Hip/Valley factor
4	1.452
5	1.474
6	1.500
7	1.524
8	1.564
9	1.600
10	1.642
11	1.684
12	1.732

For the house in Figure 5, the total length of the two valleys on the horizontal projection is 16 feet. Ordinarily, you would simply multiply 16 by the correct factor in Table 2 to get the valley length. In this case, however, the procedure is a little more complicated since two different slopes meet at the valley. Here you have to calculate each slope separately and then average them. The average gives a close approximation of the true length of the valleys.

Horizontal length	x	Conversion factor	=	Actual length
16 feet	x	1.600 (for 9-inch slope)	=	25.6 feet
16 feet	x	1.500 (for 6-inch slope)	=	24.0 feet

Average: (24.0 + 25.6)/2 = 24.8 feet

The approximate length of the two valleys is 24.8 feet or 12.4 feet each.

The total projected horizontal length of the dormer valleys in figure 5 if 5 feet. From Table 2, with the slope of the ell roof and the dormer both 6 inches, the actual length of the valleys is calculated to be 7.5 feet.

The total length of valleys for the house is 25 + 7 = 32 feet. Now you can estimate how much valley flashing material is needed.

Porch and bay window flashing. Building projections, such as porches, bay windows, entrances, garages, wing building, solariums, etc., require flashing where they join the main structure.

Building projections, such as porches, bay windows, entrances, garages, wing buildings, and solariums all require flashing where they join the main structure. You can use the flashing table to estimate quantities.

Table 3 helps you estimate the flashing.

First, find the slope of the roof. Then decide if the roof is gable or hip. For gable roofs, measure the span of the gable. Using Table 3, look down the "span" column. We'll work an example based on the drawing in Figure 6.

Table 3: Flashing Table

		ROOF SLOPE				
		5:12	6:12	8:12	12:12	18:12
W	S	Linear Feet of Flashing				
3	6	8	8	8	10	13
4	8	10	10	11	13	16
5	10	12	12	13	15	20
6	12	15	15	16	18	24
7	14	17	17	18	21	27
8	16	19	19	20	24	31
9	18	21	21	23	27	34
10	20	23	23	25	30	38
11	22	25	26	28	33	42
12	24	27	28	30	35	45
13	26	30	30	33	38	49
14	28	32	32	35	41	53
15	30	34	35	37	44	56
16	32	36	37	40	47	60
17	34	38	39	42	50	63
18	36	40	41	45	52	67
19	38	42	44	47	55	70
20	40	45	46	49	58	74
21	42	47	48	52	61	78
22	44	49	50	54	64	81
23	46	51	53	57	67	85
24	48	53	55	59	69	89
25	50	55	57	62	72	92
26	52	58	59	64	75	96
27	54	60	61	66	78	100
28	56	62	64	69	81	103
29	58	64	66	71	84	107
30	60	66	68	74	86	111

W=Width S=Span

The span of the gabled porch in figure 6 is 24 feet. The roof slope is 8:12. We read down the "span" column in Table 3 until we find 24 feet. Then we read across until we find the column for 8:12 roof slope. Reading the number in that box, we find we need 30 feet of flashing.

Finding the amount of flashing needed for a hip roof is much the same. But this time, we will use the projected width of the hip. To see how it's done, we'll work an example based on Figure 7.

First, we see that the hip porch in Figure 7 can be divided into three parts. The top part of the hip is flat. But unless you get up on a ladder, you won't know how long this section is. Instead, we're going to only used numbers we can measure on the ground. The overall span of the porch is 24 feet. Its width is 8 feet. Again, the roof slope is 8:12.

Now look down the width column in Table 3 until you find 8 feet. Then look across the row until you find the number under 8:12 slope. That number is 20 feet. You need 20 feet of flashing for the sloped part of the roof.

Next, you'll find the length of that small, flat portion between the sloped portions. Find the "flat" length by subtracting twice the width from the total length.

24 feet (L)-16 feet (2 x W) = 8 feet

You need 8 feet of flashing for the top, flat part of the roof. Now add the sloped sections and the flat lengths together.

20 feet + 8 feet = 28 feet

You'll need 28 linear feet of flashing to do the job. Make sure you always include the overhang in your measurements.

Chimney flashing. Count the number of brick wide and long in one course. The proper slope column in Table 4 will give the lineal feet of flashing, including waste and lap for four sides of the chimney.

Where only three sides are flashed, such as a chimney on the side of a house, deduct the number of inches to the nearest foot corresponding with the number of brick on the unflashed side.

If you're going to make a saddle or cricket to divert water or snow, deduct the number of inches to the nearest foot corresponding with the number of brick on the side affected. Make sure you add the saddle price to the remaining flashing.

Table 4: Chimney Flashing Table

No. of Brick		Inches		Slope of Roof		
				to 8:12	to 12:12	to 18:12
W	L	W	L	Linear Feet of Flashing		
2	2	18"	18"	11	11	12
2	2-1/2	18"	22"	12	12	13
2	3	18"	26"	13	13	15
2	3-1/2	18"	30"	13	14	16
2	4	18"	34"	14	15	17
2	4-1/2	18"	38"	15	16	19
2	5	18"	43"	15	17	21
2	5-1/2	18"	47"	16	18	22
2	6	18"	51"	17	19	23
2	6-1/2	18"	55"	18	20	24
2	7	18"	60"	19	21	25
2	7-1/2	18"	64"	20	22	27
2	8	18"	68"	21	23	28

W=Width L=Long

Prepare Now

To really stay ahead of the game, get ready for your next roofing bid now. Make up a worksheet with all the steps we've outlined in this article. Get some graph paper for your drawings. You may even want to photocopy the roofing jig and mount it on some cardboard. If you get ready now, you next roofing estimate will be a lot easier and more accurate. ■

Maureen Russell is President of Hawaii Pacific Roofing Co., San Francisco, California. The estimating procedure was adapted from the Residential Asphalt Roofing Manual, Asphalt Roofing Manufacturers Association, 1800 Massachusetts Ave., NW, Suite 702, Washington DC 20036.