

# TIMBER QUEENSLAND TECHNICAL DATA

## TIMBER BALUSTRADES AND TIMBER DURABILITY

*Timber recycles carbon*



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## Alert -

### Amendments to Timber Queensland Technical Data Sheet 23

Timber Queensland have been recently alerted to some structural deficiencies with their technical data sheet 23 - **Timber Handrails and Balustrades**.

Until the data sheet is revised and amended, they have requested industry apply the following interim changes and corrections to this data sheet.

#### Page 2, Posts/Newel Posts

Delete existing clause and replace with:

Newel posts with handrails attached (handrails not greater than 1000mm from the floor) and posts connected to and restrained by the roof frame, up to 2,700mm high shall be in accordance with the table below.

F8 88 x 88 newel post used internally may be spaced up to 2.7m.

Where posts support roof and or floor loads, refer to AS 1684 to determine minimum grade and size but shall be F8 88 x 88.

#### Page 3, Table 2

For continuous span handrails, increase all the Handrail Connection Loads by 25%.

Timber grade	Newel post (external)		Full Height posts	
	Minimum size (mm)	Maximum post spacing (m)	Minimum size (mm)	Maximum post spacing (m)
F8 (softwood)	88 x 88	1.3	88 x 88	2.3
F17 (hardwood)	90 x 90	2.7	90 x 90	3.6
F27 (hardwood)	90 x 90	3.6	90 x 90	3.6



## ADVISORY NOTE

# RECOMMENDATIONS FOR USE OF H3 LOSP TREATED PINE

### Background

Timber Queensland and the Building Services Authority are experiencing increasing feedback and concerns from the building industry regarding the performance and premature failure of H3 Light Organic Solvent Preservative (LOSP) treated pine products due to decay. In many instances failure of these products has occurred under 5 years in-service. These products may include solid timber, laminated and finger jointed timber and LVL.



Photo 1: - Avoid premature failure by applying supplementary preservative and oil-based alkyd primers on all cuts, notches, holes etc

Satisfactory in-service performance of these products is dependent upon the timber, the quality of the LOSP treatment, together with the painting, installation and maintenance practices applied.

This advisory note provides information and advice aimed at improving and ensuring the in-service performance of these products such as beams, cladding, hand rails, posts, newels, mouldings, decking etc.

## Product Requirements

H3 LOSP treated pine (solid timber, glued laminated timber or LVL) is required to comply with either:-

- AS 1604.1 – Specification for preservative treatment – Part 1: Sawn and round timber or,
- AS 1604.2 – Specification for preservative treatment – Part 4: Laminated veneer lumber (LVL) or,
- AS 1604.5 – Specification for preservative treatment – Part 5: Glued laminated timber products.

AS 1604.1 defines the H3 Hazard as:

Hazard Class	Exposure	Specific Service Conditions	Biological Hazard	Specific Uses
H3	Outside, above ground	Subject to periodic moderate wetting and leaching	Moderate decay, borers and termites	Weatherboard, fascia, pergolas, window joinery, framing and decking

Implicit within the above definition is that wetting is ‘periodic’ and that the timber can dry relatively quickly if it becomes wet. That is, well ventilated and free draining. If, due to the installation practices, or where a higher hazard exists that will trap moisture for prolonged periods, then a product treated to a higher Hazard (H4) or with a timber preservative more suited to a higher hazard such as CCA (not hand rails or decking), ACQ or Copper azole, should be used.

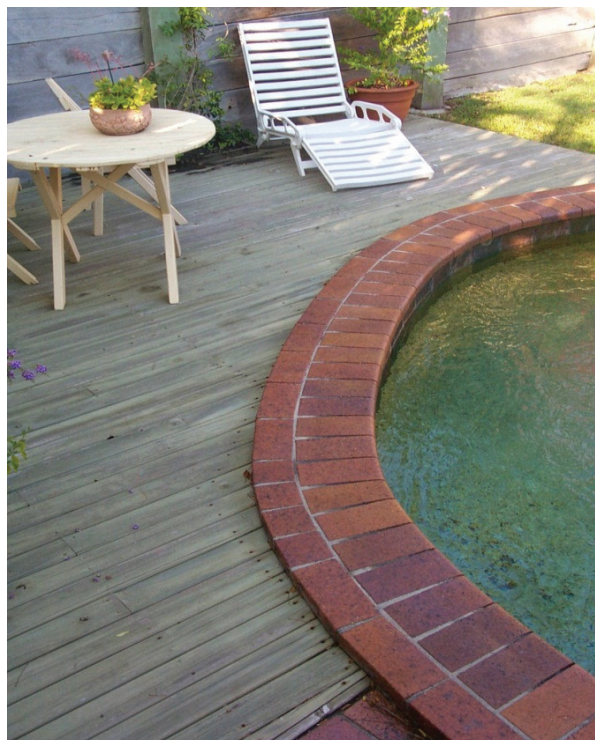


Photo 2: Timber Deck on the Ground - H4 (min) Hazard

The efficacy and suitability of a timber preservative system will be dependent upon both the **penetration** of the preservative into the timber and the **retention** of the active constituents in the timber. As an example, for H3 LOSP treated pine, AS 1604.1 specifies for solid timber (different penetration requirements for LVL and glued-laminated timber) that the **penetration** shall be in **all of the sapwood** and,



(A) where the lesser cross-sectional dimension is greater than 35 mm, the penetration shall be not less than 8 mm from any surface. Where the lesser cross-sectional dimension is equal to or less than 35 mm, the penetration shall be not less than 5 mm from any surface;

OR

(B) un-penetrated heartwood shall be permitted, provided that it comprises less than 20% of the cross-section of the piece AND does not extend more than halfway through the piece from one surface to the opposite surface AND does not exceed 50% of the width of the surface on which it occurs.

As can be noted from the above penetration requirements, it is permissible under AS 1604.1 for solid timber for there to be a reasonable percentage of the cross-section allowed in **untreated** low durability timber.

For **glued-laminated** and LVL members, the glue lines can also act as a barrier that inhibits penetration of the treatment solution and this can also impact upon obtaining satisfactory penetration through the cross-section.

The **retention** requirements of the AS 1604 series relate to achieving a satisfactory concentration of the active preservatives throughout the penetration zone. The AS 1604 series prescribe minimum levels of preservative retention, which vary depending upon the type of preservative. For LOSP treatment systems, the most common actives used today are the 'azoles' (tebuconazole + propiconazole) combined with an approved insecticide. For all intense and purpose, the organic azoles have replaced earlier LOSP's that were tin based, albeit these are still permitted by the Standard.

## Branding

All LOSP treated timber should be branded according to the AS1604 standard. A brand will include three separate parts;

- A treatment plant number e.g. 123
- A Preservative number e.g. 65 (for tebuconazole + propiconazole)
- The Hazard Class the timber is treated to withstand e.g. H3

The brand may appear on the end or along the length of a piece of treated wood. Thin treated products such as battens or mouldings may be pack branded.

A brand is your only indicator of treatment quality as it is a claim of compliance by the producer/manufacturer and should be recorded/retained in case there are issues with the quality of treatment. You **CAN NOT** assume the timber is properly treated if it is not branded.

## Supplementary Treatment, Painting & Installation

H3 LOSP treated products are available in both a pre-primed form or un-primed.

Irrespective, it is recommended by most manufacturers that all H3 LOSP treated products be primed all round with a quality alkyd (oil) based primer and finished with a high quality top coat.

For pre-primed product, the quality of the primer may vary from a high quality solvent (alkyd) based primer to lesser quality finishes that just offer temporary protection. The exact nature of the pre-prime should be established from the manufacturer to determine the additional finishing requirements which may include sanding and re-priming with a quality alkyd based primer.

If the primer appears loose (check by X hatching with a blade and applying 'gaffer' tape to check adhesion) or chalky, sand these areas as required and re-prime with a quality oil based primer.

Ensure that the primed timber is free from any dirt, oil or any other surface contaminants. Remove thoroughly by wiping clean or lightly sanding.

**Prior to installation**, treat all cut ends, notches, check-outs, bolt holes, etc with a site applied supplementary timber preservative and prime all these areas as above. Supplementary preservatives include products such as copper and zinc based (usually with a wax or water repellent additive etc.) products in white spirit or similar. Examples of these products include:- Osiose Protim Solignum "XJ Clear" and Tanalized "Ecoseal" and "Enseal Clear".

Supplementary treatments containing water repellents and/or waxes may effect water based primers.

Fill any knot or nail holes etc. with wood putty and spot prime. Sand lightly to an even finish once dry.

Apply 2 topcoats of either quality acrylic or solvent based paint to the prepared product.



Photo 3: Adequate overhang and quality pale coloured paint system provide good protection to end grain and sun exposure

The finishing coat system should be maintained in accordance with the paint manufacturer's instructions and it is important that these **instructions are given to owners** who will be responsible for ongoing maintenance.

Manufacturers may also have very specific **installation** recommendations for H3 LOSP treated products which if not followed may void the manufacturer's warranty for these products. In addition to the painting and finishing requirements above, these recommendations typically include:-

- Installation of a damp proof flashing ('joist strip') to the tops of beams
- Caps over exposed end grain
- Avoiding built in moisture traps
- Protecting sun exposed surfaces and
- Use of light coloured paint finishes



Photo 4: Flashing installed over H3 LVL beam under a deck

## Product Certification and Quality Control

Some manufacturers of H3 LOSP treated timber participate in independent 3<sup>rd</sup> party quality assessment and certification schemes. Purchasers of H3 LOSP treated timber should assure themselves of the product's compliance with the relevant standards.

## Checklist for Builders, Contractors and Other Users

- ✓ Before commencing any constructions undertake a risk based assessment of the proposed work. If outside above ground constructions are proposed consider whether the constructions will be subject to greater than periodic, moderate wetting or leaching (e.g. protracted wet weather conditions, very high humidity levels, poor ventilation, construction close to or on the ground, high vegetation/dirt build up etc). If these environmental conditions are possible timber treated to H4 level or greater, more suitable timber preservative treatments, or durability Class 1 hardwood timbers may be more appropriate.
- ✓ If constructing a water proof deck, will the waterproofing system be effective for the life of the structure (50 years)? If not, follow the advice in this Advisory Note for weather exposed construction.
- ✓ Ensure construction practices are appropriate, do not trap or hold moisture against the timber and that all cut ends, notches, bolt holes etc are treated with a site applied supplementary preservative treatment as recommended by the product manufacturer
- ✓ Ensure the product is treated in accordance with the relevant Australian Standards by either checking that the product is branded in accordance with the relevant standard or by having samples tested by an appropriately qualified testing laboratory
- ✓ Ensure the product manufacturers installation instructions for the type of product being used and the anticipated environmental conditions are strictly followed
- ✓ Ensure all timber is primed with a quality alkyd based primer or quality solvent alkyd based primer (pre-primed timbers) and finished with two quality acrylic or solvent based top coats
- ✓ If work is undertaken for a client, ensure the client is advised in writing of ongoing maintenance requirements associated with the constructions and type of product used. Retain a copy of this advice for future reference.
- ✓ Maintain records of supplier's invoices, jobs, treatment brands, end labels etc, as well as photographs of site installation practices and details.

### For further information contact:-

[www.ewp.asn.au](http://www.ewp.asn.au) - Engineered Wood Products Association of Australasia

[www.gltaa.com](http://www.gltaa.com) – Glued-Laminated Timber Association of Australia

[www.tpaa.com.au](http://www.tpaa.com.au) – Timber Preservers Association of Australia

[www.timberqueensland.com.au](http://www.timberqueensland.com.au) – Timber Queensland Limited



All timber, (irrespective of species, durability classification, or whether it is preservative treated or not) will undergo changes when exposed to the sun and rain. Ultraviolet light and changes in moisture will cause timber to “weather”. It will lose its natural colour and fade to a silver/grey, its surface will become rough, and splits and cracks could develop.

Weathering primarily affects the appearance of timber, however in the long term could affect durability and performance.

Varying degrees of protection from weathering may be provided by the application of coatings such as paints, water repellents, water repellent preservatives and pigmented penetrating stains.

This data sheet describes the various finishing products available and the degree of protection they provide.

*Note: Preservatives used to increase durability (protection from decay and/or insects) do not permanently prevent timber from weathering.*

### **WEATHERING PROTECTION**

The application and regular maintenance of coatings will reduce weathering.

Proper finishing also helps external timber fulfill its designed function.

To protect from rapid moisture content changes, finishes form a barrier between the weather and the timber, reducing water absorption on wetting, and slowing moisture loss on drying.

To protect from UV light, finishes generally should contain a pigment (light colours preferred). The pigment reflects or absorbs the UV light, and shields the timber.

### **TYPES OF FINISHES**

Many protective finishes are commercially available. They range from clear water repellent resins and penetrating oils, through stains, to full paint systems. There are major differences between them in their appearance, cost, ease of application, ease of maintenance, degree of protection offered and frequency of re-application.

When choosing a finish it is generally a matter of deciding on an appropriate balance between maximum service life (frequency of maintenance) and maximum ‘naturalness’ in its appearance.

The following will help with that choice:-

### **PAINTS**

Maximum protection from the effect of the environment is provided by the traditional paint systems which form surface films. Thousand of old Queensland homes with timber cladding in perfect condition after one hundred years service stand in testimony to the protective qualities of paint films.

The disadvantages of paints are that they obscure the timber colour and grain, and they require surface preparation prior to re-coating.

Paint systems give the longest interval between re-coats. Up to ten years can be expected from top quality systems.

*Note: Poor quality paint systems (dark colours, no primer to end grain and joints, cheap paints etc.) can actually accelerate degrade.*

Dark colours absorb more solar radiation than light colours, and can deteriorate the finish and the timber faster in service. White pigments reflect the maximum amount of ultraviolet light possible, and provide the best protection to both the timber and paint film.

Solvent borne (alkyd or oil) finishes are more resistant to water vapour than water borne (acrylic) finishes. Where a high level of protection is required, a finish system with a solvent borne primer and/or undercoat should be selected.

Acrylic (water based) paints have been vastly improved in recent years and now offer service lives comparable with alkyd resin (oil or solvent based) paints. They are somewhat easier to apply but their softer films tend to retain more dirt than alkyd (solvent based) paints, and thus harbour more mould growth.

### **CLEAR FINISHES**

Being transparent to light, clear finishes allow the full beauty of the timber to be seen, but where exposed to sunlight they also allow UV damage, with consequent fading and surface roughening.

Water repellent preservatives (WRP) are useful in temporarily protecting certain timber species which have marginal durability for exterior use. They contain water repellent resins and waxes which penetrate about 1-2 mm into the wood to form a water barrier. They may also contain a wood preservative fungicide such as copper naphthenate, zinc naphthenate or other type, and/or an insecticide such as permethrin. While this barrier is intact, the timber is protected from rapid moisture content changes. However, the resins and waxes are degraded by atmospheric oxidation (accelerated by the action of sunlight), and usually are effective for periods of six

to 18 months, depending on the degree of weather exposure. Re-application however is a simple procedure, involving a minimum of surface preparation.

Most clear film type finishes (varnishes, clear polyurethanes, epoxies etc.) generally give insufficient service life to recommend them for external use. However, water based and solvent (oil) based clear finishes, with UV absorber additives are available, which may provide limited protection as long as they are regularly re-applied and maintained.

### STAINS

An attractive natural appearance may be achieved using penetrating stains. They allow the grain and texture of the timber to be seen, and are available in a wide range of colours to match or change the original colour of the timber species in use (as with paints, pale colours preferred).

Stains contain dyes or pigments which minimise the effects of UV light. They offer greater protection and a longer maintenance interval than clear finishes, providing they also contain some water repellent compounds. Both water based and solvent based stain formulations are available. Water based stains are generally cheaper, but do not penetrate as well as those based on light oil or organic solvents.

Penetrating stains which do not build up a surface film are easy to maintain. When they lose their effectiveness (after about two to four years, depending on exposure), a simple washing of the surface is all that is necessary before re-application.

### SUBSTRATE

Timber species and timber based products have different characteristics which could influence the choice of finish. The following should be considered:-

- **density** - higher density species (e.g. most hardwoods) are less prone to absorb moisture and solvents and therefore film coatings (paints) are generally best, lower density species (e.g. softwoods) readily absorb stains.
- **texture** - fine, smooth grains and textures are best for paints, and course grains best for penetrating stains.

- **seasoning** - seasoned timber is best for paint finishes.
- **dressed timber** - painting is best on dressed timber.
- **unseasoned sawn timber** - stains perform well.
- **weathered timber** - staining is preferable on weathered and worn surfaces. (Surfaces to be brushed clean) Painting will require substantial surface preparation such as filling and sanding.

### APPLICATION OF FINISHES

The manufacturers' recommendations with respect to surface preparation, sealing, priming, number of coats, spreading rates, frequency between coats, weather conditions at time of application etc. should be followed to achieve maximum life and performance. The following table shows typical applications.

### SURFACE PREPARATION

The surface should be free of loose material before painting or staining. All dust, sawdust, grease and surface deposits of preservative should be removed.

Sharp edges should be rounded before painting. Paint tends to pull back from sharp edges, leaving a thin film which will soon fail.

Timber should be reasonably dry before painting. Blistering will occur if excess moisture is trapped behind a cured paint film.

Before painting CCA, ACQ or copper azole treated timber, ensure that the timber has had sufficient time to allow the water from the treatment solution to dry out. (A few weeks is usually sufficient) If any deposits are on the timber surfaces, these should be removed before painting by scrubbing under a hose.

Before painting LOSP-treated timber, allow sufficient time for the light organic solvent to evaporate. (A week is usually sufficient) LOSP treated timber must have a solvent based primer, prior to either solvent or water based finishing coats.

Holes, depressions, mechanical damage and natural imperfections should be repaired by scraping clean or cutting out, priming and filling with putties which are compatible with the selected finish system.

Finishing System	Cladding*		Decking*		Joinery		Framing	
	Hardwood & Cypress	Softwood	Hardwood & Cypress	Softwood	Hardwood & Cypress	Softwood	Hardwood & Cypress	Softwood
Primer + Undercoat + minimum 2 coats solvent borne or water borne paint	●	●	●	●	●	●	●	●
Primer + minimum 2 coats water borne paint (solid stain)	●	●	●	●	●	●	●	●
WRP + 2 coats solvent borne or water borne semi transparent stain	●	●	●	●	●	●	●	●
Minimum 2 coats solvent borne or water borne semi-transparent stain	●	●	—	—	—	—	●	●
Minimum 3 coats clear exterior finish**	●	●	—	—	●	●	—	—

NOTES: \*Refer to other Technical Data Sheets for more detailed finishing recommendations for decking, cladding etc. \*\*Will require frequent re-application.

End grain of all timber should be carefully sealed. Sealants should be applied to joints in cladding and joinery to prevent moisture entry. Knots in hoop pine and cypress should be sealed (e.g. with two pack polyurethane) to prevent knot bleeding.

**Primers** provide protection to the substrate and a good base for adhesion of subsequent coats. Primers can also incorporate fungicides. Primers should be applied by brush, as this technique gives better surface wetting and penetration into grain, joints and corners. External timber products such as fascia, cladding, joinery and mouldings may be factory primed. This provides protection from weather and contamination during transport, site storage and construction. Unprimed timber products should be primed all round before installation (i.e. on all surfaces whether exposed or hidden from view) preferably as soon as they reach site. Re-priming is required after any cutting or handling which removes primer or exposes end-grain. Any primed work that has deteriorated through exposure should be cleaned down and re-primed.

**Undercoats** may be required to provide a bridge between primer and top coats. They are designed to bridge cracks, and ensure easy application of finishing coats. As they are opaque they obscure the background colour of the substrate and primer. Solvent and water borne undercoats are available. Undercoats should match the colour of finish coats on unseasoned cladding.

**Finishing coats** are available in both solvent and water borne forms. Water borne finishes have the added advantages of rapid clean-up and faster drying and re-coating times. Finishing coats are available in gloss, semi-gloss/satin and flat/matt or low sheen formulations. Undercoats and finish coats may be applied by brush, roller or airless spray system.

## MAINTENANCE

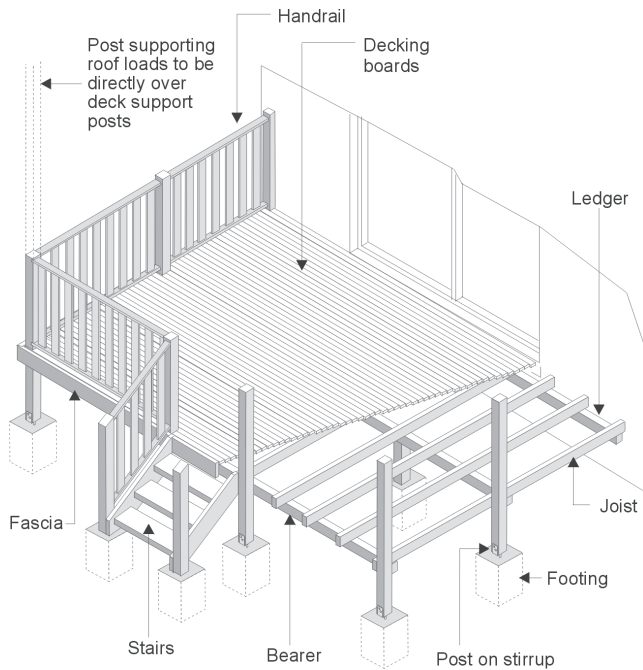
All finish systems require regular maintenance to provide protection for the timber substrate. Mould and mildew should be removed before re-coating as it may spread between coats and even result in lifting of film or stain. Finish performance should be monitored to detect deterioration. Early detection and re-application will often reduce the need for surface preparation such as stripping and sanding.

## SAFE WORKING

Working with timber produces dust particles. Protection of the eyes, nose and mouth when sanding, sawing and planing is highly recommended. Refer to tool manufacturers for safe working recommendations for particular items of equipment and finish manufacturers for material safety data sheets.

*Whilst every effort is made to ensure the accuracy of advice given, Timber Queensland Limited cannot accept liability for loss or damage arising from the use of the information supplied.*

This data sheet contains TQ's recommendations for residential timber decks, verandahs, patios etc which are exposed to the weather. It covers the most common timber species and deck sizes. Footing sizes and deck bracing shall be designed in accordance with the Building Code of Australia (BCA) regulatory requirements. For alternative sizes, spans and stress grades refer to AS 1684 Residential timber framed construction. For commercial and industrial decks, refer to Technical Data Sheet 7. For decks close to the ground (i.e. framing less than 400 mm above ground), refer to Technical Data Sheet 13. For timber handrails and balustrades, refer Technical Data Sheet 23.



**TIMBER SELECTION**

Posts in contact with the ground shall be either preservative treated pine or In-ground Durability Class 1 hardwood, with any sapwood preservative treated. Some In-ground Durability Class 2 hardwoods and cypress (refer Table 1) may be used for in-ground applications if they can be easily replaced should decay occur.

Decking and deck framing above ground shall be either cypress, preservative treated pine or Above Ground Durability Class 1 hardwood. Hardwood decking boards and deck framing containing sapwood must be preservative treated.

Preservative treatment for posts in the ground and framing on the ground, shall be to hazard level H5. Preservative treatment for framing more than 150 mm above ground shall be H3.

Cypress framing may contain limited amounts of sapwood (max. 25% width of face or edge) provided the sapwood does not occur at joints or fixing points.

**TABLE 1 - SPECIES SELECTION**

Species	Posts in Ground	Post and Framing Above Ground	Decking
PRESERVATIVE TREATED PINE (Carribean, Hoop, Radiata, Slash)	✓ H5 Treatment	✓ H3 Treatment	✓ H3 Treatment (See Note 2)
MIXED OPEN FOREST HARDWOODS (QLD, Nthn. NSW)	(See Note 1)	✓	✓
BALAU Yellow			✓
BELIAN			✓
BLACKBUTT	(See Note 1)	✓	✓
CYPRESS	(Sapwood Free)*	✓	✓
GUM Forest Red	✓	✓	✓
GUM Grey	✓	✓	✓
GUM Spotted	(See Note 1)	✓	✓
IRONBARK Red or Grey	✓	✓	✓
KWILA (MERBAU)			✓
MAHOGANY Red	(See Note 1)	✓	✓
MAHOGANY White	✓	✓	✓
MESSMATE Gympie	✓	✓	✓
TALLOWOOD	✓	✓	✓
TURPENTINE	✓	✓	✓

\* See Note 1

Note:

1. These timbers should only be used for in-ground applications if they can be easily replaced if degrade occurs.

2. CCA treated timber shall not be used for domestic decking boards



Cypress decking shall be Grade No. 1 in accordance with AS 1810. Sapwood in cypress decking boards shall face downward and be below or as close as possible to any eaves or roof projection.

Hardwood decking shall be standard (medium feature) grade or select grade in accordance with AS 2796. Select grade decking is recommended in fully weather exposed situations. Softwood

decking shall comply with AS 4785 - Timber - Softwood - Sawn & milled products.

Decking boards shall be seasoned to the requirements of the applicable Australian Standard (i.e. Hardwood 10% to 18%, Softwood 10% to 15%).

Note: TQ recommends a maximum MC of 15% for residential decking.

**TABLE 2 - TIMBER POSTS SUPPORTING ROOF AND/OR FLOOR LOADS**

		Floor Area Supported (m <sup>2</sup> )	5				10				15			
		Roof Area Supported (m <sup>2</sup> )	0	5	10	20	0	5	10	20	0	5	10	20
		Member Size	Maximum Post Height (mm)											
Unseasoned Cypress, F5	Sheet Roof	75 x 75 100 x 100	4800 4800	3800 4300	2700 2100	1900 2100	1700 2000	1600 1900	1400 1700	NS NS	NS NS	NS NS	NS NS	NS NS
	Tile Roof	75 x 75 100 x 100	4800 4800	2600 4600	1800 3200	1200 2300	1800 3300	1600 2900	1300 2600	900 2100	NS 1500	NS 1300	NS NS	NS NS
Seasoned Treated Pine, F7	Sheet Roof	70 x 70 90 x 90	4800 4800	4100 4800	2900 4800	2000 3400	1900 3200	1800 3000	1700 2900	1500 2600	NS 1600	NS 1500	NS 1400	NS 1300
	Tile Roof	75 x 75 100 x 100	4800 4800	2900 4800	1400 1200	1900 3200	1700 2800	1500 2600	1500 2600	1100 2200	NS 1600	NS 1400	NS 1300	NS NS
Unseasoned Hardwood, F14	Sheet Roof	75 x 75 100 x 100	4800 4800	4800 4800	3700 4800	2600 4600	2600 4600	2500 4300	2300 4100	2100 3700	1500 2600	1400 2600	1400 2500	1300 2400
	Tile Roof	75 x 75 100 x 100	4800 4800	3700 4800	2600 3700	1800 2600	2600 4600	2300 4000	2100 3600	1700 3000	1500 2600	1400 2500	1300 2400	1100 2200
Treated Pine Rounds F8	Sheet Roof	100 dia 125 dia 150 dia	2100 3600 4800	2000 3400 4800	1900 3200 4800	1800 2900 4800	1500 2500 4500	1400 2400 4300	1300 2400 4300	1200 2300 4000	900 2000 3600	NS 2000 3600	NS 1900 3500	NS 1800 3400
	Tile Roof	100 dia 125 dia 150 dia	2100 3600 4800	1900 3200 4800	1700 2900 4800	1400 2500 4400	1400 2500 4500	1300 2400 4200	1200 2200 4000	900 2000 3600	NS 2000 3600	NS 1900 3500	NS 1800 3400	NS 1600 3100

**TABLE 3 - BEARERS**

		Floor Load Width (mm) (Length of joists supported)								
		1800	2400	300	3600	1800	2400	3000	3600	
		Maximum Bearer Span (mm)								
		Member Size (mm)	Single Span				Continuous Span			
Unseasoned Cypress, F5	100 x 75	1000	NS	NS	NS	1000	NS	NS	NS	
	2/100 x 50	1300	1100	900	NS	1300	1100	900	900	
	125 x 75	1300	1100	1000	1100	1300	1100	1000	NS	
	2/125 x 50	1600	1400	1300	1100	1600	1400	1300	1100	
	150 x 75	1600	1300	1200	1350	1600	1300	1200	1100	
	2/150 x 50	1950	1650	1500	1300	1950	1650	1500	1350	
	175 x 75	1800	1600	1400	1300	1800	1600	1400	1300	
	2/175 x 50	2200	1900	1700	1600	2200	1900	1700	1600	
	200 x 75	2100	1800	1600	1500	2100	1800	1600	1500	
2/200 x 50	2600	2200	2000	1800	2600	2200	2000	1800		
Seasoned Treated Pine, F7	140 x 45	1300	1100	1000	900	1300	1100	1000	900	
	2/140 x 35	1700	1500	1300	1200	1700	1500	1300	1200	
	2/140 x 45	2000	1700	1500	1400	2000	1700	1500	1400	
	190 x 45	1750	1500	1200	1350	1750	1500	1350	1200	
	2/190 x 35	2400	2000	1800	1600	2400	2000	1800	1600	
	2/190 x 45	2700	2300	2100	1900	2700	2300	2100	1900	
	240 x 45	2200	1900	1700	1550	2200	1900	1700	1550	
	2/240 x 35	3000	2600	2300	2100	3000	2600	2300	2100	
2/240 x 45	3400	2900	2600	2400	3400	2900	2600	2400		
Unseasoned Hardwood, F14	100 x 75	1700	1400	1300	1100	1700	1400	1300	1100	
	2/100 x 50	1900	1700	1600	1400	2100	1800	1600	1400	
	125 x 75	2100	1800	1800	1600	2100	1800	1600	1500	
	2/125 x 50	2400	2200	2000	1800	2600	2300	2000	1800	
	150 x 75	2500	2200	1900	1900	1800	2500	2200	1800	
	2/150 x 50	2900	2600	2400	2200	3100	2700	2400	2200	
	175 x 75	2900	2600	2300	2100	2900	2600	2300	2100	
	2/175 x 50	3300	3000	2800	2600	3700	3200	2800	2600	
	200 x 75	3400	2900	2600	2400	3400	2900	2600	2400	
2/200 x 50	3700	3400	3200	3000	4200	3600	3200	3000		

- Notes:
1. Bearers to support floor loads only. Posts supporting roof to be directly over deck supports.
  2. Maximum cantilever can be 25% of allowable span provided the actual backspan is at least twice the actual cantilever.
  3. Sizes greater than 200 mm deep may not be readily available.
  4. For other stress grades and sizes refer to AS1684 Residential timber-framed construction.

**TABLE 4 - FLOOR JOISTS (450 MM SPACING)**

	Member Size (mm)	Maximum Floor Joist Span (mm)	
		Single Span	Continuous
Unseasoned Cypress, F5	100 x 50	1400	1700
	125 x 50	2200	2200
	150 x 50	2600	2600
	175 x 50	3000	3000
	200 x 50	3500	3500
Seasoned Treated Pine, F7	90 x 45	1300	1700
	120 x 45	2200	2200
	140 x 45	2600	2600
	190 x 45	3600	3600
	240 x 45	4500	4500
Unseasoned Hardwood, F14	100 x 50	2200	2500
	125 x 50	2800	3200
	150 x 50	3400	3800
	175 x 50	3900	4500
	200 x 50	4400	5100

Notes:

1. Joists to support floor loads only. Posts supporting roof to be directly over deck supports.
2. Maximum cantilever can be 25% of allowable span provided the actual backspan is at least twice the actual cantilever.
3. Sizes greater than 200 mm deep and 7200 mm long may not be readily available.
4. 45/50 mm wide joists are recommended where decking boards are nail fixed to tops of joists. 35/38 mm wide joists are suitable where side of joist proprietary fixings (e.g. Deklok) are used.
5. For other stress grades and sizes refer to AS 1684 Residential timber-framed construction.

**TERMITE PROTECTION**

Physical and/or Chemical barriers must be provided to protect the deck and to ensure termites do not bypass protection systems to adjacent structures. Termite barriers must be designed so that they can be readily inspected and maintained.

Where adequate termite protection is not provided to decks, they shall be completely isolated from any adjacent structure.

**MEMBER DESIGN**

Tables 2, 3 and 4 list sizes for posts, bearers and joists, for common member spacings and commonly used timber stress grades.

The following tolerances apply:-

- Unseasoned Cypress + 2 mm - 4 mm
- Seasoned Pine + 2 mm - 0 mm
- Unseasoned Hardwood + 3 mm - 3 mm.

The sizes for bearers and joists do not allow for roof loads (i.e. posts supporting roof to be continuous to the ground or be positioned directly over deck supports) and are suitable for a maximum decking mass of 20 kg/m<sup>2</sup>.

For alternative sizes, spans and stress grades or for members supporting roof loads, refer to AS 1684 Residential timber-framed construction.

**FIXINGS**

Post stirrups shall be hot dipped galvanised.

Bolts, screws and nails shall be hot dipped galvanised or stainless steel (not zinc plated).

Proprietary connectors (joist hangers, framing anchors, etc), in fully weather exposed situations, shall be either hot dipped galvanised,

stainless steel or with a fused or baked epoxy coating in accordance with manufacturer’s recommendations.

Notes:

1. Standard galvanised connectors (Z 275 class) are only recommended when weather protected (i.e. under roof).
2. In corrosive environments (i.e. close to the coast, swimming pools, etc), higher levels of protection are required.
3. The above recommendations apply to treated timber which remains dry in service. Proprietary connectors used with CCA, ACQ or copper azole treated timber, which remains moist (i.e. over 20% for extended periods), shall be either stainless steel or with a fused or baked epoxy coating (not standard or hot dipped galvanised).

**ATTACHING DECKS TO HOUSE**

Ledgers shall be a minimum 90 x 45 mm treated pine, hardwood or cypress, fixed to house framing (studs, joists or bearers) with 12 mm dia. hot dipped galvanised bolts or coach screws at 900 mm maximum spacing. Ledgers may be fixed with masonry anchors to structural brick or block walls in accordance with manufacturer’s instructions.

Note: Brick veneer or other single skin brick walls may not be structurally adequate and require additional piers or freestanding posts.

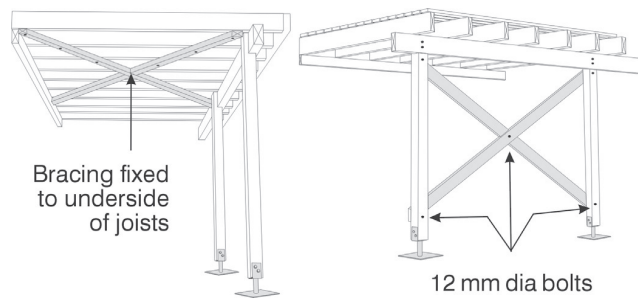
**BRACING**

Decks shall be braced to prevent lateral movement and shall be designed in accordance with the BCA and regulatory requirements. Where timber braces are used they shall be double diagonal 100 x 38 mm hardwood or 90 x 45 mm treated pine, halved at the crossing.

Decks attached to the house shall have double diagonal bracing either:

- (a) fixed to the underside of joists with each brace fixed to each joist with 75 mm No. 14 Type 17 batten screws or two 75 x 3.15 mm nails, or
- (b) for decks greater than 1800 mm high, fixed between a pair of posts, parallel to the wall, with the ends of braces bolted to posts with 12 mm dia. bolts.

Freestanding decks greater than 1800 mm high shall be braced in both directions with double diagonal braces between at least two pairs of posts at right angles. Freestanding decks less than 1800 mm may have posts embedded in the ground to provide lateral bracing.

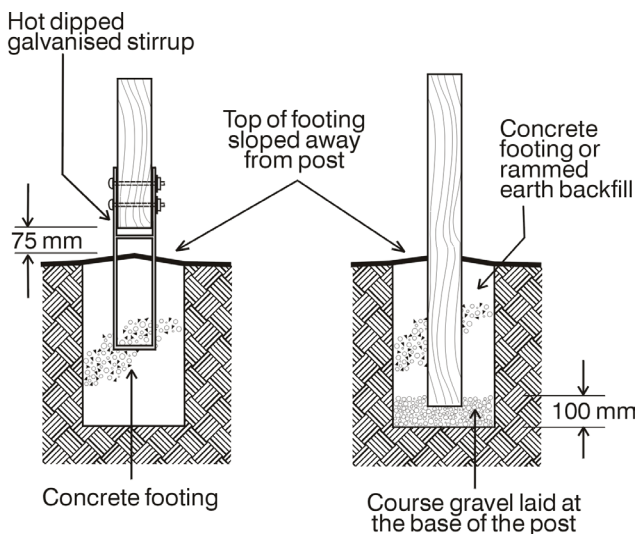


**INSTALLING POSTS**

Footings for decks etc shall be in accordance with the BCA regulatory requirements. Timber posts should preferably be fixed to hot dipped galvanised steel stirrups set in concrete. A minimum clearance of 75 mm shall be provided between the top of the concrete footing and the bottom of the post as a termite inspection zone.

Posts embedded in the ground shall be a durable species (refer Table 1). Holes for embedded posts shall be filled with 100 mm depth of coarse gravel (to allow water to drain) before backfilling

with concrete or rammed earth. 'No fines' concrete is recommended for hardwood posts. Top of backfill to be sloped away from posts to shed water. Termite protection to embedded posts shall be provided by stainless steel mesh (Termimesh) socks or caps or by chemical treatment to the surrounding ground.



### INSTALLING BEARERS

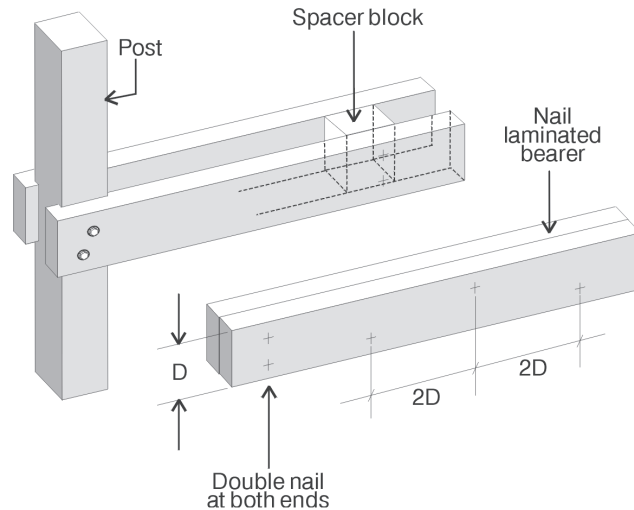
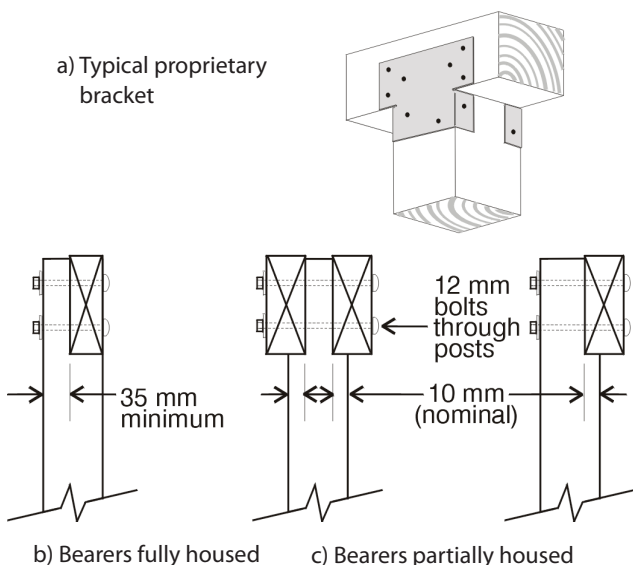
Bearers shall be adequately fixed to posts.

Either:-

- Where bearers sit on top of posts, fixed with proprietary post caps or brackets in accordance with manufacturer's instructions, or
- With bearers housed into posts and bolted with two 12 mm dia. bolts. (Minimum 35 mm of post to remain after housing), or
- For double bearers or where posts continue up to support handrails or roof, partially housed (10 mm nominal) into side of posts and bolted with two 12 mm dia. bolts.

Note: Housed joints shall be coated with water repellent preservatives or oil based primer

Seasoned double bearers may be either spaced or nail-laminated together with staggered nails, at a spacing equal to twice the bearer depth. Unseasoned double bearers shall be spaced. Where double bearers are spaced, solid timber spacing blocks shall be provided and bolted between the bearers at mid-span.



### INSTALLING JOISTS

Joists shall be fixed on top of bearers or ledgers at 450 mm maximum spacing with either two 75 mm x 3.15 mm skew nails or proprietary framing anchors or brackets.

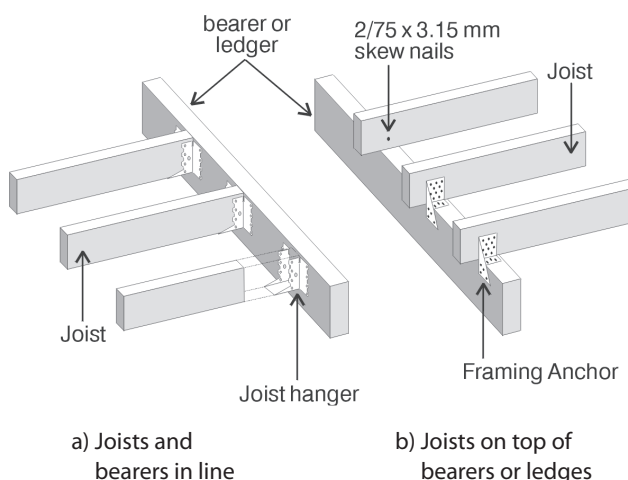
Alternatively, joists may be installed in line with bearers and/or ledgers and fixed to proprietary joist hangers in accordance with manufacturer's recommendations.

Note: Nails for proprietary connectors to be hot dipped galvanised

Sizes shown in Table 4 list only 45 mm and 50 mm wide joists although 35/38 mm wide joists may be structurally adequate. Joists 45/50 mm wide are recommended because they are less prone to splitting and provide better bearing and fixing for decking boards at joins and ends. Joists 35/38 mm wide may be suitable for use where decking is fixed to sides of joists with proprietary fixings (Refer AS 1684 for larger range of joist sizes).

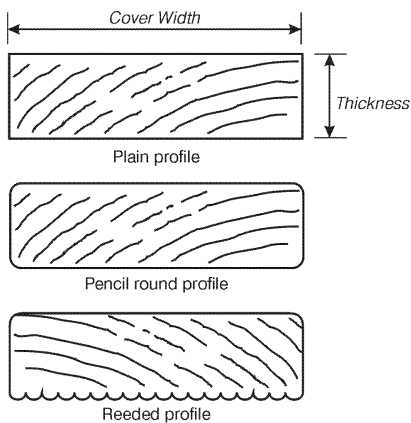
Where depth of joist is greater than four times the width, solid blocking shall be provided between joists at each support. For joists spans over 3 m, additional herringbone strutting or solid blocking should be provided in evenly spaced rows as follows:-

- For spans over 3.0 m to 4.2 m - one row
- For spans over 4.2 m - two rows equally spaced.



### DECKING

Decking boards are available plain (square edged), with pencil round or arrised edges, or with one reeded or ribbed surface. Tongue and grooved flooring must not be used for weather exposed decks.



Standard cover widths are:-

Cypress	68 mm
Treated Pine	70 mm or 90 mm
Hardwood	63 mm, 86 mm or 135mm

Narrow boards are recommended as they shed water more readily and are therefore less prone to cupping and twisting.

Reeded or ribbed decking may be fixed with reeded face down or up (owners choice), however where fixed with reeded face up (as a "non-slip" surface), decking must be regularly maintained as build up of dirt and mould in grooves can make surfaces more slippery and accelerate decay.

Decking boards shall be seasoned to the requirements of the applicable Australian Standard (i.e. hardwood 10% to 18%, softwood 10% to 15%).

Note: TQ recommends a maximum MC of 15% for residential decking.

TABLE 5 - DECKING

Species	Min. Grade	Thickness (mm)	Max. Joist Spacing (mm)	Nailing Requirements (see Note #)
Hardwood	Standard Grade (AS 2796)	19	500	50 x 2.8 Galv Bullet Head
		25	650	65 x 2.8 Galv. Bullet Head
	F17 (AS 2082)	32	800	65 x 2.8 Galv. Bullet Head
Cypress*	Standard Grade (AS 1810)	21	450	50 x 2.8 Galv Bullet Head
	F5 (AS 2858)	34	700	65 x 2.8 Galv. Bullet Head
Treated Pine (H3)	Standard Grade (AS 1782)	35	750	65 x 3.15 Galv. Flat Head or 75mm Batten Screw
	F17 (AS 2858)	45	950	65 x 3.15 Galv. Flat Head or 75mm Batten Screw

Notes:

\* Cypress containing sapwood should not be used closer than 250mm from ground. Refer recommendations in AS 1810.

# Where joists are treated softwood, nails shall be deformed ring shank, or alternatively screws.

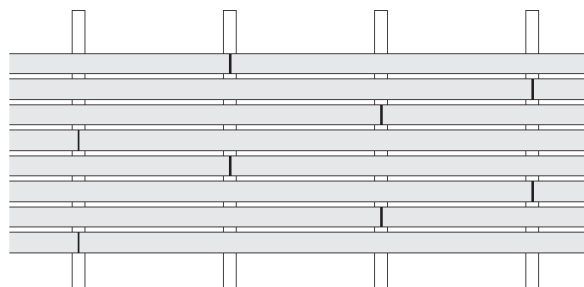
Recent comparative laboratory withdrawal tests carried out by Timber Queensland on a wide range of commercially available machine driven nails indicated a large variation in machine nail withdrawal resistance. Installers of decking should ensure that machine nails used have equal or better withdrawal resistance than the hand nails given above. Installers should obtain comparative withdrawal information from nail suppliers or conduct comparative trials (pinch bar) on test material before using a particular machine nail.

## INSTALLING DECKING

The top surface of joists and all surfaces of decking boards shall have a coat of water repellent preservative or oil based primer plus one coat of the selected finish (paint or stain) applied before fixing decking (refer Finishes). Table 5 lists the required fixings for domestic decking.

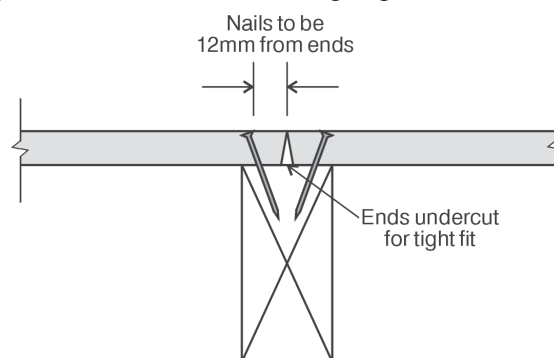
Hardwood and Cypress decking shall be spaced with 3 mm gaps. Softwood decking shall have 5 mm gaps.

Butt joints shall be staggered (i.e. not on adjoining boards).



Joints staggered

A slight back-cut will assist in obtaining a tight fit at butt ends.



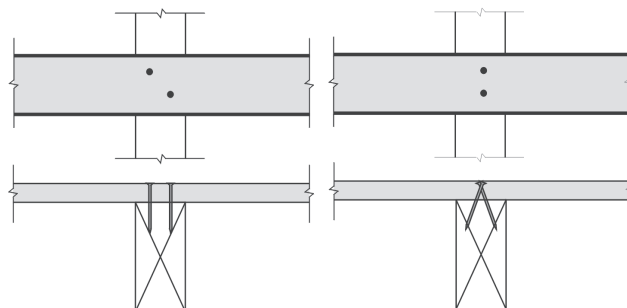
Each board shall be fixed at every joist crossing with two nails as required by Table 5. Alternatively, proprietary fixings may be used in accordance with manufacturer's instructions.

Nails shall be hot dipped galvanised or stainless steel (not zinc plated). Within 1 metre of swimming pools, stainless steel or silicon bronze fixings are recommended.

Nails shall be kept 12 mm from edges and ends of boards. Nail holes at butt joints shall be predrilled (80% nail diameter) to avoid splitting.

Nails shall be driven flush with surface (not punched).

At intermediate fixings nails shall either be offset or driven at slightly opposing angles.



Nails/screws offset

Nails/screws at opposing angles

## HANDRAILS AND BALUSTRADES

Decks more than one metre above ground require a handrail or balustrade. Refer to TDS 23 for Timber Handrails and Balustrades.



## FINISHING

All decks shall have a finish applied as protection against the weathering effects of sun and rain.

*Note: Unprotected timber exposed to the weather will fade to a silver-grey colour and could distort and develop splitting and surface checking.*

One coat of a water repellent preservative or an oil based primer plus one coat of the selected finish shall be applied to the top surface of joists and to all surfaces of decking (including cut ends) prior to fixing. Additional coats shall be applied (to manufacturer's instructions) to the top surface of decking after construction.

**The following finish types are available:**

### Clear Finishes/Water Repellent Preservatives (WRP)

These are generally water repellent materials (waxes, resins, etc.) in a light organic solvent base. They often also contain chemicals which inhibit decay. These finishes provide protection against moisture and are recommended as a priming coat for other coatings. The compatibility of WRP with other coatings should however be checked. Generally, two weeks is required between application of WRP and other finishes.

Clear finishes provide minimal protection against the UV effects from the sun. When used on their own they require reapplication at about six monthly intervals.

*Note: Clear polyurethane finishes can breakdown under UV exposure and are not recommended for external use.*

### Paints

Opaque paint finishes provide the best protection against weathering, however they obscure the natural colour and grain of the timber. Pale colours are recommended. Normal paints cannot withstand the wear from foot traffic, therefore only special decking paints should be used, strictly in accordance with manufacturer's recommendations.

*Note: Oil-based primers are recommended for both oil-based and water-based paint finishes.*

Recoating is necessary every five to seven years, depending upon exposure. Additional preparation (sanding, repriming etc.) is frequently necessary.

### Decking Oils/Decking Stains

Decking oils and stains are available which provide a relatively natural, semi-transparent, protective finish. Solvent (Oil) or water based stains are available often with mould inhibiting additives. Decking stains with light coloured pigments are recommended as they absorb less heat and only slightly change the natural colour of the timber.

Reapplication is generally necessary every two to five years depending upon the amount of pigment included, and the degree of exposure. Apart from cleaning, no additional surface preparation is generally required.

## MAINTENANCE

Frequent wetting of decks should be avoided (sweep or clean, don't hose). Adequate ventilation should be provided to allow rapid drying after rain or watering. Pot plants should be on trays and prevented from overflowing. Shrubs which permanently shade the deck and creepers on rails etc. should be avoided.

Reapplication of finishes will be required at regular intervals, depending on finish type and degree of exposure. Before recoating all decks shall be thoroughly cleaned and debris removed from between boards. For some finishes, decks may also require sanding. Recoating shall be carried out in accordance with the manufacturer's recommendations

## SAFE WORKING

Working with timber produces dust particles. Protection of the eyes, nose and mouth when sanding, sawing and planing is highly recommended. Refer to tool manufacturers for safe working recommendations for particular items of equipment.

## DISPOSAL OF OFFCUTS AND WASTE

For any treated timber, do not burn offcuts or sawdust. Preservative treated offcuts and sawdust should be disposed of by approved local authority methods.

*Whilst every effort is made to ensure the accuracy of advice given, Timber Queensland Limited cannot accept liability for loss or damage arising from the use of the information supplied.*

When designing and building timber decks where timber is less than 400 mm from or on the ground, considerations must be given to the following to ensure good long term performance:-

- adequate ventilation • surface drainage • correct timber species selection
- access for future maintenance and termite control.

### TIMBER SELECTION

Where framing timbers are more than 150 mm above the ground timber should be termite resistant, Above Ground Durability Class 1 or better (with sapwood H3 treated) e.g. blackbutt, spotted gum, ironbark, cypress, forest red gum, Gympie messmate, or H3 or better preservative treated softwoods.

For lower decks or those on the ground, framing timber should be In-ground Durability Class 1 (sapwood treated to H5) or H5 preservative treated softwood.

Decking boards should be Above Ground Durability Class 1 (sapwood treated to H3), or H3 preservative treated softwood. Commonly available timber suitable for this purpose include - turpentine, spotted gum, ironbark, forest red gum, white mahogany, tallowwood, blackbutt, cypress, merbau (kwila), balau and preservative treated pine. These timbers are termite resistant.

*Note: CCA treated decking boards shall not be used in residential applications.*

### TIMBER SIZES

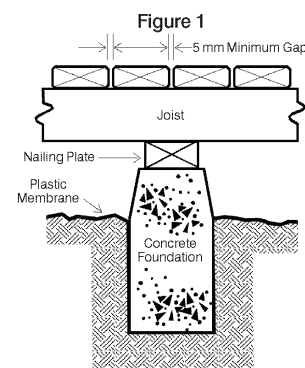
For sizes of bearers, joists and allowable floor joist spacings, refer to Tables 1 - 3. Other grades and sizes can be used. Refer to Timber Queensland for details.

*Note: Tongue and Groove flooring should not be used in weather exposed situations.*

### BEFORE CONSTRUCTION

The ground beneath the deck should be graded away from adjacent buildings and the deck so that water does not pond. In some cases agricultural drainage pipes may be needed to ensure water is removed from under the deck.

It would also be good practice to lay down a plastic membrane under the deck, covered with gravel or sand to keep it in place. This will help keep soil moisture from affecting the timber as well as preventing any vegetation growth.



### TERMITE PROTECTION

Only termite resistant timbers should be used for these decks. However, protection of the dwelling to which the deck adjoins must also be considered. This could be achieved by leaving an appropriate gap for inspection (refer figure 2). It may be necessary to provide a removable panel, to inspect physical barriers (e.g. metal caps) or to retreat where a chemical perimeter treatment to Australian Standard AS 3660.1 has been used on the dwelling.

### FINISHING BEFORE FIXING

For maximum serviceability and protection against weathering, timber decking should be properly finished and maintained. Before fixing, the following should be applied:-

#### (i) For Oil Based Stain Finishes

- Give all faces and edges of decking and top edge of deck joists one coat of water repellent preservative such as:
  - \* 10% copper naphthenate in a light organic solvent.
  - \* 20% zinc naphthenate in a light organic solvent and,
- The first coat of stain should be applied all round to decking and to top edge of deck joists before laying.

*Note: Some stains may not be compatible with water repellent preservatives. Seek stain manufacturer's advice before applying finish.*

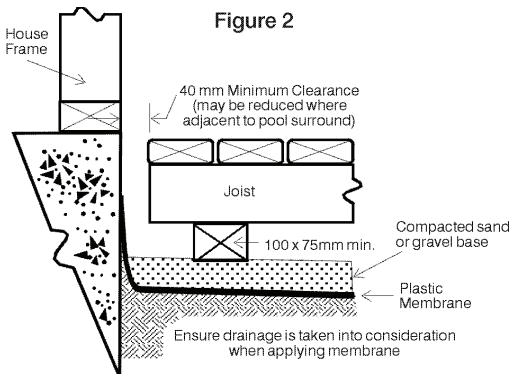
**(ii) For Acrylic Stains and Paint Finishes**

All faces and edges of decking and top edge of deck joists should be primed with a good quality wood primer, followed by one coat of the selected decking paint (as per the manufacturer’s specifications).

*Note: Pale colours are best, dark colours can accelerate degrade and decay.*

**(iii) End Sealing**

All cut ends should be sealed with preservative, stain or primer, depending on the final coating, prior to being fixed in position.



**CONSTRUCTION**

A number of methods are suitable depending on the design. For very low decks, “bearer less construction” could be used. i.e. floor joists are supported on a nailing plate on concrete beam walls (refer Figure 1). This method is acceptable as long as the concrete does not inhibit drainage. Likewise, timber bearers could be laid directly on a well drained gravel/sand or concrete base as long as they are of minimum Durability Class 1 or H4 treated softwood, and again do not inhibit the drainage of water. A panelised decking system could be used to allow for easy maintenance and inspection.

Due to the proximity to the ground, ventilation is very important. For this reason, the perimeter of the deck should be kept open.

For decking laid directly over the ground or to bearers on concrete, boards should be limited to a maximum nominal width of 100mm.

For decking, a minimum spacing between boards of 5 mm is recommended.

**FIXINGS**

All bolts , screws, nails, brackets, framing anchors and other hardware should be **hot dipped galvanised or stainless steel**. Electroplated fasteners are not suitable due to early breakdown of the plating.

For recommended minimum nail size for fixing the decking refer to Table 1. Each board (over 68 mm wide) should be fixed at every joist crossing with two nails. Nails should be located at least 12 mm from board edges. The ends of boards should be predrilled prior to nailing to avoid splitting. Adjacent nails should be driven at slightly opposing angles. When bullet head nails are used with hardwood or cypress decking, they should be driven flush with the surface. Do not punch and fill.

*Special Note:- Fixings within 1 metre of pool surround should be stainless steel or monel metal.*

**FINISHING AFTER INSTALLATION**

Timber serviceability is enhanced by the application of a suitable finish, whether the surface be sawn or dressed. The finish may take the form of a clear external decking finish, a pigmented oil based stain, or a good quality paint system. The use of the finish should be in accordance with the finish manufacturer’s recommendations. The retention of the timber’s original colour cannot be guaranteed with the use of a clear finish.

**MAINTENANCE**

The long term performance of timber decking in weather exposed situations is dependant on regular and effective maintenance. The frequency of maintenance will depend on the type of finish and the degree of exposure to the weather.

Before recoating, the decking should be thoroughly cleaned and the gaps between boards, particularly over joists, cleared of debris. Recoating should be carried out in accordance with the finish manufacturer’s specifications.

The over-watering of pot plants standing on timber decks should be avoided. It is recommended that pots be placed in drip trays standing on small cleats. Where possible decks should be broom/ blower cleaned rather than cleaned by hosing.

**TABLE 1 - DECKING**

Species	Min. Grade	Thickness (mm)	Max. Joist Spacing (mm)	Nailing Requirements (see Note #)
Hardwood	Standard Grade (AS 2796)	19	500	50 x 2.8 Galv Bullet Head
		25	650	65 x 2.8 Galv Bullet Head
	F17 (AS 2082)	32	800	65 x 2.8 Galv Bullet Head
Cypress*	Standard Grade (AS 1810)	21	450	50 x 2.8 Galv Flat Head
	F5 (AS 2858)	34	700	65 x 2.8 Galv Bullet Head
Treated Pine (H3)	Standard Grade (AS 1782)	22	450	50 x 2.8 Galv Flat Head
		35	750	65 x 3.15 Galv Flat Head or 75 mm Batten Screw
	F7 (AS 2858)	45	950	75 x 3.15 Galv Flat Head or 75 mm Batten Screw

Notes:

\* Cypress containing sapwood should not be used closer than 250 mm from ground. Refer recommendations in AS 1810.

# Where joists are treated softwood, nails shall be deformed ring shank, or alternatively screws.

Recent comparative laboratory withdrawal tests carried out by Timber Queensland on a wide range of commercially available machine driven nails indicated a large variation in machine nail withdrawal resistance. Installers of decking should ensure that machine nails used have equal or better withdrawal resistance than the hand nails given above. Installers should obtain comparative withdrawal information from nail suppliers or conduct comparative trials (pinch bar) on test material before using a particular machine nail.

**TABLE 2 - BEARERS**

Species	Stress Grade	Spacing of Bearings to (m)	Size of Bearers (mm) for spans of		
			1.2 m	1.5 m	1.8 m
Cypress *	F5	1.8	100 x 75	125 x 75	125 x 75
Treated Pine (H4)	F7	1.8	90 x 70	120 x 70	120 x 70
Hardwood	F14	1.8	75 x 75	125 x 75	125 x 75

Note: Bearers lying directly on ground: 75 x 100 (on flat).

\* Limit Sapwood

**TABLE 3 - JOISTS**

Species	Stress Grade	Spacing of Bearings to (m)	Size of Bearers (mm) for spans of		
			1.2 m	1.5 m	1.8 m
Cypress *	F5	450	100 x 50	100 x 50	125 x 50
Treated Pine (H4)	F7	450	90 x 45	120 x 45	120 x 45
Hardwood	F14	450	75 x 50	100 x 50	100 x 50

### SAFE WORKING

Working with timber produces dust particles. Protection of the eyes, nose and mouth when sanding, sawing and planing is highly recommended. Refer to tool manufacturers for safe working recommendations for particular items of equipment.

### DISPOSAL OF OFFCUTS AND WASTE

For any treated timber, do not burn offcuts or sawdust.

Preservative treated offcuts and sawdust should be disposed of by approved local authority methods.

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This data sheet provides general guidance on member sizes, connections and suitable materials for the construction of handrails and balustrades. The information provided in this data sheet does not preclude the use of manufacturer's proprietary information where this satisfies the requirements of the regulatory authority.

**INTRODUCTION**

For all Classes of building, handrails and balustrades are required to comply with the Building Code of Australia (BCA). The BCA requirements include design and construction provisions for the various components including compliance with the loading provisions of AS 1170.1 Structural design actions Part 1: Permanent, imposed and other actions.

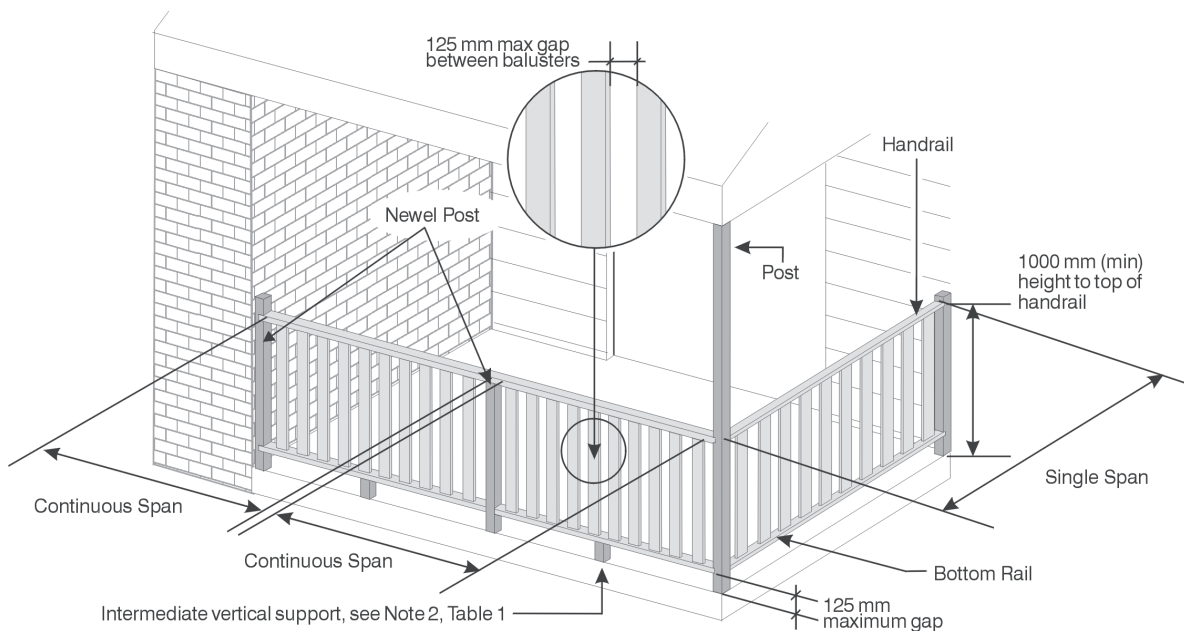
For handrails and balustrades, the BCA is primarily concerned with the safety of building users and occupants. Design and construction must therefore take into consideration both the strength and durability of materials and components as well as the "geometric" constraints prescribed by the BCA to prevent people from accidentally falling through, under or over the balustrade.

The BCA should be consulted to determine where handrails and balustrades are required and for specific details regarding handrails for stairs, geometric limitations and other criteria.

**LOADS**

AS 1170.1 requires balustrades and railings together with members and connections which provide structural support to be able to resist the following factored limit state loads - 0.9kN inward, outward and downward load at any point. It also requires balustrades and handrails to be able to resist a factored horizontal or vertical loads of 0.53kN/m for all areas within or servicing exclusively one dwelling including stairs and landings but excluding external balconies and 1.13kN/m for external balconies in domestic and other residential buildings. Infill, including balusters, should be capable of resisting 0.75kN in any direction.

*Note: In addition, AS 1170 recommends other design loads for specific conditions such as to restrain crowds or people under panic conditions. For this case, design to resist a uniform load of 4.5kN/m is required. For these conditions, handrail and balustrade systems should be specifically designed and are not covered in this data sheet.*



**Figure 1. Balustrade terminology and dimensions**

## MATERIALS (Timber - general)

### Durability

In **weather exposed** above ground applications or, where subjected to other sources of moisture, handrails, posts, newels, balusters, and infill should be either Above Ground Durability Class 1 species such as blackbutt, spotted gum, ironbark, jarrah, merbau or kwila with any sapwood present treated to H3 (or higher) or, H3 (or higher) treated softwood such as slash, hoop or radiata pine. Preservative treatment shall comply with AS 1604.

Note: Meranti, Victorian Ash and Tasmanian Oak are not suitable for weather exposed applications.

For **internal use**, timber of any durability class is suitable.

### Timber Grade

The timber should be free from any major strength reducing features, be straight grained and be in accordance with the following:-

- Hardwood (Including Meranti) – AS 2796 – Timber - Hardwood – Sawn and milled products - Clear or select grade
- Softwood (Including imported softwood) – AS 1786 – Joinery timber milled from Australian grown conifers – Clear grade

Note: Finger jointed timber shall comply with AS 1491 – ‘Finger jointed structural timber’ and laminated timber shall comply with AS 1328 – ‘Glued laminated structural timber’.

## MATERIALS (Structural Properties & sizes)

### Handrails

Handrail sizes and spans shall be in accordance with Table 1.

Note: 1. Manufacturers that use this data sheet as the basis of their design should ensure that their products satisfy Australian Standards and have the relevant minimum mechanical properties including the following:-

**Hardwood** – Stress Grade F22, (characteristic bending strength  $f'b = 65$  MPa, Modulus of elasticity  $E = 16000$  MPa) and Joint Group JD2. Examples - spotted gum, ironbark, blackbutt, kwila and merbau.

**Meranti and Australian Softwood** – (characteristic bending strength  $f'b = 25$  MPa, Modulus of elasticity  $E = 9100$  MPa) and Joint Group JD4. Examples - radiata pine, hoop pine, slash pine and meranti.

**Imported Softwood** - (characteristic bending strength  $f'b = 25$  MPa, Modulus of elasticity  $E = 6900$  MPa) and Joint Group JD4. Examples - New Zealand radiata pine.

2. Unless branded to identify that it is ‘Australian Grown’, softwood balustrades spans shall be determined from the ‘Imported Softwood’ spans given in Table 1.

### Posts / Newel Posts

Posts and Newel posts shall have a minimum Stress Grade of F5. Where supporting handrails/balustrades only, the minimum size of posts and newel posts shall be 80x80 mm (maximum post spacing 3600mm and height of 2700 mm).

Where supporting roof and or floor loads, refer to AS 1684 to determine minimum size but shall be not less than 80x80 mm.

### Infill / Balusters

The minimum size of infill/balusters shall be as follows:-

Hardwood - 25 x 19 mm or 25mm diameter

Softwood – 62 x 19 or 35 mm diameter

### Corrosion Resistance

For weather exposed applications, all metal connections including nails, screws, bolts and brackets should be a minimum of hot dipped galvanised (or for screws, Class 3 corrosion resistance as per AS 3566). For coastal environments subjected to airborne salt deposition,

stainless steel or equivalent corrosion resistant metal connections should be used.

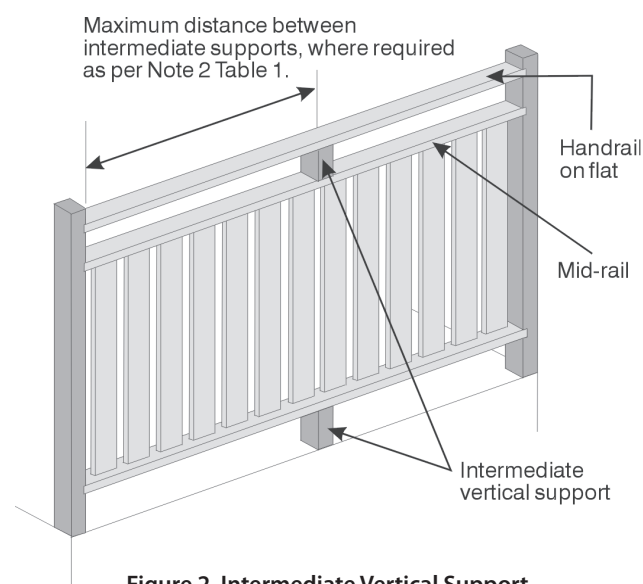


Figure 2. Intermediate Vertical Support

TABLE 1 - HANDRAILS

Timber	Size / Description	Maximum span of Handrail (mm)			
		Within or exclusively servicing one Dwelling (excluding external balconies)		Other areas in Residential Buildings (including external balconies)	
		No Intermediate Vertical Supports (1)	With Intermediate Vertical Supports (2)	No Intermediate Vertical Supports (1)	With Intermediate Vertical Supports (2)
Hardwood	65 x 65 (profiled)	3000	3000	3000	3000
	42 x 65 (profiled)	2200	2700	2200	2700
	42 x 85 (profiled)	2400	3400	2400	3400
	35 x 70	2100	3000	2100	3000
	35 x 90	2200	3600	2200	3600
	35 x 120	2400	3600	2400	3600
	45 x 70	2500	3200	2500	3200
	45 x 90	2700	3600	2700	3600
	45 x 120	2900	3600	2900	3600
	70 x 70	3500	3500	3500	3500
70 x 90	3600	3600	3600	3600	
Meranti and Australian Grown Softwood	65 x 65 (profiled)	2700	2700	2200	2200
	42 x 65 (profiled)	1400	2000	1400	1800
	42 x 85 (profiled)	1800	3000	1700	2400
	35 x 70	1200	2400	1200	2000
	35 x 90	1600	3200	1600	2500
	35 x 120	2100	3600	1800	3400
	45 x 70	2000	2800	1800	2200
	45 x 90	2400	3400	2000	2900
	45 x 120	2600	3600	2400	3600
	70 x 70	3200	3200	2800	2800
70 x 90	3400	3600	3200	3600	
Softwood Imported or Unknown Origin	65 x 65 (profiled)	2400	2400	2200	2200
	42 x 65 (profiled)	1400	2000	1400	1800
	42 x 85 (profiled)	1800	2700	1700	2400
	35 x 70	1200	2400	1200	2000
	35 x 90	1600	2900	1600	2500
	35 x 120	1900	3600	1800	3400
	45 x 70	2000	2600	1800	2200
	45 x 90	2200	3100	2000	2900
	45 x 120	2300	3600	2300	3600
	70 x 70	2900	2900	2800	2800
70 x 90	3000	3400	3000	3400	

(see notes over page)

Notes

1. Handrails with no intermediate vertical supports may be used on flat or on edge. See Figure 3.
2. Handrails with intermediate vertical supports shall be installed on flat with intermediate vertical supports spaced not greater than the allowable spans given for the same handrail with no intermediate vertical supports. See Figures 2 and 3.
3. Where a mid-rail (minimum size 42x65) is within 150mm of the main handrail and is rigidly fixed to it (using blocks, or balusters or dowels that pass through the mid rail and are fixed to the top rail) at least once at mid span, the allowable span of the handrail may be increased by 300mm.
4. Handrail spans have been limited to 3600 mm maximum.
5. Profiled sections typically include bread loaf, ladies waist and colonial profiles.
6. There is no negative tolerance permitted on the breadth or depth dimensions (overall outside dimensions of profiled shapes) given in the above table.

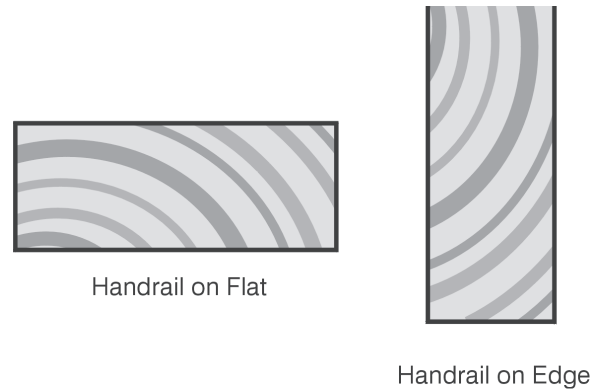


Figure 3. Handrails - on flat / on edge

CONNECTIONS

TABLE 2 - LOADS ON HANDRAILS

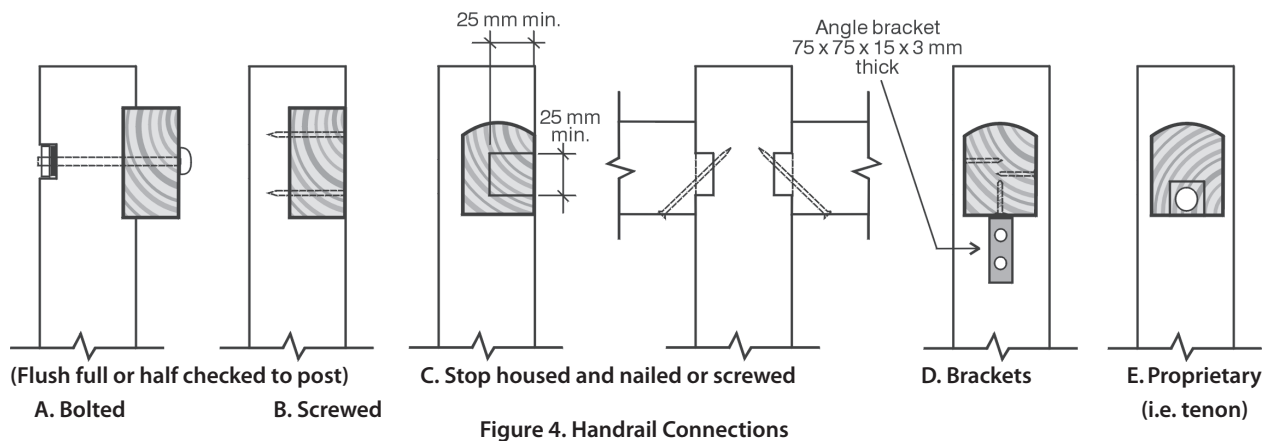
Span Type	Handrail Span (mm)	Handrail Connection Loads (kN)		EXAMPLE OF DETERMINING HANDRAIL CONNECTION
		Within or exclusively servicing one Dwelling (exc. external balconies)	Other Areas in Residential Buildings (inc. external balconies)	
Single Span	1800	0.90	1.0	<p>The shaded areas in Tables 2 and 3 provide a guide to the selection of an appropriate connection for a Class 3 Building with a continuous span softwood handrail span of 2400mm.</p> <p><b>Step 1.</b> From Table 2 determine the load on the handrail = 2.7 kN</p> <p><b>Step 2</b> From Table 3 and Figure 4, determine a connection with the capacity to resist 2.7 kN.</p> <p><b>Step 3</b> Acceptable solutions determined from Table 3 are:-                      Type A connection, 1/M10 bolt or                      Type B connection, 2/No 10 screws or                      Type D connection, 2 No 10 screws per leg of bracket</p>
	2100	0.90	1.2	
	2400	0.90	1.4	
	2700	0.90	1.5	
	3000	0.90	1.7	
	3300	0.99	1.9	
3600	1.1	2.0		
Continuous Span	1800	1.1	2.0	
	2100	1.3	2.4	
	2400	1.4	2.7	
	2700	1.6	3.0	
	3000	1.8	3.4	
	3300	2.0	3.7	
3600	2.2	4.1		

TABLE 3 - CAPACITY OF HANDRAIL CONNECTIONS

Timber	Capacity of Connections (kN)												
	Type A		Type B		Type C				Type D		Type E		
	No. Bolts	Bolt Size (Cuphead)		No. Screws	Screw Size (Type 17)		Screws		Nails		2 / Screws per leg of bracket		Refer to Manufacturers specifications
	M10	M12		No 10	No14	2/No 10	2/No 14	2/3. 15 dia	2/3. 75 dia	No 10	No 14		
Hardwood (JD2)	1	13	14	1	3.4	4.4							
	2	26	28	2	6.8	8.8	1.9	2.3	1.6	1.8	4.9	7.6	
Softwood and meranti (JD4)	1	8	9	1	2.0	2.6							
	2	16	18	2	4.0	5.2	1.1	1.3	0.9	1.0	2.8	4.3	

Notes:

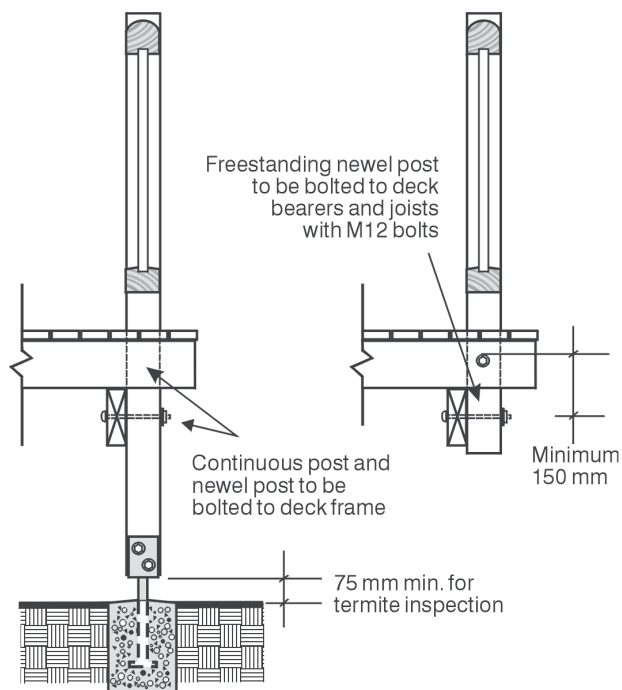
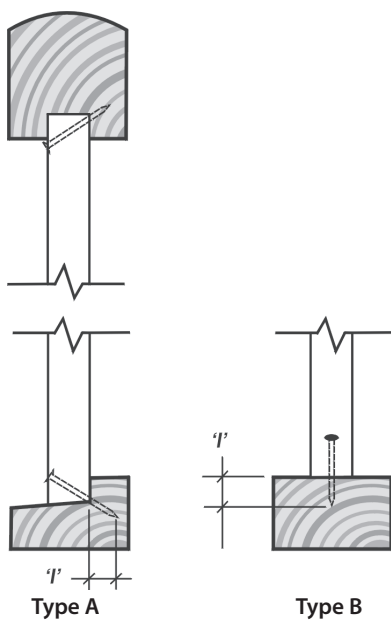
1. For Type B connections, minimum screw penetration into post is 38mm.
2. For Type C connections the minimum screw penetration into post is 40mm and the minimum nail penetration into post is 38mm.
3. Midrails and bottom rails shall be fixed with a minimum of 2 / 3.15 dia. skew nails.



**TABLE 4 - CONNECTORS FOR BALUSTERS / INFILL**

Timber	Type A - Minimum Nail / Screw Penetration 'l' (mm)				Type B - Nail in shear minimum penetration 'l' (mm)
	Nails		Screws		
	2 / 2.5 dia.	2 / 2.8 dia.	1 / No. 8	1 / No. 10	
Hardwood (JD2)	22	20	15	15	1 / 2.5 dia x 25 penetration
Softwood and meranti (JD4)	53	47	15	15	2 / 2.5 dia x 25 penetration

Notes: Where the balusters / infill are slotted into a groove or a dowel into a hole (i.e. top connection in Figure 5 Type A) that restrains both inward and outward forces, the above nail / screw fixing requirements are not applicable.



## PAINTING AND FINISHING – EXTERNAL

### Unprimed Timber

Nail holes should be stopped with an exterior grade wood filler.

Dirt or any loose material should be removed prior to coating.

All surfaces, ends and joints should be primed **prior to assembly** with a quality solvent based alkyd primer or stain, in accordance with manufacturers recommendations.

Final top coats of exterior paint or stain should then be applied in accordance with manufacturers recommendations.

### Pre-primed LOSP Treated Timber

Refer to TQ/BSA Advisory Note - Recommendations for the use of H3 LOSP Treated Pine. Pink pre-coated handrail and balustrade components should be sanded back and dusted off to remove any loose or powdery coatings prior to finishing. Cut ends, holes, notches etc should be treated with a spray on or brush on supplementary preservative.

Nail holes should be stopped with an exterior grade wood filler.

All surfaces, ends and joints should be primed **prior to assembly** with a quality, solvent based alkyd primer.

When the primer has dried in accordance with the manufacturers recommendations, apply two full coats of premium 100% acrylic exterior topcoat in accordance with manufacturers recommendations.

## SAFE WORKING

Working with timber produces dust particles. Protection of the eyes, nose and mouth when sanding, sawing and planing is highly recommended. Refer to tool manufacturers for safe working recommendations for particular items of equipment.

## DISPOSAL OF OFFCUTS AND WASTE

For any treated timber, do not burn offcuts or sawdust.

Preservative treated offcuts and sawdust should be disposed of by approved local authority methods.

*Whilst every effort is made to ensure the accuracy of advice given, Timber Queensland Limited cannot accept liability for loss or damage arising from the use of the information supplied.*



The satisfactory performance and life expectancy of timber used in outdoor applications is dependent upon a number of factors including:-

- the type and level of hazard to which the timber is exposed
- the natural durability of the heartwood of the particular species
- the type and level of preservative treatment (if any)
- supplementary preservative maintenance (if any)
- protective coatings and their ongoing maintenance (protection from weathering)
- corrosive resistance of metal fasteners.

The heartwood of many species has a high natural durability and preservative treatment to the required 'H' level will provide equivalent or greater durability to the sapwood.

Environmental hazards include weather exposure, termite and other insect attack and fungal attack. The type and degree of hazard varies markedly around Australia with severe conditions in the tropical north to less severe in the temperate south.

Correct timber and fastener selection, design, detailing, finishing and maintenance is necessary to maximise performance. Maintenance ensures that protection systems remain functional and the use of appropriate corrosion resistant fasteners is necessary to achieve equivalent life to that of the timber.

Additional information on specific applications and practices is provided in the following Timber Queensland technical data sheets.

- TDS 4 | Residential Timber Decks
- TDS 6 | Recommendations for the use of Treated Pine Outdoors
- TDS 7 | Timber Decks Commercial, Industrial and Marine
- TDS 8 | Timber Garden Walls
- TDS 13 | Timber Decks Close to the Ground
- TDS 16 | Species Properties and Uses
- TDS 19 | Pergolas and Carports
- TDS 23 | Timber Handrails and Balustrades
- Advisory Note | Recommendations for the use of H3 LOSP Treated Pine

**NATURAL DURABILITY**

The durability class, which indicates natural durability, relates to the resistance of the heartwood of the species to fungal and insect (including termite) attack. Natural durability classes, are assigned with respect to in-ground service in an adverse environment (i.e. high moisture content, warm temperatures and the presence of

subterranean termites) or above ground, exposed to weather, well ventilated situations as appropriate. Evaluation of natural durability has been obtained from service records, field stake trials and laboratory studies. Table 1 gives guidance on expected service life. Table 4 provides a list of some common species and durability ratings.

**PRESERVATIVE TREATMENT**

To use sapwood in weather exposed situations, including ground contact, it is necessary to increase the durability of the sapwood by preservative treatment. It should be noted that when timber is treated, the treatment preservative will penetrate the sapwood but will not penetrate the heartwood to any significant extent. In any external weather exposed application it is therefore necessary to consider both the natural durability class (relating to the heartwood) of the species used and the level of preservative treatment (relating to the sapwood).

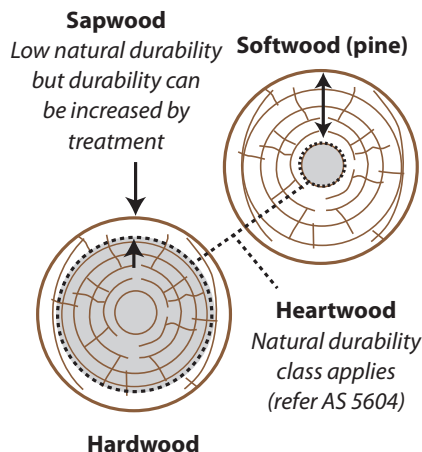
**TABLE 1 - GUIDE TO SERVICE LIFE**

Natural Durability Class	Heartwood Service Life (years) (For 'H' Class refer to Table 2)	
	H3 (Above Ground Exposed)	H5 (In-ground Contact)
Class 1 Highly Durable	>40	25+
Class 2 Durable	15-40	15-25
Class 3 Moderately Durable	7-15	5-15
Class 4 Non-durable	<7	< 5

Note: 1. The service life given in the above table will be subject to **wide variation** depending upon climatic conditions, preservative treatment, finishing, maintenance and building practice. Life expectancy can be extended by application of supplementary preservatives.

2. The untreated sapwood of all species should be considered as Class 4, non-durable.

Generally, hardwoods (broad leaf trees) have narrow sapwood bands but in softwoods (conifers) the sapwood band predominates and is usually very wide.



In-ground and Above Ground Durability Classes are quite distinct. Refer to AS 5604.

Australian Standards and referenced publications in the Building Code of Australia limit the amount of untreated heartwood that is permitted in preservative treated timber. Generally, for framing and sawn posts etc used in weather exposed situations, untreated heartwood should not exceed 20% of the cross section. For decking and similar board products, additional limits may apply. Treated timber is required to be branded with the hazard level ('H' class) to which it has been treated in accordance with AS1604.

### ENVIRONMENTAL HAZARDS AND PRESERVATIVE TREATMENT

Hazard Classes are designated as H1 through to H6. H1 and H2 relate to timber protected from the weather and H6 relates to marine applications. **This data sheet does not cover applications in hazard classes H1, H2 or H6.**

**Hazard Class H3** represents a service condition that is outside, above ground and exposed to the weather. Typical applications in this hazard class would include fence rails and palings, decking, deck framing, pergola beams and rafters, cladding and external balustrades. See Figure 1 and Table 2.

Satisfactory performance for this hazard class is obtained from Above Ground Durability Class 1 timbers where any sapwood present has been preservative treated to 'H3'. Similarly, Durability Class 4 softwoods (radiata, slash or hoop pine) will also perform well where the sapwood is treated to 'H3' and the untreated heartwood is limited and for LOSP treated timber, it is used in accordance with Advisory Note - Recommendations for the Use of H3 LOSP Treated Pine.

**Hazard Classes H4 and H5** represent outside, in-ground applications subject to extreme wetting. Hazard Class H4 is appropriate for non-structural or other applications that are not critical or where a lesser service life would be acceptable. Typical applications in hazard class H4 include fence posts and landscaping. For structural or more critical applications such as piles, house poles, stumps and retaining walls etc Hazard Class H5 shall apply. Refer Table 2 and Figure 1.

To gain a satisfactory service life for these hazard classes, the heartwood of hardwood needs to be In-ground Durability Class 1 or 2 as required by Table 2 and the sapwood needs to be preservative

treated to 'H4' or 'H5' as appropriate. Plantation softwoods are predominantly sapwood and with the sapwood treated to the appropriate level they will perform well in these service conditions provided any untreated heartwood is limited.

### APPLICATION

Both the natural durability and level of preservative treatment are important to achieve satisfactory service life. It is therefore not advisable to use low natural durability hardwoods (Class 3 and 4) containing a predominance of heartwood in weather exposed situations where hazards are severe. Where hazards are less severe (drier/colder climates) they may provide satisfactory performance if appropriately detailed, finished and maintained.

Species of low above ground natural durability (Class 2, 3 & 4), containing high proportions of heartwood may, in some above ground weather exposed applications, have a reduced service life, even though the sapwood has been treated for an H3 hazard, and should therefore be limited to non-structural applications.

### WEATHERING, FINISHES AND MAINTENANCE

Other than for aesthetic reasons, the main objective of applying and maintaining finishes (paints and stains) on timber used in external applications is to minimise the effects of weathering (exposure to sun and rain leads to wetting and drying and subsequent checking, splitting and distortion) and therefore to maximise the service life of the timber.

Application and maintenance of finishes should not be considered as a substitute for ensuring that the inherent durability (natural or by treatment) of the underlying timber is appropriate to the service life required for the applicable hazard level.

Finishes do not provide a complete moisture seal, but a suitable finish will reduce movement from moisture uptake and loss and will also reduce the effects of weathering.

From in-service performance data and recent research it has been found that low quality and or poorly maintained acrylic paints, applied to low durability timber, may actually speed up the onset and progress of decay by a factor of two. This is caused by the paint system permitting moisture entry and then trapping the moisture in the timber.

Conversely, a quality acrylic paint system applied to a highly durable timber such as a Class 1 or CCA, ACQ or Copper Azole treated pine, will extend the service life by delaying the effects of weathering and subsequent water entry. It has also been found from research that the application and regular maintenance of pigmented oil based stain finishes or water repellent preservatives on low durability timber will extend service life by inhibiting the onset of decay and weathering due to the water repellency and preservative nature of these products.

Dark coloured paints and stains should be avoided as they heat timber to elevated temperatures which cause greater loss of moisture and subsequent shrinkage and checking. Decay is also more active at higher temperatures.

End grain and surfaces within joints should be sealed with an oil based primer, stain or water repellent to maximise service life.

**TABLE 2 - GUIDE TO HAZARD CLASS AND SUITABLE TIMBER**

Service Condition	Hazard Level	Possible Hazards Encountered	Appropriate Applications	Requirements for Hardwoods and Softwoods
Outside above ground (exposed to the weather - see Figure 1)	H3	Moderate decay conditions (rot), borers and termites.	Fence palings and rails, cladding, decking, fascias, pergola rafters, beams and battens, handrails and balustrades, posts not in ground.	<ul style="list-style-type: none"> <li>● Hardwoods of Above Ground Durability Class 1 or better with sapwood preservative treated to H3. (Small proportions of untreated sapwood may be permitted by some grading standards)</li> <li>● Some Above Ground Durability Class 2 and 3 timbers are suitable in some locations for non-structural uses in these applications depending on climate, detailing and maintenance of the protective coating.</li> <li>● Softwoods preservative treated to H3 or better with untreated heartwood limited.</li> </ul>
In-ground	H4	Severe decay conditions, borers and termites.	Non critical applications such as fence posts, landscaping, garden walls and pergola posts.	<ul style="list-style-type: none"> <li>● Hardwoods of In-ground Durability Class 2 or better with the sapwood limited or preservative treated to H4.</li> <li>● Softwoods preservative treated to H4 or better with untreated heartwood limited.</li> </ul>
In-ground contact or in fresh water	H5	Very severe decay conditions, borers and termites.	Critical applications such as house piles and posts, structural retaining walls, deck posts, poles, decking close to or on the ground and similar.	<ul style="list-style-type: none"> <li>● Hardwoods of In-ground Durability Class 1 with the sapwood removed or preservative treated to H5. In-ground Class 2 rounds with a complete envelope of sapwood preservative treated to H5.</li> <li>● Softwoods preservative treated to H5 or better with untreated heartwood limited.</li> </ul>

Note 1. Irrespective of the hazard level or durability class, the sapwood of lyctus susceptible hardwoods should be preservative treated.  
 2. Table 4 outlines common species, their termite resistance, Durability Class and susceptibility to lyctus attack.

**DETAILING**

Good building design and construction detailing, which takes into consideration durability issues, can greatly increase the service life of a structure or building. Details that trap moisture and thereby allow water to soak into the timber should be avoided.

Overhangs or capping on end grain are physical systems that reduce levels of exposure. Adequate ventilation is also important as high humidities which can develop, may substantially increase the moisture content and therefore the hazard to which the timber is exposed.

The following are good design and detailing practices that will maximise service life:-

- Provide sloping cuts to the end grain of posts etc to permit rapid water run-off
- Incline the top surface of rectangular hand rails
- Leave a minimum 50 mm air gap to the bottom of posts on stirrups. Timber should be 75 mm clear of the ground for termite inspection in accordance with AS 3660.1.

**CORROSION PROTECTION OF FASTENERS**

Having ensured that the maximum service life will be achieved in the timber component, it is equally important to match this with nails, screws, bolts and other metal connectors of equivalent service life.

For most situations (up to and including close proximity to protected bays/mild marine) in exposed environments, hot dipped galvanised fasteners will afford the necessary protection from corrosion. The service life of hot dipped galvanised coatings will be proportional to their mass/area or thickness of galvanising and a minimum thickness of 42 microns is recommended for a service life of around 30 years.

For more extreme corrosive environments or where other conditions dictate such as in contact with moist CCA, ACQ or Copper Azole treated timber or in close proximity to swimming pools (within 450 mm of edge) guidance can be obtained from Table 3.

**TABLE 3 - SELECTING CORROSIVE RESISTANT FASTENERS**

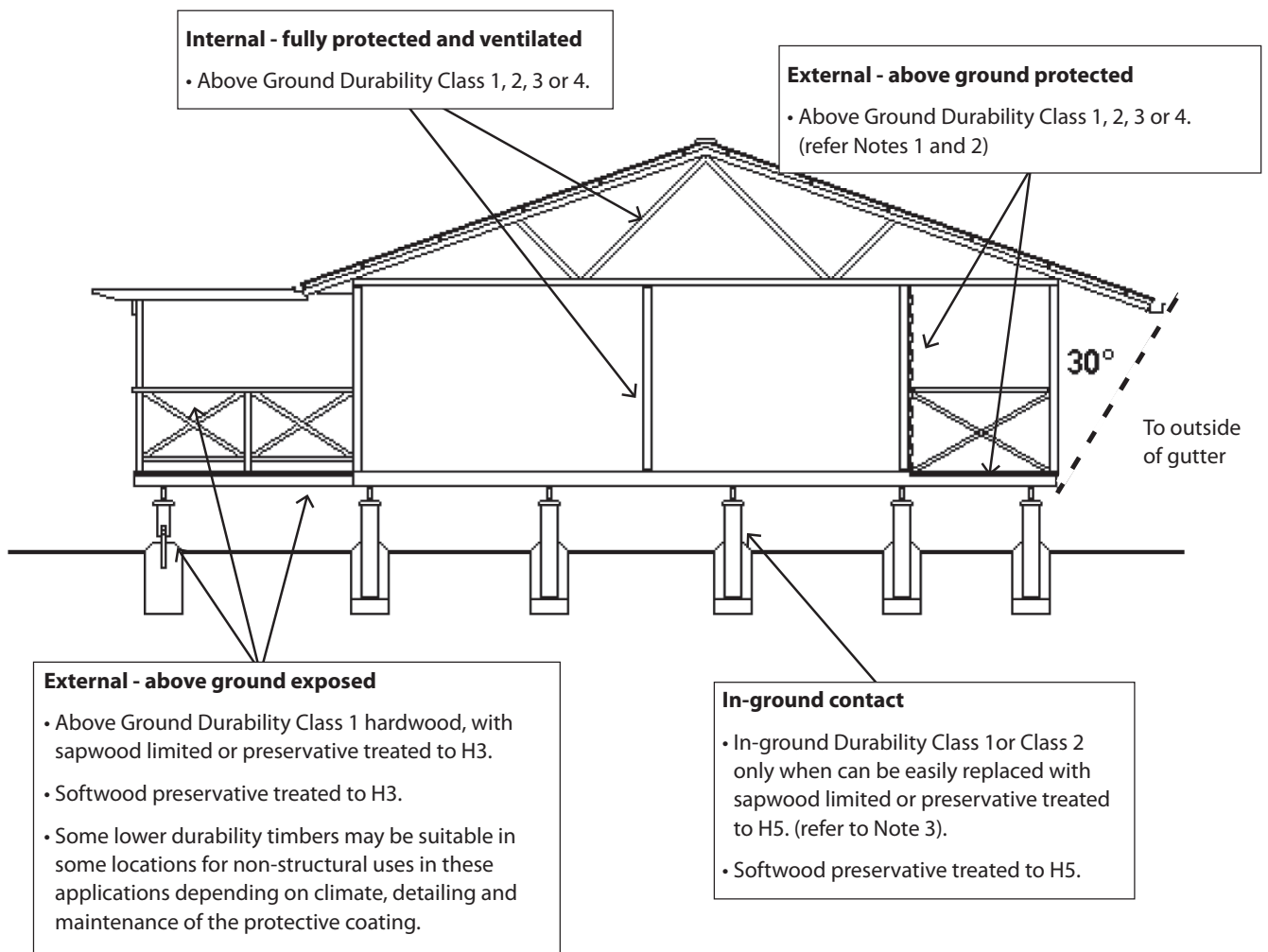
Application/Environment	Fastener Material	Remarks
Chemical, Industrial and Marine (surf beach or large bays)	Grade 316 stainless steel	Grade 304 stainless may require additional protective coatings such as epoxy paints.
Decking close to pools	Monel metal, silicon bronze and brass. Self drilling screws to be Class 4 finish.	Monel nails and screws available, usually used for boat building, are a good option for decking close to pools. Silica bronze nails are available and good for acidic species such as western red cedar.
Mild marine, industrial and other	Hot dipped galvanised or mechanically plated, minimum thickness 42 microns. Self drilling screws to be Class 3 finish.	Where hot dipped galvanised bolts etc are in contact with moist CCA, ACQ or Copper Azole treated timber, additional protection using plastic sheaths or bituminous or epoxy paints is required.

**TABLE 4 - SPECIES DURABILITY RATINGS**

	Common Species (Standard Trade Name)	Termite Resistance (Heartwood) (AS3660.1/AS5604)	Durability Class (AS 5604)		Sapwood Lyctus Susceptibility (AS 5604)	
			Inground	Outside Above Ground		
Hardwoods	Ironbark, Grey	Resistant	1	1	Not Susceptible	
	Blackbutt	Resistant	2	1	Not Susceptible	
	Gum, Spotted	Resistant	2	1	Susceptible	
	Gum, Forest Red	Resistant	1	1	Not Susceptible	
	Stringybark, Yellow	Resistant	3	2	Not Susceptible	
	Jarrah	Resistant	2	2	Susceptible	
	Karri	Not Resistant	3	2	Not Susceptible	
	Messmate	Note: Tasmanian Oak is a mix of these three species. Victorian Ash is a mix of Alpine and Mountain Ash.	Not Resistant	3	3	Susceptible
	Ash, Mountain		Not Resistant	4	3	Susceptible
	Ash Alpine		Not Resistant	4	3	Susceptible
	Kwila/Merbau	Resistant	3	2	Susceptible	
Meranti (mixed species)	Not Resistant	4	4	Susceptible		
Softwoods	Cypress, White	Resistant	2	1	Not Susceptible	
	Radiata Pine	Not Resistant	4	4	Not Susceptible	
	Slash Pine	Resistant	4	4	Not Susceptible	
	Hoop Pine	Not Resistant	4	4	Not Susceptible	
	Cedar, Western Red	Resistant	3	2	Not Susceptible	
	Douglas Fir (Oregon)	Not Resistant	4	4	Not Susceptible	

Note: For a full list of species properties and uses, refer to Technical Data Sheet 16

Figure 1: Durability and Treatment Requirements for Housing



Note:

1. External timbers are regarded as protected if they are covered by roof protection (or similar) at 30° to the vertical and they are well detailed and maintained (painted or stained and well ventilated).
2. Where framing is in extremely damp or unventilated locations, consideration should be given to using timber of higher durability similar to external above ground applications.
3. Hardwood poles for pole frame houses shall be In-ground Durability Class 1 only. Where the member is easily accessible and replaceable, In-ground Durability Class 2 treated hardwood rounds are acceptable. See Table 2.
4. Timber Queensland may be contacted for further information and/or assistance concerning the hazards, service life, species selection and appropriate detailing, preservative treatment, finishing and maintenance procedures.
5. Refer to AS5604 for In-ground and Above Ground Durability Classes.

**SAFE WORKING**

Working with timber produces dust particles. Protection of the eyes, nose and mouth when sanding, sawing and planing is highly recommended. Refer to tool manufacturers for safe working recommendations for particular items of equipment.

**DISPOSAL OF OFFCUTS AND WASTE**

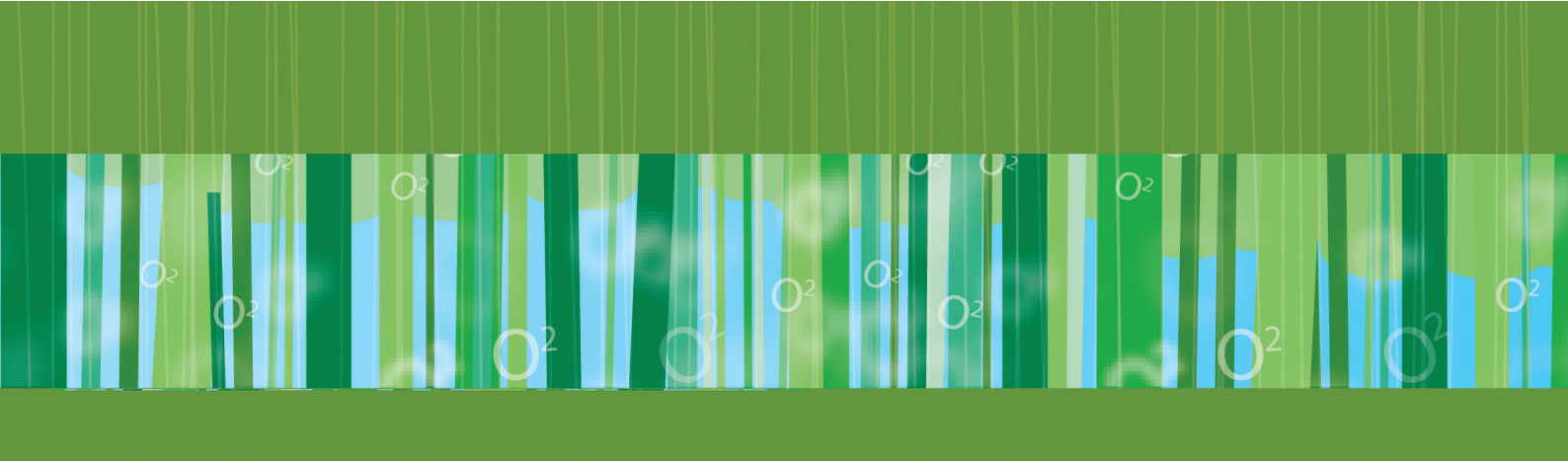
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