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# INTRODUCTION TO TIMBER

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## PURPOSE

This section provides basic introductory information on properties of timber and its use as a substrate for paint coatings.

## INTRODUCTION

Wood, like all plant material, consists of cells. "Woody" plants are able to attain a large size because of a complex substance known as 'lignin', that binds the various cells together. Wood is classified as 'hardwood' if it has vessels in its structure, or 'softwood' if it does not. Softwoods have a more fibrous structure. The term hardwood does not relate to the hardness of the wood, but is the common word for plants of the dicotyledon sub-group. Hardwoods are often more dense and more difficult to work than softwoods, but there are many exceptions to this.

The major chemical components of wood are cellulose, hemicelluloses and lignin. There are also a number of minor components known as extractives, which vary depending on the species.

## EXTRACTIVES

Extractives are so named because they can be extracted from wood with solvents. Though not part of the essential wood structure, extractives can make up between 5% and 30% of the dry wood mass and, as such, can affect colour, odour, taste, density, durability, flammability and moisture-absorbency of the wood.

The main types of extractive that can influence decisions for timber coatings are exudates, phenolic compounds and coloured compounds.

### Exudates

Damage or injury to some species of trees can provoke a flow of resin. Some species of pine tree produce a flow of resin most of the time, which can generally be removed from the timber with solvents. Exudates from some pine species can continue to flow long after the timber has been dried and dressed.

### Phenolic Compounds

Phenolic extracts include lignin, tannins and quinones, all of which can affect the drying of coatings, particularly of enamel coatings that cure by oxidation. The effect of phenolic compounds can be passivated with barrier coats or the compounds can be removed from the surface by wiping with solvents. Starch: Starch is often found in the cells of sapwood and this makes sapwood more prone to fungal attack than heartwood. Starch deposits will not absorb solvent-borne dyes and this can sometimes cause flecking, or white spots, when solvent-borne dye stains are applied to some species.

### Coloured compounds

The basic structural components of wood (cellulose, lignin and hemicellulose) do not give it colour. The colours, which give species their individual aesthetic appeal, are complex organic compounds. When exposed to sunlight, these compounds undergo a chemical change: blond woods acquire a yellowish colour and red timbers can become browner. Such changes are superficial, and sanding or planing away the surface can restore the original colour. The colouring matter in timber is often partly soluble in water, and this is a common cause of difficulty. When the surface of the timber is wetted, there is a chance that the colour will migrate and cause watermarks when the wood re-dries. Rain running off freshly installed wood is also likely to stain surfaces with which it comes in contact. Tannins in Kwila garden furniture, in particular, are likely to stain concrete to a brown or black colour.

## UNIQUE FEATURES OF TIMBER

Timber is a natural and dynamic substrate; it varies widely in colour and structure between species, and even within the same tree. Each piece of timber must be assessed and treated differently. The effects of such variation can be minimised by selecting and matching timbers carefully. There are certain features which must be taken into consideration when selecting timber for a particular purpose.

### Texture

The texture of a piece of timber is described as fine or coarse, even or uneven. It is determined by the size and arrangement of the cells, and by variations in density such as that between 'earlywood' and 'latewood'.

### Grain

Grain refers to the general direction of growth of the woody tissue and is indicated by the way it tends to separate when the piece of timber is split. The grain can be straight, spiral, sloping, interlocked, curly, wavy or rippled.

### Figure

This refers to the ornamental markings seen on the dressed surface of the timber, and produced by the arrangement of various wood tissues and variations in colour. There are numerous descriptions of figure; such as fiddleback, ribbon, striped, silver, burl and bird's eye.

### Knots

Knots, the tissue of the branches, are usually considerably harder, and in softwoods, darker in colour and more resinous than the wood enclosing them. Because of the presence of reaction wood they are likely to suffer increased shrinkage and stress; knots in softwoods are likely to contain a considerably greater amount of resin than the enclosing wood.

### Colour Changes

Timber contains unevenly distributed natural dyes or colourants, which produce colour variation in different areas of the surface. Depending on the final use of the timber, the variation may be exploited to highlight the natural appearance of the timber. However when large variations are apparent, it is often disguised using timber stains to equalise and produce a uniform colour across the piece of timber.

Sunlight, even if not directly hitting the surface will have a gradual bleaching effect on dark colours, and a yellowing effect on blond/light coloured timbers.

Even very clear finishes change the colour of the timber considerably, as they 'wet' the surface. The faster the coating dries, the less pronounced the darkening effect. A slower drying system penetrates the pores and displaces more air pockets, ie a polyurethane system will have a darker effect than a fast drying lacquer.

Many species have a high tannin content, which reacts with iron to form black insoluble iron tannates if the wood is wet. Sawn timber often has a dark colouration on the surface, from contact with a steel saw when wet. Seasoned timber is protected from such discolouration, so there is no risk when dressing or re-sawing dried boards.

In addition, timber veneer laid on plywood or other bases, may sometimes suffer from undesirable colour changes. This can arise from the effect of strongly acidic adhesives on the natural extractives in the wood, or from the reaction between extractives and strong alkalis. Additionally, veneer-jointing tape can also be a factor in colour changes; glue viscosity and veneer porosity can affect the light refraction on the veneer surface, especially if the veneer is very thin.



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## Important Facts About Coating Timber

Wood is a porous substance, which gives it some unique characteristics:

- Wood pores contain air. When the surface is coated, air can become displaced by the coating, causing bubbling in the coating.
- Wood pores also contain moisture, the amount of which varies with climatic conditions. Wood shrinks when moisture is lost to the atmosphere and vice versa.
- An inappropriate coating system can 'sink back' into the porous surface, rendering a dramatic loss of quality after only a few days.
- Synthetic staining compounds can penetrate into the surface of the wood, allowing creative and dramatic changes to its appearance. The variation in colour between adjoining strips of wood can be unified by careful application of stains.
- Conversely, timber can be bleached to reduce or tone down colour.
- Colour compounds in the wood, especially at knots, can migrate and discolour the coating if the surface is not sealed correctly.
- The structure of wood is fibrous. Fibres on the surface, which lay flat after sanding, can be raised by the tension created by the drying of the coating. The 'raised grain' gives a rough feel to the first coat, which can be made smooth by sanding. For this reason, the first coat used on a wood surface is one which facilitates sanding, such as a clear sanding sealer or coloured undercoat.

For these reasons, care needs to be taken in selection of coating systems; for more details about your application contact your local Industrial Coating Sales Representative or contact Wattyl on 132 101.

For the most up to date information contact Wattyl Customer Service Hotline or visit the Wattyl Website.

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