CHAPTER 7

TIMBER

Timber denotes wood, which is suitable for building or carpentry or various other engineering purposes like for construction of doors, windows, roofs, partitions, beams, posts, cupboards, shelves etc

Uses of timber:

(i) Used in the form of piles, posts, beams, lintels, door/window frames and leaves, roof members etc

(ii) Used for flooring, ceiling, paneling and construction of partition walls

(iii) Used for form work for concrete, for the timbering of trenches, centring for arch work, scaffolding, transmission poles and fencing

(iv) Used in wagon and coach building, marine installations and bridges

(v) Used in making furniture of agriculture implements, sports goods, musical instruments, well curbs, mortar bodies, carts and carriages, railway sleeps, packing cases etc

7.1 Classification of trees

Depending upon their mode of growth trees may be divided in the following two categories

(i) **Endogeneous trees –** These trees grow inwards and fibrous mass is seen in their longitudinal sections. Timber from

these trees has very limited engineering applications Ex: bamboo, cane , palm etc

(ii) **Exogeneous trees:** These increases in bulk by growing outwards and used for engineering purposes.

Exogeneous trees are further sub divided into two groups a) conifers b) deciduous

a) Conifers or evergreen trees: These trees having pointed, needle like or scale like leaves and yield soft wood

b) Deciduous trees: The trees having flat broad leaves and leaves of those trees fall in autumn and new ones appear in spring season. Timber for engineering purpose is mostly derived from deciduous trees. These trees yield hard wood.

Ex: ash, beach, oak, sal, teak, shishum and wallnut

Comparison of softwood and hard wood

S.No.	Item	Soft wood	Hard wood
1.	Annual rings	Distinct	Indistinct
2.	colour	light	dark
3.	fire resistance	poor	more
4.	modullary rays	Indistinct	distinct
5.	Structure	resinous and split easily	non-resinous & close grained
6.	weight	light	heavy
7.	strength	strong for direct Pull & weak for Resisting thrust or shear	equally strong for resisting tension,compr -ession & shear

Structure of tree: From the visibility aspect, the structure of a tree can be divided into two categories

1. Macro structure
2. Micro structure

I. **Macro structure:** The structure of wood visible to the naked eye or at a small magnification is called macro structure. Fig 7.1 shows the macro structure of exogenous tree.

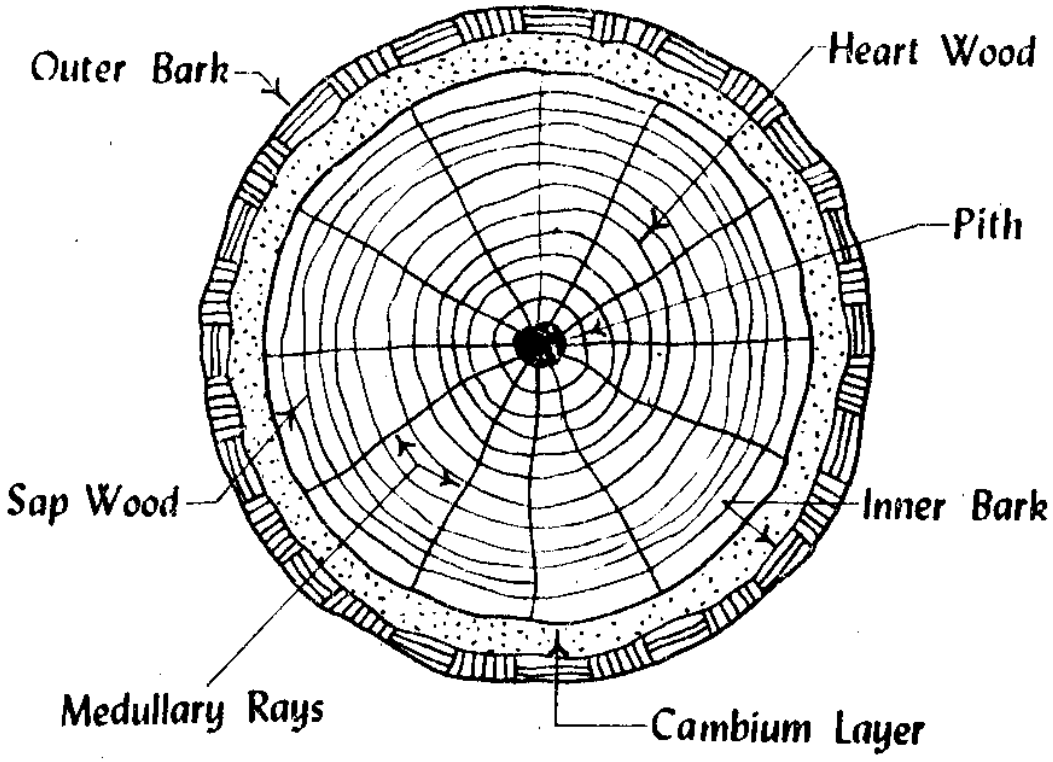


Fig 7.1 Micro structure of exogenous tree

(i) **Pith**: The innermost central portion or core of the tree is called pith or medulla

(ii) **Heart wood:** The inner annual rings surrounding the pith is known as heart wood. It imparts rigidity to tree

(iii) **Sap wood:** The cuter annual rings between heart wood and cambium layer is known as sap wood

(iv) **Cambium layer:** Thin layer of sap between sap wood and inner bark is known as cambium layer

(v) **Inner bark:** The inner skin or layer covering the cambium layer is known as inner bark

(vi) **Outer Bark:** The outer skin or cover of the tree is known as outer bark

(vii) **Medullary rays:** The thin radial fibres extending from pith to cambium layer are known as medullary rays

II. **Micro structure:** The structure of wood apparent only at great magnifications is called micro structure under micro scope, it becomes evident that the wood consists of living and lead cells of various sizes and shapes.

7.2 Defects in Timber:

Defects occurring in timber are grouped into the following divisions.

a) **Defects due to conversion:** During the process of converting timber to commercial form, the following defects may occur.

(i) **Chip mark:** mark or sign placed by chip on finished surface of timber

(ii) **Diagonal grain:** Due to improper sawing of timber

(iii) **Torn grain:** Due to falling of tool small impression is formed

(iv) **Wane:** Presence of original rounded surface on the manufactured piece of timber

b) **Defects due to fungi:** The attack of timber by fungi when moisture content of timber is above 20% and presence of air and warmth for the growth of fungi the following defects are caused

(i) **Blue stain:** Sap of wood is stained to bluesh colour

(ii) **Brown rot:** Decay or disease of timber by removal of cellulose compounds from wood and wood assumes the brown colour

(iii) **Dry rot:** Convert the wood into dry powder form

(iv) **Heart rot:** This is formed when branch has come out of a tree and the tree becomes weak and gives out hallow sound when struck with a hammer

(v) **Sap stain:** The sap wood looses its colour because of feed on cell contents of sap wood.

(vi) **Wet rot:** Caused chemical decomposition of wood of the timber and timber converts to grayish brown powder known as wet rot.

(vii) **White rot:** Attack lignin of wood and wood assumes the appearance of white mass

c) Defects due to insects:

(i) **Beetles**: Small insects form holes of size about 2mm diameter and attack sap wood of all spacies of hard woods. Tunnels are formed in all directions in sapwood by the larvae of these beetles and converted into fine flour like powder. They do not disturb outer cover and looks sound.

(ii) **Marine borers**: These make holes or bore tunnels in wood for taking shelter. The wood attacked by marine borers loses colour and strength

(ii) **Termites**: White ants are very fast in eating away the wood from the core of the cross section. They make tunnels inside in different directions and usually donot disturb the outershell or cover

d) Defects due to natural forces:

The main natural forces responsible for causing defects in timber are abnormal growth and rapture of tissues

(i) **Burls**: Irregular projections appear on the body of timber because of shock at younger age

(ii) **Callus**: Soft tissue or skin which covers the wound of tree.

(iii) **Chemical stain**: Discoloured due to the chemical action caused

(iv) **Coarse grain**: Annual rings are widened, tree grows rapidly hence timber possesses less strength

(v) **Dead wood**: Timber obtained from dead standing tree

(vi) **Druxiness**: White decayed spots by fungi

(vii) **Foxiness**: Due to poor ventilation during storage or by commencement of decay due to over maturity indicated by red or yellow tinge in wood

(viii) **Knots**: Bases of branches or limbs which are broken or cut off from the tree as shown in the fig 7.2.

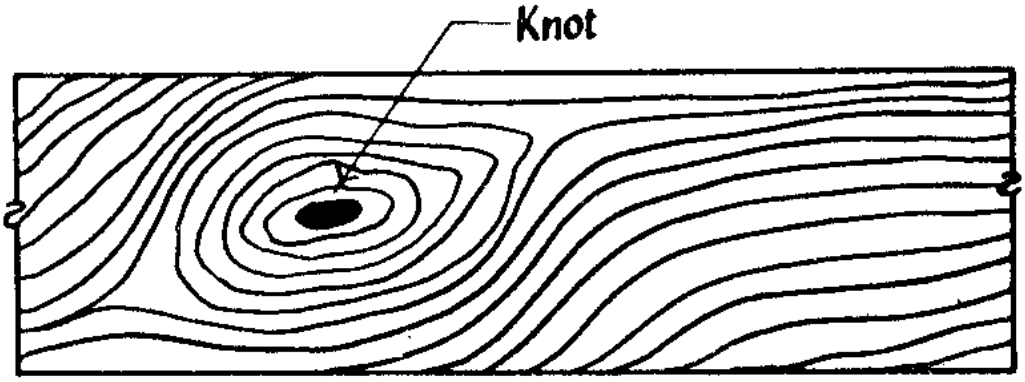


Fig 7.2 Knot

(ix) **Rind galls**: Rind means bark and gall indicates abnormal growth and pecullar curved swellings found on the body of a tree.

(x) **Shakes**: These are cracks which partly or completely separate the fibres of wood as shown in fig. 7.3.

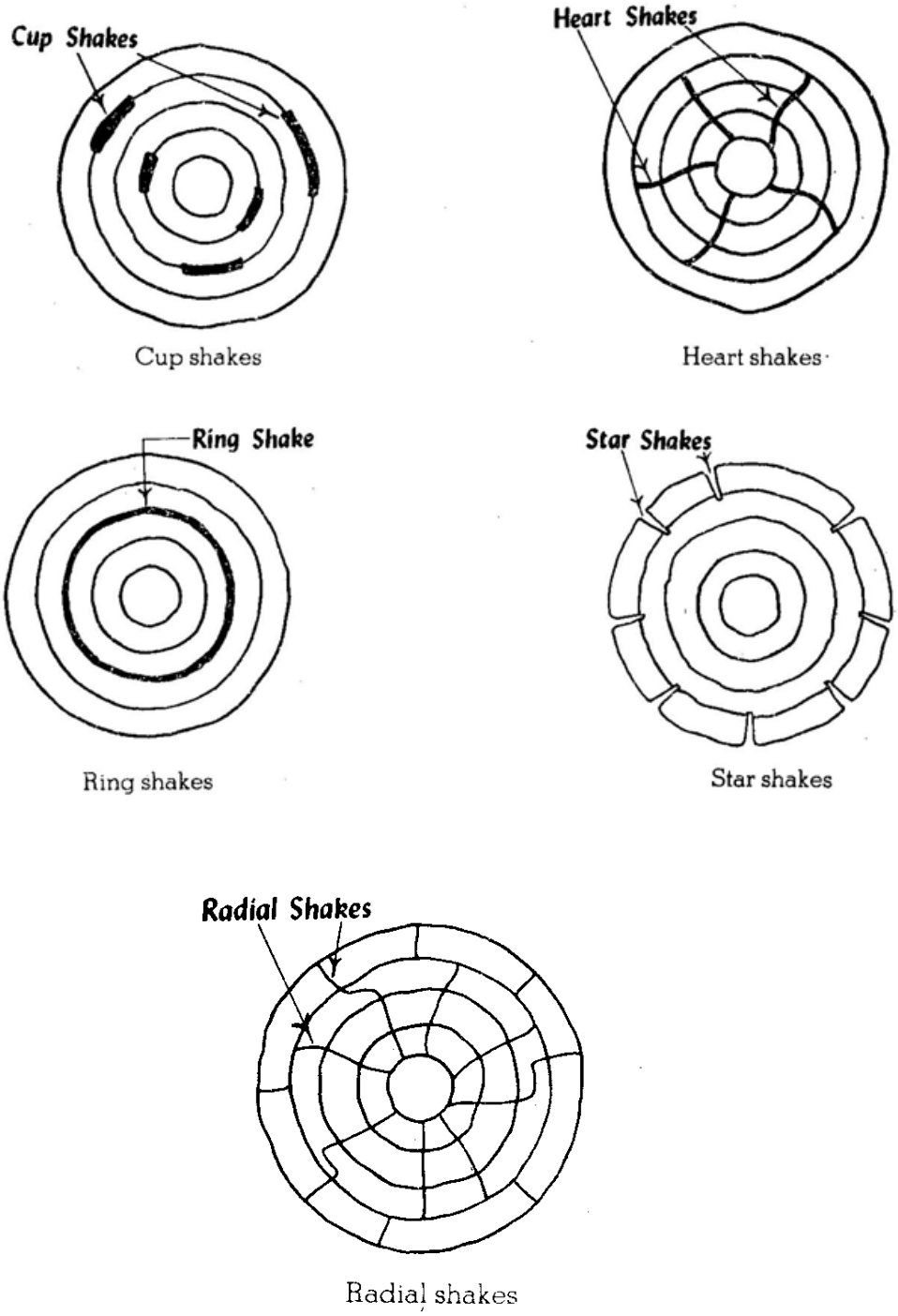
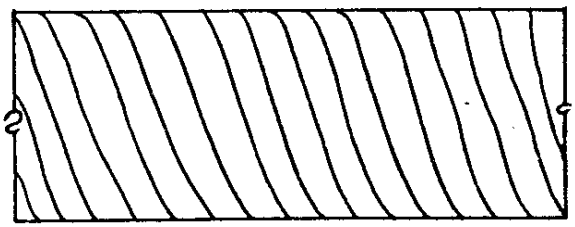


Fig 7.3 Different types of shakes

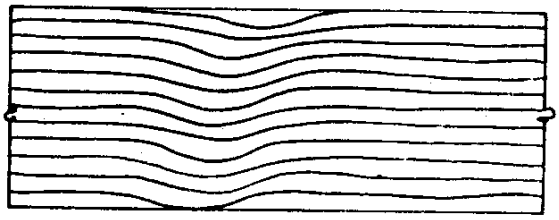
(xi) **Twisted fibres**: or Wandering hearts: caused by twisting of young trees by fast blowing wind as shown in fig 7.4.



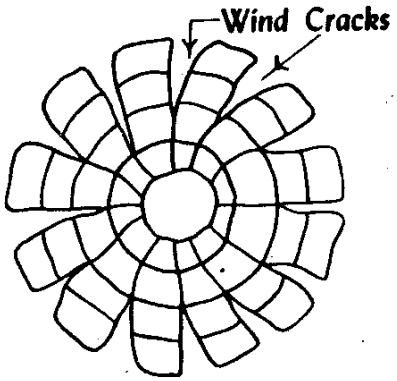
Twisted fibres

Fig 7.4

(xii) **Upsets or ruptures**: Indicate wood fibres which are injured by crushing or compression as shown in fig 7.5.



Upset



Wind cracks

Fig 7.5

7.3 Wood based products:

Timber which is prepared scientifically in a factory is termed as industrial timber and such timber possesses desired shape, appearance strength

(a) **Veneers**: These are thin sheets or slices of 0.40 to 6mm wood of superior quality. Indian timbers, which are suitable for veneers, are mahagony, oak,

rosewood, sissoo, teak etc. The process of preparing a sheet of veners is known as veneering. Veneers are used to produce plywoods batten boards and lamin boards.

(b) **Plywoods**: Plywoods are boards, which are prepared from thin layers of wood or veneers. Three or more veneers in odd number are pressed using adhesives. The plywoods are used for various purposes such as ceilings, doors, furniture, partitions, panelling walls, packing cases, railway coaches, formwork for concrete etc. Thickness may vary from 6 to 25mm.

(c) **Fibre boards**: These are rigid boards and they are also known as pressed wood or reconstructed wood. The thickness varies from 3mm to 12mm. These are available in lengths from 3 to 4.5m and width varying from 12 to 18m. These are used for

(i) For internal finish of rooms such as wall panelling; suspended ceilings.

(ii) To construct form work for cement concrete.

(iii) To construct partitions.

(iv) To prepare flush doors, tops of tables etc.

(v) To provide an insulating material of heat and sound.

(vi) To work as paving or flooring material.

(d) **Impreg timbers**: Timber which is fully or partially covered with resin is known as impreg timber. The usual resin employed is phenol formaldehyde which is soluble in water. Impreg timber is available under trade names such as formica, sungloss, sunmica etc and it is used for moulds, furniture, decorative artuicles etc.

(e) **Compeg timbers**: The process of preparing compreg timbers is same as that of impreg timbers except that curing is carried out under pressure. The strength and durability of compreg timbers is more as compared to the impreg timbers.

7.4. Characteristics of good timbers:

1. **Appearance**: A freshly cut surface of timber should exhibit hard and of shining appearance.
2. **Colour**: A colour should preferably be dark
3. **Defects**: A good timber should be free from series defects such as knots, flaws, shakes etc
4. **Durability**: A good timber should be durable and capable of resisting the action of fungi, insects, chemicals, physical agencies, and mechanical agencies.
5. **Elasticity:** The timber returns to its original shape when load causing its deformation is removed
6. **Fibres**: The timber should have straight fibres

7. **Fire resistance**: A dense wood offers good resistance to fire
8. **Hardness**: A good timber should be hard
9. **Mechanical wear**: A good timber should not deteriorate easily due to mechanical wear or abrasion
10. **Shape**: A good timber should be capable of retaining its shape during conversion or seasoning
11. **Smell**: A good timber should have sweet smell. Unpleasant smell indicates decayed timber
12. **Sound** : A good timber should give a clear ringing sound when struck
13. **Strength**: A good timber should be sufficiently strong for working as structural member such as joist, beam, rafter etc.
14. **Structure**: The structure should be uniform
15. **Toughness**: A good timber should be tough (i.e.) capable of offering resistance to shocks due to vibration
16. **Water permeability**: A good timber should have low water permeability, which is measured by the quantity of water filtered through unit surface area of specimen of wood.
17. **Weathering effects**: A good timber should be able to stand reasonably the weathering effects (dry & wet)
18. **Weight**: The timber with heavy weight is considered to be sound and strong.
19. **Working conditions**: Timber should be easily workable. It should not clog the teeth of saw.