

SPECIAL METHODS OF SEASONING WOOD

INFRARED RADIATION

The successful use of infrared radiation for hardening paints and enamels on metal has caused some speculation that it might be used to advantage in seasoning wood. In drying paints or enamels on metal by this method a battery of lamps is directed toward the object so that radiation from adjacent lamps overlaps to provide uniform coverage. The conduction of the metal and movement of the object past the lamps tends to equalize surface temperatures rapidly.

Seasoning of lumber, however, presents a basically different problem because the heat must penetrate the wood without raising the surface temperature to such a point that drying defects occur. When wood is heated by infrared radiation the depth of penetration is slight and heat applied in this manner is carried into the wood by conduction only.

Since infrared radiation penetrates wood only to a slight degree it does not appear advantageous to use it as a source of heat for seasoning wood because the rate at which the interior wood heats will depend upon the surface temperature and not upon whether the surface temperature was established by absorption of infrared radiation or by contact with hot circulating air. The time required for heating wood in air in a dry kiln to the desired drying temperature is relatively small in comparison with the total drying time. To heat green wood 1 inch thick to the kiln temperature in a modern forced-air circulation kiln takes only approximately 1 hour, but several days or weeks may be needed to dry the lumber because of the slow diffusion rate of moisture at permissible kiln temperatures and relative humidities. All this time the air is circulating throughout the lumber pile and reaches all surfaces of each piece. Heat supplied by infrared radiation, in contrast, would reach only the surfaces in direct exposure.

To apply infrared radiation to all surfaces of each board would, seemingly, require the single-file, board-by-board passage of the lumber through a tunnel on a traveling chain, a highly impractical and costly method that would have to compete in output with the commonly provided kiln capacities of 20,000 to 60,000 board feet that are standard in the process of drying lumber by heated air.

In drying lumber by any method, temperatures and relative humidities must be under accurate control for most woods. Green oak, for example, is particularly susceptible to surface checking caused by initial relative humidities below 80 percent and green oak that is 2 inches or more in thickness,

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especially in a forced-air circulation kiln, should have an initial relative humidity as high as 85 or 90 percent. Oak is also susceptible to honeycombing caused by the use of temperatures much above 115° F. during the time the moisture content of the core is above 30 percent. Some species, such as basswood, dry easily and higher temperatures and lower relative humidities can be used.

The relative humidity cannot be controlled within the desired limits at the surface of the wood when the surface is heated to a temperature greater than that of the surrounding air because the wood then heats the adjacent air layer and thus lowers the relative humidity at the wood surface. With infrared radiation, the wood surface is always heated above the temperature of the surrounding air. Relative humidity decreases rapidly as temperature increases. Starting with a temperature of 80° F. and a relative humidity of 80 percent, the relative humidity of the air when heated to 150° F. will be only 11 percent.

It might seem that infrared radiation is well suited for the drying of veneer because veneer is so thin, but here again practical procedures do not lend themselves to this method of heating. In drying veneer, restraint must be provided against wrinkling and buckling by drying it between heavy wire mesh, springs, closely spaced iron rolls, or plates. When these driers are used the veneer comes from them reasonably flat and in good condition for storage, shipment, or manufacture into plywood. In drying with infrared radiation, the restraining mechanism would interfere with the application of heat or it would be difficult to maintain the lamps if used with the drying equipment now available.

Even though practical solutions were found for the difficulties of using infrared radiation for the seasoning of wood, the cost of electricity would be greater in most localities than the cost of steam.

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