

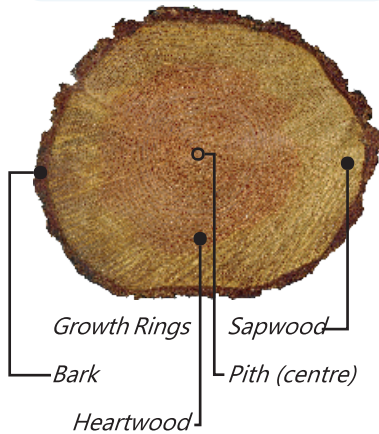
## WOODEN YOU LIKE TO KNOW

Wood has been used since the Stone Age and is one of the most important materials to have been harassed by humans. It has been used as a fuel for keeping warm and cooking, creating homes, tools, weapons, furniture and decorative ornamentation.

### NEED TO KNOW

There are three families of wood:

- Hardwood
- Softwood
- Manufactured Board



Wood is an organic material and comes from the fibre part of a tree, rather than the bark or the roots. The wooden part of the tree is responsible for holding the tree upright and is therefore strong in compression. It has grain which is used to transport water and nutrients from the roots to the leaves. This grain makes each piece of natural wood unique - no two trees are identical.

As a tree grows, it increases in diameter. This creates growth rings. Some trees will grow in more than one season of a year and this will create many more growth rings. Those trees that grow in only one season of a year will create a ring per year. These are then called annual rings. Wood has some key sections. The inner part, or Heartwood and the outer part, the Sapwood. In many cases, the Heartwood will be darker in colour than the Sapwood although this does not affect the strength. Some designers will take advantage of the aesthetics of heartwood.

### DO YOU KNOW?

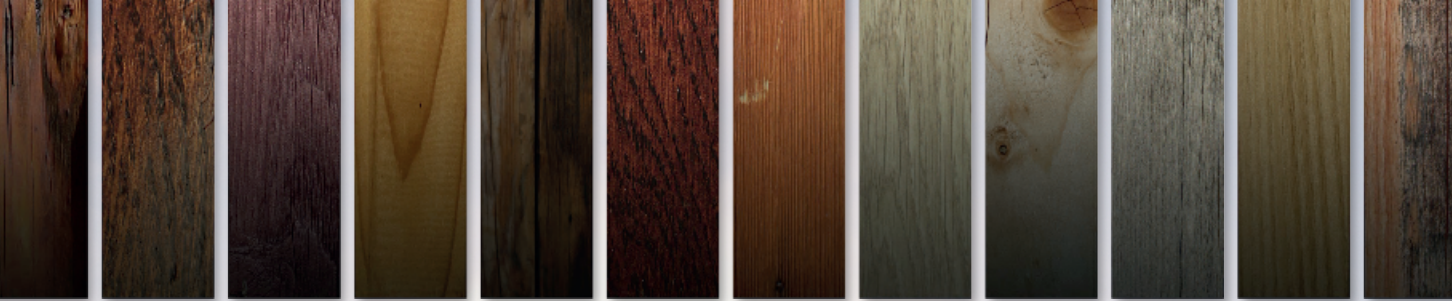
Compression is used to describe a force pushing against a material. Wood is strong under compression, meaning it can withstand a lot of force trying to crush it.

A key advantage of most woods is that it can be described as sustainable. Tree seeds can be planted and new wood regrown. However, different species of tree grow at different rates. Some trees can take over 60 years to reach maturity, whilst others will be at their full size after only 25 years. Some trees are being cut down faster than they are being replanted and are at risk of extinction; cutting some tree breeds down is now banned.

*Wood is available in a wide selection of colours and textures. However, not all woods are equally sustainable and some woods are becoming endangered.*

Trees also sustain a wide eco-system and harvesting trees can destroy the habitats for other plants and many animals. This environmental impact is something that is considered by designers, engineers and manufacturers when choosing a wood for a project.





## CAN'T SEE THE WOOD FOR THE TREES

There are three families of wood, two of which are natural. The two natural woods have unique characteristics and grow at different rates. All wood comes from various types of tree. Once the wood has been cut from the tree, it is called *timber*. Timber comes in many different colours and details.



While most hardwood and softwood timber is cut down from managed forests, there are some illegal loggers destroying whole forests and habitats, causing irreparable damage to the environment.



All natural woods can be divided into two categories. Hardwoods and Softwoods.

### SOFTWOOD

Softwoods are cut from coniferous - sometimes called Evergreen - trees. The leaves of coniferous trees are short, thin and needle-like and are not shed during autumn. Coniferous trees grow continually through-out the year, so reach their full size quicker than deciduous trees. Softwoods tend to be less expensive than hardwoods.

Coniferous trees grow in cooler climates, such as Scotland, Baltic countries, North America, Russia and China.

### HARDWOOD

Hardwoods come from deciduous trees. Such trees have broad leaves which are shed in Autumn. The term 'hardwood' can be misleading as they are not necessarily harder, heavier or stronger than softwood. Deciduous trees grow in warmer climates and the tropics and will shed their leaves during the winter or a drought and become dormant - effectively falling into hibernation. Most deciduous trees will take longer to grow than coniferous varieties and as such, the wood tends to be more expensive.

### DO YOU KNOW?

Trees have green leaves to harness the energy of the sun through a process called 'photosynthesis - a process you will learn more about in Biology.



*The leaves of coniferous trees are short, thin and needle like. They are not shed in autumn, so the trees are often described as Evergreen.*



*Deciduous tree leaves are flat and broad. Many have evolved to channel rain water down the spine of the leaf so it falls closer to the trunk and therefore the roots.*



# WONDERFUL WORLD OF WOOD

There are hundreds of varieties of natural wood in the world, each with their own unique characteristics, costs and suitability for projects. There are more varieties of hardwoods than softwoods.

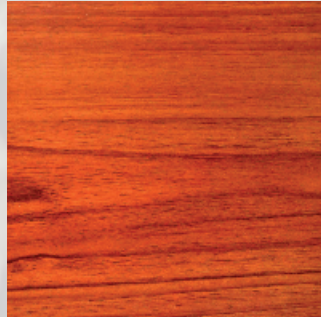
*Knots in wood are caused when a branch grows from the side of a tree. Knots are sometimes considered imperfections by some designers and consumers. Knots can be a unique of decorative feature, especially if well finished.*

As part of your unit and Course Assessment, you may be expected to research suitable woods. However, it is important that you do not waste time or space within your assignments researching woods that are obviously not relevant or suitable to a project - you will receive no marks.

Below is some information to help you with some research.



**Ash** is a hardwood that has over 50 varieties. The wood is characterised by a tight, straight, light coloured grain. It is very tough. Ash is used for interior furniture, but is less suitable for exterior projects as it is prone to rotting quickly.



There are three varieties of **Mahogany**, all of which are brown/red in colour. Mahogany is a hardwood most normally associated with expensive furniture. Whilst Mahogany does resist rot, it is an expensive material so used only for quality exterior projects.



**Meranti** is a member of the Shorea family of trees. It is a reddish coloured hardwood often used as less expensive, fake mahogany. Meranti is quite soft and prone to being marked. Meranti is quite durable, so can be used for exterior products such as window frames.



**White Oak** is usually not white, but a very pale grey. It is a very popular hardwood as it is very strong, with a straight, consistent grain. It is very rot resistant so can be used for both interior and exterior products. Be aware, ferrous metals react and stain the wood.



**Larch** is a strong, weather resistant softwood that is used for many exterior projects, such as cladding for buildings. It has a very straight grain with few knots. Larch is a very fast growing tree and a highly sustainable.



Also called **Poplar**, Canary Whitewood is a strong, tight grained hardwood. The heartwood of Canary Whitewood can have streaks of blue and purple through the grain. It is an easy to shape and finish material, good for making furniture.



**Douglas Fir**, also known as Oregon Pine, is a very popular softwood. It is fast growing and very sustainable. It is used as a structural timber. Douglas Fir is used for exterior work, but does need treatment to keep it from rotting. It is occasionally used for furniture.



**Pine** is a softwood, with over 100 varieties. Pine trees are fast growing and sustainable. However, is not suitable for exterior work as it will rot quickly. Low grade Pine with lots of knots is used for frames in construction work, whilst high quality pine is used for furniture.



## DO YOU KNOW?

*Plywood is a popular choice of manufactured board. The striped ply 'end grain' can be finished to a high standard and many designers use this as an aesthetic feature.*

## NATURALLY MANUFACTURED

As Manufactured boards are created in a factory - often from recycled natural wood fragments or sawdust - they are very sustainable and have a number of advantages.

They can be produced to large sizes - bigger than is possible from natural woods. Manufactured boards are also consistent in quality, strength and durability.



**MDF or Medium Density Fibreboard** is produced by breaking hardwoods and softwoods into small, short fibres. These fibres are glued together and heated and compressed to make large, incredibly strong sheets. Prolonged exposure to MDF dust is considered toxic. MDF will also dissolve with water.



**OSB or Oriented Strand Board** is made from thin slices of wood, that are sorted to face the same direction. These are bonded with wax and glue. OSB is a very strong board, suitable for flooring or products requiring large panels.



**Plywood** is a very popular board made from thin layers (ply) of natural wood. Each layer of wood is glued at 90° to the previous layer, making it rigid and strong. Plywood can be made from hardwood, softwood or both.



Sometimes called **Particle Board, Chipboard** is made from rough chips of wood and sawdust. This wood is then glued and compressed to create huge sheets. Chipboard is very inexpensive but is not particularly strong and will quickly dissolve when wet.

## HIDDEN MARVALS

For many years, manufactured board has been hidden away as a purely structural element to products - it has been shunned because of their particular aesthetic qualities.

Recently, some design engineers have begun to exploit the mechanical, man-made look of a range of manufactured board. Every material has its own unique qualities that can be creatively applied to add a unique structural or aesthetic quality.



# SOMETHING A LITTLE BIT SPECIAL

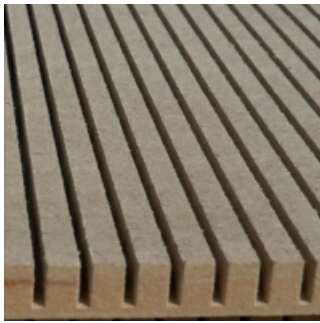
## NEED TO KNOW

Within any unit or Course Assessment Task where you are intending on using any speciality material, it is important that you explain and justify your choice within your presentation.

This may require you to conduct further research or explain manufacturing techniques in more detail.

There are a wide range of manufactured, speciality woods available that allow designers to create unique products with surprising shapes or finishes. You may have the opportunity to experiment and use some of these materials on your Design and Manufacture course.

Many of these materials are inexpensive, but will rely on your design ability to use them in a creative way.



Flexi-MDF is made from normal MDF with the exception that it has grooves or channels cut on one face. This allows the MDF to have a gentle curve. The Flexi-MDF requires a frame to be constructed behind it to maintain the curve.



Veneers are thin slices of natural wood. These veneers are glued to the surface of manufactured boards to make them appear like a natural wood. Veneers can be easily cracked before they are glued. If they are not glued to the manufactured board well enough, they will peel away.



Similar to Flexi-MDF, Flexi-wood is cut on both sides of the material to all the material to be curved. The deeper and more frequent the cuts, the tighter a curve can be created. Be careful, too many deep cuts, and the material will become very weak.



Flex-Ply is similar to regular plywood, with the exception that all layers are glued with the grain in the same direction. This allows the ply to bend along the grain. A vacuum press uses a heavy duty plastic bag and an air pump to bend a material such as flexi-ply around a foam pattern.



*Veneers come from a wide range of hardwood and softwood trees.*