Chapter 10. **Shingles and Shakes**

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In the past, western redcedar was the species most commonly used for shingles and shakes, but advances in wood preservation and fire retardant treatments have increased the use of species such as hemlock and true fir. Either shingles or shakes may be used for roofing or siding, with the choice depending on the appearance preferred by the consumer.

Shingles are sawn on both surfaces and therefore present a rather smooth and precise appearance. They are manufactured in 16, 18, and 24 inch lengths and three grades. Width is generally random, but fixed widths can be obtained. They taper in thickness, and the convention is to measure the thickest (butt) end. Thickness may be reported in terms of the butt thickness or as the number of butts that stack to a given thickness.
Thus a 4/2 thickness designation means that 4 butts measure 2 inches thick. Table 10-1 presents data for common shingle grades and sizes.

Shakes or handsplit shakes are split on at least one surface and have a more rugged, irregular texture than shingles. They are made in 18 and 24 inch lengths. Table 10-2 contains data for common shake products.

Definitions and Measurements

Exposure and Coverage

Exposure refers to the distance between the butt end of a shingle in one course, or layer, and the butt end of a shingle in the next overlapping course. *Coverage* refers to the area of roof or wall that is covered at the recommended exposure.

Square and Bundle

A *square* is a quantity of shingles that yields 100 square feet of coverage. A *bundle* is a pack in which shingles are laid in alternate directions with the butts to the outside and bound in the middle where the tapered ends overlap. Bundles are referred to by the number of courses of butts at each end; a 20/20 bundle has 20 layers at each end, or 40 layers in total. Bundles are usually packed so that four bundles of shingles or five bundles of shakes constitute a square.

Tables 10-1 and 10-2 indicate coverages per bundle for various sizes and exposures of these products. Estimating the number of bundles required for a job is done by measuring the area to be covered and dividing by the coverage per square for the recommended exposure.

Running inches refers to the lineal distance that the shingles will cover when placed side by side. These values are averages from actual installations.

Weight

Tables 10-1 and 10-2 show average weights of squares. The weight of a bundle is one-fourth (shingle) or one-fifth (shake) the weight of a square.

Estimating Cubic Volume Equivalents

The cubic volume of a square can be estimated in two ways: from area coverage or from running inches. The volume of a bundle is either one-fourth (shingle) or one-fifth (shake) the volume of a square.

Method 1. From Area Coverage. The 100 square foot coverage of a square represents 14,400 square inches. Running inches can be estimated by dividing by the exposure (E). Multiplication by shingle length (L) and the average thickness (T) yields the cubic volume:

$$V, ft^3 = (L * T * 14{,}400) / (E * 1{,}728).$$

The value 1,728 converts cubic inches to cubic feet. See Example 1.

Method 2. From Running Inches. A similar calculation uses the running inches (R) from Table 10-1:

$$V, ft^3 = (L * T * R) / 1{,}728.$$

Manufacturing and Recovery

The process of shingle and shake manufacture involves two basic steps: cutting fixed length bolts of suitable quality from logs and then sawing or splitting shingles or shakes from the bolts. Table 10-3 shows results of a shingle and shake recovery study using western redcedar. The data portray

Example 1

Calculate the cubic foot volume of a square of 16 inch shingles having a thickness of 0.4 inch when the exposure is 5 inches. In this case, it is assumed that the thickness at the small end is 1/15 (0.0666) inch.

{16 * [(0.4 + 0.0666) / 2] * 14,400} /
(5 * 1,728) = 6.22 ft^3.

A bundle of these shingles would contain 1.56 ft^3.

Example 2

How many bundles of shingles in Example 1 can be obtained from a cubic foot of log? Table 10-3 indicates that 24% of incoming log raw material will be recovered as shingles.

(1 ft^3 log * 0.24 ft^3 shingle/ft^3 log) /
(1.56 ft^3 shingle/bundle) = 0.154 bundle/ft^3 log.

The recovery study obtained 337 bundles of shingles from 2,119 ft^3 of logs, giving a ratio of 0.159 bundle per cubic foot of log. Similarly, the recovery study obtained 0.293 bundle of shakes per cubic foot of logs.

Example 3

Using Example 2, calculate the cubic feet of log needed to produce

one bundle of shingles	1/0.159 = 6.29 ft^3 log per bundle
one square of shingles	1/0.040 = 25.0 ft^3 log per square
one bundle of shakes	1/0.293 = 3.41 ft^3 log per bundle
one square of shakes	1/0.059 = 17.0 ft^3 log per square

both the recovery of bolts from log raw material and the recovery of shingles or shakes from the bolts. The shingle study was based on 31 pieces (logs, chunks, and slabs) that had an average net volume of 68 cubic feet. Of this, 72% was recovered as bolts. When processed, 33% of the bolt volume (24% of the original raw material) was recovered as shingles.

The shake study was based on 61 pieces that had an average net volume of 66 cubic feet. About 87% of the raw material was recovered as bolts. When processed, 60% of the bolt volume (53% of the original raw material) was recovered as shakes. About 43% of the shakes were graded as *heavy*, 45% as *light*, and 12% as other grades.

Bundles per Log

To calculate bundles per cubic foot of log, multiply the log volume in cubic feet by the cubic recovery percent in decimal form and divide the result by the cubic foot volume of a bundle of the appropriate product. See Example 2.

To calculate bundles per cunit (100 ft^3) of log, multiply the result of Example 2 by 100.

To obtain bundles per cubic meter of log, multiply the result of Example 2 by 35.315 ft^3/m^3 or substitute metric equivalents of each item in Example 2.

Squares per Log

Divide the result obtained above for bundles by four bundles per square for shingles or five bundles per square for shakes:

Squares of shingles per ft^3 of log =
0.159 / 4 = 0.040.

Squares of shakes per ft^3 of log =
0.293 / 5 = 0.059.

Log Volume Requirement

To calculate the volume of log required per bundle or square, take the reciprocal of the result obtained above. See Example 3.

Table 10-1. *Summary of sizes, packing rules, running inches, and shipping weights for shingles.*

Grade	Shingle thickness (in) (green)[a]		Approximate bundle thickness (in)[a]		Courses per bundle[b]	Running inches per 4-bundle square[b]		Shipping weight per square (lb)
			Green	Dry		Green	Dry	Roof 4 bdls.
No. 1—24" (Royals)	4 Butts = 2"	(0.50)[c]	6-1/2 to 7	6-1/3 to 6-3/4	13 / 14	1,998	1,920	192
No. 1—18" (Perfections)	5 Butts = 2-1/4"	(0.45)	8-1/8	7-7/8	18 / 18	2,664	2,620	158
No. 1—16" (Fivex 5X)	5 Butts = 2"	(0.40)	8	7-3/4	20 / 20	2,960	2,880	144
No. 2 Red Label—24" (16" Clear)	4 Butts = 2"	(0.50)	6-1/2 to 7	6-1/3 to 6-3/4	13 / 14	1,998	1,920	192
No. 2 Red Label—18" (11" Clear)	5 Butts = 2-1/4"	(0.45)	8-1/8	7-7/8	18 / 18	2,664	2,620	158
No. 2 Red Label—16" (10" Clear)	5 Butts = 2"	(0.40)	8	7-3/4	20 / 20	2,960	2,880	144
No. 3—24" (10" Clear)	4 Butts = 2"	(0.50)	6-1/4 to 6-3/4	6 to 6-1/2	13 / 14	1,998	1,920	192
No. 3—18" (6" Clear)	5 Butts = 2-1/4"	(0.45)	7-7/8	7-5/8	18 / 18	2,664	2,620	158
No. 3—16" (6" Clear)	5 Butts = 2"	(0.40)	7-3/4	7-1/2	20 / 20	2,960	2,880	144

Dimensions of No. 1 and Red Label grades	Shingle thicknesses (green)		Width (green)	Courses per bundle	Additional cross shingles	Bundles per square	Pieces per bundle	Shipping weight per square (lb)
						Roof		Roof 4 bdls.
24" x 16"	4 Butts = 2"	(0.50)	6"	14 / 14		4	84	192
18" x 5"	5 Butts = 2-1/4"	(0.45)	5"	16 / 16	8	4	136	158
18" x 6"	5 Butts = 2-1/4"	(0.45)	6"	17 / 18	8	4	113	158
16" x 5"	5 Butts = 2"	(0.40)	5"	16 / 18	8	4	152	144
16" x 6"	5 Butts = 2"	(0.40)	6"	19 / 20	8	4	125	144

[a] A small amount is allowed for shrinkage from green to dry wood. See grading rules for specific grade measurements, and also note Dry columns, this table.

[b] No specific number of random width shingles are packed in a bundle; the minimum content is determined by actual running inches of wood contained (combined width of shingles laid side by side).

[c] Average butt thickness.

Table 10-1. *Continued*

Covering capacities per bundle in square feet of the various sized shingles

Exposure (in)	16" shingles	18" shingles	24" shingles	Exposure (in)	16" shingles	18" shingles	24" shingles	Exposure (in)	16" shingles	18" shingles	24" shingles
3-1/2	17-1/2	15-1/2		7-1/2	37-1/2	34	25	11-1/2	57-1/2	52	38
4	20	18		8	40	36	26-1/2	12	60	54-1/2	40
4-1/2	22-1/2	20		8-1/2	42-1/2	38-1/2	28	12-1/2		56-1/2	41-1/2
5	25	22-1/2		9	45	40-1/2	30	13		59	43
5-1/2	27-1/2	25		9-1/2	47-1/2	43	31-1/2	13-1/2		61	45
6	30	27	20	10	50	45	33	14		63-1/2	46-1/2
6-1/2	32-1/2	29-1/2	21-1/2	10-1/2	52-1/2	47-1/2	35	14-1/2			48
7	35	31-1/2	23	11	55	50	36-1/2	15			50

Formula to figure covering capacity per bundle (based on green measurements):

(Total number of courses in both ends of bundle) * 18.5 (Running inches in each course) * (Number of inches exposed to weather) / 144 = number of square feet that 1 bundle will cover.

For example: Find the covering capacity of one bundle of 16 inch shingles exposed 5 inches to the weather:

$$\frac{(20 + 20) * (18.5 * 5)}{144} = \frac{3,700}{144} = 25.7 \text{ square feet.}$$

4	bundles—16" = 1 square at 5"	exposure
4-1/2	bundles—16" = 1 square at 4-1/2"	exposure
5	bundles—16" = 1 square at 5"	exposure

Source: Red Cedar Shingle and Handsplit Shake Bureau.

Table 10-2. *Summary of sizes, packing rules, and coverage for shakes.*

Length and thickness	20" Pack		18" Pack		Approximate coverage (in square feet) of one square based on the following weather exposures:												Shipping weight per square (lb)
	Courses per bundle	Bundles per square	Courses per bundle	Bundles per square	5-1/2"	5-1/2"	7"	7-1/2"	8"	8-1/2"	10"	11-1/2"	13"	14"	15"	16"	
18" x 1/2 to 3/4" handsplit & resawn	10 / 10	4	9 / 9	5	55[a]	65	70	75[b]	80	85[c]							220
18" x 3/4 to 1-1/4" handsplit & resawn	8 / 8	85	9 / 9	5	55[a]	65	70	75[b]	80	85[c]							260
24" x 3/8" handsplit	10 / 10	4	9 / 9	5		65	70	75[a]	80	85	100[b]	115[c]					225
24" x 1/2 to 3/4" handsplit & resawn	10 / 10	4	9 / 9	5		65	70	75[a]	80	85	100[b]	115[c]					280
24" x 3/4 to 1-1/4" handsplit & resawn	8 / 8	5	9 / 9	5		65	70	75[a]	80	85	100[b]	115[c]					350
32" x 3/4 to 1-1/4" handsplit & resawn	6 / 7	6									100[a]	115	130[b]	140	150[c]		450
24" x 1/2 to 5/8" tapersplit[a]	10 / 10	4	9 / 9	5		65	70	75[a]	80	85	100[b]	115[c]					260
16" x 3/8" true-edge straight-split	14 straight	4												100	106	112[d]	120
18" x 3/8" straight-split	19 straight	5			65[a]	75	30	90	95	100[c]							200
24" x 3/8" straight-split	16 straight	5				65	70	75[a]	80	85	100	115[c]					260
15" starter-finish course	8 / 8 10 / 10	5 4	9 / 9	5	Use supplementary with shakes applied not over 10" weather exposure												225

Source: Red Cedar Single and Handsplit Shake Bureau.

Note: Shakes are *packed* in straight courses in frames that are either 18 or 20 inches wide, hence the term "pack."

[a] Recommended maximum weather exposure for 3-ply roof construction.

[b] Recommended maximum weather exposure for 2-ply roof construction.

[c] Recommended maximum weather exposure for single-coursed wall construction.

[d] Recommended maximum weather exposure for double-coursed wall construction.

Table 10-3. Material balances for shingles and shakes

	Shingles			Shakes		
	Quantity	% of raw material volume	% of bolt volume	Quantity	% of raw material volume	% of bolt volume
Wood raw material (logs, chunks, slabs)	31 pieces			61 pieces		
Net volume	2,119 ft^3			4,020 ft^3		
Average volume	68 ft^3			66 ft^3		
Bolt recovery						
Bolt volume	1,520 ft^3	72		3,505 ft^3	87	
Residue	599 ft^3	28		515 ft^3	13	
Total	2,119 ft^3	100		4,020 ft^3	100	
Shingle/shake recovery from bolts						
Product	505 ft^3	24	33	2,118 ft^3	53	60
Residue	1,015 ft^3	48	67	1,387 ft^3	34	40
Total	1,520 ft^3	72	100	3,505 ft^3	87	100
Number of bundles	337[a]			1,185[b]		
Number of squares	84-1/4			237		

Grade distribution of shakes

Grade	ft^3	%	Bundles
Heavy	910	43	454
Light	950	45	586
Other	258	12	145
Total	2,118	100	1,185

Source: USDA Forest Service, Pacific Northwest Research Station (unpublished).

[a]At four bundles per square.

[b]At five bundles per square.