Timber Seasoning Methods in Australia

By DOMINGO LANTICAN
College of Forestry

I. INTRODUCTION

Australia, with a population of about one-half that of the Philippines, consumes some 900,000,000, board feet of sawn lumber annually. This big consumption is due to the diversified use of wood such as construction of buildings and houses; ship building; manufacture of furniture, vehicles, agricultural implements, toys, sporting goods, and many other uses in the wood working trade.

To meet the demand for lumber, Australian sawmills are supplying the market with local hardwoods and softwoods. However, a considerable need for softwood and hardwood for special uses are supplied through importation. About 35% of the need for lumber had for years been imported from other countries although, it has dropped considerably at present.

Most Australian timber species are hardwood most of which are refractory and have a tendency to warp and shrink excessively. For this reason, there was a time in Australia when prejudice against the use of local hardwood existed so that a great bulk of the lumber consumed were imported from other countries.

To be able to use their hardwood, attempts were made to apply proper seasoning methods so that in 1929 there were already about 40 or 50 kilns intalled for the purpose. Most of these kilns however, were so badly designed and drying procedure not very satisfactory so that very little progress was achieved.

The Division of Forest Products when it was founded in 1929 had the difficult task of combatting prejudice against the use of Australian timber due to the deformities and defects that occur during drying which were regarded as inherent in the species and could not be remedied.

The Division of Forest Products conducted kiln test; studied best designs that would suit Australian species; developed drying schedules; carried out lectures on the principles and practice of kiln drying; gave correspondence course in seasoning and later designed kilns for seasoning plants free of charge.

The current seasoning equipment and methods which are being used in commercial kilns have been the result of years of research of the division.

The seasoning of lumber in Australia is so wide spread and so well appreciated so that at present, it is estimated that there are some 1,000 units of lumber kilns and dryers of all types.

The success of timber seasoning in Australia is such that inspite of increasing demand for lumber, importation has dropped to a considerable extent.

II. REASONS FOR SEASONING

Wood would dry up to a point when its moisture content has come to a balance with the surrounding atmosphere, so that lumber which has been machined and used for construction or for furniture would tend to dry in service accompanied by shrinkage if they have been assembled in the green. This shrinkage causes opening and loosening of joints which results in the weakening of the structure aside from the undesirable effects on appearance. In cases of plywood and core

boards which has been assembled before the veneer sheets or the core are of optimum moisture content, warping and twisting would almost inevitably occur.

The aim of seasoning, therefore, is to dry the wood to a moisture content which will be in equilibrium with the average moisture condition likely to be attained by the locality where the wood would be placed in service. At the same time, to dry them with minimum moisture gradient, least degrade and least stress in the shortest possible time.

Seasoning however, is not as simple as drying any other material because of the attendant degrade such as checking, warping, twisting, honeycombing and collapse which accompany the drying; most of which occur during the early stage of the drying, i.e., the removal of free moisture. It is in this stage wherein utmost care is practised. A very high temperature and very low humidity would almost certainly result in severe degrade.

The later stage which involves the removal of hygroscopic moisture is not so critical and may be carried out as fast as possible within the limits of the species.

III. FACTORS INVOLVED IN SEASONING

There are three factors involved in the drying of wood: temperature, air circulation and humidity.

Heat is necessary to supply energy for the evaporation of moisture from the surface of the wood and the transfusion of moisture from the interior to the surface. With all factors remaining the same, the higher the temperature, the faster is the rate of drying and the faster is the rate of moisture transfusion. However, different species vary in tolerance to temperature. Above certain limits of the species, there is a weakening of the fibers at high temperature which could result in checking and splitting as well as collapse. It is for this reason that a thorough knowledge of the species is necessary to carry out a satisfactory result.

Dry air would absorb moisture, first at a rapid rate and gradually lessen as it nears saturation point, as well as gets colder as the process of absorption continues. Therefore, no matter how dry the air is, a time will come when it will become saturated and will cease to absorb moisture altogether.

In the drying of timber, it is necessary to displace the saturated air in the stack with dry air to insure continuous drying and this is achieved by good air circulation. The faster the circulation, the faster is the drying and vice versa.

As dry air enters a stack of timber, it has a high absorbing capacity and as it continues to draw moisture from the timber, it would have a poor absorbing capacity by the time it reaches the leaving air side of the stack. Under such case, the entering air side of the stack will dry faster.

Although such condition cannot be totally eliminated, it could be minimized by providing a good circulation so that the air would be replaced before it nears saturation point, thereby insuring a continuous supply of fairly dry air throughout the stack.

All factors being equal, the lower the relative humidity the higher is the moisture absorbing capacity of the air. Hence, the rate of drying is greatly dependent on the relative humidity. However, if a certain relative humidity and temperature is maintained in a kiln, a time will come when drying will cease. It is then necessary to change the humidity progressively as drying goes on, to insure a drying condition compatible with the species.

VI. SEASONING EQUIPMENT

A. *Equipment in the Yard*

1. *Handling equipment.*—The handling equipment used in the yard are the overhead gantry, cranes, fork lift, straddle carriers, transfer trucks and the Christensen lift truck. The most common equipment used are the transfer truck and the Christensen lift truck. The transfer truck is used to carry the lift truck from one place to

another in the mill and the lift truck in turn used to carry the load.

The most important advantage of the lift truck is its flexibility. Whereas in kiln installation in the Philippines the trucks or bogies carrying the timber charge stays in the kiln during the drying, the Christensen lift truck is used to carry the charge into the kiln but is removed before the operation of the kiln commences. The Christensen lift trucks therefore, has the advantage in that one truck can be used to load and unload several charges of timber into and from the kiln which elimnates the building and breaking of the stack every time they are loaded or unloaded. Aside from this, the truck is not subjected to corrosive kiln atmosphere during the drying.

The most important feature of the Christensen lift truck is its double frame. The lower frame serves as the chassis and the upper frame used to lift the load. In some types, the upper frame rides on either an inclined plane or a swivel attached to the lower frame so that the upper frame could be lifted or lowered with the aid of a screw or hydraulic cylinder.

2. *Stack support.*—Stack supports are either made of concrete or wood. The usual practice is to use about four feet distance between centers with a clearance of about 18 inches above the ground to permit the use of the Christensen lift truck.

In some cases, when straddle carriers are used, the supports are so designed as to permit straddle carriers to lower their load directly on the holding bays and then subsequent handling allows the use of the Christensen lift truck.

3. *Strips.*—The dimension of strips (stickers) used is about 3/4" thick by 1-1/2" wide.

4. *Stacking guides.*—Stacking guides are frames against which a pile of timber is built. It consists of a frame which moves on a hinge so that it may be set for piling and then swung back when the pile is removed. It is provided with vertical strip guides at proper intervals so that a vertical alignment of strips is always assured.

5. *Stacking elevator.*—This is a mechanical device fitted with elevator arms which moves on an endless chain and is used for building a timber pile.

B. *The Kiln*

1. *General description.*—The kilns used in Australia are usually small with capacities of about 5 to 8 thousand board feet (on the basis of 1" thick boards). Such small units have been found most convenient for Australian conditions due to the density of most of their species as well as the various handling method which the timber pile undergo during the drying process. To make up for size, seasoning plants are usually installed in batteries of say four to twelve units or more.

They are brick or concrete constructions steam heated and with forced circulation and heating system located above the pile of timber.

The charge are usually 40 ft. by 6 ft. wide and 6 ft. high which rest on hobs during the drying. This is one of the most important feature of Australian kilns. That is, the charge to be dried does not rest on trucks or bogies inside the kiln. The trucks are used to move the timber in and out of the kiln but does not stay inside the kiln during the drying process.

2. *Estimated parts*: (a) Heating unit.—The heating unit is usually the header-return bend system. The coils are of wrought iron pipes which are subdivided into groups by headers so that the number of heating pipes in use at any one time may be controlled depending on the amount of heat required.

(b) Circulation unit.—Circulation is furnished by internal cross shaft, flat blade, propeller fans distributed along the length of the kiln with the number depending on the size of the fans used and the length

of the kiln. For average kilns, five or six 36" diameter fans are used.

Electric motors are used to drive the fans. In some plants each fan has its own motor whereas in most kilns fewer but powerful motors are used to drive several fans. In either case, the shafts are driven by pulleys and belts connected to the motor.

(c) Humidifier unit.—There are two means by which the humidity is controlled in the kiln, namely: by humidifying pipe and by the amount of vent opening, although both means may be used in combination.

The humidifying pipe is a wrought iron pipe which is perforated at intervals throughout its length. To maintain the required humidity, steam is introduced into the kiln through this pipe with the amount of steam varying with the need.

This means is most commonly used and is always present in a kiln installation.

The vents are located on the top of the kiln and are installed in pairs, one on each side of each fan.

The vents serve two purposes: the expulsion of saturated air from the kiln and the intake of fresh air from the outside into the kiln.

C. *The Reconditioner*

Description. — The reconditioner is a simple unit but is one of the most important units in the seasoning plant in Australia. It is a concrete chamber with a capacity the same as that of the kiln and provided with a perforated steam pipe. Its function is to steam the charge after the preliminary air or kiln drying.

As condensation of the steam is unavoidable, a provision to rid the chamber of condensate is necessary. A simple condensate drain is provided at one end of the reconditioner which is just an opening with a well wherein part of the condensate collects to serve as a water lock to prevent the escape of steam.