

# Kiln-Drying of Western Juniper

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## Abstract

Kiln schedules have not been available for western juniper (*Juniperus occidentalis* Hook.) lumber. As western juniper boards recently have been utilized for 5/8-inch "distressed" paneling, which includes bark pockets, encased and intergrown knots, and other natural defects, a kiln schedule was developed for this species. The kiln-dried lumber should be free of surface checks and split knots. Boards 5/8 inch thick were dried in 66 hours to an average MC between 6 and 8 percent. The 5-quarter and 6-quarter lumber was dried in 144 hours to final MC's averaging 9.8 percent and 11.1 percent respectively.

Western juniper (*Juniperus occidentalis* Hook.) is found in pure or mixed stands in eastern Oregon in areas characterized by dry summers, cold winters, and limited, moisture. This species is not considered of commercial value, although it is utilized in small quantities for fence posts and novelty items such as fireplace mantels or turnings. One reason for limited use is that the mature tree has only 4 to 8 feet of clear bole from 6 to 18 inches in diameter, and the wood is characterized by bark pockets and spiral and interlocked grain.

Recently, western juniper has been utilized for "distressed" paneling, which includes bark pockets, encased or intergrown knots, and other natural -defects. The manufacturer saws the material into 5/8-inch thickness and random widths. As no kiln schedules were available for this species, a kiln schedule was developed for drying the lumber required in production of the paneling. The final moisture content (MC) of the lumber should average about 7 to 8 percent.

## Testing

All charges were dried in a 4-foot-long kiln that contained about 125 board feet of lumber. Air velocity in this study was 450 fpm, measured on the leaving-air side. Lumber was stickered at 2-foot intervals with 9/16-inch stickers.

Five charges of 5/8-inch lumber were dried, each successive charge at a higher dry-bulb temperature and corresponding conditions for lower equilibrium moisture content (EMC). In each charge, six sample boards were selected, two with 90 percent or more sapwood, two a mixture of sapwood and heartwood, and two 90 percent or more heartwood. Initial MCs of the three segregations for the five charges were as follows:

	Moisture Content (%)	
	Avg.	Range
Sapwood	162.5	127.6 - 216.2
Mixed sap and heart	118.6	64.0 - 177.8
Heartwood	71.3	45.7 - 86.8

During drying of the charges, the drying rate was determined by periodic weighing of the sample boards. Also, the occurrence and magnitude of drying defects, during drying, was assessed by visual inspection of the sample boards. After drying, all boards in the charge were inspected for drying defects.

Charge 1 was dried 141 hours at initial dry-bulb temperature of 130 degrees F with conditions for 11 percent

EMC, and final dry-bulb temperature of 170 degrees F with conditions for 4.5 percent EMC. Visual inspection indicated that bark was retained, encased knots were not loosened, and excessive warp did not occur.

Charge 2 was dried for 95 hours at initial dry-bulb temperature of 150 degrees F with conditions for 11 percent EMC, and final drying conditions similar to Charge 1. End checking and splitting of knots was minimal in Charges 1 and 2. Charge 3, dried at 160 degrees F dry-bulb temperature at conditions for 9.5 percent EMC, had less end checking and knot splitting than Charges 4 and 5, but more hairline end checks and surface checks around large intergrown knots than Charges 1 and 2. Charge 4, dried at initial dry-bulb temperature of 180 degrees F with conditions for 10 percent EMC, had more end and surface checking and splitting than previous charges. The fifth charge, dried at high temperatures (above 212 degrees F), had excessive internal checking and collapse. Increase in end and surface checks was a factor of EMC and not temperature. An EMC of 11 percent or higher is required to reduce checking to a minimum.

The final average moisture was determined by a resistance electric moisture meter for all charges. Values ranged from 6 to 8 percent. The sapwood boards averaged 6.7 percent for all charges. The sapwood and heartwood boards were about 1/2 percentage point higher, and the heartwood boards 1 percentage point higher than the sapwood boards.

Two additional charges were kiln-dried, one of 5-quarter and the other of 6-quarter stock at conditions given in recommended schedules. About 90 percent of the boards contained a mixture of sapwood and heartwood, so the sample boards were not segregated. Some of the boards were partially air-dried. The unseasoned average MC was 73.5 percent and ranged from 27.0 to 130.0 percent. Upon completion of drying, visual inspection of the boards indicated the "distressed" appearance was retained. End checking and knot splitting were not a problem. The final MC for 5-quarter stock averaged 9.8 percent and ranged from 7.0 to 14.5 percent; 6-quarter stock averaged 11.1 percent and ranged from 9.5 to 13.0 percent.

## Recommended Schedules

The suggested kiln schedules to dry 5/8-inch, 5-quarter, and 6-quarter juniper boards to a final MC of 6 to 8 percent and to retain the natural defects for the "distressed" appearance are as follows:

Time (hr.)	Dry Bulb (degrees F)	Wet Bulb (degrees F)
5/8-inch-thick boards		
24	160	150
24	160	140
18 or until dry	160	130
5- and 6-quarter boards		
60	150	140
36	160	145
48 or until dry	160	130

Depending on initial MC, amount of heartwood, and final desired MC, the suggested schedules would require more or less time in the final stage of drying. If the lumber were to be resawed, a conditioning period would be required.