HOW TO CALCULATE WOOD SHRINKAGE AND EXPANSION

All you need to do is multiply three numbers together. Here's how to find them.

STEP 1: MEASURE THE BOARD'S WIDTH.

● Know that wider boards expand and contract more than narrower ones.

● Wood expands and contracts mostly across its width. Measure width in inches.

STEP 2: FIND THE AVERAGE YEARLY CHANGE IN MOISTURE CONTENT.

● Wet air expands wood, dry air shrinks it.

● Use a moisture meter to note the highest moisture content (MC) in your wet season and the lowest in your dry season.

● Subtract the smaller number from the larger one to find the yearly change. Most climate-controlled houses change 3 percent to 4 percent MC during a year.

STEP 3: DETERMINE THE DIMENSIONAL CHANGE COEFFICIENT OF THE SPECIES.

● Dimensional Change Coefficient: A number that reflects how much a certain species of wood will change in width.

● Formula works only when wood is between 6 percent and 14 percent moisture, but this is a fair range for furniture.

● First, determine if your board is mostly flatsawn (F/S) or quartersawn (Q/S). Few boards are entirely one or the other, so make a best guess. The best place to look is in the end grain (see drawing at right).

● Now look up the right number in the chart of common species (below right).

STEP 4: DO THE MATH.

● Multiply the width of the board (in inches) by the annual change in MC (highest annual MC minus lowest). Then multiply the result by the number from the chart.

● Because few boards are entirely F/S or Q/S, calculate both numbers and shoot for something between.

EXAMPLE: The workbench in this issue is 24" wide. The annual change in moisture in our shop is 3 percentage points (12 percent minus 9 percent). The top is mostly Q/S yellow pine (the numbers from the chart are .00176 and .00263).
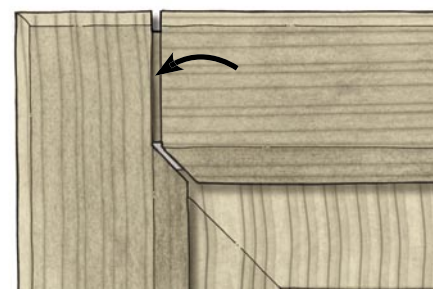
So our equations are:

Q/S: 24 x 3 x .00176 = .127" (about 1/8")
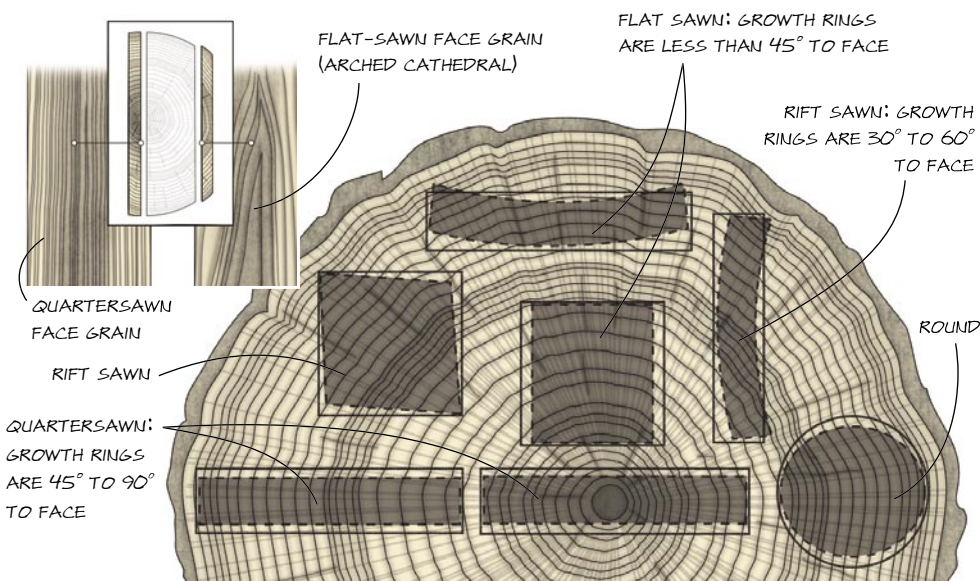
F/S: 24 x 3 x .00263 = .189" (about 3/16")

TWO COMMON WOOD MOVEMENT DISASTERS

Panel has shrunk and exposed unfinished wood by door stiles.

Panel has expanded and broken the corner joint of door.

QUARTERSAWN FACE GRAIN

RIFT SAWN

QUARTERSAWN: GROWTH RINGS ARE 45° TO 90° TO FACE

FLAT-SAWN FACE GRAIN (ARCHED CATHEDRAL)

FLAT SAWN: GROWTH RINGS ARE LESS THAN 45° TO FACE

RIFT SAWN: GROWTH RINGS ARE 30° TO 60° TO FACE

ROUND

TYPE OF LUMBER CUT AND SHRINKAGE

DIMENSIONAL CHANGE COEFFICIENT FOR COMMON SPECIES

HARDWOODS	Q/S	F/S	SOFTWOODS	Q/S	F/S
ALDER, RED	.00151	.00256	BALD CYPRESS	.00130	.00216
ASH, WHITE	.00169	.00274	CEDAR, EASTERN RED	.00106	.00162
BEECH, AMERICAN	.00190	.00431	DOUGLAS-FIR, COAST	.00165	.00267
BIRCH, YELLOW	.00256	.00338	HEMLOCK, WESTERN	.00144	.00274
CHERRY, BLACK	.00126	.00248	PINE, EASTERN WHITE	.00071	.00212
HICKORY, TRUE	.00259	.00411	PINE, LODGE POLE	.00148	.00234
MAPLE, RED	.00137	.00289	PINE, SLASH	.00187	.00267
MAPLE, SILVER	.00102	.00252	PINE, SUGAR	.00099	.00194
MAPLE, SUGAR	.00165	.00353	PINE, WESTERN WHITE	.00141	.00259
OAK, RED	.00158	.00369	PINE, YELLOW	.00176	.00263
OAK, WHITE	.00180	.00365	REDWOOD	.00101	.00229
WALNUT, BLACK	.00190	.00274	SPRUCE, SITKA	.00148	.00263
POPLAR, YELLOW	.00158	.00289	SPRUCE, WHITE	.00130	.00274

SOURCE: WOOD HANDBOOK, FOREST PRODUCTS LABORATORY, U.S. DEPARTMENT OF AGRICULTURE

ILLUSTRATIONS BY MATT BANTLY