

KILN DRYING OF CALIFORNIA REDWOOD

By: Douglas Clayton

Mr. Chairman, Gentlemen:

The kiln drying of Redwood is a slow process in comparison with the drying of pine and fir. One inch Redwood over 150% Moisture Content takes from 20-30 days with 2" sinker taking about three times that long. However, the drying of Redwood has improved greatly through the last few years and especially since the formation of the Redwood Seasoning Committee. The work that this Committee has done in conjunction with the California Redwood Association has been of tremendous importance to the Redwood Industry. Redwood is now being dried better and cheaper than ever before.

KILN DRYING LOSSES IN REDWOOD

Because the factors that influence drying vary so much and because Redwood drying rate is naturally slow it can be a costly process to dry green from the saw. Degrade losses run high in sinker lumber dried green from the saw. Our losses in Redwood are due chiefly to checked birdseye and collapse.

BIRDSEYE

Birdseye, act similar to knots in seasoning. The density and moisture content of the birdseye and the surrounding wood varies greatly. These differences tend to set up severe drying stresses due to uneven shrinkages. In order to allow this shrinkage to take place the birdseye will check. As kiln conditions become more severe and the shrinkage increases, the size of the checks also increases, sometimes even checking the surrounding wood. Losses from birdseye can be minimized by pre-air seasoning to allow an equalization of moisture content between birdseye and surrounding area. Kiln drying at low temperatures and moderate humidities will tend to reduce damage from checked birdseye.

COLLAPSE

Collapse is another cause of degrade. It is a distortion or collapse of the actual wood cells caused by tension stresses set up by capillary action of the free water leaving the cell cavity. Severe kiln conditions hasten this capillary force and thus increase the stresses until the cells actually fold up or collapse. The external force of caseharding also adds materially to collapse in Redwood. Wet streaks and areas about knots and birdseye are very subject to collapse. Collapse also is much more prevalent in heavy lumber dried green from the saw.

Pre-air seasoning helps to eliminate collapse by equalizing wet streaks and by permitting slow drying during the stages when danger from collapse exists. Use of mild kiln temperatures and moderate humidities until the fiber saturation point is reached, will help greatly to eliminate collapse.

STAIN

Occasional Redwood boards are also subject to a chemical stain which appears as dark areas on the board after surfacing. This stain is due to the leaching of the Redwood extractives on the board's surface as the moisture leaves the wood. A very slow rate of air drying or kiln drying, or allowing rain water to stand on the boards surface seem to be the chief causes of stain. Very high temperatures and humidities will also cause stain. Yards where a good rate of air drying exists and kilns where moderate schedules are in use give the least trouble from stain.

OTHER LOSSES

Checking, warping and cupping do not cause much concern in the kiln drying of Redwood. Compression wood streaks will check due to uneven shrinkage conditions, but this can be reduced by slower drying conditions in the kiln.

IMPROVEMENTS IN KILN DRYING

Work at the pilot kiln proved that no new overnight method of drying redwood was to be found, but that sound schedules could be derived that would materially reduce drying times and cost. Through this experimental work it was found what the proper kiln characteristic of Redwood kilns were. Optimum amounts of ventilation, circulation and amount of heating coils were derived. From this work and work done individually at the various plants it was found that the best and cheapest kiln dried Redwood was that which had been pre-air seasoned to below 50% moisture content. Consequently, further tests proved that many of our yards were nothing but storage areas, and that a better rate of drying could be obtained by increasing the distance between stacks. More emphasis is now put on segregation which in turn accounts for less degrade in the kiln and shorter drying periods.

DRYING METHODS AND ACTUAL SCHEDULES

Since Redwood does vary so much in those characteristics that effect drying rate, schedules based on moisture content are in general use in the Redwood industry. Many of the operators base their schedules on several samples placed in the kiln, while others use pre-determined schedules for the various initial moisture contents. In the sample board method a definite relation is kept between moisture content and the kiln conditions. Through the experimental work definite optimum drying rates have been established for various moisture contents as the charge dries, and those can be maintained by careful regulation of kiln conditions. In general, no heavy segregation lumber over 1-1/2" is being dried in the kilns. Relatively moderate schedules are in use especially until the charge is below the fiber saturation point, and the danger from collapse and popped birdseye is non-existent.

A typical schedule for 1" heavy Redwood would be a starting dry bulb temperature of about 110° with a 15° or 20° wet bulb depression. This setting is

usually held until the moisture content is down to 100%, then it is stepped up each day until at 50% moisture content the dry bulb is approximately 130° with a wet bulb depression of about 25°. This gradual step-up is continued until about 20-25% moisture content at which time the danger from collapse is past and temperatures up to 190° dry bulb and wet bulb depressions 30 or 35° can be used to complete the drying.

Until recently commons have only been air dried but some companies are now kiln drying them due to changes in market demand. This presents another problem since drying varies so greatly between the various boards. Some start shrinking and losing knots long before others. Only very mild schedules that will minimize shrinkage can be used in commons.

Since much of our Redwood goes into resawn articles such as siding, furniture stock and pattern stock, there is a definite need for a conditioning period at the conclusion of drying so as to relieve the drying stresses. This relief of stresses is done in the same manner as is done in fir and pine. About 12 hours of steaming at a dry bulb of 160° and a wet bulb depression of 8 to 10° will usually relieve the stresses in 1" Redwood.

Thank you.