

*Redwood Shrinkage*

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This investigation was made for the purpose of comparing three types of shrinkage in redwood, namely, radial, tangential and longitudinal. Redwood boards were secured which had been sawed in such a way that proper samples could be cut from them. A quarter sawed board was selected for the radial samples and eight blocks 4" x 4" x 3/4" were cut from it. Two pencil lines were drawn across the face of each block, one near each end. These lines were drawn at right angles to the grain and thus extended along what would be the radius of a cross section of the log from which the blocks were removed. Each line was marked A or B, the blocks numbered and the length of A and B recorded for each block. This first measurement was made of course with the block in an air dry condition.

Four blocks were placed in a tank to soak and four were placed in a dry kiln. At the end of one week the lines on each block were remeasured and the results recorded. The same was done at the end of three weeks and since there was no great difference between these measurements and those at the end of the first week, they were used to compute the percentages shown in Table No. 1. The above measurements along with the individual line percentages can be seen in the tables under Radial Shrinkage.

In studying the tangential shrinkage the procedure was essentially the same. In this case however it was necessary to select the blocks from boards that had been "slash" sawn. In other words the lines A and B were drawn along the blocks so that they were tangent to the annual rings. The decrease and increase in the length of the penciled lines due to kiln drying and soaking respectively can be seen in the tables under Tangential Shrinkage. The average percentages of increase and decrease are shown in Table 1 along with those of Radial and longitudinal shrinkage.

The study of the longitudinal shrinkage required a slightly different procedure. Four foot sticks two inches square were selected these sticks having been cut lengthwise of the log. Near each end of

a stick a rivet was placed and driven in with the head flush with the wood surface. A cross was scratched on each rivet head and the distance between the points of intersection measured. After each stick had been so measured and the distances recorded for the air dry condition, they were placed in a kiln and remeasured after a period of time as shown in the tables. They were then put in a tank and soaked and later again remeasured. Below are the results as computed from the tables.

Table No. 1

Condition	% of Deviation from Air Dry.		Shrinkage
	Plus	Minus	
Soaked	1.46 %		Radial
Kiln Dry		1.77 %	
Soaked	1.41 %		Tangential
Kiln Dry		2.62 %	
Soaked	0.00		
	0.079 %		
Kiln Dry		0.113 %	Longitudinal
		0.173 %	

Since the longitudinal shrinkage was more greatly desired two sets of samples were run thru.

An inspection of the tables shows that the longitudinal shrinkage falls considerably below both radial and tangential. In other words the length or distance along the grain is less susceptible to weather conditions than the width or thickness. The actual shrinkage or swelling of a board may appear to be greater in its length than in either of the other two dimensions, but this is due to the greater length of boards in comparison to their width or thickness. It is also interesting to note that the deviation due to drying is much greater than that due to soaking.

Radial Shrinkage.

Air Dry			Soaked one week			Soaked three weeks		
Block No.	Length in.		Block No.	Length in.		Block No.	Length in.	
	Line A	Line B		Line A	Line B		Line A	Line B
1	4.10	4.10	1	4.150	4.140	1	4.150	4.145
2	4.10	4.055	2	4.150	4.110	2	4.150	4.110
3	4.115	4.110	3	4.170	4.170	3	4.175	4.175
4	4.090	4.095	4	4.150	4.180	4	4.150	4.180
5	4.090	4.090	5	4.025	4.020	5	4.025	4.025
6	4.09	4.07	6	4.020	4.000	6	4.020	4.00
7	4.085	4.085	7	4.010	4.005	7	4.010	4.010
8	4.090	4.085	8	4.015	4.000	8	4.015	4.000

Percentage Differences in Line Lengths  
Due to Different Treatments.

Block No.	Soaked		Block No.	Kiln Dried	
	Line A	Line B		Line A	Line B
1	1.22 %	1.34 %	5	1.59 %	1.59 %
2	1.22	1.35	6	1.71	1.72
3	1.46	1.58	7	1.84	1.84
4	1.47	2.08	8	1.84	2.08

Average percent of difference or deviation from air dry condition.

1.46 %

1.77 %

Air Dry			Soaked one week			Soaked three weeks		
Block No.	Length in.		Block No.	Length in.		Block No.	Length in.	
	Line A	Line B		Line A	Line B		Line A	Line B
1	4.00	4.00	1	4.075	4.065	1	4.070	4.065
2	4.00	4.015	2	4.060	4.060	2	4.060	4.060
3	4.02	4.02	3	4.060	4.055	3	4.060	4.060
4	4.00	4.01	4	4.050	4.055	4	4.060	4.060
5	4.04	4.03	5	4.110	4.090	5	4.110	4.100
6	4.04	4.03	Kiln Dried one week			Kiln dried three weeks		
6	4.04	4.03	6	3.93	3.93	6	3.930	3.935
7	4.04	4.03	7	3.935	3.925	7	3.935	3.925
8	4.04	4.035	8	3.920	3.915	8	3.920	3.920
9	3.99	4.00	9	3.88	3.90	9	3.88	3.90
10	4.04	4.03	10	3.945	3.930	10	2.35	3.93

Percentage Differences in Line Lengths  
Due to Different Treatments.

Block No.	Soaked		Block No.	Kiln Dried	
	Diff. in Length % Line A	Line B		Diff. in Length % Line A	Line B
1	1.75 %	1.62 %	6	2.72 %	2.36 %
2	1.50	1.12	7	2.60	2.60
3	0.99	0.99	8	2.97	2.86
4	1.50	1.25	9	2.76	2.50
5	1.73	1.74	10	2.35	2.48

Average % of difference  
or deviation from air  
dry condition

1.41%

2.62%

Longitudinal Shrinkage. Exp. No. 1

Stick No.	Length inches	Length inches	Length inches
	Air Dry	Kiln Dried 1 week	Soaked 4 weeks
1	45.02	44.96	45.01
2	44.87	44.81	44.84
3	44.95	44.91	44.96
4	45.60	45.56	45.59
5	45.31	45.27	45.30
6	45.58	45.50	45.57
7	45.48	45.44	45.47
8	45.59	45.54	45.58

Percent of Deviation from Air Dry Condition.

Stick No.	Kiln Dried	Soaked
	Minus	Plus
1	0.133 %	After soaking 4 weeks the sticks lengthened only to approximately their air dry length.
2	0.134	
3	0.089	
4	0.088	
5	0.088	
6	0.075	
7	0.088	
8	0.110	
Average Deviation	0.113 %	0.00 %

Exp. No. 2

Stick No.	Length inches	Length inches	Length inches
	Air Dry	Kiln Dried 3 weeks	Soaked 3 weeks
1	46.930	46.840	46.970
2	46.940	46.86	46.965
3	46.985	46.910	47.002
4	46.990	46.910	47.050
5	46.805	46.690	46.835
6	46.220	46.140	46.270

Percent of Deviation from Air Dry Condition.

Stick No.	Kiln Dried	Soaked
	Minus	Plus
1	0.192 %	0.085 %
2	0.173	0.054
3	0.159	0.036
4	0.170	0.128
5	0.245	0.063
6	0.173	0.108
Average Deviation	0.185 %	0.079 %



