



# **Demonstrate knowledge of timber use in construction**

Unit Standard – 13002

Level 3, Credit 2





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**Published by: Building and Construction Industry Training Organisation**

Level 6, 234 Wakefield Street  
PO Box 2615  
Wellington

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# Introduction

Over the centuries trees have provided the basic material used for the construction of shelter for society.

This module will look at the classification, uses and characteristics of timber and its importance to the modern building and construction industry.

# Timber Use in New Zealand

Timber used for construction in New Zealand falls into three categories.

- Exotic species;
- Native species; and
- Imported species.

## Exotic Species

Exotic is the term used to define trees from another country which are now grown in New Zealand for commercial purposes.

## Softwoods

### Radiata Pine (*Pinus Radiata*)

Originally a native of California USA, this timber is now the principal exotic timber commercially grown in New Zealand. Extensive plantations cover large areas of both the North and South Islands.

The timber is lightly coloured with an even texture and with very little heartwood. Natural durability is low, but the timber is easily treated to resist both fungal decay and insect infestation. It is moderately strong and has excellent gluing, nailing and machining properties.

### Douglas Fir (*Oregon*)

Douglas Fir accounts for 5% of the annual production of sawn timber in New Zealand. It has a high proportion of heartwood, which is pinkish brown, and has a marked alternation of high and low density in the annual rings. Douglas Fir is mostly used for structural applications because it is moderately strong and does not need to be treated for use as house framing. As Douglas Fir is difficult to treat with preservatives, it is often unsuitable for other applications or uses.

### Cypress

This group includes *Macrocarpa* and *Lawson's Cypress*. These species have similar wood properties characterised by an attractive grain, a medium to low density, natural durability and excellent stability. The wood is highly suitable for interior and exterior joinery, weatherboards and boat building. It also suits general construction uses and is slightly stronger than *Radiata Pine*. The dry wood is, however, prone to splitting when nailed.

### Other Softwoods

Other softwoods are available in small quantities, but are generally only used for specialist decorative applications where high toughness or small knot size is important.

## Hardwoods

There are several species of Eucalyptus which have been planted widely in New Zealand. They are mostly medium to high density, with a red or brown heartwood. They are often used for panelling, furniture, flooring and joinery, but can be used for general structural uses. They are stronger than Radiata Pine, but can be difficult to dry in large sizes. Locally grown European and American hardwood species are also available in small quantities for specialist uses.

## Native Species (Indigenous)

These are trees which originated in New Zealand – so are native to this country. They are not readily available now because of the relatively slow growth rate. Felling of native species is also restricted, and monitored closely. There is a thriving furniture industry centred on recycled native timbers, especially Rimu, Kauri and Matai. Because of their high demand and limited availability, native timber is generally very expensive.

## Native Softwoods

### Rimu

Rimu (sometimes called Red Pine) was used extensively in construction until logging restrictions significantly reduced the availability to the industry. Grown throughout the country it is the principal indigenous timber of New Zealand. The heartwood is an attractive yellowish brown, highly coloured, fine grained, moderately durable (although the sapwood is susceptible to insect attack), even-textured medium-density timber. Rimu is now used principally for furniture manufacture.

### Kahikatea (White Pine)

Kahikatea is yellowish to white timber, clean, straight and close grained which is easily worked. This timber is often used for joinery, moulding, veneer and boat building and is still available in small quantities.

### Matai (Black Pine)

Matai is straw yellow in colour and is a hard timber. Its heartwood is moderately durable, but its sapwood is not as durable and is prone to borer attack. While the timber is strong, it also splits easily. This timber is used in flooring, window and door sills and exterior joinery. Its availability is very limited, but some recycled timber may be obtainable.

### Totara

Totara is reddish brown and straight grained. It is easily worked, but brittle when dry. It is both durable and stable. This timber is used in boat building, joinery, roofing shingles and for carving.

### Kauri

Kauri is light brown with light speckle. It is straight grained, easily worked, moderately durable and very stable. Due to limited availability, this timber is restricted to use in furniture, boat building, joinery and panelling.

## **Native Hardwoods**

These include Red Beech, Silver Beech and Tawa. They are available in small quantities in particular areas. Because they are harder and more dense than Radiata Pine, they are more preferable for use in furniture, panelling or manufactured items.

### **Red Beech**

Red Beech has a light brown to grey sapwood and a light red or brown heartwood. It is straight grained, easy to work, durable and very stable once dry. Red Beech can corrode sheet and galvanised steel over a period of time when in direct contact. This timber is used in furniture, joinery, panelling, veneers, boat building and wharf decking.

### **Silver Beech**

Silver beech has a pinkish-brown heartwood. It is straight grained, easily worked, moderately durable and reasonably stable. This timber is used in furniture, joinery, panelling and boat building.

### **Tawa**

Tawa has a white to pale brown heartwood. It is straight grained, and is excellent to work with – although it is not as durable as other timber and should be stored carefully. It is used in furniture, turning and veneers.

## **Imported Timber**

Imported timber is timber that has been grown in another country and brought into New Zealand – usually in a finished state.

Species such as Kwila, Mahogany, Redwood and Western Red Cedar are examples of timbers imported for decorative or specialist uses.



# Timber Resource Sustainability

## Sustainability

The word “sustainable” refers to a system that can be kept in its current state (in this case, a forestry system). Timber sustainability is about producing the timber we need, without reducing the world’s forest resources.

Less forest in the world is not only bad for the many plants and animals that become displaced when forests are cleared, it also reduces the planet’s ability to process carbon in the atmosphere. Put very simply, trees take in the (bad) carbon and give off (good) oxygen. The destruction of large areas of forest is believed to be a contributing factor in climate change and global warming. Just because we live in “clean, green” New Zealand, it does not mean we can ignore damage done to the planet through the destruction of forests. We have a legal and moral obligation to only use sustainable timber resources.

## Definitions

Term	Meaning
Sustainable timber resources	<p>A sustainable timber resource (plantation or forest) is one that has been planted by people, and once harvested will be replanted.</p> <p>OR</p> <p>A natural forest that is managed sustainably under appropriate authority (e.g. in New Zealand under an approved and registered Sustainable Forest Management [SFM] Plan or Permit). We should only use sustainable timber resources.</p>
Unsustainable timber resources	<p>An unsustainable timber resource is a natural forest that is harvested faster than it can grow and is not regenerated or, if necessary, replanted.</p> <p>We should not use unsustainable timber resources.</p>
Renewable timber resources	<p>Timber is a renewable resource because we can plant more trees to replace the ones cut down. However, just because <b>we can</b> renew the resource – it does not mean the people cutting down the trees actually replant.</p> <p>Just because it says it is renewable, it does not mean the resource is being renewed.</p>
Sustainably managed resources	<p>Many loggers claim that their cutting of selected trees within old native forests is “sustainably managed logging”. If the forest is not replacing itself OR there is no active replanting, this activity isn’t sustainable. In New Zealand, many native species regenerate quite satisfactorily and don’t generally require replanting. Beech regenerates readily and other species like rimu and tawa with the right combination of light, protection and access to mineral soil.</p> <p>So-called “sustainably managed” timber resources may not really be sustainable.</p>

## New Zealand Native Timbers

It is by no means a given that new New Zealand native timber is the product of illegal or unsustainable harvesting. There are approximately 100,000 hectares of indigenous forest in New Zealand subject to approved sustainable forestry management (SFM) plans and permits.

NZ beech species (red, silver, hard and black beech), rimu, matai, kahikatea, totara, rewarewa, hinau, tawa and a number of other indigenous species from New Zealand private indigenous forests may be used with confidence if they are from forests subject to SFM Plans and Permits. The Ministry of Agriculture and Forestry (MAF) approves these harvests and monitors forest management activity. Where necessary, MAF enforces the requirements of the Forests Act that governs the harvesting of indigenous timber from private forests.

The only New Zealand native timber that is not commonly harvested any longer is kauri – for which availability is pretty much limited now to swamp or recycled.

## Sustainable Timber Resources

The timbers listed below are on the whole grown using sustainable forestry practices and can be purchased and used legally and with good conscience within New Zealand:

Australian blackwood, chestnut, douglas fir, elm, eucalyptus species, larch, lawson cypress, macrocarpa, oak, poplar, radiata pine, redwood, spruce, sycamore, walnut, western red cedar.

## Possible Unsustainable Timber Resources

The timbers listed below are imported for use in New Zealand. While it would be nice to think that they are grown using sustainable forestry practices, many are often a result of 'illegal logging' and should therefore be avoided. It is recommended that when purchasing these timbers for use, you ask the supplier to provide documentation that verifies the timber has been produced legally.

a'asa, African mahogany, Agathis species, asi-toa, amoora, aucomea, balau, bauvadi, blackbutt, blackwood, ironbark, calophyllum species, castanopsis, cedar (pencil), chengal, chlorophora, damanu, Dacrydium, decussocarpus, dipterocarpus, dryanobalanops, dyera, pometia, endospermum, entrandrophragma, Fiji kauri, gonystylus species, homalium, hopea species, giam, Intsia species, iroko, ironbark, jarrah, jelutong, kalantas, kapur, karri, kaudamu, kauvula, kempas, keruing, khaya, koilo, koompassia, kwila, lauan, lithocarpus, mahogany, malas, meranti, merbau, milicia, narra, nemesu, neobalanocarpus, New Guinea oak, nyatoh, obeche, odum, okoume, oregon, palaquium, pencil cedar, pterocarpus, ramin, red cedar, red seraya, rosawa, rosewood, sapele, salu salu, sapele, Shorea species, sipo, spotted gum, syncarpa, syzgium, Tasmanian oak, taun, teak, tectona, Toona species, triplochiton, turpentine, vesi, Vitex, watergum, yaka, yasiyasi.

## **MAF Responsible Buying Guide**

The five tips below are provided by (MAF):

- 1.** Buy New Zealand timber or wood products. New Zealand timber is harvested and processed according to well-enforced environmental laws. Therefore, New Zealand consumers can generally assume that products produced from New Zealand forests are legal and sustainable.
- 2.** Check to see if the timber or wood product carries documentation that verifies compliance with a reputable forestry management standard or certification scheme.
- 3.** Buy timber or wood products that are made from recycled or used product.
- 4.** Ask the supplier where the wood has come from. Do they know if it has been legally produced, harvested and traded? What supporting evidence can they produce?
- 5.** Ask your supplier if they have a responsible timber and wood purchasing policy in which they seek to only buy legally harvested timber and wood products. For example, for imported products, the supplier may belong to the Imported Tropical Timber Group which is an industry-environmental group that has a specific policy around sourcing legal and sustainable timber and wood products.

## Ordering Timber

It is important when ordering timber to indicate all the relevant information necessary to meet the job requirements. This should include:

- nominal size (this may not be the finished size);
- finish (rough sawn or dressed);
- grade;
- species;
- treatment;
- number; and
- lengths of pieces.

When ordering timber, the following abbreviations can be used to meet specific requirements:

Abbreviation	Description	Abbreviation	Description
R/S	Rough Sawn	MG	Machine Gauged
D4	Dressed Four Sides	DG	Dressing Grade
KD	Kiln Dried	DRY	Air Dried
GREEN	Timber Not Dry	FJ	Finger Jointed
PKT	Packet (approx 450-500m)	T&G	Tongue and Groove
SL	Selected Lengths	RAD	Radiata Pine
BN	Bull Nose	RP	Red Pine
H1,H3 H4,H5	Treatment Level	BT	Boron Treated
RAND or RL	Random (a total meterage of timber made up of varying lengths)	EX	"Out of" (eg. ex 200x40DG=180x35 or ex 100x50MG=94x47)
NZO	New Zealand Oregon	UT	Untreated

### Definitions

**Length** – refers to the length of a single piece of timber. Total length or "meterage" refers to the combined lengths within a packet or number of lengths.

**Size** – refers to cross section dimensions, eg: 100x50. This may differ from the actual size, depending upon the machining process used. The term x.100x25 refers to dressed timber that was 100mm x 25mm when rough sawn. When dressed it will be slightly smaller than this.

**Finish** – this refers to the outward appearance (and size) of the timber due to the machining processes it has been through. Each time it is machined, the timber will become a slightly smaller size, but may retain its "call size" name. For example, a 100mm call size will measure 100mm in rough sawn state, about 94mm in gauged state, and about 90mm in dressed state. Finishes include rough sawn, dressed and gauged.

**Finger jointed** – refers to a method of joining boards lengthwise using wedge-shaped projections on one piece, which fit to matching recesses on the other piece. A strong bond is achieved through the use of a powerful glue.

**Profiles** – refers to the cross sectional shape the timber may be moulded into. This includes profile groups such as weatherboard, flooring, skirting, architraves, fascias, etc. When ordering, a specific profile must be provided, simply asking for “weatherboard” is not enough as there are dozens of different weatherboard profiles.

Below are some typical timber orders in their abbreviated form:

**RAD 100 x 50 No.1 R/S GREEN RAND 100m**

(Radiata Pine, 100x50mm, number 1 grade, rough sawn, not dry, random lengths to 100m)

**RAD ex 200 x 40 DG H1.2 D4 DRY SL 3/3.600**

(Radiata Pine, out of 200x40mm, dressing grade, treatment H1.2, dressed four sides, air dried, selected lengths 3/3.600)

**RP ex 100 x 25 BN skirting RAND 38m**

(Red Pine, out of 100x25mm, bull nose, skirting, random lengths to 38m)

**NZO 94 x 47 No.1 MG GREEN SL 21/2.400**

(New Zealand Oregon, 94x47mm, number 1 grade, machine gauge, not dry, selected lengths 21/2.400)



**Note:** No.1 indicates a timber grade that is dealt with later in this module. It would be appropriate to check the ordering method used by your employer and become familiar with the system.

## Defects in Timber

A defect is defined as any irregularity occurring in or on timber that may lower its strength, or value, or detract from its appearance.

Some common defects in timber are:

- knots;
- splits, checks and shakes; and
- warps.

### Knots

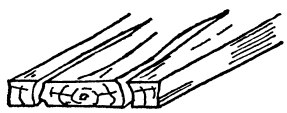
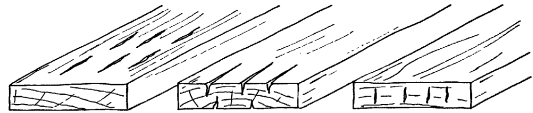

A knot is the result of a former branch being cut through during the milling of the log. The timber is weakened by the grain deflection around the knot causing:

- reduction of load-bearing capacity;
- distortion of the grain fibres; and
- checking around the knot during drying or seasoning.

Knots will have a greater effect on the performance of a piece of timber for a given application or use when the timber is in tension rather than in compression.

A structural beam or lintel will be weakened significantly when a knot is located centrally and in the lower half of the beam.

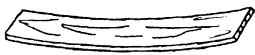
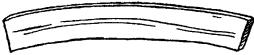


### Splits, Checks and Shakes

Split	Check	Shake
A split is a longitudinal separation of the grain extending from one face through to the other.	A check is similar to a split, but the separation does not extend right through the timber.	A shake is a separation of the annual growth rings. Shakes can appear as large splits in milled timber as a result of the different rates of shrinkage during drying or seasoning.
	 <div> <div>Surface</div> <div>End</div> <div>Internal</div> </div>	

Each of these defects can cause not only a significant strength loss, but also be a cosmetic problem for paint finishes.

## Warp

This is a term given to any variation from a true surface. It is caused by uneven shrinkage or uneven drying. It includes bow, crook, cup and twist or a combination of these.

Bow	Crook	Cup	Twist
A bow is the curving of a piece of timber flatwise along its length.	A crook is the curving of a piece of timber edgewise along its length.	A cup is the curving of a piece of timber across its width.	A twist is the spiral curving of a piece of timber along its length.
			

## Other Defects in Timber

**Burls or Burrs** – Abnormal growths on the side of a tree which produce a confused grain structure.

**Cross Grain** – When the grain does not maintain an even inclination with the surface of the timber.

**Diagonal Grain** – Spiral grain and interlocked grain also can be classified as defects as they can cause a strength loss in timber.

## Insect Attack

Insects often tunnel into timber, spoiling its appearance and reducing its strength. If the tunnels are numerous, they may reduce the strength enough to make the wood valueless. Some insects attack only living trees or newly felled logs. Some attack only seasoned timber, while others only attack the sapwood. The presence of insect damage is not in itself a cause for alarm as the damage may have occurred before the timber was seasoned.

Signs of insect attack include:

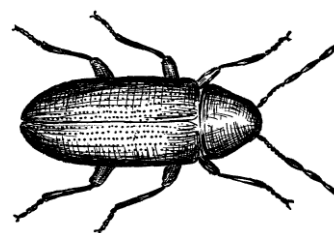
- small irregular (random) holes on underside/inside (out of light) of timber;
- small irregularly carved grooves; and
- very fine borer dust

### Wood Boring Insects in New Zealand

The following are the most common wood boring insects affecting New Zealand timber.

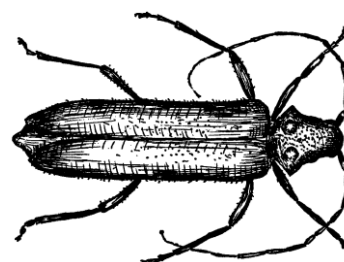
#### Common House Borer

**Anobium Punctatum** – This is the common house borer. It attacks old, well seasoned timber preferring the sapwood of softwood timbers. It will, however, attack both the sap and heartwood of both soft and hard woods. The beetles emerge from the wood between November and February. They are more active at night, and tend to return to flight holes during the day to lay eggs.



#### Two-Toothed Longhorn Borer

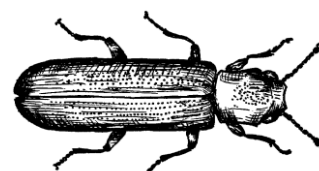
**Ambeodontus Tristis** – This is one of the more destructive of all wood boring insects. This insect prefers the sapwood of the softwood timbers, but will also attack heartwood. The beetles emerge during autumn, and are active over a long period. They dislike light and prefer the underside of timber.



#### Powder Post Borer

**Lyctus** – There are several kinds of powder post borer, but their habits and characteristics are similar.

It is about the same length as the common borer, but is narrower. It attacks only the sapwood of hardwoods such as Oak and Tawa. As it lays its eggs in the pores of the hardwood, softwood (which does not have pores) is not affected.

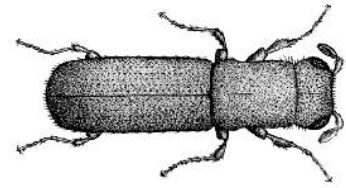




## Pinhole Borer

**Platypus** – There are a few different types of pinhole borer or beetle, all are quite similar in appearance.

They are a shiny, slender, brown beetle about 5.5cm in length. They have long yellow coloured hairs. The New Zealand pinhole borer is a native insect that can fly several kilometres looking for suitable wood in which to burrow. The pinhole beetle will attack standing trees, green timber and occasionally, milled timber. It has an interest in a wide range of native and introduced timbers including pine, Douglas fir and beech.



**Note:** The pictures of the different types of borer have been magnified to show more clearly what they look like.

## Life Cycle of Wood Boring Insects

### The Egg

This is laid on the surface of the wood in a crack, split or old flight hole.

### The Larva

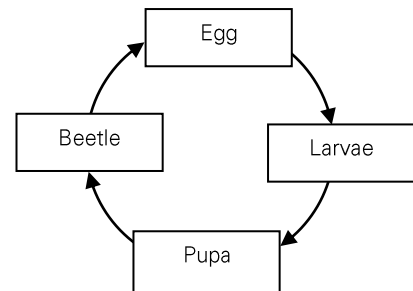
When emerging from the egg the larva or grub bores into the wood using the tunnel as its home and food source. When it has finished growing it bores a chamber near the surface of the timber and changes into a pupa.

### The Pupa

While in the pupal stage it does not move or eat. During this period it develops the adult features. When growth is complete it casts its skin and exits the wood as a fully grown adult.

### The Beetle

The sexes mate and the female lays her egg to begin the cycle again.



**Note:** While it is the larvae that bores the holes inside the wood, it is the beetle which leaves the distinctive exit or flight holes which indicate the presence of infestation.

## **Preventing Attack by Wood Boring Insects**

To discourage borer attack from the three types of borer in New Zealand, the following precautions should be taken:

- All rubbish and debris should be removed from underneath a building.
- There should be adequate ventilation to keep the timber dry.
- Appropriately treated timber (or timber that is naturally resistant to borer attack) should be used. (The natural chemicals that are contained within the heartwood of a tree are in many cases poisonous to borer.)
- Untreated timber should be dressed. (Borer like to lay their eggs in the crevices of rough sawn timber.)
- A painted coating on the surface of timber discourages borer from laying their eggs there.

## **Termites**

Termites are widespread throughout Australia where they can cause considerable damage in residential and commercial buildings. They can also be found in some parts of New Zealand.

There are a number of different species of termites in New Zealand which can be divided into two categories:

- subterranean (earth-dwelling) termites; and
- wood-dwelling termites.

### **Subterranean Termites (Earth-dwelling)**

All subterranean termites are native to Australia and have been introduced to this country with the import of hardwood timbers.

They establish their colony under a building. From this colony the workers build tunnels to the source of the wood on which they feed. They will build these tunnels over obstructions and once they gain access to the timber they will remove the interior wood, leaving only a thin exterior veneer or shield.

### **Wood-dwelling Termites**

These are a native species of New Zealand which live in the timber. There are two groups:

- Dry-wood dwellers – These termites live in seasoned timber.
- Damp-wood dwellers – These termites live in damp wood such as dead logs and stumps.

In buildings where attack is localised, if the appropriate measures are taken they will repay the expenditure of time and money. These measures include:

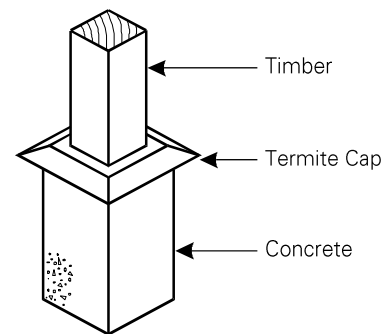
- removal and replacement of badly infested timber; and
- treatment of infested timber with a reliable preservative.



**Note:** *It is necessary when ordering timber to specify the preservative treatment for the situation in which it is to be used.*

### Termite Prevention and Control

To prevent the attack on timber by termites, unwanted timber should be removed from beneath and around buildings. The reason being, these dark and damp locations are an ideal breeding ground for insect infestation. (Unwanted timber could include scraps that have been left lying around, stacks “put aside for a rainy day”, or old tree stumps.) If any timber is found that seems to be infested, it should be burned. If a termite colony is discovered, the best thing to do is to get in a professional eradicator.



If building in a known termite area, foundation walls and piles should be fitted with termite caps. Caps will help prevent invasion by earth-dwelling termites. They are, however, ineffective against dry-wood species, which enter the timber above the ground.

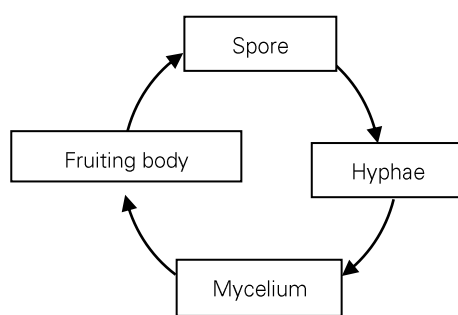
# Fungal Infection

Fungi are plants that lack chlorophyll and therefore cannot manufacture the starch and sugar essential for plant growth.

However, they have special root-like structures, called hyphae, which can dissolve out the necessary starches and sugars already manufactured by other plants.

The hyphae are very fine tubes or hollow threads that eventually become matted together to form a felt-like mass. This mass is called the mycelium and it is from the mycelium that the fruiting body arises. The fruiting body sheds spores and from these spores, when moisture conditions and temperature are just right, fresh hyphae grow.

The complete life cycle of any fungus is a continuous loop that starts with the spore.



There are two basic types of fungi that cause rot:

- **Soft Rot Fungi** – can attack timber when the moisture content is between 35 - 50%.
- **Brown Rot (Dry Rot)** – can attack timber when the moisture content is between 20 - 50% by drawing the water from a moist location and transferring it to a dry location.



**Dry Rot**

- ❑ initially white
- ❑ can develop cracks
- ❑ timber weakens and crumbles



**Wet Rot**

- ❑ wood feels spongy
- ❑ wood is darker in colour and weaker
- ❑ usually found in damp areas

Fungal attack can be prevented by keeping timber dry. **Adequate ventilation is extremely important.** Off-cuts should be removed from beneath a house because, being in contact with the ground, they can rot quickly and, if conditions are suitable, fungi could spread to house timbers.

Timbers showing fungal damage should be removed and replaced with sound timber. The timber in the surrounding area from the point of attack should also be removed as it is difficult to decide merely by inspection how far the fungal attack has spread. The cause of the attack should be traced and treated. The new timber should be well seasoned heartwood, or well seasoned sapwood treated with an appropriate preservative.

In an exposed situation, a good paint finish will prevent the entry of moisture and the conditions that are essential for fungal growth.

# Damage to Timber

The following factors can cause deterioration in timber. These effects, along with those relating to insect and fungal attack, need to be considered.

## Ultraviolet Light

Ultraviolet light (UV) oxidises the surface of timber, changing its colour to the soft grey often seen on buildings sheathed with natural unprotected wood such as cedar shingles or planks (silver discolouration). The discolouration is of no structural concern. Paints and stains can prevent this damage.

## Mechanical Abrasion

Decking, steps, floors and paving are often subject to wear by people walking over them. The use of a hard, dense timber or the provision of a protective coating or membrane is usually the best solution in these situations.

## Moisture Fluctuations

Unprotected timber that is exposed to the weather can develop surface checks – due to rapid alternative wetting and drying by rain and sun.

Timbers with a large width or depth are more likely to be affected than timbers of smaller width or depth. Splitting often occurs if the shrinkage movement is prevented.

## Bacteria

Attack by bacteria has been observed where timber is in contact with heavily fertilised soils such as orchards, horticultural blocks, market gardens, sheep yards and compost bins. Bacteria damage may show as colour changes in the timber in and around areas that meet the source of the bacteria.

## Chemicals

When corroding metal is in direct contact with timber, the interaction of the oxides can cause a structural breakdown in the surrounding wood fibres. Sometimes this is referred to as iron sickness.

## Storage and stacking

Incorrect storage and stacking of timber can result in damage to timber due to the five causes listed above, and as a result of some specific storage and stacking issues.

Damage from storage and stacking problems can include:

- impact damage from vehicles or equipment;
- dampness to the bottom of the stack from lying on wet ground;
- splatters of paint, concrete, etc.; and
- warping from placement on uneven surfaces.

## Wood Preservation (Timber Treatment)

Wood preservation is the process of preserving timber effectively to ensure that the timber is protected from attack by wood-destroying insects and fungal decay.

While the heartwood of most native timbers is naturally durable, the sapwood of both native and exotic softwood species is subject to decay and insect attack. Preservative treatments are necessary in order to obtain an economic service life from these timbers which have little natural durability.

Various methods of treatment are available to provide adequate protection from the conditions expected over the service life of the timber.

For example, framing timber for a residential dwelling will require a different treatment method than timber which will be in continuous contact with the ground.

The Timber Preservation Authority's branding regulations ensure that timber treatment methods are easily identified and the appropriate product selected.



**Note:** Timber should be dry prior to treatment to allow the preservative to penetrate the timber cell structure.

Full details regarding timber treatment and hazard classes as well as typical end use, can be found in NZS 3640:2003 and in the House Building Guide reference below.

The higher the hazard class the higher the resistance to fungi or insect attack. This allows the selection of the appropriate timber treatment for the purpose to which the timber is to be used.

## Methods of Timber Treatment

Preservative application methods used for on-site remedial work include brush-on and dip diffusion. The most successful commercial method is pressure impregnation and the chemicals commonly used for preservation treatment of building include:

- **Boron salts** – Widely used in New Zealand and to a lesser extent in Australia. They are used where the main hazard is insect attack but experience has shown that at a certain level, defined by hazard class H1.2, it also has valuable anti-fungal action. Prolonged exposure to moisture can cause the salts to leach out of the timber so this treatment should only be used on timber that will remain protected from the weather in-use.
- **Pressure treated Boron with Glycol** – These are a mix of borate salts in a carrier of monoethylene glycol (which is almost the same as car antifreeze). This treatment can kill existing fungus in the wood and provides protection against future fungal attacks. Pressure treatment refers to the way the timber is treated in a sealed vessel which first “sucks” out the existing moisture, then “pushes” the treatment in by pressure.
- **Copper-chrome-arsenate (CCA)** – The most widely used treatment. The chemicals are forced into the timber under high pressure. Once these chemicals become fixed in the timber they won't leach out as a result of wetting under normal conditions. The length of time taken to fix chemicals in the timber varies from weeks to months, depending on weather conditions.
- **Copper-based alternatives** (chrome and arsenic-free, such as copper azole CuAz and Alkaline copper quaternary) – These are alternatives where environmental legislation or customer-preference restricts the use of CCA. They are applied to the timber under pressure.
- **Light Organic Solvent Preservatives (LOSP)** – A solution of fungicides and/or insecticides in a light organic solvent, such as white spirit, is applied by a vacuum process and because it is spirit-based it avoids wetting timber that is already dry. This makes it particularly useful for treating fully machined components by avoiding waste and disposal problems with dust and shavings. The solvents must be fully evaporated before paint, stain or glues are applied. The chemical preservatives are not fixed and therefore can be leached out by water so LOSP-treated timber must be protected by a three-coat paint system if used externally.
- **Chemical free** – Some kiln dried and untreated timbers can be used in applications where there is no risk of decay. Typically this will be limited to internal partitioning, exposed rafters and ceiling joists and use timbers such as Douglas fir, larch, macrocarpa, Lawson cypress and kiln dried, planer gauged pine.



## Cut Ends

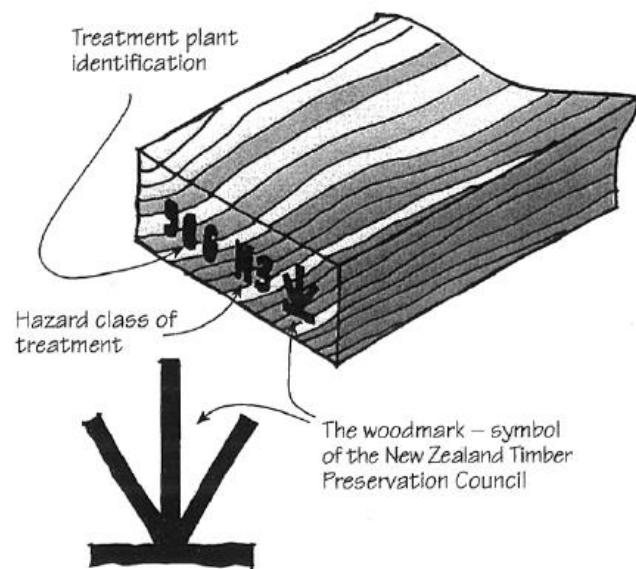
When selecting treated timber it is important to note that:

- if large section timbers are to be cut, chased, bored or machined after treatment from H3 to H6, the area exposed should be protected with a paint or preservative such as copper naphthenate; and
- cut ends of treated softwood posts, stumps and piles must not be embedded in the ground, because site-protected applications cannot give adequate protection.

## Marking

Each piece of timber (with some minor exceptions, such as packets of small pieces like fence battens) must be clearly branded with an identification branding mark and colour codings defined in NZS3640:

- a timber treatment plant identification number;
- preservative code number;
- hazard class of treatment; and
- Woodmark® for treatment plants licensed by the New Zealand Timber Preservation Council Inc.



## Colouring

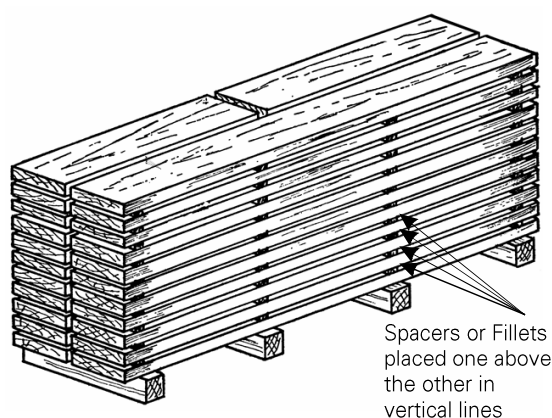
In addition to end-branding, framing timber used in New Zealand must be colour coded as defined in NZS3640 clause 5.2: for hazard classes H1.2 and H3.1.

## Timber Handling, Storage and Protection

Timber is a relatively soft material and may be damaged if not handled carefully. Fork lifts and tipping trucks are a significant source of mechanical damage and should be used with care. Cable or chain slings can damage the timber surface and should be avoided. (If the use of a cable or chain sling is unavoidable they should be used with protective packing.) Web slings are satisfactory when handling large members. Some thin members may need to be held in a vertical position.

Careful storage of timber is essential to prevent problems occurring between the drying of the timber and the final finishing. Weather is a major cause of timber deterioration. For example, if Radiata Pine is left exposed to the weather, the moisture pick up is extremely rapid.

Care must be taken to ensure that large dry timbers (such as beams) do not become wet during construction. Temporary protection from rain and moisture can be provided by paints, stains, polyurethanes or other proprietary sealants.



Dry members installed in a structure should be sealed or remain wrapped or covered until the roof goes on.

All timber and timber products should be:

- stacked on well-aligned bearers;
- kept well clear of the ground or concrete floor slab;
- covered to protect from the sun and rain; and
- kept in the original wrapping if delivered wrapped.

A new concrete floor slab (ie. still green) will release a lot of moisture into any timber that is placed and stored directly on the slab.

Framing timbers should preferably be dried before delivery. If not, to minimise distortion, they should be carefully fillet stacked for air drying on site. Spacers or fillets between the stacked members should be placed in a vertical line to prevent the loads from the stack above distorting the timber members below.

Alternatively they can be block stacked with no spaces between the layers to prevent drying, and then installed in position in the structure before the drying commences. If timber members are installed green, much of the drying distortion in wall studs can be resisted by the nogs, dwangs and exterior cladding of a building.

Metal banding or plain steel nails will produce rust stain on wet wood surfaces. Non-ferrous strapping and galvanised fasteners should be used where the appearance is important.

## **Health and Safety Requirements**

Timber treatment consists of chemicals that may be harmful. Important measures to take when working with treated timbers are:

- reduce contact with the timber by wearing gloves, goggles and a dust mask;
- don't burn off-cuts or cook with them;
- dispose of waste in an approved landfill;
- wash your hands before using the toilet, smoking, drinking or eating;
- wash work clothes separately;
- ventilate work spaces as much as you can; and
- working with solvent damp timber is not advised – solvent damp timber should be allowed to dry properly before use.

# Worksheet

**Name:** \_\_\_\_\_

1. Timber can be described in terms of treatment, length, size, finish and profile. For the uses listed below fill in these details for common or typical uses. First line is completed for you.

Application	Size & Finish	Treatment	Quantity	Profile
Fencing rails	100 50 R/S	H3.2	8 @ 5.4	N/A
Internal framing				
Finishing round internal doorways				
Boxing for concreting				
Finishing around internal wall/floor joins				

2. Describe the following common defects in timber:

a) Knot.

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b) Split.

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c) Warp.

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d) Check.

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3. What sort of timber is attacked by the borer listed below?

**a)** Common borer.

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**b)** Two-toothed longhorn borer.

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**c)** Pinhole borer.

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**4.** Identify two (2) factors that can prevent fungal growth in timber.

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**5.** Identify two (2) factors that will prevent wood boring insect attack in timber.

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**6.** What would indicate that timber has been damaged by storing and stacking?

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**7.** What effect can insect attack have on timber?

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8. Which one of the following is an example of deterioration of timber due to insect damage?



Picture A



Picture B



Picture C

Answer: =

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9. What effect can dry and wet rot have on timber?

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10. In the pictures below, what damage is caused by dry rot and what is caused by wet rot?



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- 11.** Draw lines to match the timber treatment methods with their correct description.

Treatment method	Description
Boron salts	Commonly used to protect against insect attack
Pressure treated boron with glycol	The most widely used treatment, known as CCA
Copper-chrome-arsenate	A mix of borate salts in a carrier of monoethylene glycol to kill existing fungus in the wood and provide protection against future fungal attacks
Copper base chrome and arsenic free	Fungicide/insecticide applied in a spirit base, known as LOSP
Light organic solvent	Used as an alternative to CCA when customer or legislation does not allow CCA
Chemical free	A limited number of timbers in limited applications can be used without chemical treatment

- 12.** What would be the appropriate action required on the discovery of:

**d)** Insect attack?

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**e)** Fungal attack?

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- 13.** How should timber be stored on site?

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- 14.** If wet timber was delivered to site, explain the best method to stack this timber to encourage drying and minimise distortion.

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- 15.** What health and safety measures must be taken when working with timber on a construction site because of timber treatment?

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## Assessment Record Sheet Timber

Unit Standard 13002, Level 3, Credit 2

### Sign off check

The learner has successfully completed all the worksheets and answered all the questions correctly.

#### Checklist:

☐ Worksheet

Where reassessment of certain questions has occurred, the correct answers were:

- ☐ Re-written by the learner
- ☐ Confirmed through oral questioning and noted next to the answer

In signing off this unit standard, the learner can:

- ☐ Describe the nominal dimensions and finish of types of timber used in construction
- ☐ Describe common defects in timber and how they affect its use in construction
- ☐ Identify borer damage and describe its effect on timber used in construction
- ☐ Identify fungal damage and describe its effect on timber used in construction
- ☐ Describe how to protect timber against insect and fungal attack
- ☐ Describe how to handle and store timber
- ☐ Identify and describe health and safety requirements for working with construction timber

#### Comments:

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<b>UNIT STANDARD 13002 COMPLETED</b>	<b>Evaluator Signature:</b>	<b>Date:</b>
	<b>Assessor Signature:</b>	<b>Date:</b>