

## Dimensional Changes in Wood - Expressed in Decimal Inches for a 12" Panel

	1%		2%		3%		4%		5%		6%		7%		8%		9%		T/R Ratio
	R	T	R	T	R	T	R	T	R	T	R	T	R	T	R	T	R	T	
<b>Hardwoods</b>																			
	Decimal Inch		Decimal Inch		Decimal Inch		Decimal Inch		Decimal Inch		Decimal Inch		Decimal Inch		Decimal Inch		Decimal Inch		
Ash, White	.02	.03	.04	.07	.06	.10	.08	.13	.10	.16	.12	.20	.14	.23	.16	.26	.18	.30	1.6
Basswood	.03	.04	.05	.08	.08	.12	.11	.16	.14	.20	.16	.24	.19	.28	.22	.32	.24	.36	1.4
Beech	.02	.05	.05	.10	.07	.15	.09	.21	.11	.26	.14	.31	.16	.36	.18	.41	.21	.46	2.2
Birch, Yellow	.03	.04	.06	.08	.09	.12	.13	.16	.16	.20	.19	.24	.22	.28	.25	.32	.28	.36	1.3
Butternut	.01	.03	.03	.05	.04	.08	.06	.11	.07	.14	.09	.16	.10	.19	.11	.22	.13	.24	1.9
Cherry	.02	.03	.03	.06	.05	.09	.06	.12	.08	.15	.09	.18	.11	.21	.13	.24	.14	.27	1.9
Elm, American	.02	.04	.03	.08	.05	.12	.07	.16	.09	.20	.10	.24	.12	.28	.14	.32	.15	.36	2.3
Hickory	.03	.05	.06	.10	.09	.15	.13	.20	.16	.25	.19	.30	.22	.35	.25	.40	.28	.45	1.4
Locust, Black	.02	.03	.04	.06	.06	.09	.07	.12	.09	.15	.11	.18	.13	.21	.15	.24	.17	.27	1.6
Maple, Sugar	.02	.04	.04	.09	.06	.13	.08	.17	.10	.21	.12	.26	.14	.30	.16	.34	.18	.39	2.1
Oak, Red	.02	.04	.04	.09	.06	.13	.07	.18	.09	.22	.11	.27	.13	.31	.15	.35	.17	.40	2.1
Oak, White	.02	.04	.04	.09	.06	.13	.09	.18	.11	.22	.13	.27	.15	.31	.17	.35	.19	.40	1.8
Sassafras	.02	.03	.03	.05	.05	.08	.07	.10	.09	.13	.10	.15	.12	.18	.14	.21	.15	.23	1.6
Sycamore, American	.02	.04	.04	.07	.06	.11	.08	.14	.10	.18	.12	.21	.14	.25	.16	.29	.18	.32	1.7
Walnut, Black	.02	.03	.05	.07	.07	.10	.09	.13	.11	.16	.14	.20	.16	.23	.18	.26	.21	.30	1.4
Willow, Black	.01	.04	.03	.07	.04	.11	.05	.15	.06	.19	.08	.22	.09	.26	.10	.30	.12	.33	2.6
Poplar, Yellow	.02	.03	.04	.07	.06	.10	.07	.14	.09	.17	.11	.21	.13	.24	.15	.27	.17	.31	1.8
<b>Softwoods</b>																			
Bald cypress	.02	.03	.03	.05	.05	.08	.06	.10	.08	.13	.09	.15	.11	.18	.13	.21	.14	.23	1.6
Cedar, Alaskan	.01	.02	.02	.05	.03	.07	.05	.10	.06	.12	.07	.15	.08	.17	.09	.19	.10	.22	2.1
Douglas Fir	.02	.03	.04	.06	.06	.09	.08	.13	.10	.16	.12	.19	.14	.22	.16	.25	.18	.28	1.6
Pine, Eastern White	.01	.03	.02	.05	.03	.08	.03	.10	.04	.13	.05	.15	.06	.18	.07	.21	.08	.23	2.9
Redwood	.01	.02	.02	.05	.03	.07	.05	.10	.06	.12	.07	.15	.08	.17	.09	.19	.10	.22	2.2
Spruce, Sitka	.02	.03	.03	.06	.05	.09	.07	.13	.09	.16	.10	.19	.12	.22	.14	.25	.15	.28	1.7
<b>Tropical Hardwoods</b>																			
Khaya	.02	.02	.03	.05	.05	.07	.07	.10	.09	.12	.10	.15	.12	.17	.14	.19	.15	.22	1.4
Laun	.02	.03	.03	.06	.05	.09	.06	.13	.08	.16	.09	.19	.11	.22	.13	.25	.14	.28	2.1
Mahogany	.02	.03	.04	.06	.06	.09	.08	.11	.10	.14	.12	.17	.14	.20	.16	.23	.18	.26	1.4
Teak	.01	.02	.02	.05	.03	.07	.05	.09	.06	.11	.07	.14	.08	.16	.09	.18	.10	.21	1.8

Directions: Find the numerical "MC" extremes (January & July) for Moisture Content of Interior Woodwork on USDA maps for your area

With a moisture meter, check the MC for the lumber that you are using to glue up the panel

Locate the column headings corresponding to the difference between the wood's MC and the extremes for the region.

Locate wood species in left hand column & follow that line to the identified columns - use "R" for Quartersawn or "T" for Flat Sawn wood.

These numbers, expressed as decimal inches, indicate approximately how much movement you can expect in each direction.

Example: Assume you are in Detroit and building a Flat Sawn, 24" wide, White Oak consol table top that is attached at the front and floating at the back.

MC range for Detroit is approximately 7% in January and 12% in July. Assume that the wood meters at 9% MC. The differences are 2% winter & 3% summer.

The math is as follows:  $.09 \times 2 = .18$ " or  $\sim 12/64$ " or  $3/16$ " shrinkage &  $.13 \times 2 = .26$ " or  $\sim 17/64$ " or  $\sim 9/32$ " growth. Don't forget to add a "foo factor" for good measure.

Notes: T = Tangential Movement - use for Flat Sawn Wood

R = Radial Movement - use for Quartersawn Wood

T/R Ratio is an indication as to likelihood of cupping. The larger the number, the more likely it is to cup, relative to other species shown.

## Dimensional Changes in Wood - Expressed in 64ths of an Inch for a 12" Panel

	1%		2.0%		3%		4.0%		5%		6.0%		7%		8.0%		9%		T/R Ratio
	R	T	R	T	R	T	R	T	R	T	R	T	R	T	R	T	R	T	
	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	64ths	
<b>Hardwoods</b>																			
Ash, White	1	2	3	4	4	6	5	8	6	11	8	13	9	15	10	17	12	19	1.6
Basswood	2	3	3	5	5	8	7	10	9	13	10	15	12	18	14	20	16	23	1.4
Beech	1	3	3	7	4	10	6	13	7	16	9	20	10	23	12	26	13	30	2.2
Birch, Yellow	2	3	4	5	6	8	8	10	10	13	12	15	14	18	16	20	18	23	1.3
Butternut	1	2	2	3	3	5	4	7	5	9	5	10	6	12	7	14	8	16	1.9
Cherry	1	2	2	4	3	6	4	8	5	10	6	12	7	13	8	15	9	17	1.9
Elm, American	1	3	2	5	3	8	4	10	5	13	7	15	8	18	9	20	10	23	2.3
Hickory	2	3	4	6	6	10	8	13	10	16	12	19	14	22	16	26	18	29	1.4
Locust, Black	1	2	2	4	4	6	5	8	6	10	7	12	8	13	10	15	11	17	1.6
Maple, Sugar	1	3	3	5	4	8	5	11	6	14	8	16	9	19	10	22	12	25	2.1
Oak, Red	1	3	2	6	4	9	5	11	6	14	7	17	8	20	10	23	11	26	2.1
Oak, White	1	3	3	6	4	9	5	11	7	14	8	17	10	20	11	23	12	26	1.8
Sassafras	1	2	2	3	3	5	4	7	5	8	7	10	8	12	9	13	10	15	1.6
Sycamore, American	1	2	3	5	4	7	5	9	6	11	8	14	9	16	10	18	12	21	1.7
Walnut, Black	1	2	3	4	4	6	6	8	7	11	9	13	10	15	12	17	13	19	1.4
Willow, Black	1	2	2	5	2	7	3	10	4	12	5	14	6	17	7	19	7	21	2.6
Poplar, Yellow	1	2	2	4	4	7	5	9	6	11	7	13	8	15	10	18	11	20	1.8
<b>Softwoods</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Bald cypress	1	2	2	3	3	5	4	7	5	8	6	10	7	12	8	13	9	15	1.6
Cedar, Alaskan	1	2	1	3	2	5	3	6	4	8	4	9	5	11	6	12	7	14	2.1
Douglas Fir	1	2	3	4	4	6	5	8	6	10	8	12	9	14	10	16	12	18	1.6
Pine, Eastern White	1	2	1	3	2	5	2	7	3	8	3	10	4	12	4	13	5	15	2.9
Redwood	1	2	1	3	2	5	3	6	4	8	4	9	5	11	6	12	7	14	2.2
Spruce, Sitka	1	2	2	4	3	6	4	8	5	10	7	12	8	14	9	16	10	18	1.7
<b>Tropical Hardwoods</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Khaya	1	2	2	3	3	5	4	6	5	8	7	9	8	11	9	12	10	14	1.4
Laun	1	2	2	4	3	6	4	8	5	10	6	12	7	14	8	16	9	18	2.1
Mahogany	1	2	3	4	4	5	5	7	6	9	8	11	9	13	10	15	12	16	1.4
Teak	1	1	1	3	2	4	3	6	4	7	4	9	5	10	6	12	7	13	1.8

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 MC range for Detroit is approximately 7% in January and 12% in July. Assume that the wood meters at 9% MC. The differences are 2% winter & 3%  
 The math is as follows:  $6 \times 2 = 12$  or  $\sim 12/64$ " or  $3/16$ " shrinkage &  $9 \times 2 = 18$  or  $\sim 18/64$  or  $\sim 9/32$ " growth. Don't forget to add a "foo factor" for good r

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 R = Radial Movement - use for Quartersawn Wood  
 T/R Ratio is an indication as to likelihood of cupping. The larger the number, the more likely it is to cup, relative to other species shown.