PREVENTION AND REDUCTION OF SEASONING DEGRADE

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Wood is an elasto-plastic, anisotropic, hygroscopic, ligno-cellulosic material. This hygroscopic material shrinks and swells with loss or gain in moisture content below its fibre saturation point. Thus, wood shrinks when it is kiln dried below the fibre saturation point. This shrinkage, in conjunction with the anisotropic characteristic of wood, produces stress patterns which, in turn, are responsible for nearly all forms of seasoning degrade. Further, any stress pattern that exists in the wood before drying will have a marked effect on drying stress pattern which, in turn, may result in enhancing the seasoning degrade.

When we talk about the seasoning degrade we mean the defects arising in the process of drying wood. Checking, collapse, honeycombing, casehardening, distortion, stain, etc., fall under the category of seasoning defects. Some of these defects can be minimized by taking necessary preventive measures while others can be reduced by adopting the correct kiln drying schedules. Many research workers have reported various steps to prevent or reduce to minimum some of these defects. For example, collapse can be reduced to minimum by using low temperature schedules; distortion can be minimized by careful and good piling; use of higher humidities in the early stages of drying prevents or reduces casehardening, honeycombing and surface checking. Uneven drying has also been reported to cause degrade which can be prevented by proper designing and control of the kiln.

Now, let us focus our attention to the stress pattern that exists in wood before it is kiln dried. Strikha (1) examined the internal stresses in lumber throughout the operation - from logging to drying - and suggested methods to reduce them. Gaby (2) reported that surface checking was found to vary widely between boards processed by circular sawing, band sawing and green surfacing. Tears and subsequent checking, which appear in rough sawn boards, were found to be negligible in green surfaced boards after kiln drying. Leney (3) studied checking of planed and rough red oak during drying. His experimental results confirmed those of Gaby's, i.e. reduced surface check development in green surfaced lumber as compared to rough lumber.

Thus, it was established that green surfacing reduces surface checking. Further, it was thought that green surfaced boards would form a good uniform stack for kiln drying. Thus, all the boards in this uniform stack would be equally supported in between the stickers and the air flowing through each section of the stack would be uniform. Therefore, it was stipulated that green surface hemlock drying would reduce seasoning degrade due to surface checking and distortion. Hence, a degrade study was undertaken to study the reduction in seasoning degrade due to green surfacing of hemlock lumber, c.f. rough sawn hemlock lumber in kiln drying.

Procedure

Two experimental charges were kiln dried. Each charge contained equal number of green surfaced and rough boards. Two inch thick clear grade hemlock stock of 8 to 10 feet in length was selected for these experiments. The first kiln charge contained 4" wide boards and the second 6" and wider boards.

Each board was graded (for B.C.D. and reject clear grades) by an experienced grade supervisor. Alternate boards were checked for moisture content by a resistance type moisture meter. Half of the stock was green surfaced at a planer to 1-15/16" thickness. Dimensions and grade of green surfaced boards were again recorded. The lumber was then stacked at the automatic stacker and kiln dried in an experimental kiln according to the schedule given in Table 1.

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(1) I. A. Strikha, Naukai Tekhnika 7:7-11 (Russian) Transl. No. 290, U.S., F.P.L. 1955.

(2) Gaby, L. I. "Surface checking of white oak as related to mechanical processing", Forest Products Journal 13 (12) 529, 1963.

(3) Leney, L. "Checking of planed and rough red oak during kiln drying", Forest Products Journal 14(3)103, 1964.

TABLE I
KILN DRYING SCHEDULE

MOISTURE CONTENT AT START OF STEP Percent	DRY BULB TEMPERATURE °F	WET BULB TEMPERATURE °F	EQUILIBRIUM MOISTURE CONTENT Percent
98	150	148	20.2
85	155	148	13.5
63	158	148	11.6
31	165	150	9.3
14	170	140	5.7
below 12	180	140	4.4

After drying, the charge was pulled out and dimensions of 10% of the boards from each part (rough and surfaced) were measured. All the dried lumber was then planed for a final thickness of 1-25/32". Each board was again graded and the boards which were checked for moisture content were again metered for moisture content determination. Relevant collected data has been reported in Table II.

TABLE II
LOSS OF GRADE IN DRYING ROUGH AND GREEN SURFACED BOARDS

		ROUGH LUMBER DRYING		GREEN SURFACED LUMBER DRYING		REDUCTION IN DEGRADE DUE TO GREEN SURFACING
DIMENSION	GRADE	FBM	Change in Grade %	FBM	Change in Grade %	%
2 x 4	B & C	1033	12.9	1087	10.4	19
	D	287	11.6	233	8.5	26
2 x 6 & Wdr.	B & C	1198	31.4	537	12.3	60.8
	D	244	15.6	85	-	

Results and Conclusions

The potential grade of lumber prior to drying and the final grade of lumber after kiln drying and planing, was recorded for each board. From this data all the boards which changed grades due to seasoning defects were separated and change of grade was calculated as a percentage of the original grade of lumber. Table II presents the total board feet of each grade of lumber prior to drying and the percent change of grades. Reduction of seasoning degrade due to green surfacing has also been reported in Table II. The figures of 19% - 60% reduction on seasoning degrades due to green surfacing prior to drying looks very impressive. Further, the results also indicate that this reduction of seasoning degrade is more pronounced in wide boards.

Maximum variation in final moisture content was found to be $\pm$ 2 % in the first charge. In the second charge, eight boards out of a lot of 151 boards showed moisture content of 10% - 16%, while the rest of the boards were of 8% $\pm$ 1% moisture content.

Shrinkage in thickness of the boards was approximately the same for both green surfaced and rough sawn boards. Skips during planing operation caused some degradation in both types of boards.

In conclusion, I would like to state that green surfacing prior to drying has given us some encouraging results in reducing seasoning degrade.