

12

Timber Seasoning

KEYWORDS

equilibrium
hygroscopic

kiln
relative humidity

stickers
timber seasoning

WATER AND TIMBER

Around 50 per cent of the weight of a newly felled tree is due to its water content. When a tree is converted into a log (green timber), this moisture starts to dry out quickly. The drying process must be controlled or defects will occur in the wood. **Timber seasoning** is the controlled drying of wood.

The aim of seasoning is to dry out the wood to a suitable moisture content of 20 per cent or less.

Reasons for seasoning

- While wood will dry naturally, seasoning allows the process to be controlled
- Seasoning helps to prevent the wood from splitting
- Fungi do not attack dry timber
- Dry wood is less likely to be affected by shrinkage or distortion
- After seasoning, timber will be lighter, harder and also stronger
- Dry wood is easier to work with

The table on page 88 gives the most desirable moisture content of timber in different situations or uses.

Moisture content	Situation
20%–22%	Limit of good air-seasoned wood
20%	Limit of dry rot occurring
16%	Outdoor furniture
12%–14%	Occasional heated areas, bedroom furniture
11%–13%	Living room furniture, well-heated areas
9%–11%	High degree of central heating, office furniture

In order for **controlled seasoning** to take place, water must evaporate from the surface of the wood gradually. As the surface dries, moisture from the centre of the wood takes its place. It is important that the surface does not dry out too quickly or **case hardening** will result. The rate at which the wood dries depends on the **relative humidity** of the air around the wood.

Relative humidity

There is a certain amount of water vapour (moisture) in the air at all times. You cannot see water vapour, but it affects, for example, the time it takes for clothes to dry on a line or for wood to dry. There is significantly more vapour in the air during winter than in summer time.

Relative humidity

The amount of moisture in the air at a given temperature, compared with the maximum amount of moisture the air could hold at that same temperature.

As wood is a substance that is affected by moisture changes (**hygroscopic**), it will release or absorb moisture to reach a balance (**equilibrium**) with the surrounding air. Wood, even in finished form, for example a door, will soak up or let out water in order to reach this balance. This is called its **equilibrium moisture content (EMC)**. Have you ever noticed how some outdoor doors will swell in winter and shrink in summer? This balance or equilibrium moisture content will change as the humidity of the air changes.

SEASONING

There are two methods of seasoning timber:

- Natural or air seasoning
- Kiln seasoning

Natural (air) seasoning

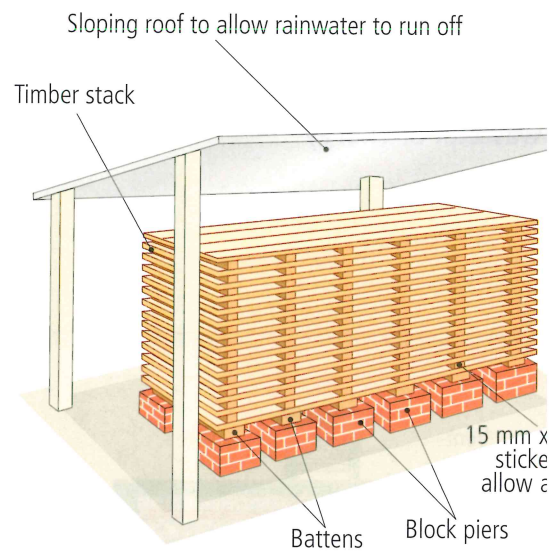
Natural seasoning or **air seasoning** is where the planks or boards are laid down on large battens that are raised above the ground. The stack is made with timbers separated by stickers to give an air gap between the boards, which allows air to circulate up and down the stack.

Stickers or **skids** are small pieces of wood about 25 mm in section which help air to pass through the stack and, depending on how easily the timbers warp, can be spaced accordingly.

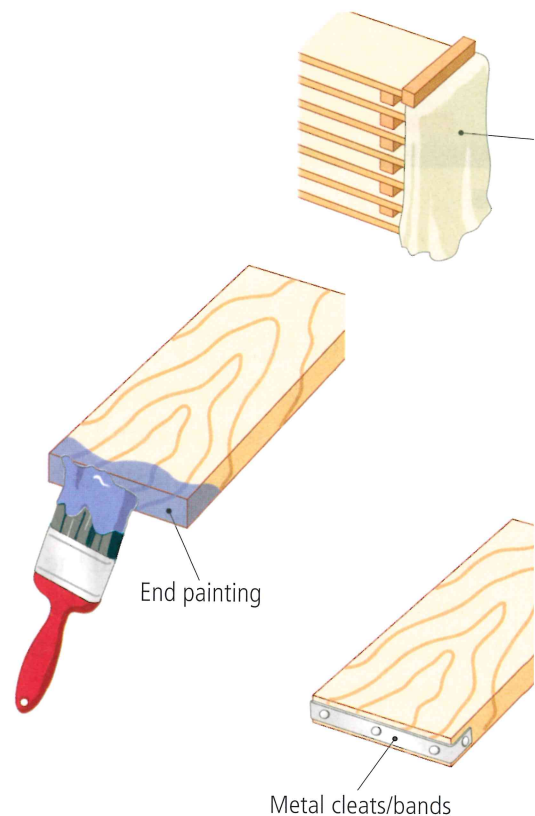
Important

- The stack must be raised off the ground to keep it clean and dry
- It must be covered with an overhanging lean-to roof so rainwater can run off
- The stack must be on a dry, clean site
- It must not be any more than two metres in thickness to allow air to flow through the stack. The free flow of air ensures that all the wood dries evenly
- Timbers of the same species should be kept in the one stack
- Boards of the same thickness and width should be kept together to keep the drying rate uniform
- The ends of the boards should be protected from the sun, which may cause them to dry more quickly than the rest of the boards, causing the ends to split

The air-seasoning method can only reduce the moisture content of a board to between 18 per cent and 22 per cent. Timber with this moisture level is suitable for joinery to be used out of doors. If a further reduction in moisture level is needed the boards must be kiln dried.



Air seasoning



Methods of preventing the ends of boards from splitting

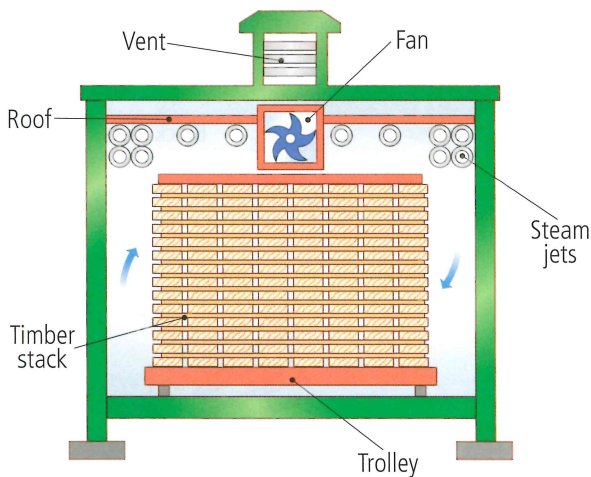


Advantages of air seasoning

- No expensive equipment needed
- Small labour cost once the stack is made
- Not wasteful of energy

Disadvantages of air seasoning

- Slow drying rate
- Large area of space required
- Dependent on weather conditions
- Rate of seasoning cannot be controlled
- Only dries to a content of 20 per cent to 22 per cent



KILN SEASONING

Another method for controlled wood seasoning is kiln (oven) seasoning. In these large kilns, temperature, humidity and drying rates can be controlled by the operator to achieve precise drying. The operator will have a drying schedule (a guide for each kiln) for every type of timber and its particular thickness (as different thicknesses of wood dry at different rates).

Compartment kiln

Compartment kiln

The timber is stacked on a trolley in a similar way to that used in the air-seasoning methods. The trolley runs on rails into the kiln. The steam jets on the walls, floor and ceiling pipe heated steam through the timber stack. The steam heats the wood but does not dry it. Once heated, the relative humidity of the kiln is reduced while the heat is maintained. This allows the moisture in wood to evaporate gradually until the required moisture content is reached.

Fans circulate the air around the kiln and through the stack. Air vents allow moist wet air out of the kiln and fresh air in. Removing the moisture-laden air improves the efficiency of the kiln, giving speedy and efficient seasoning.

The process of kiln seasoning may be helped by first air seasoning the timber, to dry it slightly. This is necessary with some woods and is advisable with most, as it both speeds up the kiln stage and also helps to cut down the final drying cost.

Advantages of kiln seasoning

- Quicker due to higher temperatures, ventilation and air circulation
- The final moisture content is lower
- More control over the process (drying schedules)
- Allows more precise rates of drying for various timber species and thickness of boards
- Allows uniform circulation through the stack
- Defects associated with drying can be minimised

Disadvantages of kiln seasoning

- Heating the kiln is expensive
- Requires supervision by a skilled operator
- Dependent on energy for heating

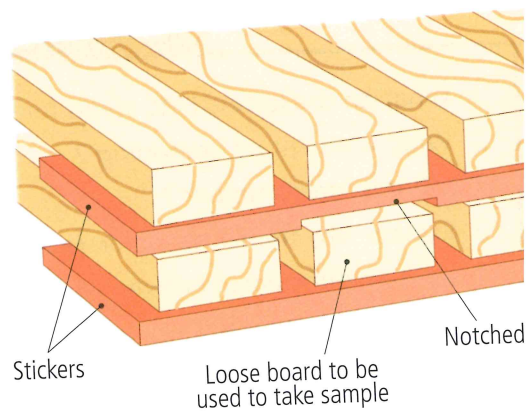
Moisture content

The amount of moisture present in wood is shown as a percentage (%) of the weight of the wood when dry. Boards have to be checked for moisture content at intervals during the seasoning process to ensure that the wood is drying properly. Samples are taken from boards at the centre of the stack at various intervals.

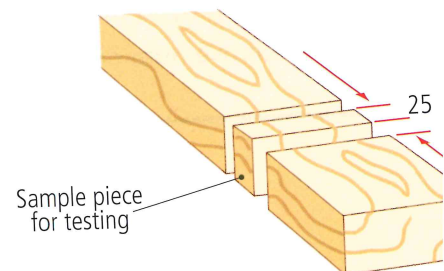
The samples are then tested to find the moisture content (using the equation below).

However, electronic moisture meters, with their increased accuracy, are replacing this test. Moisture meters are electronic instruments that have a dial or digital read-out that indicates the percentage moisture content of the timber. The two electrodes of the meter are pushed into the timber.

$$\% \text{ moisture} = \frac{\text{Wet weight} - \text{Dry weight}}{\text{Dry weight}} \times 100$$



Sample boards are taken from the centre of t



The sample is taken from the end of the bo



Moisture meter

Re-seasoning

Wood should be allowed to adjust to final room conditions where it is to be placed. The wood will reach a balance with its surroundings and therefore avoid distortion or cracking later on. Re-seasoning treatment helps to keep the wood stable in its final environment.

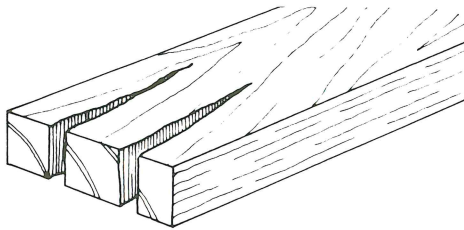
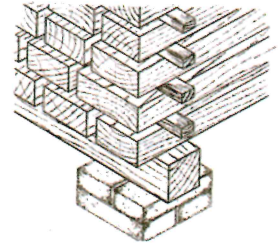


Exercises

- 1 What do the letters EMC stand for?
- 2 What is meant by 'seasoning'?
- 3 What is 'green timber'?
- 4 Explain why timber has to be seasoned.
- 5 List two differences between air seasoning and kiln seasoning.
- 6 Timber is stacked with air gaps between the boards during seasoning. Explain how the gaps help the seasoning process.
- 7 List three advantages of air seasoning.
- 8 List two disadvantages of kiln seasoning.
- 9 What is a moisture meter?
- 10 What is meant by % moisture content?
- 11 What is relative humidity?

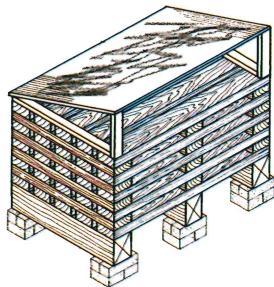
Exam Questions

- 1 When air seasoning, the planks being seasoned are raised up on bricks or blocks. Why is this important?
(JC, OL, 2005)
- 2 Splitting may occur on the end grain of a piece of timber during seasoning. Suggest one method of preventing this from happening.
(JC, HL, 2007)

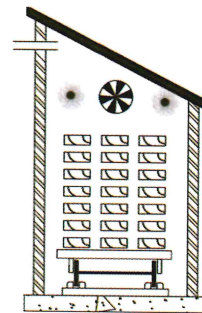


- 3 (a) Name the two methods of seasoning, A and B, shown in the diagram and state two advantages and two disadvantages of each method.

A



B



- (b) Explain what is meant by the term: **Equilibrium Moisture Content (EMC)**.
(JC, HL, 2006)



Sample answers to exam questions

- 1 The planks are raised on bricks to keep them off the ground. This keeps them clean and dry.
- 2 Splitting can be prevented by painting the end grain or by hanging sackcloth over the end of the stack of boards. This stops the ends drying too quickly.
- 3 (a) The two methods of seasoning are
A Air seasoning/natural seasoning
B Kiln seasoning

Advantages of air seasoning

- Low labour cost once the stack is made.
- Low energy method as it does not require any heating

Disadvantages of air seasoning

- It takes a lot of time and so uses a lot of space to store the stacks
- It is dependent on weather conditions and it is difficult to control the drying rate

Advantages of kiln seasoning

- A quick method
- Careful controlled drying is possible

Disadvantages of kiln seasoning

- Requires a skilled operator
- High energy cost so it is an expensive method

(b) Equilibrium Moisture Content

Wood absorbs moisture and releases it through evaporation into the air all the time. As boards of wood dry out, they reach a balance (equilibrium) with the air and so are neither absorbing nor releasing moisture. This balance or equilibrium moisture content will change as the humidity of the air changes.

Web Links

www.forestprod.org/cdromdemo/wd/wd4.html

www.geoffswoodwork.co.uk/seasoning.htm

www.timber.org.au/NTEP/menu.asp?id=86

www.fpl.fs.fed.us/documnts/fplgtr/fplgtr117.pdf