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SHRINKAGE TABLE FOR SOFTWOOD LUMBER

Shrinkage across the grain (in width and thickness) results when wood loses some of its absorbed moisture. Likewise swelling occurs when dry or partially dry wood is soaked or when it takes up moisture from the air. Shrinkage of wood in the direction of the grain (length) is usually too small to be of practical importance.

The following table, compiled by the Forest Products Laboratory, provides a convenient means for estimating the swelling and shrinkage to be expected in boards of softwood species for given changes in moisture content. The table is based on shrinkage measurements of four thousand 1 by 6 inch boards of the commercially important species listed.

The boards are grouped for each species into 3 classes: flat-grained sapwood, flat-grained heartwood, and edge-grained heartwood. No values are given for edge-grained sapwood, since, in general, it is not commercially possible to produce wide boards from such stock.

As a rule, shrinkage begins to occur when the fiber-saturation point is reached in seasoning. This point has been assumed to be at 25 percent moisture content for all species listed in the table. It has been further assumed that between 25 percent moisture content and 0 percent moisture content (oven-dry) the shrinkage or swelling for each unit change in moisture content is constant. These assumptions are accurate enough for ordinary use.

A moisture content of 15 percent has been taken as representative of the moisture content of air-dry stock, and 10 percent as representative of kiln-dry stock. A moisture content of 5 percent has been assumed to represent the moisture content of interior woodwork of houses. It should be pointed out that the moisture content of air-dried stock depends upon climatic conditions and upon the length of time the stock has been in the seasoning yard or in storage. Likewise the moisture content of kiln-dried stock is determined by the kiln conditions to which it has been subjected and by subsequent conditions of storage. Further, the moisture content of interior woodwork of houses varies considerably with season and climate, ranging upward from 5 percent for winter conditions in the cold northern states and for summer conditions in the arid southwestern states to as high as 12 percent in the states along the Gulf of Mexico and along parts of the Pacific Coast.

All figures in the table are based upon full thickness and full width, when green. The shrinkage or swelling of scant-dimensioned stock will be in proportion. The shrinkage or swelling of boards of dimensions other than 1 by 6 inches can usually be calculated by mental arithmetic. For example, the shrinkage or swelling in width of a 12-inch board will be twice that of the 6-inch board, and the shrinkage or swelling in thickness of a 2-inch joist will be twice that of the 1-inch board.

The shrinkages in the table are based on a moisture content change of 5 percent, or multiples thereof. Thus, the values under the second and fifth column headings represents a 10 percent change in moisture content, those under the third and sixth headings a 5 percent moisture content change, and the values under the fourth column heading a 15 percent moisture content change. Other moisture content changes produce corresponding dimensional

SHRINKAGE IN 64THS OF AN INCH OF 1 BY 6 INCH SOFTWOOD BOARDS

Species	Green (25%) to air dry (15%)		Air dry (15%) to kiln dry (10%)		Green (25%) to kiln dry (10%)		Air dry (15%) to the mois- ture content of the inter- ior woodwork of houses (5%)		Kiln dry (10%) to the mois- ture content of the inter- ior woodwork of houses (5%)	
	Width	Thick- ness	Width	Thick- ness	Width	Thick- ness	Width	Thick- ness	Width	Thick- ness
DOUGLAS FIR (Coast)										
Heartwood, flat-grained:	10	1	5		1 1/2:15	1-1/2:2	10	1	5	
Heartwood, edge-grained:	7-1/2	1-1/2	4		11-1/2	2-1/2	7-1/2	1-1/2	4	1/2
DOUGLAS FIR (Inland Empire)										
Sapwood, flat-grained:	10-1/2	1	5		1 1/2:15	1-1/2:2	10-1/2	1	5	
Heartwood, flat-grained:	10	1-1/2	5		15	2	10	1-1/2	5	1/2
Heartwood, edge-grained:	7-1/2	1-1/2	4		11-1/2	2-1/2	7-1/2	1-1/2	4	1
LOBLOLLY PINE										
Sapwood, flat-grained:	10-1/2	1	5		1 1/2:15	1-1/2:2	10-1/2	1	5	
Heartwood, flat-grained:	10	1	5		15	2	10	1	5	1/2
Heartwood, edge-grained:	8	1-1/2	4		12	2-1/2	8	1-1/2	4	1
LONGLEAF PINE										
Sapwood, flat-grained:	10-1/2	1-1/2	5-1/2		1 1/2:15	2	10-1/2	1-1/2	5-1/2	1/2
Heartwood, flat-grained:	10-1/2	1-1/2	5-1/2		15	2	10-1/2	1-1/2	5-1/2	1/2
Heartwood, edge-grained:	8	2	4	1	12	3	8	2	4	1
PONDEROSA PINE										
Sapwood, flat-grained:	8-1/2	1	4-1/2		1 1/2:13	1-1/2	8-1/2	1	4-1/2	1/2
Heartwood, flat-grained:	8-1/2	1	4		12-1/2	1-1/2	8-1/2	1	4	1/2
Heartwood, edge-grained:	6	1-1/2	3	1	9	2	6	1-1/2	3	1
REDWOOD										
Heartwood, flat-grained:	5-1/2	1/2	2-1/2		1 1/2:6	1	5-1/2	1/2	2-1/2	1/2
Heartwood, edge-grained:	4-1/2	1	2		6-1/2	1-1/2	4-1/2	1	2	1/2
SHORTLEAF PINE										
Sapwood, flat-grained:	10	1	5		1 1/2:15	1-1/2:2	10	1	5	
Heartwood, flat-grained:	11	1-1/2	5-1/2		17	2	11	1-1/2	5-1/2	1/2
Heartwood, edge-grained:	7-1/2	1-1/2	4	1	11-1/2	2-1/2	7-1/2	1-1/2	4	1
SITKA SPRUCE										
Heartwood, flat-grained:	11	1	5-1/2		1 1/2:15	1-1/2:2	11	1	5-1/2	1/2
Heartwood, edge-grained:	7	2	3-1/2	1	10-1/2	3	7	2	3-1/2	1
SOUTHERN CYPRESS										
Sapwood, flat-grained:	8-1/2	1	4-1/2		1 1/2:13	1	8-1/2	1	4-1/2	1/2
Heartwood, flat-grained:	8-1/2	1	4		12-1/2	1	8-1/2	1	4	1/2
Heartwood, edge-grained:	5	1-1/2	2-1/2	1	8	2-1/2	5	1-1/2	2-1/2	1
SUGAR PINE										
Sapwood, flat-grained:	7-1/2	1/2	4		1 1/2:11	1	7-1/2	1/2	4	1/2
Heartwood, flat-grained:	7	1/2	3-1/2		10-1/2	1	7	1/2	3-1/2	1/2
Heartwood, edge-grained:	5-1/2	1	2-1/2	1	8	1-1/2	5-1/2	1	2-1/2	1/2
WESTERN HEMLOCK										
Sapwood, flat-grained:	13	1-1/2	6-1/2		1 1/2:19	1-1/2:2	13	1-1/2	6-1/2	1/2
Heartwood, flat-grained:	12	1-1/2	6		18	2	12	1-1/2	6	1/2
Heartwood, edge-grained:	7	2	3-1/2	1	11	3	7	2	3-1/2	1
WESTERN LARCH										
Heartwood, flat-grained:	10-1/2	1	5		1 1/2:15	1-1/2:2	10-1/2	1	5	
Heartwood, edge-grained:	9	1-1/2	4-1/2	1	14	2-1/2	9	1-1/2	4-1/2	1/2
WESTERN WHITE PINE										
Sapwood, flat-grained:	11	1	5-1/2		1 1/2:16	1-1/2:2	11	1	5-1/2	1/2
Heartwood, flat-grained:	11	1	5-1/2		16	1-1/2	11	1	5-1/2	1/2
Heartwood, edge-grained:	7-1/2	1-1/2	4	1	11-1/2	2-1/2	7-1/2	1-1/2	4	1
WHITE FIR										
Sapwood, flat-grained:	11-1/2	1	6		1 1/2:17	1-1/2:2	11-1/2	1	6	
Heartwood, flat-grained:	10	1	5		15-1/2	1-1/2:2	10	1	5	1/2
Heartwood, edge-grained:	8	2	4	1	12	2-1/2	8	2	4	1

¹Five percent is the approximate moisture content of interior woodwork of houses during the coldest part of the winter in the Northern States, and during the summer in the arid Southwestern States.

changes. Total shrinkage from green to oven-dry, corresponding to a 25 percent moisture content change, can be obtained by adding the corresponding figures under the second and fourth column headings.

It must be remembered that the figures in the table represent species averages and that the characteristics and properties of any individual board may vary considerably from the species average. The method of drying a board may also have a marked effect upon the amount of shrinkage produced during the process.