

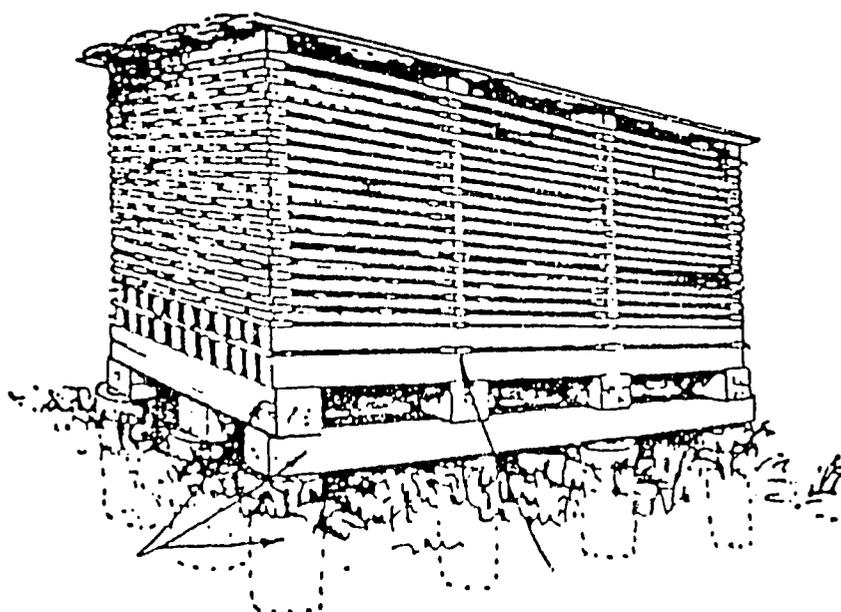


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FORESTRY PLANNING & DEVELOPMENT PROJECT

Government of Pakistan-USAID

AIR - SEASONING LUMBER



TECHNICAL NOTE

FPDP No. 9

April 1992

WI Winrock International

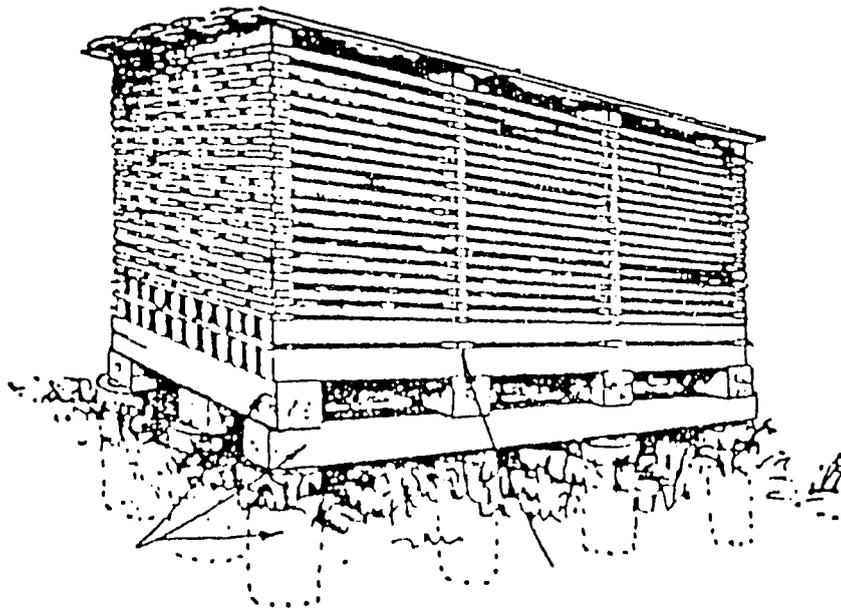
Technical Assistance Team

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AIR-SEASONING LUMBER

by

Gary G. Naughton

The value, durability and utility of sawn lumber can be greatly increased by proper seasoning before it is put to final use. Whether for construction of buildings or the making of fine furniture, properly seasoned wood gives the best results.

About one-half of the weight of most freshly cut hardwood lumber is water. Nearly all of this water must be removed before lumber can be used for most purposes. Air-seasoning of lumber does not normally make it suitable for indoor use, but it greatly reduces the amount of time that the lumber must be held in heated storage or kilns for final drying. In Pakistan, air-seasoning is usually sufficient for exterior uses, if the lumber is seasoned in the area where it is to be used.

If the lumber is not dried prior to its use, it will dry while in service, warping, cracking, or shrinking and leaving gaps between boards or in joints that were originally tight.

Contrary to popular belief, soaking logs by submerging them in water before sawing does not season the lumber. The water protects the wood from decay, and from defects caused by rapid drying on the ends of the logs and in the external layers of wood under the bark. It also makes the job of sawing boards easier. But, after the boards are cut, they need to be seasoned to remove the water absorbed by soaking, plus the natural water in the wood, before they can be used.

Another common belief is that a log should be allowed to lie around for months or years before it is sawn so that it will "season" first. All this does is to increase the amount of defect in the log by exposing it to the uneven drying effects of weather and to attacks by insects and decay. Water in the wood dries out very quickly from the outside surfaces and ends, but very slowly from the inside of the log. This uneven drying causes the outside of the log to shrink and crack. It is only through continuous shrinking and cracking from the outside that the wood on the inside can finally begin to dry out. This system of "seasoning" is very wasteful and should be avoided.

The best quality lumber comes from freshly cut logs, followed by immediate stacking for proper seasoning.

Plan Proper Air Seasoning To Reduce Losses

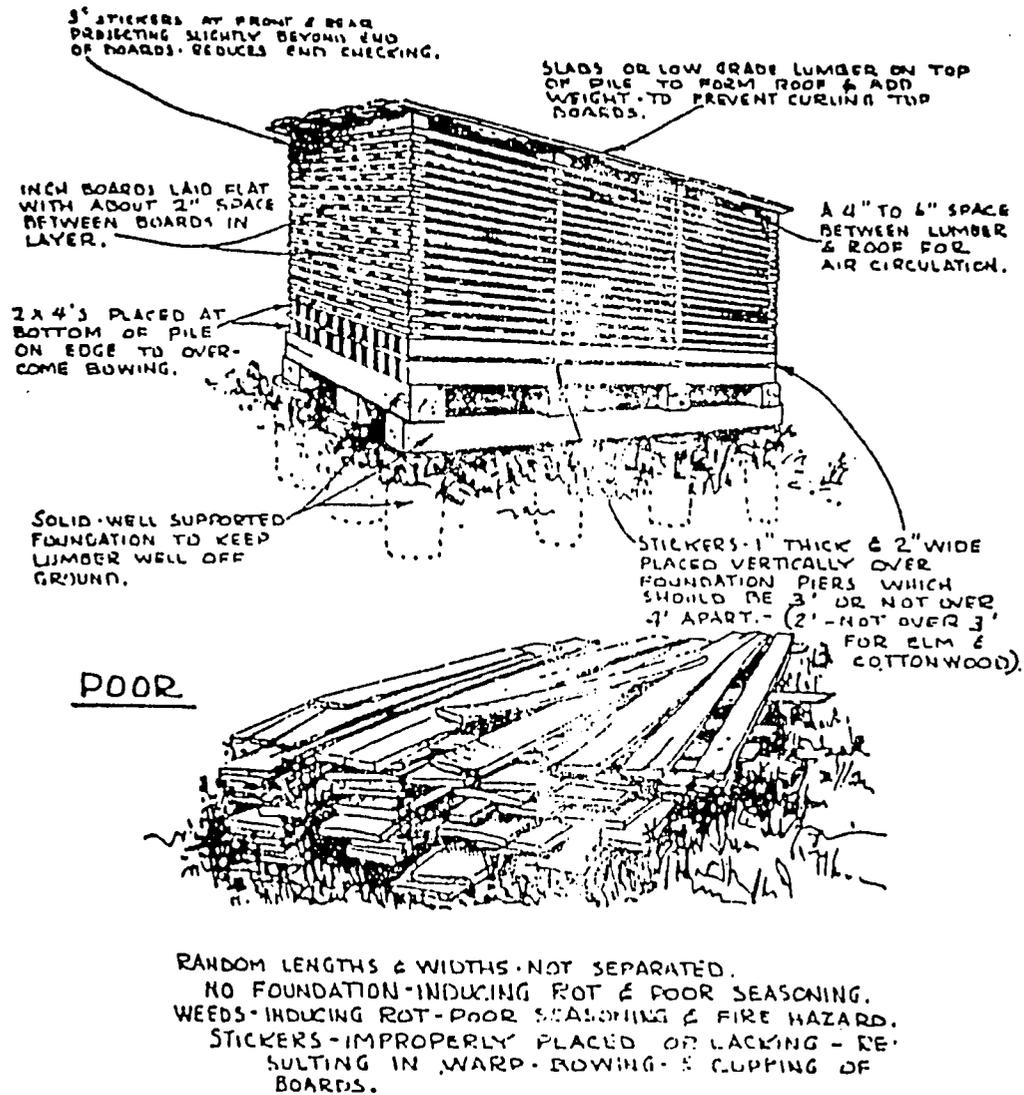


FIGURE 1

STACKING

To air-season lumber in a reasonable amount of time and with minimum drying defects, certain steps need to be taken. Figure 1 shows the main features of a well-constructed lumber stack.

The stack location should be far enough away from obstacles so that there is good air movement around, across, and under the stack. The stack should be oriented perpendicular to the prevailing winds so that wind blows across the boards and not into the ends of the boards. The stack should always be covered to protect the lumber from rain, snow, and the destructive effects of bright sun. In very hot, dry areas, you can get good results by selecting sites with reduced air movement and extra shade (under trees, for example).

Start with a good foundation. Permanent stack foundations are usually made with brick or concrete footings with either iron or wooden cross-beams bolted directly to the footings. Even a temporary foundation of railroad sleepers or brick must be solidly constructed so it will not shift, sink, or collapse when a load of lumber is stacked on the cross-beams.

Regardless how the foundation is erected, you might want to design it to slope from front to back, about one inch for every foot of length to insure water run-off. The lowest end of the stack should be at least one foot above the ground level. Make certain that the cross-beams are in perfect alignment since any low or high spot, or a slope from opposite corners of the stack, will cause the lumber to warp. Cross-beams should be aligned so that there is one at the very front of the stack, one at the very back of the stack, and one at each 2-foot interval in between.

Stack the lumber carefully! The amount of lumber you have will likely affect the stacking method used. Sort the lumber by length and thickness. The thickest lumber should go on the bottom of the stack; it takes longer to dry. The longest lumber should go on the outside of the stack (see Figure 2). Shorter boards should be on the interior of the stack and should alternate being flush with the front or the back of the stack. Loose ends should not be allowed to overhang without support. Never mix boards of different thickness on the same layer!

Stickers (or spacers) are narrow boards used to separate each layer of lumber so that the air can move between the layers. The stickers are very important! They must be clean, absolutely straight, uniform in thickness, free from bark, decay, and stain, and thoroughly dry. Stickers are commonly 1-inch thick, 1-1/2 inches wide, and long enough to reach across the width of the stack. When thinner stickers are used, the seasoning will be slowed down. This could be an advantage in hot, dry areas where drying too fast may cause too much cracking and splitting of the lumber.

Be certain that your stack foundation and an adequate supply of good stickers are ready before you cut the lumber!

After the first layer of lumber is placed on the cross-beams, the first set of stickers must be placed on top of the lumber, and directly over the foundation cross-beams in good vertical alignment. As the stack goes up, keep the stickers lined up.

If you are making a sloped lumber stack, each layer of boards should protrude slightly forward of the board ends in the previous layer, so that the front of the pile is pitched slightly forward.

To reduce severe end splitting, it is helpful to place a sticker directly at the end of the board. As the stack builds up, the board-end and the sticker are compressed by the weight and splitting is reduced.

In properly stacked lumber, the weight of the lumber helps to prevent excessive warping and twisting in all but the top layers. Therefore, the lowest grade boards should be placed on the top of the stack. In addition, the top layer can be weighted down with bricks to help control the twisting and warping.

When completed, the stack should be covered to shed water. Use any locally available material such as old sheet metal, tar paper, or old lumber. The cover should extend past the ends of the pile, front and back, for about 2 feet, and should be positioned to leave from 4 to 6 inches of space between the top of the stack and the roof to allow for free movement of air.

END COATINGS

Lumber dries several times faster from the ends than it does from the surface or edges. As the moisture content of wood drops below 30 percent, shrinkage begins. Because of the way that wood shrinks as it dries, boards will often split and check on the ends during seasoning. This is especially a problem with wide boards.

If the boards are coated on the ends the moisture in the wood will move more slowly and the boards will shrink more evenly, reducing the amount of splitting and checking. If you are seasoning a large amount of high quality lumber it might be worthwhile to buy roofing tar (asphalt) for this purpose. Aluminum paint mixed with spar varnish is also very effective. For smaller quantities of less valuable lumber for home use, try a thick pasty mixture of clay and cow dung.

DETERMINING MOISTURE CONTENT

The standard method of determining moisture content is called oven-drying, and the moisture content of wood is expressed as a percentage of the oven-dry weight of the wood. You can test the

moisture content in the following way:

1. Select a board of the average width and thickness that you are working with;

2. Cut a cross-section piece about one foot long from the center of the board;

3. Be sure the piece is clean of dirt, mud, and foreign material by brushing it thoroughly;

4. Weigh this piece accurately - to the nearest gram if possible, and record the weight;

5. Place the board in an ordinary oven heated to 105 degrees Centigrade (220 degrees Fahrenheit); after 2 hours, take the board from the oven, weigh it again and record the weight;

6. Place the board back in the oven and weigh it again after one more hour; if the weight has not changed, the board is oven-dry; if the weight is less, continue to weigh the board at one hour intervals until the weight remains the same. This is the oven-dry weight;

7. Calculate as follows:

$$\% \text{ Moisture} = \frac{\text{wet weight} - \text{oven dry weight}}{\text{oven dry weight}} \times 100$$

EXAMPLE: A section of board weighed 17,470 grams to start with; after 4 hours drying in the oven the board was at a constant weight of 12,110 grams. The difference between these two weights is $17,470 - 12,110 = 5,360$ grams. Then, $5,360$ divided by $12,110 = 0.4426$. Then taking this 0.4426 times 100 will convert it to 44.26% , the percentage moisture content in the sample of unseasoned lumber.

Each new batch of lumber should be tested for moisture content at the time that stacking is done, so that you will have some idea of the amount of extra moisture that needs to be removed. One good way to keep track of the progress of the seasoning is to use part of the same board from which your oven-dry sample was taken. Weigh it and write down the weight on the board as a permanent record of the starting weight. Place this board in the stack in such a way that it can be easily removed every 10 to 15 days for re-weighing.

Each time you re-weigh the sample board, write down the weight on the sample board. As soon as the sample board shows no change in weight after a period of about 10 days of normal summer conditions you can assume that it is thoroughly air-dry. During monsoon or in the coolest days of winter, the drying rate will be slower. Under such conditions, the sample board should show no weight change over a period of 30 days before you can assume that it is thoroughly air-dry.

The final test of the moisture content in the air-dry lumber can be calculated by following the procedure for oven drying, and starting with the air-dry weight of the piece before oven drying is done. The result will give you the percentage moisture in the air dry sample.

Example:

$$\% \text{ Moisture} = \frac{\text{Air dry weight} - \text{Oven dry weight}}{\text{Oven dry weight}} \times 100$$

ESTIMATING AIR-SEASONING TIME

The time required to properly season lumber will be different for each place, each time of the year, each kind of wood, and for each thickness of wood. The following chart is our estimate of the drying days required for a few well-known species in Pakistan, for lumber of 1 inch thickness* to reach 20% moisture content:

SPECIES	KARACHI	LAHORE	PESHAWAR	QUETTA
eucalyptus	40 - 65	45 - 75	45 - 75	40 - 60
kiker	40 - 65	45 - 75	45 - 75	35 - 60
mulberry	40 - 70	45 - 75	40 - 75	35 - 60
poplar	35 - 65	40 - 70	40 - 70	30 - 60
semal	30 - 60	35 - 65	35 - 65	30 - 60
shisham	50 - 100	60 - 120	50 - 110	50 - 75
willow	30 - 65	35 - 70	35 - 70	30 - 60

* NOTE: the time required to season lumber 2 inches thick is between 3 and 4 times more than for 1 inch lumber.

The time required for seasoning may be increased by doing the following things:

1. Reducing the movement of air through the stack by putting stacks closer together;
2. Stacking behind wind barriers;
3. Reducing the thickness of the stickers;
4. Increasing the width of the stacks;
5. Seasoning during the monsoon and winter months.

Increasing the amount of time for air seasoning is especially helpful in reducing the amount of splitting, cracking, warping, and case-hardening of the lumber. High quality lumber which will be kiln dried after air seasoning should be dried as slowly as possible for the first two weeks. Because of this, the best time to start seasoning lumber is during monsoon or during the cool months of winter.

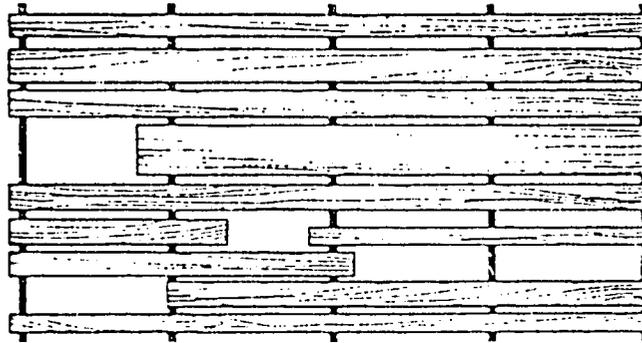


Figure 2. Plan view of a tier of boards, illustrating the system of alternating short lengths for box piling. Unsupported ends of boards placed on the inside will dry with less defect than if allowed to extend over the end of the pile.

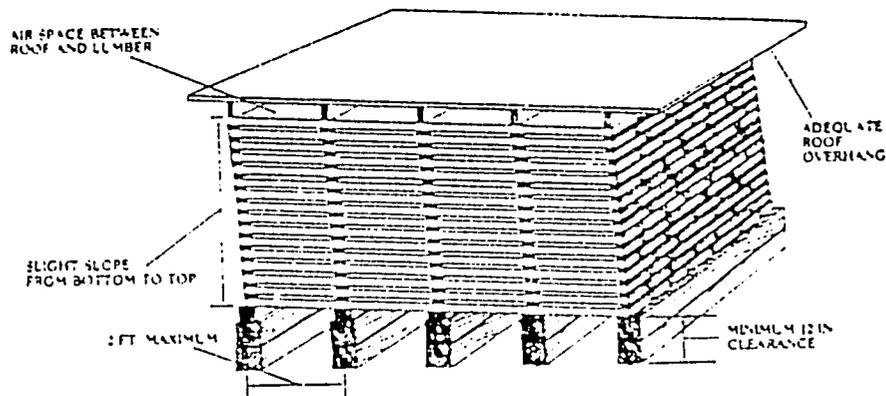


Figure 3. Diagram of essential features of lumber stacking for proper seasoning.