Carpentry Shop

Carpentry Shop

- Carpentry deals with the **construction of work such as making roofs, floors portions et**c of a building , doors, windows, trusses, workbenches, house hold furniture and many other useful articles by means of suitable wood.
- The term joinery is used for **connecting the wooden parts with the different joints** such as making doors, stairs, furniture and many other articles.
- The **timber** is the material used for carpentry and
joinery work.

Timber

- Wood obtained from **exogenous tree** by cutting these trees after their full growth and made suitable for engineering or building purposes by sawing and converting into various suitable commercial sizes.

Advantages of Timber

- 1. It is very easy to be worked with tools to give it desired shape and size.
- 2. Structural connections and joints can be easily made .
- 3. It is lighter in weight.
- 4. In framed structure , it suites equally well both load bearing and non load bearing members.
- 5. In timber work, cost of material as well as construction both are minimized as compared to the other materials of similar use.
- 6. It responds very well to polishing and

Advantages of Timber

7. It suites very favorably to doors, windows, cabinet work furniture an decorative designs and fittings.
8. It is quit suitable for making sound proof construction.
9. It, being non conductor of heat, is favoured for the construction of houses. Such houses will remain warm in winter and cool in summer.
10. It provides combination of strength, durability, lightness and economy as compared to other materials of construction.

Disadvantages of Timber

- Combustible
- Diminish due to rusting
- Destroyed and decay due to attack of insects, fungi, terminators etc.
- Timber swell and undergoes shrinkage with changing atmosphere humidity.

Uses of Timber

- Piles, post, beam, door –windows, roof member, Truss, paneling, ceiling, partition wall, frame work, scaffolding, transmission poles, wagon and coaches, bridges, boat, ships, agricultural implants, sports goods, musical instruments etc.

Classification of Trees

1. Exogenous Tree or Outer growing
   (a) Conifer or Evergreen Tree (Soft Wood)
   (b) Deciduous (Hard Wood)
2. Endogenous Tree or Inwards Growing

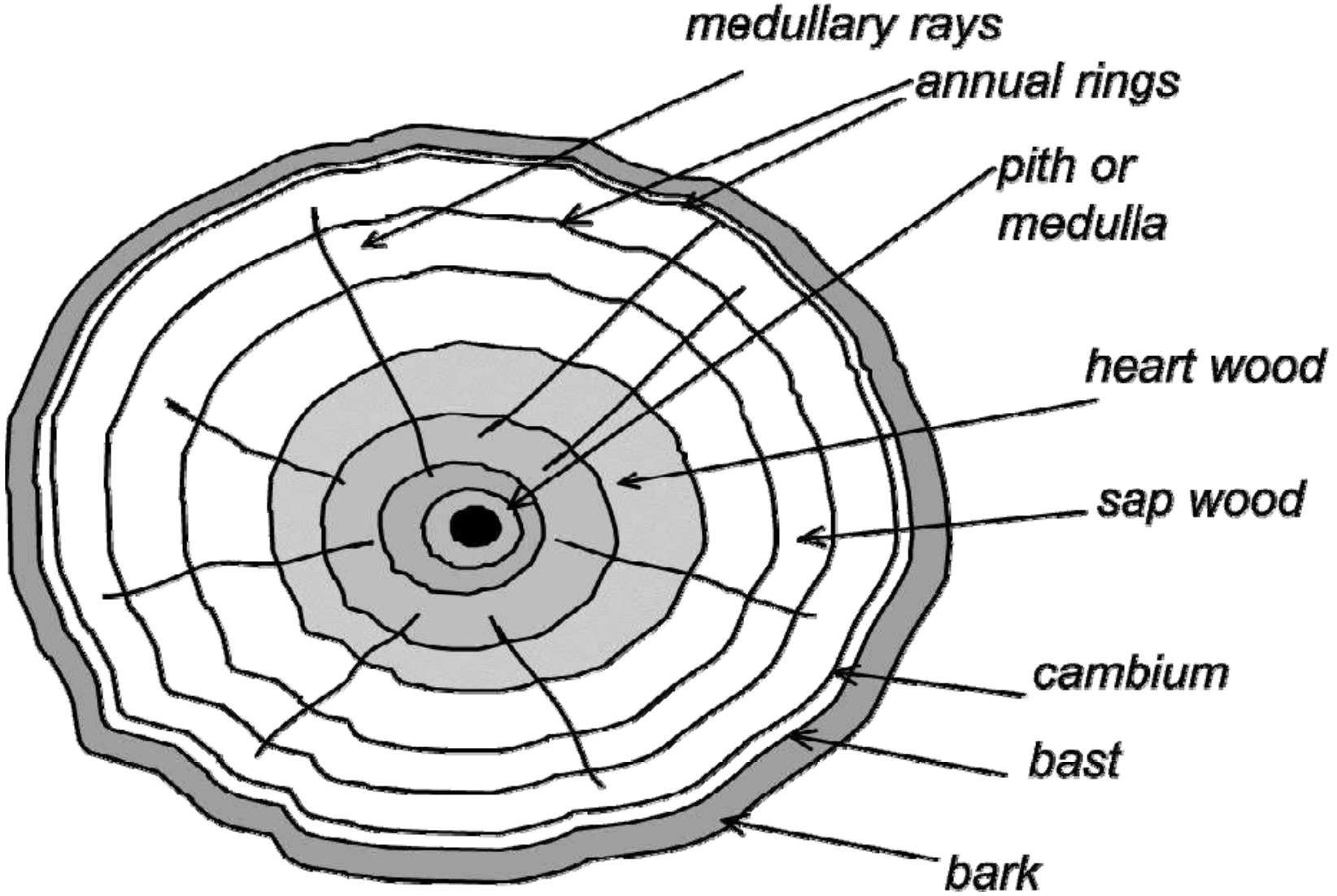
Exogenous trees grow in width by forming a new layer of wood under the bark.

Endogenous trees grow by forming new fibers within the trunk interspersed with the old fibers.

1. Carpentry Introduction Workshop and Manufacturing Engineering 1st year

Structure of Timber Tree

1. Pith
2. Heart Wood
3. Sap Wood
4. Cambium Layer
5. Inner Bark or Bast
6. Outer Bark or Cortex
7. Annual Rings
8. Medullary Rays



The tree trunk showing growth rings

Characteristics of Soft Wood and Hard Wood

Soft Wood

- 1. It is resinous wood having a fragrant smell and regular texture.
- 2. Straight fiber and good texture.
- 3. Light in colour and weight.
- 4. annual rings are distinct
- 5. Good tensile strength and week shear strength

Hard Wood

1. It is non-resinous wood containing a fairly good amount of acid.
2. Fibers are quite close and compact.
3. Dark in colour and heavy in weight.
4. Annual rings are not distinct
5. Good tensile as well as shear strength.

Soft Wood	Hard Wood
6.Get split quickly	• 6. Does not split quickly
7.Weaker and less durable	• 7. stronger and more durable
8.Catch fire soon cannot withstand high temperature.	• 8. It has an added advantage in its refractoriness.
9. It is easy to be worked.	• 9. It is difficult to be worked.

2. HARDWOOD VS SOFT WOOD IN HINDI

Softwood	•Cedar •Linden/Lime/Basswood •Pine •Spruce •Kail Wood
Hardwood	•Ash •Aspen •Birch •Cherry •Elm •Hazel •Mahogany •Maple •Oak •Teak •Walnut

Defects in Timber

(a) Natural Defects

Exp: Knots, Shakes, Twisted Fibers, Rind Galls etc.

(b) Defects Occurring During Conversion, Seasoning or Use

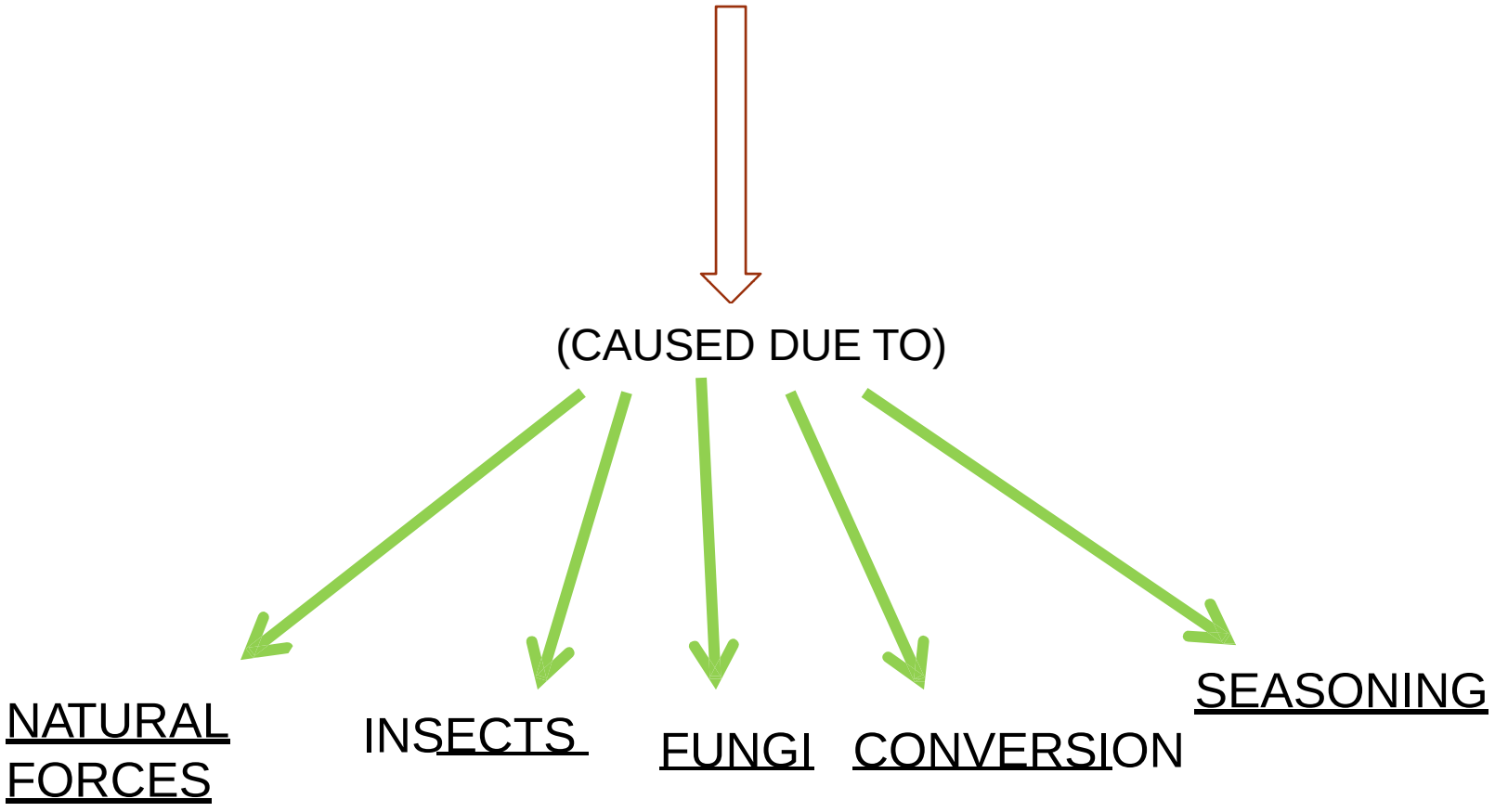
Exp: Shakes, Distortion, case hardening, Honey Combing etc.

(c) Defects Due to action of Fungi or Insects

Exp: Dry rot, Wet rot

Various Defects of Wood

CLASSIFICATIONS OF DEFECTS

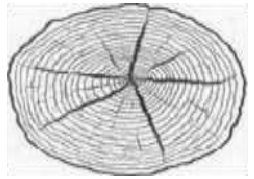


Various Defects of wood

CHEMICAL STAIN

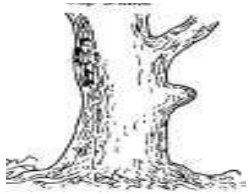
KNOTS

SHAKES

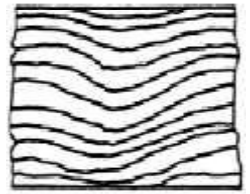


TWISTED FIBRES

RIND GALLS



UPSETS



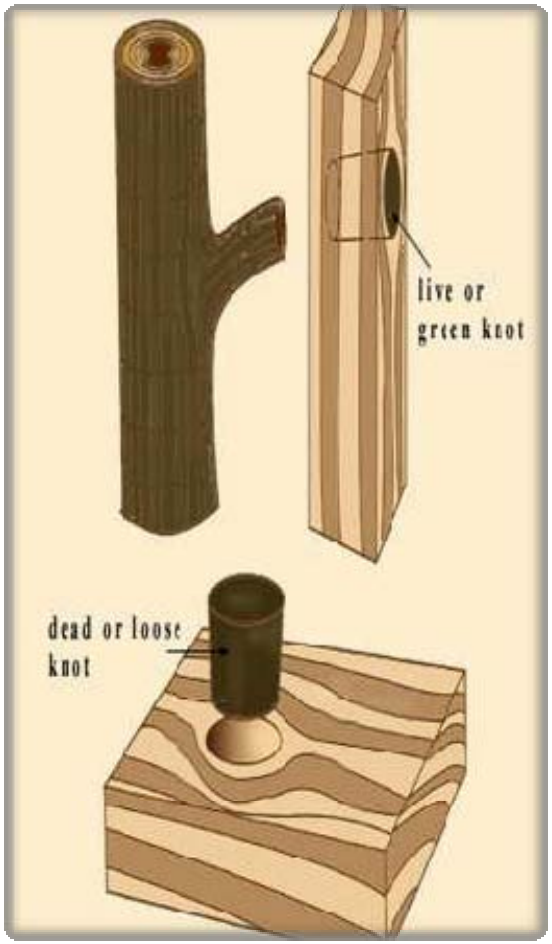
BURLS

3. Defects in Timber Due to Natural Forces
Timber Building Materials

CHEMICAL STAIN:- THE WOOD IS SOMETIMES DISCOLOURED BY THE CHEMICAL ACTION CAUSED WITH IT BY SOME EXTERNAL AGENCY.THIS IS KNOWN AS CHEMICAL STAIN.

RIND GALLS:-THE RIND MEANS BARK AND GALL INDICATES ABNORMAL GROWTH.HENCE PECULIAR CURVED SWELLING FOUND ON THE BODY OF TREE ARE KNOWN AS RIND GALL.THEY DEVELOP AT POINTS FROM WHERE BRANCHES ARE IMPROPERLY CUT OFF OR REMOVED.THEY ARE RARELY FOUND IN A TREE

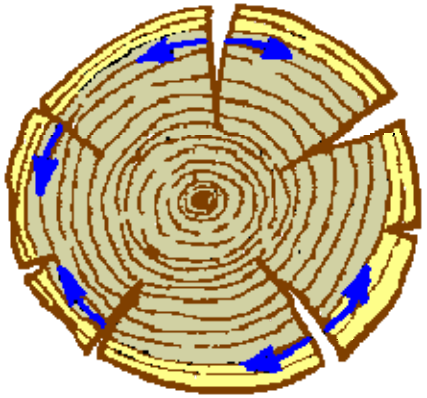
COARSE GRAIN:-IF THE TREE GROWS RAPIDLY, THE ANNUAL RINGS ARE WIDENED.IT IS KNOWN AS THE COARSED GRAIN TIMBER AND SUCH TIMBER POSSESSES LESS STRENGTH



KNOTS:-THESE ARE THE BASES OF BRANCHES OR LIMBS WHICH ARE BROKEN OR CUT OFF FROM THE TREE.THE PORTION FROM WHICH THE BRANCH IS REMOVED RECIEVES NOURISHMENT FROM THE STEM FOR A PRETTY LONG TIME AND IT ULTIMATELY RESULTS IN FORMATION OF DARK HARD RINGS WHICH ARE KNOWN AS KNOTS.AS CONTINUITY OF WOOD FIBRES ARE BROKEN

SHAKES:-THESE ARE LONGITUDINAL SEPERATIONS IN WOOD BETWEEN THE ANNUAL RINGS.THESE ARE CRACKS WHICH PARTLY OR COMPLETELY SEPARATE FIBRES OF WOOD.THE SEPERATIONS MAKE THE WOOD UNDESIRABLE WHEN APPERANCE IS IMPORTENT

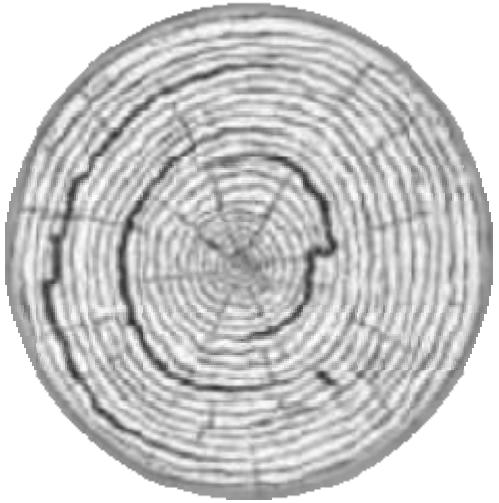
TYPES OF SHAKES



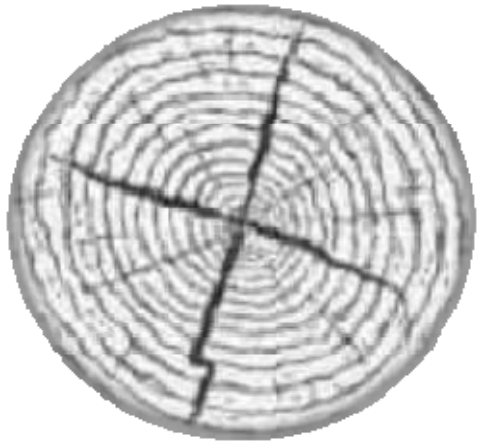
STAR SHAKES:-THESE ARE CRACKS WHICH EXTEND FROM BARK TOWARDS THE SAP WOOD.THESE ARE USUALLY CONFINED UPTO THE PLANE OF SAP WOOD.THESE ARE WIDER ON OUTSIDE ENDS AND NARROWER ON INSIDE ENDS.THEY ARE USUALLYFORMED DUE TO EXTREME HEAT OR SEVERE FROST DURING THE SEASON

CUP SHAKES:-

SPLIT WHICH PARTLY OR WHOLLY SEPERATES ANNUAL RINGS FROM ONE ANOTHER.IT IS CAUSED DUE TO EXCESSIVE FROST ACTION ON SAP PRESENT IN THE TREE ESPECIALLY WHEN THE TREE IS YOUNG

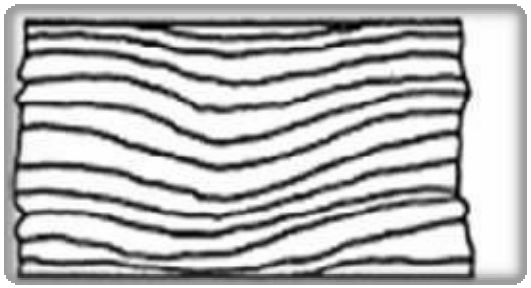


HEART SHAKES:-THESE CRACKS OCCUR IN CENTRE OF CROSS-SECTION OF TREE AND THEY EXTEND FROM PITH TO SAP WOOD IN DIRECTION OF MEDULLARY RAYS.THESE CRACKS OCCUR DUE TO SHRINKAGE OF INTERIOR PART OF TREE WHICH IS APPROACHING MATURITY.THE HEART SHAKE DIVIDE THE TREE CROSS-SECTION INTO TWO OR FOUR PARTS.



RING SHAKES:-WHEN CUP SHAKES COVER THE ENTIRE, THEY ARE KNOWN AS RING SHAKES

TWISTED FIBRES:-THESE ARE KNOWN AS WANDERING HEARTS AND CAUSED BY TWISTING OF YOUNG TREES BY FAST BLOWING WIND.THE TIMBERS WITH TWISTED FIBRES IS UNSUITABLE FOR SAWING

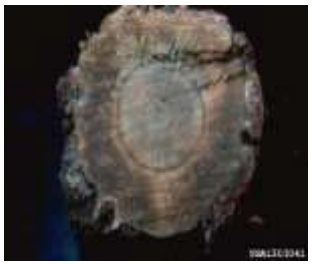


UPSETS:-THESE INDICATE WOOD FIBRES WHICH ARE INJURED BY CRUSHING OR COMPRESSION.THE UPSETS ARE MAINLY DUE TO IMPROPER FELLING OF TREE AND EXPOSURE OF TREE IN ITS YOUNG AGE TO FAST BLOWING WIND

BURLS:-THEY ARE PARTICULARLY FORMED WHEN A TREE RECIEVES SHOCK OR INJURY IN ITS YOUNG AGE.DUE TO ITS INJURY,THE GROWTH OF TREE IS COMPLETELY UPSET AND IRREGULAR PROJECTIONS APPEAR ON THE BODY OF TREE

DEFECTS DUE TO FUNGI

BLUE STAIN



BROWN ROT

DRY ROT

HEART ROT

WET ROT

WHITE ROT

3.1 Defects in timber due to conversion, fungis, natural forces and seasoning

BLUE STAIN :-THE SAP OF WOOD IS STAINED TO BLUISH COLOUR BY THE ACTION OF CERTAIN TYPE OF FUNGI

BROWN ROT :-THE TERM ROT IS USED TO INDICATE DECAY OR DISEASE OF TIMBER,THE FUNGI OF CERTAIN TYPE REMOVES CELLULOSE COMPOUNDS FROM WOOD AND HENCE WOOD ASSUMES THE BROWN COLOUR

WHITE ROT:-IT IS JUST OPPOSITE OF BROWN ROT.IN THIS CERTAIN TYPE OF FUNGI ATTACK LIGNIN OF WOOD AND WOOD ASSUMES THE APPEARANCE OF A WHITE MASS CONSISTING OF CELLULOSE COMPOUNDS

HEART ROT:-THIS IS FORMED WHEN BRANCH HAS COME OUT OF THE TREE.IN SUCH CASE,THE HEART WOOD IS EXPOSED TO ATTACK OF ATMOSPHERIC AGENTS.ULTIMATELY THE TREE BECOMES WEAK AND IT GIVES HOLLOW SOUND WHEN STRUCK WITH HAMMER

~~WET ROT:~~ SOME KIND OF FUNGI CAUSED CHEMICAL DECOMPOSITION OF WOOD OF TIMBER AND IN DOING SO CONVERT TIMBER INTO GREYISH BROWN POWDER.IT IS KNOWN AS WET ROT. SOME IMPORTANT POINTS TO BE REMEMBERED

- THE ALTERNATE WET AND DRY CONDITIONFAVOURS THE DEVELOPMENT OF WET ROT
- IF UNSEASONED OR IMPROPERLY SEASONED TIMBER ARE EXPOSED TO RAIN AND WIND,THEY BECOME EASILY LIABLE FOR ATTACK OF WET ROT.
- TO PREVENT WET ROT,THE WELL SEASONED TIMBER SHOULD BE USED FOR EXTERIOR WORK OR FOR UNDERGROUND WORK

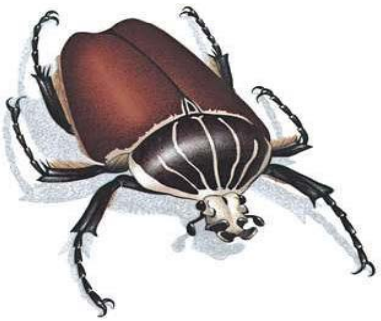
DRY ROT :- SOME TYPES OF FUNGI FEED ON WOODS AND DURING FEEDING THEY ATTACK ON WOOD AND CONVERT IT INTO DRY POWDER FORM.THIS IS KNOWN AS DRY ROT.THE FOLLOWING FACTS TO BE NOTED.

- **DRY ROT OCCURS AT THE** PLACES WHERE THERE IS NO FREE CIRCULATION OF AIR SUCH AS IMPROPERLY VENTILATED BASEMENTS,ROOMS ETC AND DAMPED SITUATION LIKE KITCHEN TOILET ETC.
- THE UNSESONED SAP WOOD ARE EASILY ATTACKED BY DRY ROT.
- THE FAVOURABLE CONDITIONS FOR GROWTH OF FUNGUS CAUSING DRY ROT ARE ABSENCE OF SUNLIGHT,DAMPNESS,PRESENCE OF SAP,STAGNANT AIR AND WARMTH.
- IT IS ALSO CAUSED BY CHARRING,PAINTING AND TARRING THE UNSEASONED TIMBER.
- THE DRY ROT MAY BE PREVENTED BY USING WELL SEASONED TIMBER FREE FROM SAP.
- WHEN A PART OF TREE IS SERIOUSLY AFFECTED BY DRY ROT,THE DAMAGED PORTION MAY BE COMPLETELY REMOVED AND REMAINING

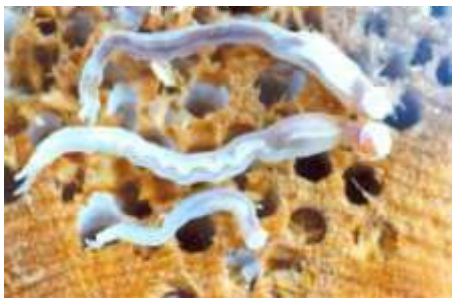
DEFECTS DUE TO INSECTS

(CAUSED BY)

BEETL ES



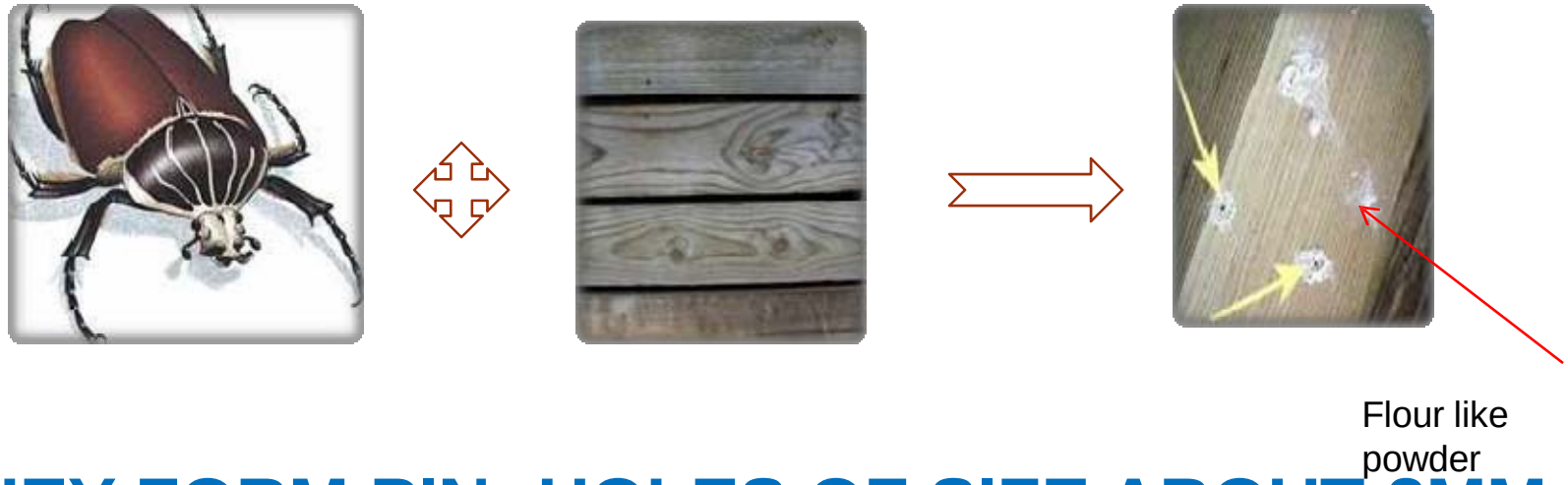
MARINE BOARERS



TERMIT ES

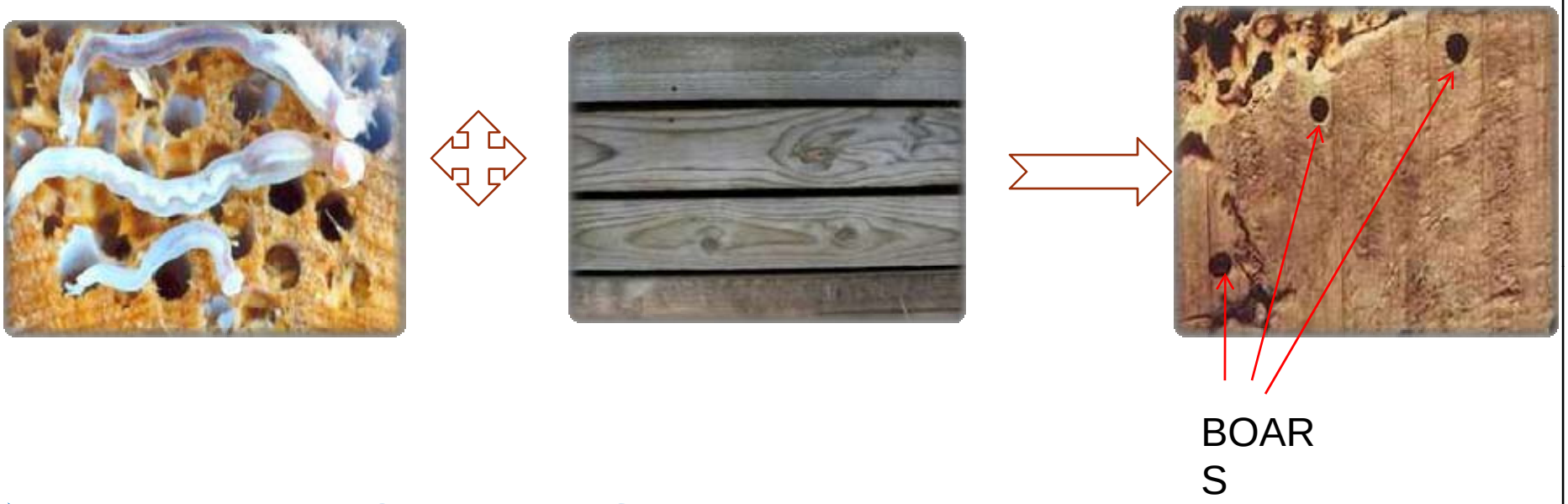
DEFECTS DUE TO INSECTS

DEFECTS CAUSED BY BEETLES



- THEY FORM PIN HOLES OF SIZE ABOUT 2MM DIA IN WOOD
- TUNNEL FORMATION IS DONE IN SAP WOOD BY LARVAE OF BEETLE
- CONVERSION OF TIMBER INTO FLOUR LIKE POWDER
- THEY DO NOT DISTURB OUTER SHELL

DEFECTS DUE TO MARINE BOARERS



- THEY ARE FOUND IN SALTY WATER
- THEY FORM TUNNELS OR BORES TO TAKE SHELTERS
- DIAMETER AND LENGTH OF HOLES ARE AS HIGH AS 25MM AND 60 MM RESPECTIVELY
- AFFECTED WOOD LOOSES ITS COLOUR AND STRENGTH
- NO TIMBER IS COMPLETELY IMMUNE FROM ATTACK OF MARINE BOARERS

DEFECTS CAUSED BY TERMITES

- LIVES IN COLONY AND VERY FAST IN EATING AWAY THE WOOD FROM CORE OF CROSS-SECTION.
- MAKES TUNNELS IN DIFFERENT DIRECTIONS AND USUALLY NOT DISTURB THE OUTER SHELL OR COVER.
- THE TIMBER PIECE ATTACKED BY TERMITES MAY LOOK SOUND UNTILL IT COMPLETELY FAILS
- FEW GOOD TIMBERS LIKE TEAK,SAL,ETC CAN

DEFECTS DUE TO CONVERSION

CHIP MARK

DIAGONAL GRAIN

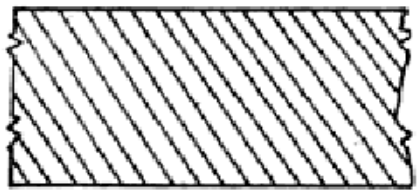
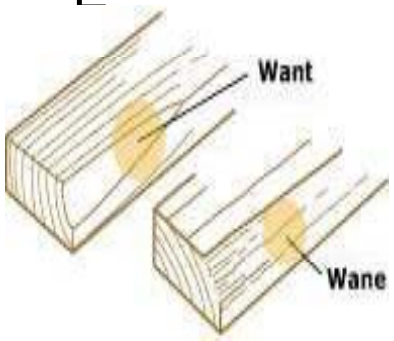


FIG. 3.15. DIAGONAL GRAIN

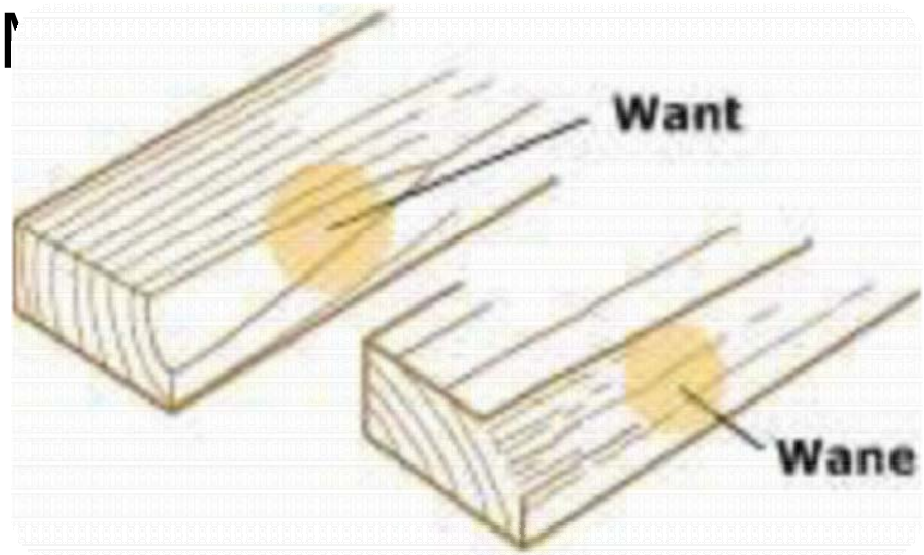
TORN GRAIN

WANE



DEFECTS DUE TO CONVERSION

CHIP MARK:-THIS DEFECT IS INDICATED BY MARK OR SIGNS PLACED ON FINISHED SURFACE OF TIMBER.THEY MAY BE FORMED BY PLANING



WANE:-THIS DEFECT IS DENOTED BY PRESENCE OF ORIGINAL ROUNDED SURFACE ON MANUFACTURED PART OF TIMBER

DIAGONAL GRAIN:-THE DEFECT IS FORMED DUE TO IMPROPER SAWING SAWING OF TIMBER.IT IS INDICATED BY DIAGONAL MARKS ON STRAIGHT GRAINED SURFACE OF TIMBER

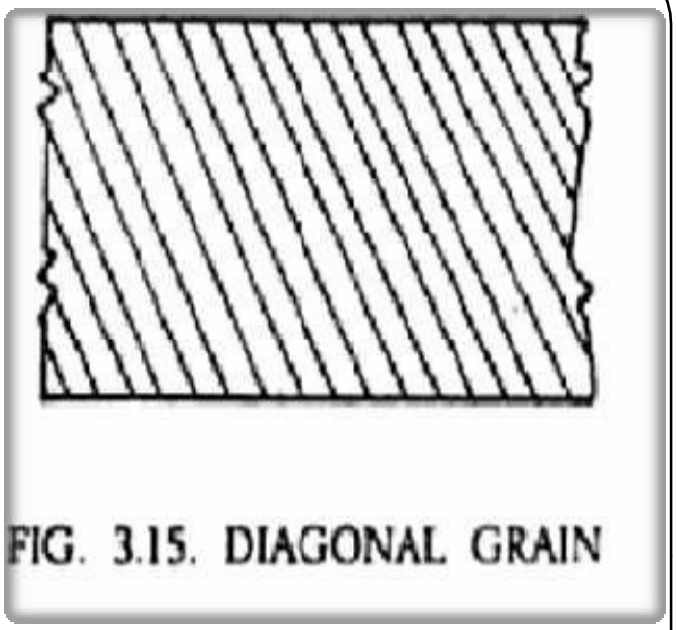
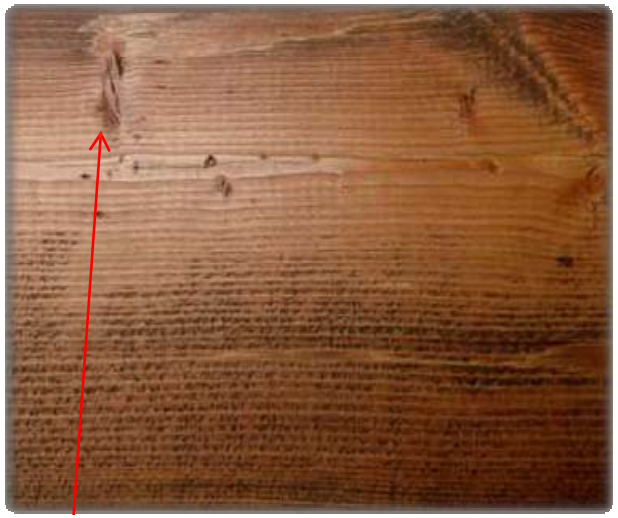


FIG. 3.15. DIAGONAL GRAIN

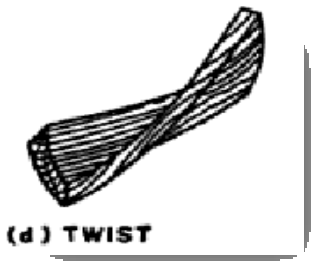


TORN GRAIN

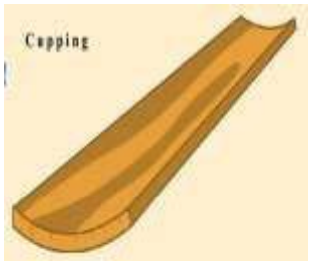
TORN GRAIN:-DEFECT CAUSED WHEN A SMALL DEPRESSION IS FORMED ON A FINISHED SURFACE OF TIMBER BY FALLING A TIMBER OR SO

DEFECTS DUE TO SEASONING

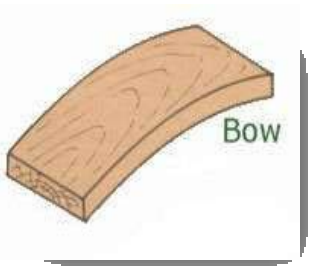
TWIST



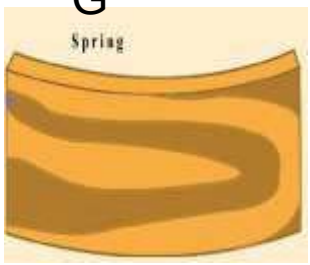
CUP



BOW



SPRING

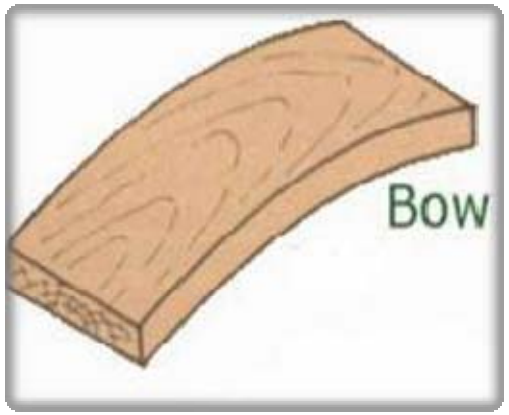


SPLIT

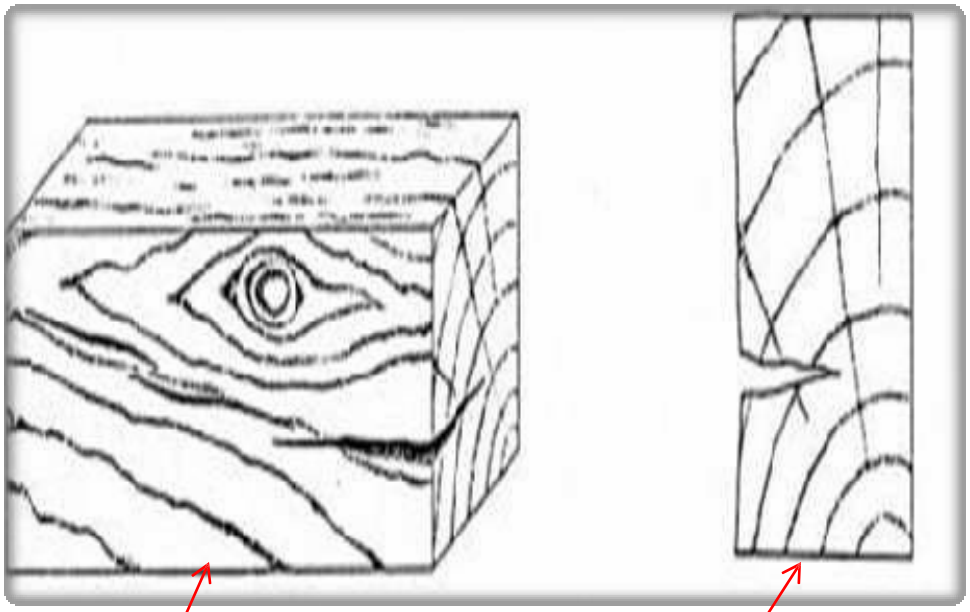
HONEY COMBING

DEFECTS DUE TO SEASONING

BOW:-THIS DEFECT IS INDICATED BY CURVATURE FORMED IN DIRECTION OF LENGTH OF TIMBER



CUP:-THIS DEFECT IS INDICATED BY CURVATURE FORMED IN TRANSVERSE



CHECK

SPLIT

CHECK:-A CRACK WHICH SEPERATES FIBRES OF WOOD.IT DOES NOT EXTEND FROM ONE END

SPLIT:- EXTENDS FROM ONE END TO OTHER,IT IS KNOWN AS A SPLIT

TWIST:-WHEN A PIECE OF TIMBER HAS SPIRALLY DISTORTED ALONG ITS LENGTH,IT IS KNOWN AS A TWIST

HONEY-COMBING:-DUE TO STRESS DEVOLOPED DURING DRYING,VARIOUS RADIAL AND CIRCULAR CRACKS DEVELOP IN THE INTERIOR PORTION OF TIMBER

HONEY-COMB STRUCTURE

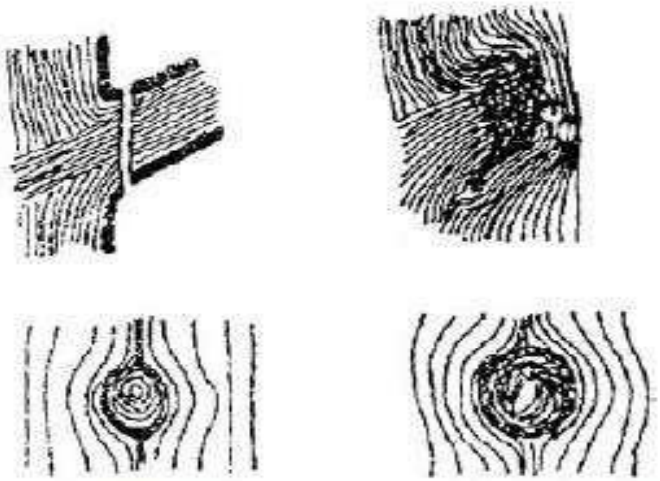


Fig. 1.9. Knots

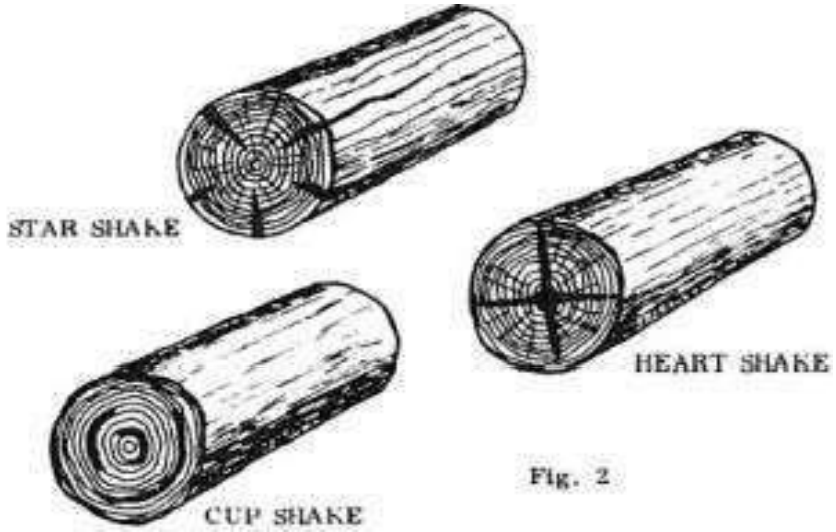


Fig. 2

Qualities of Good Timber

1. It Should have Straight Fiber
2. Wood Obtained from near the pith is always better than the rest of the tree.
3. It should be free from knots.
4. It should not posses natural defects.
5. On sawing it should give a sweet smell.
6. It should have regular annual rings.
7. It should not clot the saw teeth during sawing.
8. It should be Strong and heavy.
9. It should not split when nails are driven in to it.
10. It should bear high resistance shock and stresses.
11. It should have dark colour, give clear sound, easily workable, high resistance to fire and free from decay.
12. On planning it should give silky texture and bright appearance.
13. It should not wrap or twist after seasoning.
14. It should respond well to polishing and painting.

Selection of Timber

- 1. Durability
- 2.workability
- 3. Weight
- 4. Hardness
- 5.Cohesivness
- 6. Elasticity
- 7. Type of texture
- 8. Type of grains
- 9. Resistance to fire
- 10.Resistance to various stresses
- 11. Ability to retain shape
- 12. Easy Polishing

Seasoning of Timber

- Seasoning of timber is the process of drying or removing the moisture or Sap presents in a freshly felled timber, under more or less controlled conditions.

- Freshly felled timber contains a large humidity of moisture roughly from 100 to 200%, based upon dry weight of wood. If the timber is used without seasoning it is liable to shrink , wrap and crack.

Advantages of Seasoning

- Wood becomes hard, more durable, resistance to shock and stresses produced.
- Its workability is improved.
- Its density is reduced, does not wrap after seasoning.
- Shrinkage does not occur after seasoning.
- Defects like twisting, bowing and splitting do not occur.
- Improved ability to polishing and painting.
- Its resistance to fire is increased.

Methods of Seasoning

1. Natural Seasoning
    - (a) Air Drying/ seasoning
    - (b) Water Seasoning

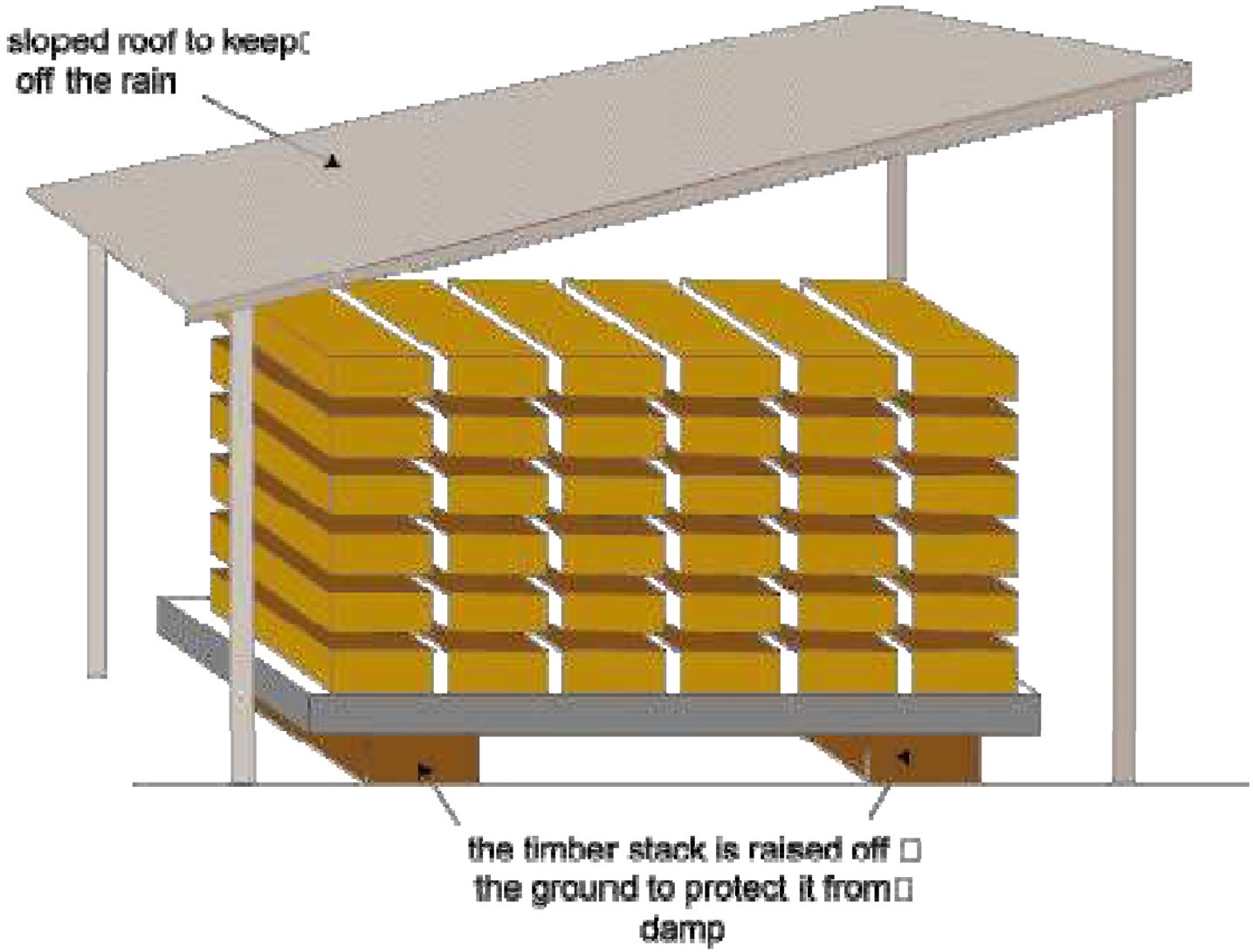
2. Artificial Seasoning
    - (a) Kiln Seasoning
    - (b) Chemical Seasoning
    - (c) Electrical Seasoning

Natural Seasoning

(a) Air Seasoning:-

In this method of seasoning the sawn timber is stacked in a dry place about 30 cm above floor level with longitudinal and crosspieces arranged one upon another, leaving a space of a few Centimeters for free circulation of air. Wood fit for carpenter's work after 2 years and for painter's work after 4 years.

Air Drying/Natural Seasoning



Advantages

(i) It does not necessitate much attention
(ii) It is simple and cheap method.
(iii) Less chances of damage to the timber.

Disadvantages

(i)Very slow extends over years.
(ii)For large stacks considerable space is required.
(iii) Rigid control cannot be exercised
(iv) Block the capital a long time.
(v) Timber may get damaged by insects and fungi during seasoning period.

(b) Water Seasoning

This method of seasoning timber consists in keeping logs of wood completely immersed in a running stream of water, the longer ends of the log being kept pointing up-stream. By this process, the sap, sugar and gum etc are leached out of the wood and replaced by water. The logs are then taken out and left to dry in an open places.

Advantages

It is quick process, tendency of wood to shrink or wrap is reduced less liable to be eaten away by worm or to decay by dry rot.

Disadvantages

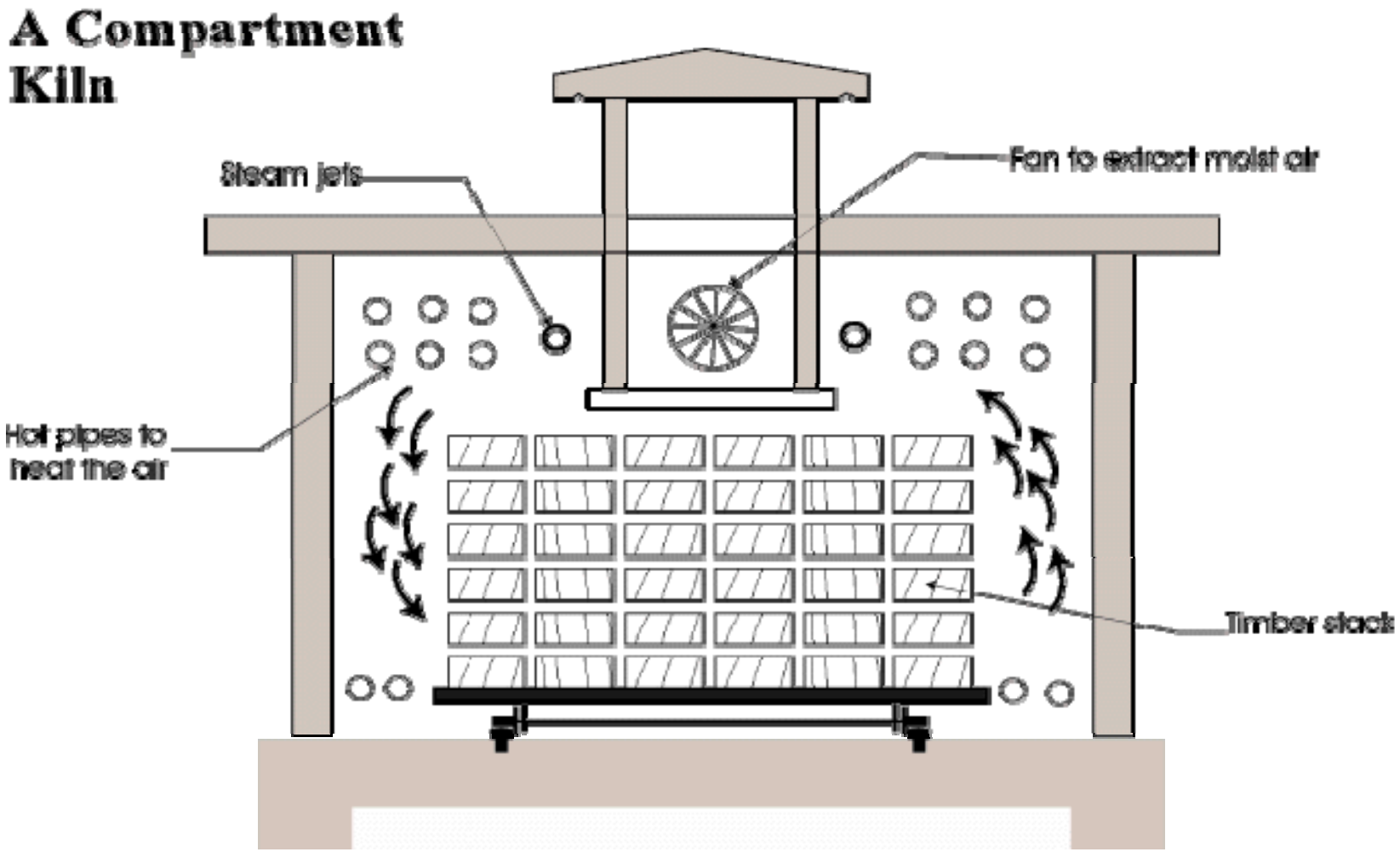
(i) The process reduces the elasticity and the durability of the timber.

(ii) The timber is redder brittle.

2. Artificial Seasoning

(a) Kiln Seasoning:- The timber is seasoned under controlled temperature and humidity conditions with proper circulation and ventilation system. The rise in temperature should be such that the timber retains the original strength and elastic properties. The required humidity level is maintained to avoid wrapping and cracking. The drying of timber at uniform rate is well maintained by circulating hot air by fans and a certain amount of steam is added in order to retain correct humidity. The ventilation is provided to avoid over heating and excessive humidity. The timber inside the chamber , on trolley is kept under controlled conditions for about fortnight or depending upon the initial water content and required moisture level. The quality of wood is inferior as compared to the one seasoned by natural seasoned methods.

Kiln Method


A Compartment Kiln
Steam jets
Fan to extract moist air
Hot pipes to heat the air
Timber stack
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