FURNITURE DESIGN

NATURAL WOOD

Wood

The Mechanical properties and availability of wood have made it a natural material for building structures, furniture, tools, vehicles, and decorative objects.

all wood is composed of cellulose, lignin, hemicelluloses, and minor amounts (5% to 10%) of extraneous materials contained in a cellular structure.

Wood comprises about 50% of cellulose which responsible for most of its mechanical properties.

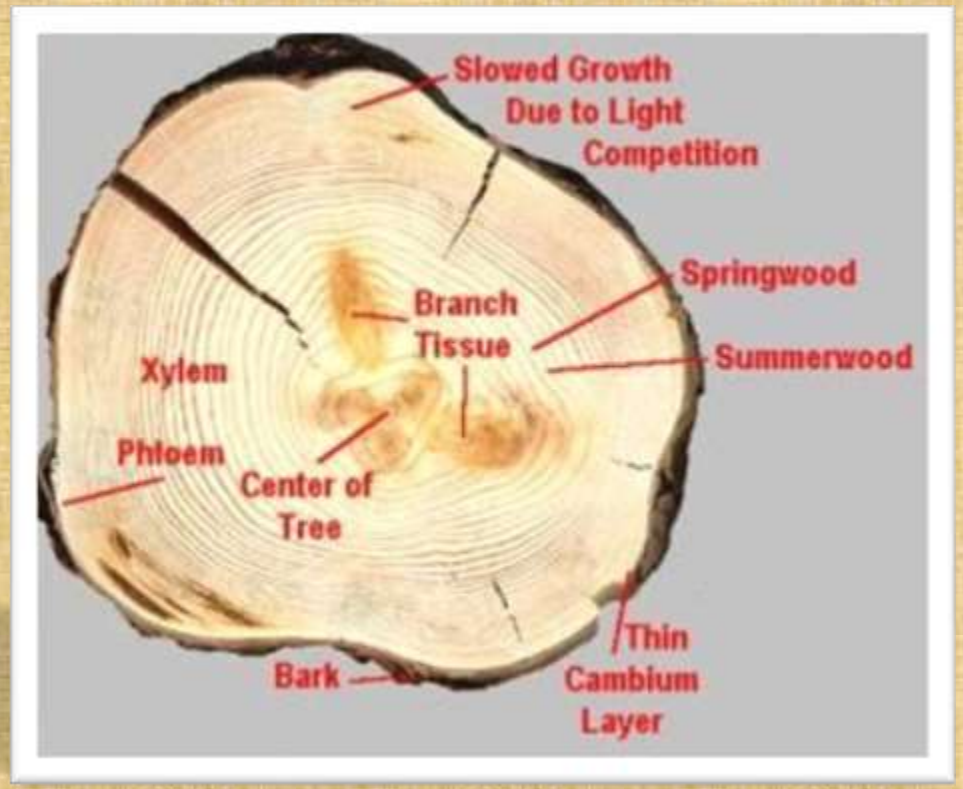
Natural wood is generally composed of bundles of long fibers which are effectively water carrying tubes. These fibers are laid in the direction of the tree trunk or branch from which the wood is removed

Wood Measures

It is customary to describe wood using the following terms:-

- Carpentry- applying to structural work in buildings and ships
- Timbering- applying to temporary work such as formwork for concrete, gantries and shoring
- Joinery-wooden structures inside building ,such as doors and window frames
- Cabinetwork - cabinetry-making furniture

Growth rings



Knots

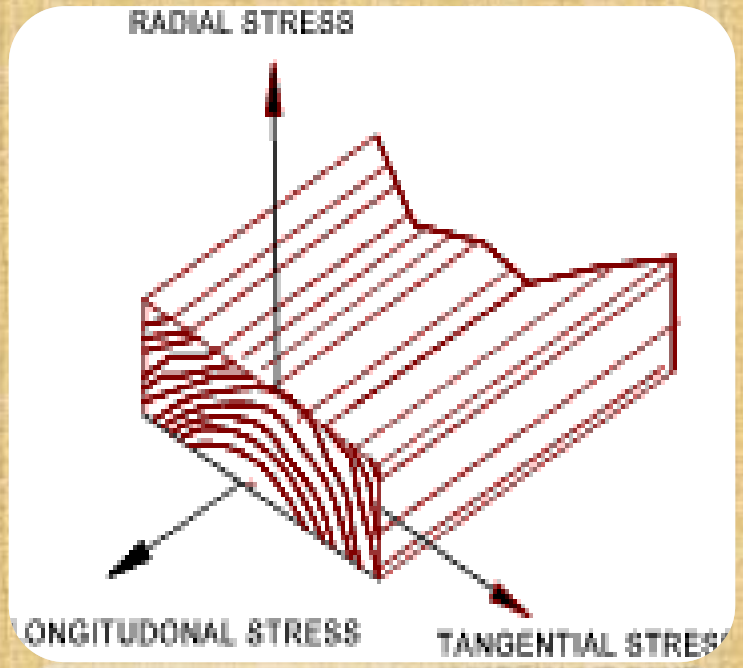
A knot is a particular type of imperfection in a piece of wood; it will affect the technical properties of the wood, usually for the worse, but may be exploited for artistic effect. In a longitudinally-sawn plank, a knot will appear as a roughly circular "solid" (usually darker) piece of wood around which the grain of the rest of the wood "flows" (parts and rejoins). Within a knot, the direction of the wood (grain direction) is up to 90 degrees different from the grain direction of the regular wood.

Density of wood

The density of wood varies widely for different woods, and for the same wood. The density is significantly affected by the moisture content which varies through its life from initial cutting to final use. The normal range of wood densities varies form about 320 kg/m^3 to 720 kg/m^3. Imported woods can be obtained with densities as low as 160 kg/m^3 and as high as 1020 kg/m^3.

Strength of wood

Wood is a natural product and its properties vary continuously throughout processing from when the tree is cut down. Green wood has high moisture content (generally) and this results in reduced strength. As it is dried it loses the moisture content and becomes stronger.



Wood Properties

Hard word technical name is **coniferous** and soft wood technical name is **deciduous** Some types of wood are very hard and durable and some are flexible enough to be bent. "Hardwood" is one of the common types of wood which is obtained from trees that lose their leaves in winter. The other type of wood, the "Softwood" is obtained from evergreen trees like fir, pine and redwood. All the woods fall between a range from very soft to very hard.

Water content

Drying produces a decided increase in the strength of wood, particularly in small specimens. An extreme example is the case of a completely dry spruce block 5 cm in section, which will sustain a permanent load four times as great as that which a green (undried) block of the same size will support.

The greatest increase due to drying is in the ultimate crushing strength, and strength at elastic limit in endwise compression; these are followed by the modulus of rupture, and stress at elastic limit in cross-bending, while the modulus of elasticity is least affected.

Wood seasoning

Wood Seasoning is the process of removal of moisture from Timber. This can also be termed as the drying process of timber. Fresh timber has a very high quantity of moisture and hence is not useful for use in construction or for manufacture of furniture.

In the seasoning process the moisture of the wood is brought down in the range of 8 - 15% based on the end application.

Following are the advantages of Seasoning:

Dried timber is lighter, and hence the transportation and handling costs are reduced.

Dried timber is stronger than green timber in most strength properties.

Timbers for impregnation with preservatives have to be properly dried if proper penetration is to be accomplished, particularly in the case of oil-type preservatives.

In the field of chemical modification of wood and wood products, the material should be dried to a certain moisture content for the appropriate reactions to occur.

Dry wood works, machines, finishes and glues better than green timber. Paints and finishes last longer on dry timber.

The electrical and thermal insulation properties of wood are improved by drying.

Methods of drying timber

Broadly, there are two methods by which timber can be dried: (I) natural drying or air drying, and (ii) artificial drying

Air drying is the drying of timber by exposing it to the air. The technique of air drying consists mainly of making a stack of sawn timber (with the layers of boards separated by stickers) on raised foundations, in a clean, cool, dry and shady place. Rate of drying largely depends on climatic conditions, and on the air movement. For successful air drying, a continuous and uniform flow of air throughout the pile of the timber needs to be arranged. The rate of loss of moisture can be controlled by coating the planks with any substance that is relatively impermeable to moisture; ordinary mineral oil is usually quite effective.

Coating the ends of logs with oil or thick paint, improves their quality upon drying. Wrapping planks or logs in materials which will allow some movement of moisture, generally works very well provided the wood is first treated against fungal infection by coating in petrol/gasoline or oil. Mineral oil will generally not soak in more than 1–2 mm below the surface and is easily removed by planning when the timber is suitably dry. Benefits- It does not cost anything to use this technique. Drawbacks- It takes several months at least to air-dry the wood.

Wood

CHARACTERISTICS:

1. Color -- xylem impregnated with colored compounds in some

2. Porosity -- refers to different sizes of vessels in spring/summer

3. Grain -- refers to alignment of different cell types (straight grained

Ash) as well as to the transition between winter and spring woods

4. Texture-- refers to the cellular elements; fine texture is not visible with a hand lens.

5. Figure -- important characteristic of boards in furniture making Because wood is 3-D different cuts look radically Different woods

Softwood

The term **softwood** is used to describe wood from conifers. Softwood is the source of about 80% of the world's production of timber, with traditional centers of production being the Baltic region (including Scandinavia and Russia) and North America

In general softwood is easy to work: it forms the bulk of wood used by humans.

- Prime material for structural building components.
- Furniture
- Millwork
- Raw material as pulp in the production of paper and cardboard
- Printmaking

Characteristics

- The wood from these trees is usually soft. There are fewer cells in softwood trees but at the same time they grow longer than hardwood trees. They are coniferous trees. They have needle-like leaves. Their leaves are shorter. They do not lose their leaves during autumn. They grow faster than hardwood trees but they get spoilt faster than hardwood.

Softwoods (conifers)

Pine: has a uniform texture and is very easy to work with. It finishes well and resists shrinkage, swelling and warping. It is widely used in house construction, paneling, furniture, molding and for making wooden boxes.

Hemlock: is lightweight and machines well. It is uniformly textured and has low resistance to decay. It is mainly used for construction lumber, planks, doors, boards, paneling, sub flooring and crates.

Fir: is uniformly textured and has low resistance to decay. It is no resinous, works easy and finishes well. Fir is used for making furniture, doors, frames, windows, plywood, veneer, general millwork and interior trim.

Redwood: is light, durable and easy to work with. It has natural resistance to decay and is good for making outdoor furniture, fencing, house siding, interior finishing, veneering and paneling.

Spruce: is a strong wood that finishes well and has low resistance to decay. It possesses moderate shrinkage and is light. It is a good option for making masts and spars for ships, aircraft, crates, boxes, general millwork and ladders.

Cedar: is a reddish wood with sweet odor. It is very easy to work with, uniform in texture and is resistant to decay. Cedar is extensively used in chest making, closet lining, shingles, posts, dock planks, novelties and Venetian blinds

Hardwood

Hardwood is wood from angiosperm trees (more strictly speaking non-monocot angiosperm trees). It may also be used for those trees themselves: these are usually broad-leaved; in temperate and boreal latitudes they are mostly deciduous , but in tropics and subtropics mostly evergreen.

Hardwood contrasts with softwood which comes from conifer trees, which usually are not broad-leaved. Hardwoods are not necessarily harder than softwoods. In both groups there is an enormous variation in actual wood hardness, with the range in density in hardwoods completely including that of softwoods; some hardwoods (e.g. balsa) are softer than most softwoods, while yew is an example of a hard softwood. The hardest hardwoods are much harder than any softwood. There are about a hundred times as many hardwoods as softwoods.

Applications

- Hardwoods are employed in a large range of applications including: construction, furniture, flooring, cooking, utensils, etc. Solid hardwood joinery tends to be expensive compared to softwood. In the past, tropical hardwoods were easily available but the supply of some species such as Burma teak and mahogany is now becoming restricted due to over-exploitation. Cheaper "hardwood" doors, for instance, now consist of a thin veneer bonded to a core of softwood, plywood or medium-density fiberboard (MDF). Hardwoods can also be used in a variety of objects but mainly for furniture or musical instruments because of their density

. Different species of hardwood lend themselves to different end uses or construction processes. This is due to the variety of characteristics apparent in different timbers including, density, grain, pore size, growth pattern, wood fiber pattern, flexibility and ability to be steam bent. For example, the interlocked grain of elm wood makes it suitable for the making of chair seats where the driving in of legs and other components can cause splitting in other woods.

Characteristics

- The wood from these trees is generally harder. (That's where the name comes from.) Hardwoods reproduce* by flowers. Hardwoods have broad leaves. Many lose their leaves every autumn and are dormant in the winter

Mahogany: is finely grained wood with reddish brown color. It is highly durable and can resist swelling, shrinking and warping. It is extensively used for quality furniture such as wooden_cabinets, boat construction, wood facings and veneers.

Walnut: has fine texture and is strong, easy to work with. It resists shrinking and warping and can take all types of finishes very well. It is mostly used for making gunstocks, solid and veneered furniture, novelties, cabinetry and wall paneling.

Oak: Has good bending qualities apart from being durable. It finishes well and resists moisture absorption. Oak is good for furniture, trimming, boat framing, wooden desks and flooring.

Maple: is a fine textured wood with immense strength and hardness. With moderate shrinkage, maple machines well and is best used in flooring, fine furniture and woodenware such as bowling alleys.

Cherry: is close-grained wood and as resists warping and shrinking. It gets red when exposed to sunlight. It ages well and is extensively used in cabinet making, boat trim, novelties and solid furniture handles.

Rosewood: is close grained hard wood with dark reddish brown color. It has an exclusive fragrance. It is hard to work upon and takes high polish. It is good for making musical instruments, piano cases, tool handles, art projects, veneers and furniture

Teak: is a hard and moisture- resistant wood. It resists warping, cracking and decay and is best used in fine furniture, paneling, shipbuilding, doors, window framing, flooring and as a general

WOODS IN THE LOCALITY

- Saal
- Mango
- Shorea
- Neem

SAAL

Type: Hard wood PRICE: \- rs./sq. ft.

Sal *(Shorea robusta)* is a tall handsome tree providing very good quality timber. In local languages it is called salwa, sakhu, sakher, shal, kandar and sakwa. Sal is a gregarious species. It grows well in a well-drained, moist, sandy loam soil. It is a moderate to slow growing species and can attain a height upto 35 m and a girth of about 2 to 2.5 m in about 100 years under favorable conditions

It is hard, fibrous and close-grained. It does not take up a good polish. It requires slow and careful seasoning. It is durable under ground and water. It is used for railway sleepers, shipbuilding, and bridges.

Sal trees are found from Karnataka, Andhra Pradesh, Maharashtra, Uttar Pradesh, Bihar, Madhya Pradesh, Orissa

Neem (Azadirachta indica)

Neem is a fast-growing tree that can reach a height of 15-20 m (about 50-65 feet), rarely to 35-40 m (115-131 feet). It is evergreen, but in severe drought it may shed most or nearly all of its leaves. The branches are wide spread. The fairly dense crown is roundish or oval and may reach the diameter of 15-20 m in old, free-standing specimens.

In India, the tree is variously known as "Divine Tree," "Heal All," "Nature's Drugstore," "Village Pharmacy" and "Panacea for all diseases." Products made from neem have proven medicinal properties, being anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, anti-fertility, and sedative. It is considered a major component in Ayurvedic medicine and is particularly prescribed for skin disease.

All parts of the tree (seeds, leaves, flowers and bark) are used for preparing many different medical preparations.

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Mango

Type : hardwood

PRICE: 650/-rs.q.ft

Mango wood is hard and dense but lighter to the touch than one would expect. The wood is from the same tree as the mango fruit comes from. The use of mango wood wood is varied and ranges from furniture to arts and crafts, bowls and vases. Usually hand crafted, the wood is easy to work and displays a range of colours. Items made from mango wood are often viewed as sustainable as the mango wood tree is often replanted as an old one is cut down in india it's cost is around 300 to 550 rs.

Shorea (MERANTI)

Type: softwood PRICE: 2100/-rs.q.ft

Many economically important timber trees belong to *Shorea*. They are sold under various trade names including "Meranti", "Lauan" , "Seraya", "Balau", and "Bangkirai".

Market survey

NO	NAME	PRICE sq.	LOCATION
1	BURMA TEAK	3600	BURMA
2	BURMA BORDER	1800	BURMA'S BORDER
3	GHANA TEAK	1400	GHANA
4	VALSADI	2400	INDIA
5	MALESIAN	850	MALESIA
6	WENGE	3500	South Africa
7	AMERICAN WALLNUT	2400	AMERICAN
8	MARANTI	1900	CHINA
9	WHITE OAK	1600	SOUTH AFRICA
10	AMERICAN ROSE WOOD	6500	AMERICAN
11	RED OAK	1600	SOUTH AFRICA
12	PINE	900	EUROPE, NEWZELAND

13	WHITE CIDAR	1200	SOUTH AFRICA
14	MAPLE	1700	ASIA AFRICA EUROPE
15	WHITE BEECH	1400	
16	SAPELI WOOD	1500	SOUTH AFRICA
17	RUBBLE WOOD	2100	INDIA, THAILAN, INDONESIA
18	POPLAR WOOD	1700	EUROPE CHINA N INDIA
19	EUCOLAPTIS	1300	INDIA
20	BIRCH	2700	EASTERN EUROPE, RUSSIA
21	MANGO		INDIA
22	MAHAGANI	1600	EUROPE
23	SYCAMORE	1700	AMERICAN
24	SESAME	3500	INDIA
25	SEVAN	1200	INDIA
26	SILVER OAK	1300	SOUTH AFRICA

SUBMITTED BY:

- ABHISHEK MEWADA

- THANK YOU.