

Wood:-

Lecture #13

A hard substance that form branches of tree and its trunk that can be used as building material, for making thing & used as a fuel."

OR
"A natural polymeric material which practically not age."

Types:-

Wood as building material are of two-types

1. Natural.
2. Man made

1. The woods that are naturally occur, produce and grow called natural wood.

Example:-

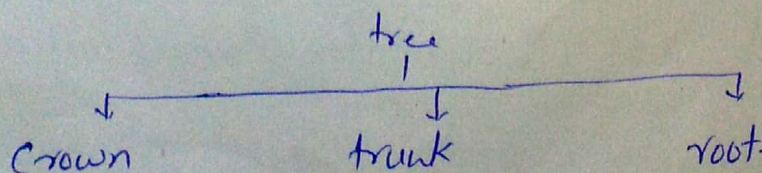
Timber, lumber etc.

2. Man made Wood:-

The wood that is by product of timber with resin.

Structure of tree:-

Tree can be divided into three portions.



(1) Crown:-
It composed of branches & leaves

(2) Trunk:-

The body of tree called trunk.
Almost 80% of wood is supply by trunk.

iii) Root:-

The under earth part of tree called roots.

Types of structure:-

i) Macro structure:-

The structure of tree that can be seen through naked eye or even with small magnification.

ii) Micro Structure:-

"The structure that can be seen through great magnification only."

Macro structure includes

→ Bark:-

It is outermost covering of wood usually hard.

Function:-

It protects the wood from mechanical damage.

(2) Bast:-

It is inner part of tree also called inner bark.

Function:-

It conveys nutrients from crown to downward and also store them.

(3) Cambium:-

Around the outer edge of trunk there is active layer called cambium which grows a little bit each year.

(4) Sap wood:-

Close to edge of tree there is moist living layer called sapwood packed with tubes called xylem that is used to transport nutrients from roots to leaves.

(5) Medullary Ray:-

"It is thin radiofibres extending from pith to cambium layer."

(6) Heart wood:-

It is inner part of tree

Inside sapwood there is dead and harder part of tree called heartwood.

→ Here the xylem part has block up.

Function:- It gives strong & firm support to tree.

Pith:- At the centre of cross section, there is small area occupied by friable tissues.

Function:-

It stores & transport nutrient throughout plant.

Annual Rings:-

Every year plants form new cells which are arranged in concentric circle. This is called annual ring or annual growth rings.

General characteristic of Timber:-

(1) Strength:-

Different timber has different strength.

Generally timbers are good in compression for ex it can bear 500 kg/cm^2 to 700 kg/cm^2 compressive load. { timber is weak in tension.

→ Its strength also depend upon annual ring.

Closer the annual rings more will be strength.

(*) Nice Aroma:-

When cut freshly it has nice/sweet smell.

(*) Heavy weight:-

It has heavy weight.

(*) Dark Colour:- Mostly in dark brown colour.

→ When timber brick (sonorous) pleasant sound is produced.

→ Good fire resistant and high modulus of elasticity.

Types of wood:-

(i) Soft wood:-

The wood that comes from evergreen or coniferous trees are called soft wood.

Properties:-

Usually grow in hilly areas and cold regions. Found in Canada, Russia, Pakistan (Kashmir, Hazara etc).

- Usually grow faster that why cheaper than hard wood.
- Soft wood trees are needle like or have cone.
- These woods are soft, light and we can easily work on it.
- Examples:- Pine, Spruce, redwood etc.

Uses:-

Used in various parts of furniture. For exp[#] inside drawer & at back of cabinets.

(2) Hard Wood:-

These woods come from deciduous trees.

- Hard wood trees have usually leaves.
- These woods are hard and slowly grow.
- The wood obtained from these trees are durable, resistant to wear & tear and maintain their gorgeous look for many years.
- But these woods are expensive from softwood.
- The colour of these woods are dark brown.
- These woods have better, colour, texture and grain size.
- Not easy to find as they are kept for harvesting.
- These woods not easily absorb water used as veneer on manufactured sheet.

Examples:-

Deodar, oak, walnut etc.

Uses:-

Used for manufacture of heavy furniture, door and windows etc.

(3) Hard & Soft wood:-

The wood comes from maple tree can be hard and soft wood.

- Soft wood is easy for us to work on it while hard wood is difficult to cut & make desire shape from that.
- Hard maple wood are easily find as they are harvested on commerial farm.
- Both hard & soft maple woods are harder and stronger than any type of soft wood.
- It is also less expensive than hard wood.

(4) Ply wood:-

Ply wood is man made manufactured wood in form of sheet.

- Such woods are formed by compressing several sheets of woods.
- Used in indoor i.e. in cabinet and Cupboard etc.

Types

- | | |
|-------------|--------------|
| ① Hard wood | ply wood |
| ② Soft wood | Cupboard |
| ③ Commerial | Cup' plywood |
| | Plywood etc. |

⑤ Medium Density Fiber board:-

It is manufactured (man made) wood form from different wood fibres mixed with glue (wax) & resin under high pressure & temperature in sheet form.

- It is somehow similar to plywood & used in residential & commercial buildings.
- It is hard & dense than plywood.
- Excellent for construction. It takes nails and glue easily. Having small chances of fracture.

Seasoning of Wood:-

"It is the process of reducing the moisture contents in wood in order to prevent timber from possible fermentation and make it suitable for use."

OR

It is the process of drying wood to moisture content approximately equal to average humidity of surrounding where it has to be fixed permanently."

Objectives of Seasoning of Wood:-

- To reduce its weight.
- To make it portable.
- Increase its strength, durability & workability.
- Reduce its tendency to decay.
- Reduce in shrinkage & warping after placement in structure.

Methods of Seasoning of wood.

1. Natural or Air Seasoning:-

In this type of drying the wood is placed in open air, sun or wind.

→ The log of wood is cut into different pieces of regular sizes and placed under shed in cross wise direction so that air reach to all woods member.

→ The duration of drying depend on type and size of wood.

→ This drying process is very slow & uniform.

→ It reduces moisture content upto 12-15%.

⊘ It (this) process is very difficult to dry large pieces of wood.

(2) Artificial Seasoning:-

i. Water seasoning:-

- In this process, the wood is completely placed in running stream of water.
- Which leach out gum, sap & sugar & water fill in wood.
 - This watery wood is then placed in open air to dry.
 - This is quick process but it reduced elastic property & strength of wood.
 - If wood is partially immersed, then it is harmful.

ii. Boiling:-

- In this method the wood is immersed in water & boil the water.
- The timber is thus boiled with water upto 3-4 hours & then dried slowly under shed.
 - This is very process (quick) of seasoning.
 - (*) It reduced the moist content and shrinkage but affect elastic properties & strength.
 - (*) The wood can also be dried in placed to steam.
 - But this is very expensive method.

Objectives of Seasoning of Wood:-

- To reduce its weight.
- To make it paintable.
- Increase its strength, durability & workability.
- Reduce its tendency to decay.
- Reduce in shrinkage & warping after placement in structure.

Methods of Seasoning of wood.

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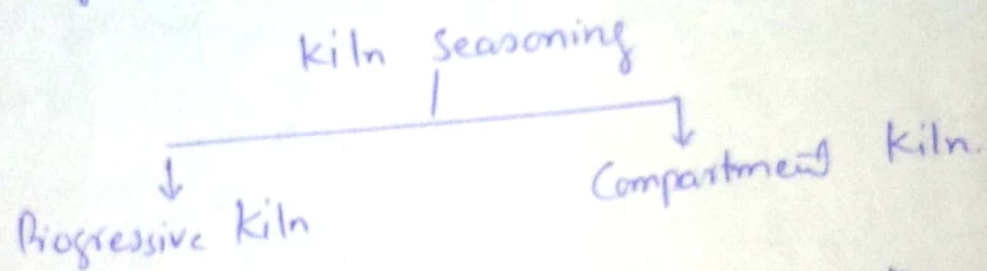
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• (ii) Kiln Seasoning:-

This method of seasoning is adopted for seasoning of timbers on large scale.

- In this method the small section of woods are arranged in Kiln in such way that heated air easily circulate through them.
- The circulating air take up moisture required from wood & season it.

Two types of Kiln method are used.



Note:- For most successful seasoning by this method is done to increase temperature as high so that it not effect strength of wood.

- It less effect strength of wood less than 10%.
- The wood is evenly & thoroughly dried.
- (d) It also reduce hygroscopicity of wood (Property of wood to absorb moisture from air & hold it in form of vapour).

Disadvantages:-

This method is uneconomical.

(3) Chemical or Salt Seasoning:-

In this method the wood is stored in salt solution or chemical that has tendency to absorb water from wood.

→ The wood is then allowed for drying

(*) This is unequal process of drying which may cause cracks

(4) Electric Seasoning:-

In this process of seasoning the two ends of timber touch electrodes.

→ As wood being bad conductor of electricity resist current which produce heat so

moisture remove from wood.

→ This process can produce cracks in wood.

Preservation of Wood:-

A preservative may defined as;

a chemical that when add to wood make wood poisonous to insect and other fungi without effecting its structural properties.

• Preservative increase the durability of wood & decrease resistance to decay.

Classes of Preservation:-

(A) Oily substances insoluble in water.
(oil soluble salt)

→ In this method oily substance is injected inside wood in order to preserve it from chemical action of fungi & insect.

→ Oily substance mostly coal tar creosote oil is used.

Advantages:-

→ Stay longer time with in cell.

→ Destructive for fungi.

→ It penetrate easily & ~~also~~ quickly in wood tissue.

Disadvantages:-

• Unpleasant appearance

• Bad smell.

• It does not allow paint over it.

(B) Water Soluble Salt:-

These are water soluble salt used for preservation of wood.

Advantages:-

→ It easily dissolve in water for using.

Disadvantages:-

It easily washed away with water if moisture are around it.

Examples:-

Compound of arsenic, Zinc chloride, Copper Sulphate etc.

① Salt carried in Volatile solvent other than water:-
These preservatives are mixed with substance other than water to make solution.

Example:-

Creosote petroleum is common example

Lamination of Wood:-

Lamination is the process of binding different sheets of wood together by using strong adhesive or glue to produce rigid, light weight structures.

- Solid wood bending is cold process generally limited to single axis.
- Wood chips technique is used to produce engineering timber.

• Example:-

Ply wood is example of lamination.

Uses:-

Used in internal of furniture for ex in cup board etc.