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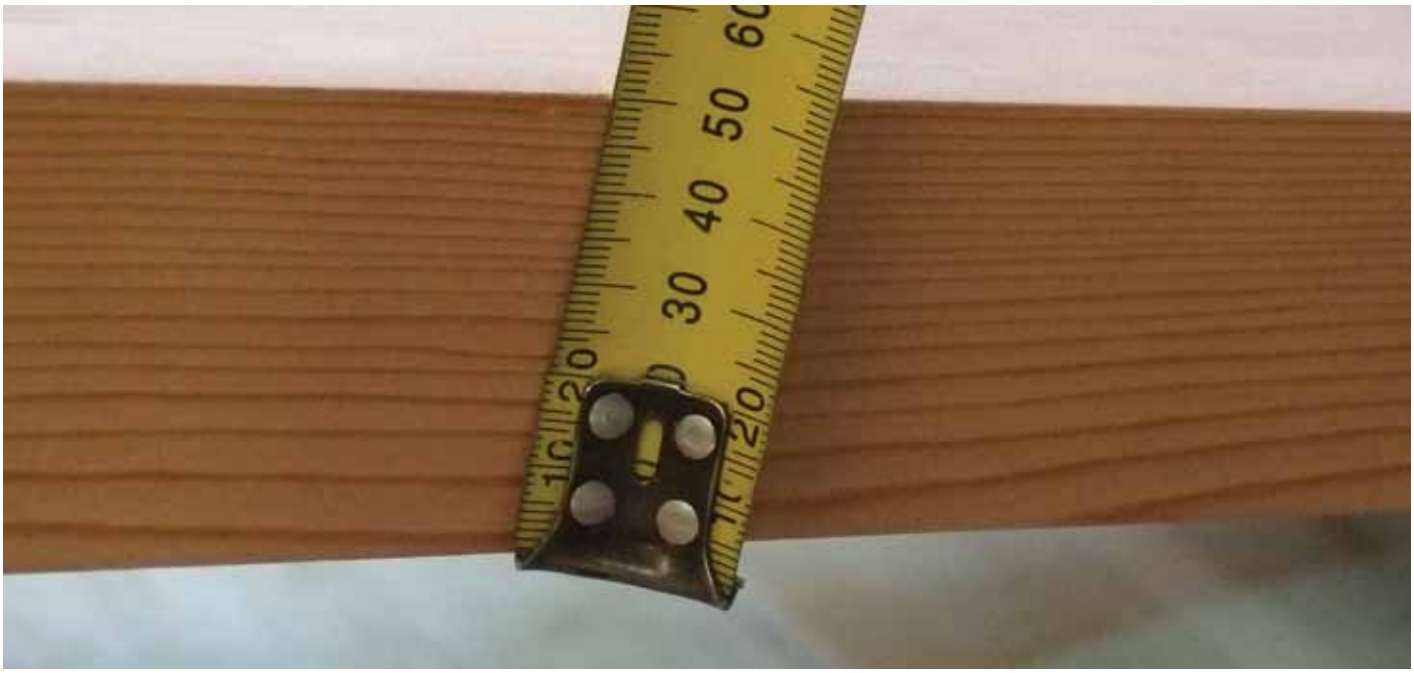

TECHNICAL SHEETS, GUIDES AND SITE CARDS

contents

Species Characteristics

DEFINITIONS

Name	Standard Trade Name as listed in Australian Standard/New Zealand Standard AS/NZS 1148: 2001, 'Nomenclature - Australia, New Zealand and imported species'.
Species Name	Botanical name.
Other Name	Other local names.
General Availability	An indication of availability in Australia - Rare, Limited, Readily or Freely Available.
Source	General location of the forest resource.
General Performance	Description of practice over time and experience in use.
APPEARANCE	
Description	The colour of dry heartwood and sapwood with comments on the grain and texture.
DURABILITY	
Durability Class	The natural ability of the heartwood to resist decay (as a result of fungal attack) in high risk conditions. A four-class system for exposure in-ground contact and outside above ground to AS 5604 is used. Durability Class 1 being most durable and Durability Class 4 is least durable.
Lyctis Susceptability	Indicates whether the untreated sapwood is likely to be subject to attack by the powder post beetle, the lyctid borer.
Termite Resistance	Indicates whether the hardwood is resistant to termite attack.
Preservation	Indicates the penetration and retention of preservatives using currently available commercial processes.
STABILITY - UNIT SHRINKAGE	
Radial	Shrinkage or expansion across the growth rings for 1% MC change. If unavailable, shrinkage from green to dry after reconditioning is given in brackets.
Tangential	Shrinkage or expansion around the growth rings for 1% MC change. If unavailable, shrinkage from green to dry after reconditioning is given in brackets.
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	The weight per unit volume, in kilograms per cubic metre (kg/m^3), of wood seasoned to a moisture content of 12%.
Strength Group	Timbers with similar strength properties are grouped for structural design purposes. All timbers are therefore classified into strength groups: with a seven grouping (S1 to S7) for unseasoned timber, and an eight grouping (SD1 to SD8) for seasoned timber. Class 1 indicates highest strength in each case. See Australian/New Zealand Standard AS/NZS 2878-2000, 'Timber - Classification into Strength Groups', for further information.
Joint Group	A classification of the strength of a species in joint design. There are six joint groups (J1 to J6) for unseasoned timber and (JD1 to JD6) for seasoned timber. 1 indicates highest capacity in each case.
Hardness (kN Janka)	A measure of the species resistance to indentation by the Janka hardness test. The higher the number, the harder the timber.
WORKABILITY	
Machining	Behaviour of the timber when planed, sawn, drilled and worked by hand or with machine tools.
Fixing	Ability to hold fixings.
Gluing	Ability of the timber to be bonded with adhesives.
Finishing	Relates to the suitability of the timber for staining, waxing, painting, and other finishing.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	The thermal conductivity of the timber. Generally, the more dense the timber, the higher the thermal conductivity and lower the insulation value.
Certification	The availability of the timber with credible third party certification. Availability of certification does not imply that all timber of that species is certified.
EARLY FIRE HAZARD INDICES	
Ignitability, Spread-of-flame and Smoke-developed	The Building Code of Australia (BCA) requires building material in some building application to have particular characteristics in the early stages of a fire. The BCA calls up tests from AS 1530.2 & 3 to establish the index ratings for materials.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group and Extinction area	The Building Code of Australia (BCA) requires building material in some building application to have particular characteristics in a fire. The BCA calls up tests in accordance with AS/NZS 3837:1998 and using the Method of Kookala, Thomas and Karlsson to calculate the Material group number.
Bushfire flammability	Status as listed in AS 3959 Construction of buildings in bushfire prone areas

Blackbutt, Eucalyptus pilularis

AUSTRALIA

Name	Blackbutt
Species Name	Eucalyptus pilularis.
Other Name	Pink blackbutt.
General Availability	Readily.
Source	A large hardwood common in the coastal forests of south-eastern Australia from Bega to Maryborough – native forest and plantation grown timber.
APPEARANCE	
Description	The timber has a colour ranging from a golden yellow through to pale browns. The sapwood is distinctly lighter than the heartwood. The grain is straight but occasionally slightly interlocked, with medium to moderately coarse and even texture that is open and uniform. In some cases it has a greasy appearance and feel.
DURABILITY	
Durability Class	Outside above ground: Class 1, In-ground contact: Class 2.
Lyctis Susceptability	Not susceptible.
Termite Resistance	Resistant.
Preservation	Sapwood readily accepts preservative impregnation but penetration of the heartwood is negligible.
STABILITY - UNIT SHRINKAGE	
Radial	0.26 (per 1% MC change).
Tangential	0.37 (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	930	Ignitability	13
Strength Group	SD2	Spread-of-flame	6
Joint Group	JD2	Smoke-developed	3
Hardness (kN Janka)	8.9		

WORKABILITY	
Machining	Machines well.
Fixing	No difficulty has been experienced with the use of standard fittings and fastenings.
Gluing	As with most high-density species, machining and surface preparation should be done immediately before gluing.
Finishing	Will readily accept paint, stain and polish. High tannin and extractives content can result in staining of painted surfaces exposed to the weather.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.22
Certification	Generally available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Average extinction area	Less than 250m^2/kg.
Bushfire flammability	Listed as a bushfire-resisting timber in AS 3959.

Hoop pine, Araucaria cunninghamii

AUSTRALIA

Name	Hoop pine
Species Name	Araucaria cunninghamii
General Availability	Readily.
Source	Hoop pine is a large tree occurring in drier rainforests from Hastings River to far north Queensland and in some places as far inland as 300 km. It is also grown in plantations, predominantly in south Queensland. While available from native forests, it is mainly a plantation timber.
General Performance	Hoop pine has traditionally been a joinery timber used for doors, window sashes and other internal and external joinery. Hoop pine is good for inside use in dry conditions. It varies in acceptance of preservative impregnation. May be attacked by the hoop pine borer in tropical areas. Can be used externally above ground if treated. Do not use in-ground.
APPEARANCE	
Description	The heartwood ranges from pale cream to light yellow-brown with little difference between heartwood and sapwood. The grain is very fine and even textured. Growth rings usually visible but indistinct.
DURABILITY	
Durability Class	Outside above ground: Class 4, In-ground contact: Class 4 .
Lyctis Susceptability	Not susceptible.
Termite Resistance	Not resistant.
Preservation	Sapwood readily accepts impregnation but the heartwood cannot be adequately treated.
STABILITY - UNIT SHRINKAGE	
Radial	0.18 % (per 1% MC change).
Tangential	0.23 % (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	550	Ignitability	14
Strength Group	SD5	Spread-of-flame	7
Joint Group	JD4	Smoke-developed	2
Hardness (kN Janka)	3.4 (native forest material)		

WORKABILITY	
Machining	Machines and turns well to a smooth surface.
Fixing	No difficulty has been experienced with the use of standard fittings and fastenings.
Gluing	Can be satisfactorily bonded using standard procedures.
Finishing	Will readily accept stain, polish and paint.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.14
Certification	Generally available.
Bushfire flammability	Not included in the tables of AS 3959

Jarrah, Eucalyptus marginata

AUSTRALIA

Name	Jarrah
Species Name	Eucalyptus marginata.
General Availability	Limited.
Source	Jarrah is a dominant species in forests in south-west of Western Australia.
APPEARANCE	
Description	The heartwood is dark red. Sapwood is usually pale yellow. The grain is generally straight, moderately coarse textured and even.
DURABILITY	
Durability Class	Outside above ground: Class 2, In-ground contact Class 2.
Lyctis Susceptability	Susceptible.
Termite Resistance	Resistant.
Preservation	Sapwood readily accepts preservative impregnation but heartwood penetration is negligible.
STABILITY - UNIT SHRINKAGE	
Radial	0.24% (per 1% MC change).
Tangential	0.30% (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	835	Ignitability	13
Strength Group	SD4	Spread-of-flame	6
Joint Group	JD2	Smoke-developed	3
Hardness (kN Janka)	8.5		

WORKABILITY	
Machining	Machines and turns well.
Fixing	Satisfactory with standard fittings and fastenings. Some care is needed when nailing.
Gluing	Can be satisfactorily bonded using standard procedures.
Finishing	Will readily accept paint, stain and polish.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.20
Certification	Generally available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Average extinction area	Less than 250m^2/kg.
Bushfire flammability	Included in Table E1 of AS 3959.

Karri, Eucalyptus diversicolor

AUSTRALIA

Name	Karri
Species Name	Eucalyptus diversicolor.
General Availability	Limited.
Source	Native of high rainfall areas of south-west Western Australia.
APPEARANCE	
Description	Heartwood is pale pink to reddish brown. Sapwood is easily distinguished as a whitish colour. The wood has a coarse, even texture with an interlocking grain.
DURABILITY	
Durability Class	Outside above ground: Class 2, In-ground contact: Class 3.
Lyctis Susceptability	Not susceptible.
Termite Resistance	Not resistant.
Preservation	Sapwood accepts preservative impregnation but heartwood penetration is negligible.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 4.5% from green to dry)
Tangential	0.4 (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	900	Spread-of-flame	7
Strength Group	SD2	Smoke-developed	3
Joint Group	JD2		
Hardness (kN Janka)	9		

WORKABILITY	
Machining	Karri is not easy to work or finish.
Fixing	May need to be pre-drilled for nailing.
Gluing	It displays problems which vary when gluing.
Finishing	It does not accept paint well.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.22
Certification	Generally available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Average extinction area	less than 250m^2/kg.
Bushfire flammability	Included in Table E1 of AS 3959.

Messmate, Eucalyptus obliqua

AUSTRALIA

Name	Messmate
Species Name	Eucalyptus obliqua.
General Availability	Limited.
Other Name	Australian Oak
Source	Large hardwoods found throughout wetter areas of Tasmania, Victoria, and southern NSW. E. obliqua has a wide distribution, occurring in wet forests but also extending into drier areas.
General Performance	While external surfaces need to be painted, Messmate have performed well in timber windows and door for over a century. The timber works and finishes very well, and is readily available with environmental certification.
APPEARANCE	
Description	Colour varies from cream to pale to reddish-brown. The timber has straight, open and even grain with a texture that is open, uniform and fairly coarse.
DURABILITY	
Durability Class	Outside above ground Class 3, In-ground contact; generally Class 3.
Lyctis Susceptability	Susceptible.
Termite Resistance	Not resistant.
Preservation	While the sapwood can be treated, the heartwood is resistant.
STABILITY - UNIT SHRINKAGE	
Radial	0.23% (per 1% MC change).
Tangential	0.36% (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	780	Ignitability	14
Strength Group	SD3	Spread-of-flame	8
Joint Group	JD3	Smoke-developed	3
Hardness (kN Janka)	7.1		

WORKABILITY	
Machining	Moulded surfaces are true and clean, with even end grain. Holds edges well.
Fixing	Fixes well.
Gluing	Glues satisfactorily with most common adhesives.
Finishing	Readily worked to a smooth, lustrous surface. Most finishes adhere very well. Stains very well.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.17
Certification	Generally available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Average extinction area	less than 250m^2/kg.
Bushfire flammability	Included in Table E1 of AS 3959.

Radiata pine, Pinus radiata

AUSTRALIA

Name	Radiata Pine
Species Name	Pinus radiata.
Other Name	Monterey pine.
General Availability	Freely.
Source	Radiata pine is native of the west coast of North America but a major plantation species throughout the world. In Australia, it is grown in all states and the ACT.
APPEARANCE	
Description	The heartwood is reddish-brown varying to shades of yellow. Sapwood is usually pale yellow to white. The grain is generally straight, often with pronounced difference in colour between earlywood and latewood results.
DURABILITY	
Durability Class	Outside above ground: Class 4; In-ground contact: Class 4.
Lyctis Susceptability	Not susceptible.
Termite Resistance	Not resistant.
Preservation	The sapwood readily accepts commercial preservative treatment while treatment of the heartwood is unreliable.
STABILITY - UNIT SHRINKAGE	
Radial	0.20% (per 1% MC change).
Tangential	0.27% (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	~ 500	Spread-of-flame	9
Strength Group	SD6	Smoke-developed	3
Joint Group	JD4		
Hardness (kN Janka)	3.3		

WORKABILITY	
Machining	Machines and turns well but planer blades should be kept sharp to avoid surface ridging.
Fixing	Nails may occasionally follow the growth rings. Nailing guns give good results.
Gluing	Differential glue absorption can occur between earlywood and latewood but this rarely causes problems.
Finishing	Will readily accept paint, stain and polish.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.13
Certification	Generally available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Extinction area	less than 250m2/kg.
Bushfire flammability	Not included in the tables of AS 3959

Silvertop ash, Eucalyptus sieberi

AUSTRALIA

Name	Silvertop ash
Species Name	Eucalyptus sieberi.
Other Name	Coast ash.
General Availabilty	Readily available
Source	A large hardwood found from central and southern New South Wales into north- eastern Tasmania.
APPEARANCE	
Description	The heartwood is a pale brown to pinkish colour with a narrow not clearly distinguishable sapwood band. The texture is medium, often with interlocking grain.
DURABILITY	
Durability Class	Outside above ground: Class 2, In-ground contact: Class 3.
Lyctis Susceptability	Not susceptible.
Termite Resistance	Not resistant.
Preservation	While the sapwood can be treated, the heartwood is resistant.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 2.5% from green to dry)
Tangential	0.36 (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	820	Ignitability	12
Strength Group	SD3	Spead-of-flame	6
Joint Group	JD2	Smoke-developed	3
Hardness (kN Janka)	9.5		

WORKABILITY	
Machining	Not difficult to work. Satisfactory for steam bending. Easy to split along rays.
Fixing	Holds fixings well.
Finishing	Accepts most coating and finishes reasonably well.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.2
Certification	Generally available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Average extinction area	less than 250m^2/kg.
Bushfire flammability	Listed as a bushfire-resisting timber in AS 3959.

Spotted gum, Corymbia spp

AUSTRALIA

Name	Spotted gum
Species Name	Corymbia citriodora subsp. variegata, C. citriodora subsp. citriodora, C. maculata
General Availability	Readily.
Source	Corymbia citriodora occurs mainly in the coastal areas of northern New South Wales and southern Queensland through to North Queensland. C. maculata occurs from Bega to the mid-north NSW coast.
APPEARANCE	
Description	Heartwood is pale to dark brown. The sapwood is distinctly paler. The texture is moderately coarse and grain variable.
DURABILITY	
Durability Class	Outside above ground: Class 1, In-ground contact: Class 2.
Lyctis Susceptability	Susceptible.
Termite Resistance	Resistant.
Preservation	The sapwood can be treated but the heartwood is resistant.
STABILITY - UNIT SHRINKAGE	
Radial	0.3% (per 1% MC change).
Tangential	0.4% (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	~950 - 1000	Ignitability	13
Strength Group	SD2	Spread-of-flame	3
Joint Group	JD1	Smoke-developed	3
Hardness (kN Janka)	10.1		

WORKABILITY	
Machining	Machines well due to its natural greasiness.
Fixing	Easy to work. Straight grained material can be bent well. Unseasoned wood can be corrosive to nails and aluminium.
Gluing	Gluing can be difficult where phenolic type adhesives are used.
Finishing	Will readily accept paint, stain and polish. Has lower tannin content than most other eucalypts, therefore staining of paintwork, brickwork etc., as a result of water running over unpainted timber surfaces, is less likely to occur.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.23
Certification	Generally available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Average extinction area	less than 250m^2/kg.
Bushfire flammability	Listed as a bushfire-resisting timber in AS 3959.

Tallowwood, Eucalyptus microcorys

AUSTRALIA

Name	Tallowwood
Species Name	Eucalyptus microcorys.
General Availability	Limited.
Source	A moderate to large tree found in wet coastal forests from Newcastle, New South Wales to Maryborough in Queensland.
APPEARANCE	
Description	The heartwood ranges from pale to dark yellow brown. Sapwood is usually almost white. The grain is moderately coarse textured, generally with interlocked grain. Usually free from gum veins.
DURABILITY	
Durability Class	Outside above ground: Class 1, In-ground contact: Class 1.
Lyctis Susceptability	Susceptible.
Termite Resistance	Resistant.
Preservation	Sapwood accepts preservative but the heartwood is resistant.
STABILITY - UNIT SHRINKAGE	
Radial	0.28% (per 1% MC change).
Tangential	0.37% (per 1% MC change).
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	1010
Strength Group	SD2
Joint Group	JD1
Hardness (kN Janka)	8.6
WORKABILITY	
Machining	Relatively easy to work with hand tools due to its natural greasiness. Machines and turns well.
Fixing	No difficulty has been experienced with the use of standard fittings and fastenings.
Gluing	Gluing requires care.
Finishing	No difficulty has been experienced with the use of standard fittings and fastenings.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.24
Certification	Available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Average extinction area	less than 250m^2/kg.
Bushfire flammability	Included in Table E1 of AS 3959.

Tasmania oak, Victorian ash, E. regnans, E.delegatensis, E.obliqua

AUSTRALIA

Name	Tasmanian oak, Victorian ash
Species Name	Tasmanian oak (Eucalyptus regnans, E. delegatensis, and E.obliqua) and Victorian Ash (Eucalyptus regnans, E. delegatensis) are marketing groupings of almost identical species.
Other Names	Australian Oak, Alpine Ash.
General Availability	Readily.
Source	Large hardwoods found throughout wetter areas of Tasmania, Victoria, and southern NSW. E. delegatensis grows at higher altitudes, while E. regnans is found in wetter sites. E. obliqua has a wide distribution, occurring in wet forests but also extending into drier areas.
General Performance	While external surfaces need to be painted, Tasmanian oak and Victorian ash have performed well in timber windows and door for over a century. The timber works and finishes well, and has environmental certification.
APPEARANCE	
Description	Colour varies from straw colour to reddish-brown with intermediate shades of cream to pink. The timber has straight, open and even grain with a texture that is open, uniform and fairly coarse.
DURABILITY	
Durability Class	Outside above ground Class 3, In-ground contact; generally Class 4.
Lyctis Susceptability	Susceptible.
Termite Resistance	Not resistant.
Preservation	While the sapwood can be treated, the heartwood is resistant.
STABILITY - UNIT SHRINKAGE	
Radial	0.23% (per 1% MC change).
Tangential	0.36% (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	530-800	Ignitability	14
Strength Group	SD4	Spread-of-flame	8
Joint Group	JD3	Smoke-developed	3
Hardness (Janka)	4.5 - 8.0		

WORKABILITY	
Machining	Moulded surfaces are true and clean, with even end grain. Holds edges well.
Fixing	Fixes well.
Gluing	Glues satisfactorily with most common adhesives.
Finishing	Readily worked to a smooth, lustrous surface. Most finishes adhere very well. Stains very well.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.17
Certification	Generally available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Ave. extinction area	less than 250m^2/kg.
Bushfire flammability	Included in Table E2 of AS 3959.

American white oak, Quercus spp

IMPORTED

Name	American white oak
Species Name	Quercus spp.
Other Name	Northern white oak, Southern white oak.
Source	A common medium-sized hardwood of central North America.
General Performance	Stains in contact with iron and lead. Non ferrous fixing recommended.
APPEARANCE	
Description	The sapwood is light coloured and the heartwood is light to mid-dark brown. The timber is mostly straight grained with a medium to coarse texture with large rays.
DURABILITY	
Durability Class	Outside above ground: Class 4, In-ground contact: Class 4.
Lyctis Susceptability	Susceptible.
Termite Resistance	Not resistant.
Preservation	The heartwood is extremely resistant and sapwood moderately resistant to preservative treatment.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 3% from green to dry)
Tangential	(~ 5% from green to dry)
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	750
Strength Group	SD6
Joint Group	JD2
Hardness (kN Janka)	6
WORKABILITY	
Machining	White oak machines well to a smooth finish.
Fixing	It nails and screws well although pre-boring is advised. As it reacts with iron, galvanised nails or non ferrous fixings are recommended.
Gluing	Its adhesive properties are variable but satisfactory.
Finishing	It stains and polishes to a good finish.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.19
Certification	Generally available.
Bushfire flammability	Included in Table E2 of AS 3959.

Amoora, Amoora spp

IMPORTED

Name	Amoora
Species Name	Amoora spp. Principally Amoora cucullata.
Other Name	Pacific maple, thitni (Burma), amoor (Pakistan), tasua (Thailand), amari (India).
Source	Amoora is the generic marketing name for a grouping of more than a dozen species ranging from Thailand to Papua New Guinea and the Solomon Islands.
General Performance	Durability is relatively low. Poorly dried material can be unstable and prone to twist and warp.
APPEARANCE	
Description	Heartwood ranges from pink-brown to red-brown. Sapwood is a distinctly lighter colour and can be white to pink-brown. Grain is straight or slightly interlocked with an open, coarse texture.
DURABILITY	
Durability Class	Outside above ground: Class 4, In-ground contact: Class 4.
Lyctis Susceptability	Susceptible.
Termite Resistance	Not resistant.
Preservation	Difficult to impregnate with preservatives.
STABILITY - UNIT SHRINKAGE	
Radial	0.21% (per 1% MC change).
Tangential	0.28% (per 1% MC change).
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	550
Strength Group	SD5
Joint Group	JD4
Hardness (kN Janka)	3.08
WORKABILITY	
Machining	Despite its medium density, it is not very easy to saw. It machines to a smooth surface.
Fixing	No difficulty has been experienced with the use of standard fittings and fastenings.
Gluing	Can be satisfactorily bonded using standard procedures.
Finishing	Seasoned timber surfaces will readily accept stain, polish, or paint.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.15
Certification	Occasionally available.
Bushfire flammability	Not included in the tables of AS 3959.

Hemlock, Tsuga heterophylia

IMPORTED

Name	Hemlock
Species Name	Tsuga heterophylia.
Other Name	Western Hemlock.
Source	A large softwood of the west coast of Canada and extending into the United States.
APPEARANCE	
Description	The heartwood is straw to pale brown. The sapwood is hard to distinguish. The grain is generally straight and the texture relatively fine and even.
DURABILITY	
Durability Class	Outside above ground: Class 4, In-ground contact: Class 4.
Lyctis Susceptability	Not susceptable.
Termite Resistance	Not resistant.
Preservation	Heartwood moderately difficult to impregnate.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 2.5% from green to dry)
Tangential	(~ 5% from green to dry)
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	500
Strength Group	SD6
Joint Group	JD4
Hardness (kN Janka)	2.7 to 3
WORKABILITY	
Machining	Easy to work except for the small hard knots.
Fixing	Holds nails well.
Gluing	Glues satisfactory.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.13
Certification	Generally available
Bushfire flammability	Not included in the tables of AS 3959.

Kapur, Dryobalanops spp

IMPORTED

Name	Kapur
Species Name	Dryobalanops spp. principally D.arjomatica.
Other Name	Kapor, borneo, camphorwood, kapoer, belakan, kamfer.
Source	A large hardwood of lowland forest of Malaysia, Indonesia & South East Asia.
APPEARANCE	
Description	Sapwood ranges from almost white to yellow-brown and is clearly distinct from the heartwood. Heartwood is red or red-brown. The texture is medium and even.
DURABILITY	
Durability Class	Outside above ground: Class 2, In-ground contact: Class 3.
Lyctis Susceptability	Not susceptible.
Termite Resistance	Not resistant.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 3% from green to dry)
Tangential	(~ 6% from green to dry)
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	750
Strength Group	SD3
Hardness (kN Janka)	5.4
WORKABILITY	
Machining	Machines well with a moderate blunting effect on cutting edges caused by the presence of silica.
Fixing	Fixes well but pre-drilling may be necessary near edges.
Gluing	Glues satisfactory but care is need with formaldehyde adhesives.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.19
Bushfire flammability	Included in Table E1 of AS 3959.

Kwila, Merbau, Intsia bijuga, I. Palembanica

IMPORTED

Name	Kwila / Merbau
Species Name	Intsia bijuga, I. Palembanica.
Other Name	Johnstone River teak, scrub mahogany (north Queensland), merbau (Malaysia), vesi (Fiji), ipil (Philippines), melila, bendora (Papua New Guinea).
General Availability	Readily.
Source	A large tropical hardwood found from Southeast Asia to Papua New Guinea, the Philippines, Solomon Islands, Fiji and occasionally north Queensland.
General Performance	A highly durable hardwood regularly used as sills in window frames. In windows, all sides should be sealed to prevent staining of surrounding work.
APPEARANCE	
Description	Heartwood yellowish-brown or orange-brown when first cut, turning darker with age to brown or deep reddish brown. Sapwood white, pale yellow or buff and sharply differentiated from heartwood. The grain is variable but usually interlocked or wavy, texture is coarse but even. Rather greasy to the touch.
DURABILITY	
Durability Class	Outside above ground: Class 1, In-ground contact: Class 3.
Lyctis Susceptability	Susceptible.
Termite Resistance	Resistant.
Preservation	Sapwood only accepts preservative impregnation.
STABILITY - UNIT SHRINKAGE	
Radial	0.19 (per 1% MC change).
Tangential	0.30 (per 1% MC change).

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	830	Spread-of-flame	0
Strength Group	SD3	Smoke-developed	5
Joint Group	JD2		
Hardness (kN Janka)	8.6		

WORKABILITY	
Machining	Working properties variable. Cuts cleanly but may have a blunting or gumming effect on cutting edges. Cutting angle should be reduced to 20 $^{\circ}$ when planing quarter-sawn stock. Turns well.
Fixing	Kwila tends to split unless pre-bored, but holds fastenings well.
Gluing	Glues satisfactorily except with casein glues.
Finishing	It takes paint, stain and polish well, but gum bleed-through or oily patches may affect the finish.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.2
Certification	Occasionally available.
FIRE HAZARD PROPERTIES: WALL AND CEILING LINING (AS/NZS 3837)	
Material Group	3
Average extinction area	less than 250m^2/kg.
Bushfire flammability	Listed as a bushfire-resisting timber in AS 3959.

Meranti, Shorea spp

IMPORTED

Name	Meranti
Species Name	Shorea spp., Parashorea spp.
Other Name	There are many species of Shorea and Parashorea growing in South East Asia, in Australia as dark red Meranti, light red Meranti, whilte Meranti, yellow Meranti, Pacific Maple, Borneo cedar, seraya, lauan and Philippine mahogany.
General Availability	Readily.
Source	Large rainforest hardwoods found throughout South East Asia and the islands of the South West Pacific region including the Philippines, Indonesia and east Malaysia.
APPEARANCE	
Description	The heartwood varies from pale pink to dark red in the red groups and from white through straw to yellow in the yellow-white groups. Sapwood cannot always be reliably identified by colour difference. The grain is coarse textured with quarter sawn material often displaying an attractive ribbon figure.
DURABILITY	
Durability Class	Outside above ground; generally Class 3 or 4, In-ground contact, generally Class 4.
Lyctis Susceptability	Susceptible.
Termite Resistance	Yellow meranti is resistant but all other types are not resistant.
Preservation	Sapwood readily accepts preservative impregnation but except for white Meranti, penetration of heartwood is negligible.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 2% from green to dry)
Tangential	(~ 4% from green to dry)
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	Dark red, 670: light red, 560; white, 550; yellow, 660.
Strength Group	Dark red, SD6;light red, SD7; white, SD5; yellow, SD6.
Joint Group	Dark red, JD3;light red, JD4; white, JD3; yellow, JD3.
Hardness (kN Janka)	Dark red, 3.5;light red, 2.8; white, 3.2; yellow, 3.7.
WORKABILITY	
Machining	Machines reasonably well to a smooth surface. However, some of the lower density species may give a woolly cut if sharp tools are not used.
Fixing	No difficulty has been experienced with the use of standard fittings and fastenings.
Gluing	Can be satisfactorily bonded using standard procedures.
Finishing	Can be painted, stained or polished. However, due to its open grain timber surfaces may need to be filled before finishing.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.15
Certification	Occasionally available.
Bushfire flammability	Not included in the tables of AS 3959

New Guinea rosewood, Pterocarpus indicus

IMPORTED

Name	New Guinea rosewood
Species Name	Pterocarpus indicus.
Other Name	Amboyna, narra and rosewood.
General Availability	Generally available
Source	A medium hardwood found in South East Asia east to the Solomon Islands.
General Performance	New Guinea rosewood machines well, is very stable and durable. NG rosewood has unusual colour variation that can vary from yellow to red in one plant. It often needs to be lightly stained.
APPEARANCE	
Description	Heartwood can be either golden brown or a dark blood-red. Sapwood pale yellow. The grain is variable with a medium texture, often highly figured.
DURABILITY	
Durability Class	Outside above ground: Class 2, In-ground contact: Class 3.
Lyctis Susceptability	Susceptible.
Termite Resistance	Resistant.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 1% from green to dry)
Tangential	(~ 2% from green to dry)
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	650
Strength Group	SD5
Hardness (kN Janka)	4.7
WORKABILITY	
Machining	Relatively easy to work.
Fixing	Nails satisfactorily.
Gluing	Glues satisfactorily.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.17
Certification	Occasionally available.
Bushfire flammability	Included in Table E2 of AS 3959.

Douglas fir, Pseudotsuga menziesii

IMPORTED

Name	Douglas Fir
Species Name	Pseudotsuga menziesii.
Other Name	Oregon, Oregon pine.
General Availability	Readily.
Source	It occurs naturally on the west coast of the USA and Canada. It is also a plantation species in other countries, particularly New Zealand.
APPEARANCE	
Description	The heartwood ranges from yellowish through orange to deep red. Sometimes the sapwood is distinctly paler. This grain is generally straight and fine textured with prominent growth rings.
DURABILITY	
Durability Class	Outside above ground: Class 4. In-ground contact: Class 4.
Lyctis Susceptability	Not susceptible.
Termite Resistance	Not resistant.
Preservation	Sapwood and heartwood are both resistant to preservative treatment.
STABILITY - UNIT SHRINKAGE	
Radial	0.23% (per 1% MC change).
Tangential	0.38 (per 1% MC change).
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	480 - 500
Strength Group	SD5 – SD6
Joint Group	JD4
Hardness (kN Janka)	3 - 3.4
WORKABILITY	
Machining	Machines and turns well but planer blades should be kept sharp to avoid surface ridging.
Fixing	Nails may tend to split, following the growth rings. Care is therefore needed with the use of standard fastenings and fittings.
Gluing	Can be satisfactorily bonded using standard procedures.
Finishing	High resin content of some material and earlywood / latewood ridging of dressed timber mean that care is required in selecting timber for finishing applications and in preparation of surfaces for paint and varnish finishes.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.13
Certification	Generally available.
Bushfire flammability	Not included in the tables of AS 3959

Surian, Toona calantas

IMPORTED

Name	Surian
Species Name	Toona calantas syn. Cedrela calantas.
Other Name	Kalantas, limpaga, New Guinea cedar, Calantas.
General Availability	Readily.
Source	A medium to large hardwood found in Indonesia, Malaysia, the Philippines and Papua New Guinea.
General Performance	With a strong grain and colour, Surian generally requires nothing more than a clear finish to present well. The colour deepens with age. Very durable, especially out of the ground, Surian is generally less dense and can fur more than Australian cedar.
APPEARANCE	
Description	Heartwood is light red to red-brown while the sapwood is pink-grey. Grain is straight with a moderately coarse texture.
DURABILITY	
Durability Class	Outside above ground: Class 1, In-ground contact: Class 2.
Lyctis Susceptability	Susceptible.
Termite Resistance	Not resistant.
Preservation	Sapwood readily accepts preservative.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 4% from green to dry)
Tangential	(~ 7% from green to dry)
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	480
Strength Group	SD8
Joint Group	JD4
Hardness (kN Janka)	Very soft
WORKABILITY	
Machining	Easy to work with hand and machine tools if blades are kept sharp. The timber is inclined to be ‘woolly’.
Fixing	No difficulty has been experienced with the use of standard fittings and fastenings
Gluing	Gluing can be difficult in occasional material exhibiting resin exudation.
Finishing	Stains, polishes and paints well, except for occasional material exhibiting resin exudation.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.13
Certification	Occasionally available.
Bushfire flammability	Not included in the tables of AS 3959

Western red cedar, Thuja plicata

IMPORTED

Name	Western red cedar
Species Name	Thuja plicata.
Other Name	Western cedar, red cedar.
General Availability	Readily.
Source	A large softwood of wet forests on the North American west coast from Oregon and Montana to British Columbia.
APPEARANCE	
Description	Heartwood varies from pale brown to dark brown. Sapwood is yellowish white. The grain is fine textured and straight grained with distinct growth rings.
DURABILITY	
Durability Class	Outside above ground: Class 2, In-ground contact: Class 3.
Lyctis Susceptability	Not susceptible.
Termite Resistance	Resistant.
Preservation	Sapwood is rarely present in sufficient quantities to warrant preservation. Penetration of heartwood by preservatives is negligible.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 1.5% from green to dry)
Tangential	(~ 3% from green to dry)

PHYSICAL PROPERTIES - SEASONED		EARLY FIRE HAZARD INDICES	
Density (kg/m^3)	380	Ignitability	15
Strength Group	SD8	Spread-of-flame	10
Joint Group	JD5	Smoke-developed	3
Hardness (kN Janka)	1.5		

WORKABILITY	
Machining	Machines and turns well to a smooth surface.
Fixing	Ferrous fastenings and fittings may be corroded by wood extractives when used in weather-exposed situations.
Gluing	Can be satisfactorily bonded using standard procedures.
Finishing	Readily accepts paint, stain and polish.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.11
Certification	Generally available.
Bushfire flammability	Not included in the tables of AS 3959

Yellow cedar, Chamaecyparis nootkatensis

IMPORTED

Name	Yellow cedar
Species Name	Chamaecyparis nootkatensis.
Other Name	Alaskan Yellow Cedar.
Source	A medium sized softwood of the North American Pacific coast from Alaska to Oregon.
APPEARANCE	
Description	The heartwood is a consistent pale yellow to creamy white colour with has small tight knots, The grain is usually straight with a fine and even texture.
DURABILITY	
Durability Class	Outside above ground: Class 1, In-ground contact: Class 1.
Lyctis Susceptability	Not susceptible.
Termite Resistance	Resistant.
STABILITY - UNIT SHRINKAGE	
Radial	(~ 1.5% from green to dry)
Tangential	(~ 3% from green to dry)
PHYSICAL PROPERTIES - SEASONED	
Density (kg/m^3)	500
Strength Group	JD4
Hardness (kN Janka)	2.6
WORKABILITY	
Machining	Works easily to a smooth finish and can be glued without difficulty.
Fixing	It takes and holds nails and screws without splitting.
Gluing	Careful control of conditions is needed when gluing. It bonds better with resins than non-resins.
Finishing	It provides a good surface for coatings.
ENVIRONMENTAL DESCRIPTION	
Insulation value (U)	0.13
EARLY FIRE HAZARD INDICES	
Bushfire flammability	Not included in the tables of AS 3959

References

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www.rawbs.com.au/Cedarbrochure.pdf

With The Compliments of

Window and Door Industry Council

Installing of timber windows and doors

TECHNICAL SHEET A

Installation practice needs to ensure that the units can perform as designed and the integrity and performance of the building fabric is maintained at the junction between units and the building's envelope.

Architecturally, timber windows and doors form the connection between the internal spaces of the buildings and the surrounding environment, allowing sun and light into buildings. Functionally, timber windows and doors play vital roles in a building's environmental control, excluding water, providing ventilation; controlling air-infiltration and sound, and contributing to the building's thermal performance. They are an integrated part of the building's fabric, especially when included in the external envelope.

Good installation practice avoids damage, maintains quality, ensures performance and saves money.

PLANNING AND GENERAL CONSIDERATIONS

Window and door joinery is supplied to site in varying conditions.

These range from a completely finished joinery unit: pre-finished and pre-glazed with all hardware attached, to sets of pre-assembled components, primed or base coated ready for site glazing and finishing. Every unit has its own special requirements. Pre-finished units are longer lasting but require additional care during installation. Unpainted units require finishing from additional trades on site.

The installation sequence needs to respond to the construction process.

In timber frame construction, windows are installed once the frame is stood and squared and the building wrapped. In full brick construction, windows can be fitted either during the course of construction or fitted into pre-formed openings at a later stage.

Window and door joinery can be heavy and difficult to position.

Allow for the lifting capacity available on site to match the unit's weight and location. Units can easily be heavier than two people can safely carry. Single glazed doors can weight about 22 kg/m^2. Ask your fabricator for an estimate of the weight of the units before delivery.

Windows and doors are generally non-load bearing. The load has to be carried by the surrounding frame.

Window and door units are generally not designed to take building loads, except for the wind load to which they are exposed. However, units in place can generate significant live loads from the wind and from operation, particular bi-fold units where the doors and windows are supported from the lintels.

The dead weight and live loads generated by the units must be transferred to and carried by the supporting frame. In turn, this frame has to be designed to carry the loads without undue deflection.

FORMING THE OPENING

The opening has to provide a tolerance for movement and settlement.

This needs to be sufficient to allow for deflection, settlement or shrinkage in the surrounding structure without distorting or imposing loads on the frame. Once installed, the heads should be straight and non-load bearing. Guidance on minimum allowances are given in the tables below.

Table 1 Recommended minimum opening size

	HEIGHT	WIDTH
Internal	Unit + 15 mm	Unit + 15 mm
External	Unit + 20 mm	Unit + 20 mm

Table 2 Recommended minimum clearance between frame and opening after installation.

	HEAD	JAMB
Internal	10 mm	5 mm
External	10 mm	6 mm

Figure 1 Frame with lintel

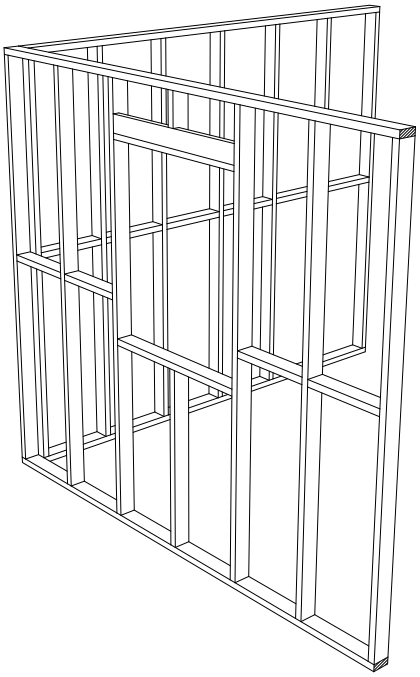


Figure 2 Windows and flashing with sarking

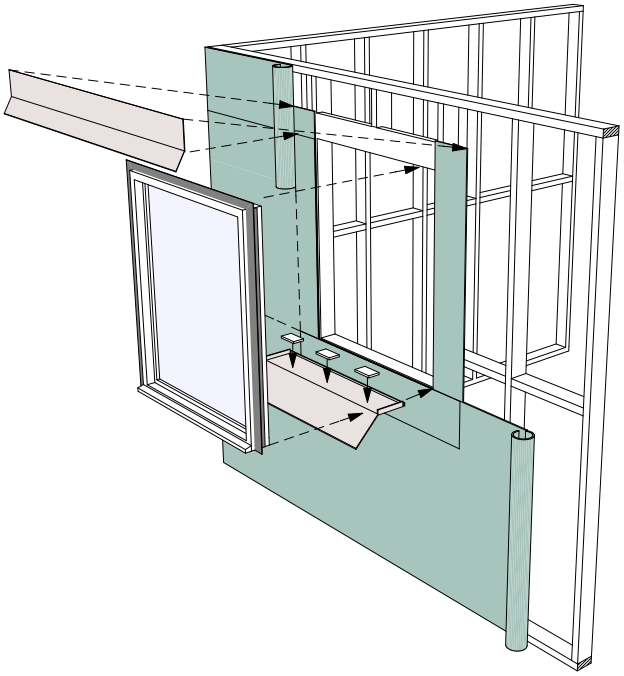


Figure 3 Windows and flashing with wrap

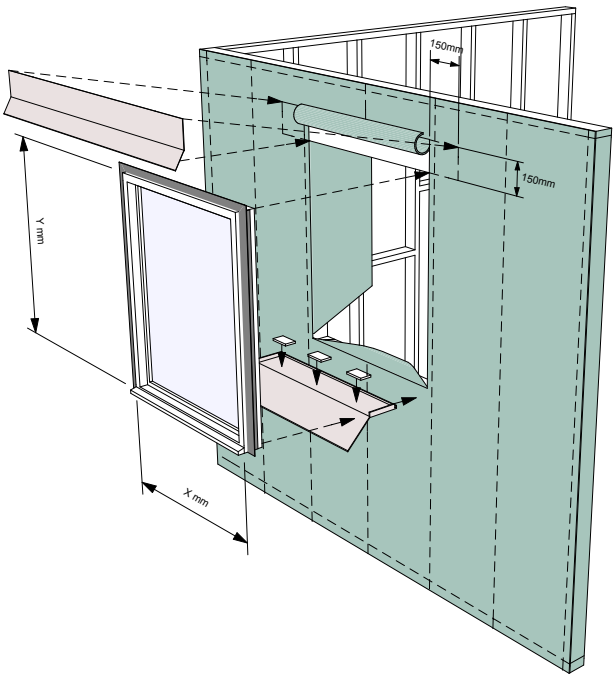


Figure 4 Opening sizes and wrapping

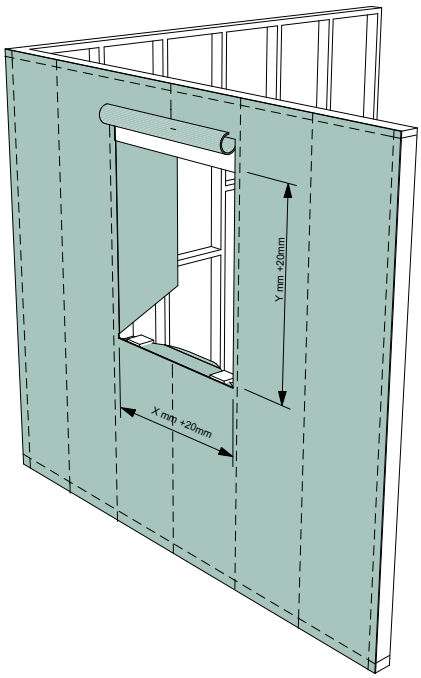


Figure 5 Door and flashing with wrap

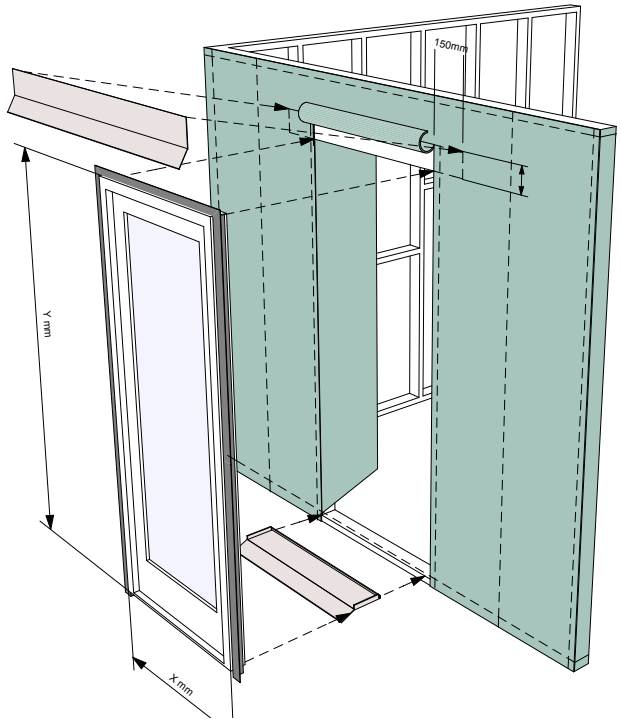
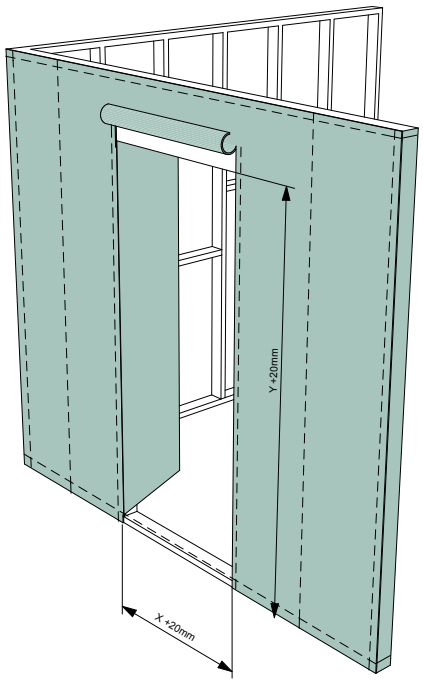


Figure 6 Opening sizes and wrapping



Check that the opening is square, has straight sides and is without twist.

Allow additional clearance to compensate for skew or hourglass openings, bows in the floor or sags in the lintel. The sill for sliding or bi-fold units must be installed flat and level. If installing a unit of this type and the bottom of the opening is uneven, it must be levelled.

Prepare the joinery for installation.

Check the size and confirm that it will fit into the opening. Vary the opening before considering any changes to the joinery.

The unit should be square, with temporary braces fitted. Sashes should opening cleanly. If any element has to be trimmed, any exposed edge must be treated with a compatible preservative and recoated with primer or stain.

Any unpainted surfaces of the joinery should be sealed with a good quality primer, especially surfaces inaccessible after installation. Remove spare keys and store them a safe place. Keep the sash and doors closed. Retain any packing or protection on the unit.

WEATHERPROOF

The weather-resistant barrier needs to be continuous from the building envelope to the unit. Any water that does enter needs to be able to drain away without entering the ‘dry’ side of the moisture barrier. This requires:

- preparation of the sarking layer to receive the joinery unit;
- flashing between the joinery unit and the sarking and the outside cladding or finish; and
- sealing between the joinery unit and supporting frame.

Install the sarking, foil or building wrap as a continous membrane across the wall.

Use plastic-capped nails, foil tacks or staples to fasten the wrap in place to the manufacturer’s recommendation. Overlap and seal the joints with sarking or foil tape. Seal all other cuts, penetrations, and openings to form an air-tight layer.

Cut the wrap or sarking at the window or door openings in an inverted “Y” pattern. Fold the edges around the jack jamb and sill trimmers and staple or nail them to the frame. Use sarking or foil tape to seal the bottom corners.

Alternately, cut, fold and position trimming pieces around the jamb studs and sill trimmers. Tape the foil or sarking to these to form a continuous layer around the sides and bottom of the opening.

FLASHING

Flashings are needed at the head, sill and jambs of the opening to prevent water entering the 'dry' side of the water barrier around the joinery frame. Flashing materials should comply with AS/NZS 2904. Incorporating storm beads or sealing the external cladding to the unit are inadequate on their own to reliably prevent water ingress in the long term. Inevitably, they will fail and water will enter the building.

Flashings shed water from the inner moisture exclusion layer to the outside of the cladding past the window or door frame. The final configuration of the flashings changes with the frame, the external cladding type, the position of the unit in the opening and the architectural intent. However, all units need:

- Head flashing: This stops water bridging between the wall cavity and the gap between the head of the door or window. It should extend up the inner wall 150 mm and past the edges of the unit by at least 150 on both sides.
- Jamb flashing: These stop water entering the gap between the unit and wall frame. They direct any water that enters between the unit and the cladding to the sill flashing.
- Sill flashing: This collects the water blown under the sill and running down the sarking layer and directs it outside.

Install the head flashing above the window and the sill flashing under the window.

Slit the sarking or foil layer 150 mm vertically above each jamb stud. Run the flashing across the head of the opening, extending 150 mm past the side of the opening. Tape the top of the flashing to the lintel and sarking. It should remain free to hinge until after the window is installed.

The sill flashing should positioned and return at least 10 mm at the back of the sill, or into a sill groove, and extend far enough to shed water to the outside of the external cladding. It should extend at least 20 up each end. The sill flashing can be fitted to the unit before installation, or positioned in the opening, ready to receive the unit.

INSTALLING WINDOWS AND PRE-HUNG DOORS

The unit has to be held in place, square and plumb, transferring loads to the external frame, and yet remain non load-bearing. Units should not be fixed at the head unless:

- They are longer than 1800 mm or
- Require support for sliding or bi-fold tracks.

There are several methods of installing a joinery unit. The method described here involves fitting a continuous fixing angle, such as 50 x 50 x 1.2 mm galvanized steel or similar aluminium angle to the outside face of the each jamb, and if the configuration allows to the unit head. Using an angle such as this provides a continuous side flashing, locates the unit in the correct position relative to face of the wall frame and simplifies fixing.

POSITION AND SUPPORT

Check that the unit is ready to install.

The opening should be square and of sufficient size. Sarking should be fitted, head and sill flashing prepared and in place, and the units primed and squared.

Position sill packers to support the units adequately.

Generally, sills should be supported on impervious packers positioned at a maximum of 150 mm from each jamb, directly underneath each mullion and at a maximum of 450 mm between these locations, preferably directly over studs in the wall frame. Ensure that the tops of the packers along the opening are level.

Packers should be about 30 mm wide. Sill packers should be impervious. Side packers can be timber or plywood.

Fully support the sill for sliding and bi-fold units. Packers for these units should be continuous. Failure to do this may result in poor operation.

Install the jamb fixing angles.

Determine the location of the unit in the opening relative to the inside face of the wall frame and any finish. Calculate the position where the side of the unit lines up with outside face of the wall frame. Mark this location as a line on the face of each jamb. The line should be parallel to the inside face of the units. Apply a bead of sealant beside the line and fit the fixing angles. Screw fix at 450 mm centres. A head angle can also be installed, if this does not foul the intended flashing detail.

Carefully position the unit and pack it square and plumb, with the sill level and jambs vertical.

The jamb fixing angles should be tight up against the frame, and the head and sill flashing free. The joinery items should have uniform clearance on all sides, and in the correct position, parallel to the inside wall face. The weight of lintels or arch bears should not be bearing on the frames.

Check that the unit is not twisted. If a window or door frame is installed with a twist, the sashes and leaves will not sit evenly in the frame.

Fit side packers between the unit and the frame a maximum of 100 mm from the sill and the head, and in the centre of the unit at a maximum 600 mm spacing. Packers should be snug but not distort the unit. Even minor distortions can prevent the correct operation of sliding units. When fitted, check the operation of all types of windows prior to fixing. If the sash or leaves binds on either the stile or mullion, packers should be adjusted until they move freely.

Do not install head packers, unless specified.

The head of the unit should not be load bearing. With units such as top-hung sliding or bi-folds, support the head from the lintel strictly in accordance with the manufacturers recommendation.

FIXING

Fixed in accordance with the manufacturer's instructions or the project specification.

Fixing shall not deform the window assembly. Starting at a maximum of 100 mm from each end, nail through the jamb fixing angles into the jamb studs at a maximum 450 mm centres.

For top-hung sliding and bi-folds, fix the head to the lintel strictly in accordance with the manufacturers recommendation.

Fixed units over 1800 mm wide with a 'sliding' fixing at the head.

Where a unit exceeds 1800 mm in width or is formed with two or more units, fixings should be provided at head and sill. Head fixing should be installed so that they provide lateral support but not vertical loads. Back fix screws into the joinery wherever possible. Where back-fixing is not possible, remove stops and conceal fixing behind them. Do not fix sills on the 'wet' side of the glazing.

Fixings should be hot tip galvanized steel in accordance with service condition No. 2 of AS 1789, stainless steel in accordance with AS 1449, or silicone bronze. Do not use uncoated steel fixings on any part of the unit.

Check operation after fixing

Sash should be wound in and out. If the sash binds on either stile or mullion, packers should be adjusted under sill until sash moves freely. After installation, remove racking braces where fitted.

SEALING EXTERNAL JOINERY TO THE FRAME

To prevent air infiltration, seal the gap between the window or door frame and wall frame.

The front face of the gap between the unit and the surrounding frame has to be sealed. There are several ways to do this. If fixing angle is used on the sides and head, the edges can be seal to the sarking or foil with tape. Under the sill or remaining parts of perimeter can be filled a polythene backed sealing strip or a backer rod and caulking.

Dress the head flashing around the unit and tape it to the wrap, ensuring an air and water proof finish.

Do not leave thermal bridges between the interior and exterior.

Carefully insulate the space between the joinery and wall frame. Pack it from the inside with mineral wool insulation. This will expand after a period of time to fill the gap. Alternately, the gap can be filled with low pressure polyurethane insulating foam. Do not use high-pressure expanding foams as they can distort the frame.

FITTING INTERNAL AND EXTERNAL LININGS

Re-check that the sill and head are straight and level before fixing architraves.

Frame head clearance should be a minimum 10 mm. Plaster head and stile clearance should be a minimum 6 mm. Do not directly tile or concrete up to the sill. This may result in cupping or distortion. Maintain at least a 5 mm expansion gap. Do not cover sill drainage holes with tiles or concrete. This may lead to poor operation, ingress of moisture and potentially void warranties.

The edge of the external cladding should allow room for a seal or a weather strip.

If sealing, ensure that the clearance provided allows for a serviceable seal width. To ensure a suitable sealer shape, insert a backer rod into the gap so that it finishes at least 12 mm clear of the external face of the unit.

Weather strips and storm moulds can limit water penetration.

A timber weather strip or storm mould can be fixed to the exposed face of the frame to protect the outside of the joint between the joinery frame and surround. This should not be sealed at the base and have a drainage space behind to allow any moisture that passes the batten to drain away.

Allow a minimum of 10 mm clearance between the unit sill and external sill bricks.
Sill bricks should be at least 10 mm clear of window frame to allow for settlement.

INSTALLATION SUMMARY	
Step 1	The opening has to provide a tolerance for movement and settlement. Check that the opening is square, has straight sides and is without twist. Prepare the joinery for installation. Install the jamb fixing angles Install the sarking, foil or building wrap as a continuous membrane across the wall.
Step 2	Install the head flashing above the window and the sill flashing under the window. Position sill packers to support the units adequately. Carefully position the unit and pack it square and plumb, with the sill level and jambs vertical. Do not install head packers, unless specified. Fixed in accordance with the manufacturer's instructions or the project specification. Checking operation after fixing To prevent air infiltration, seal the gap between the window or door frame and wall frame.
Step 3	Dress flashing to external cladding. The edge of the external cladding should allow room for a seal or a weather strip. Allow a minimum of 10 mm clearance between the unit sill and external sill bricks.
Step 4	Do not leave thermal bridges between the interior and exterior. Insulate gaps between the unit and the frame. Recheck that the sill and head are straight and level before fixing architraves. Install weather strips, storm moulds and seals that limit water penetration.

Figure 7 Installation sequence for brick veneer

STEP ONE STEP TWO STEP THREE STEP FOUR

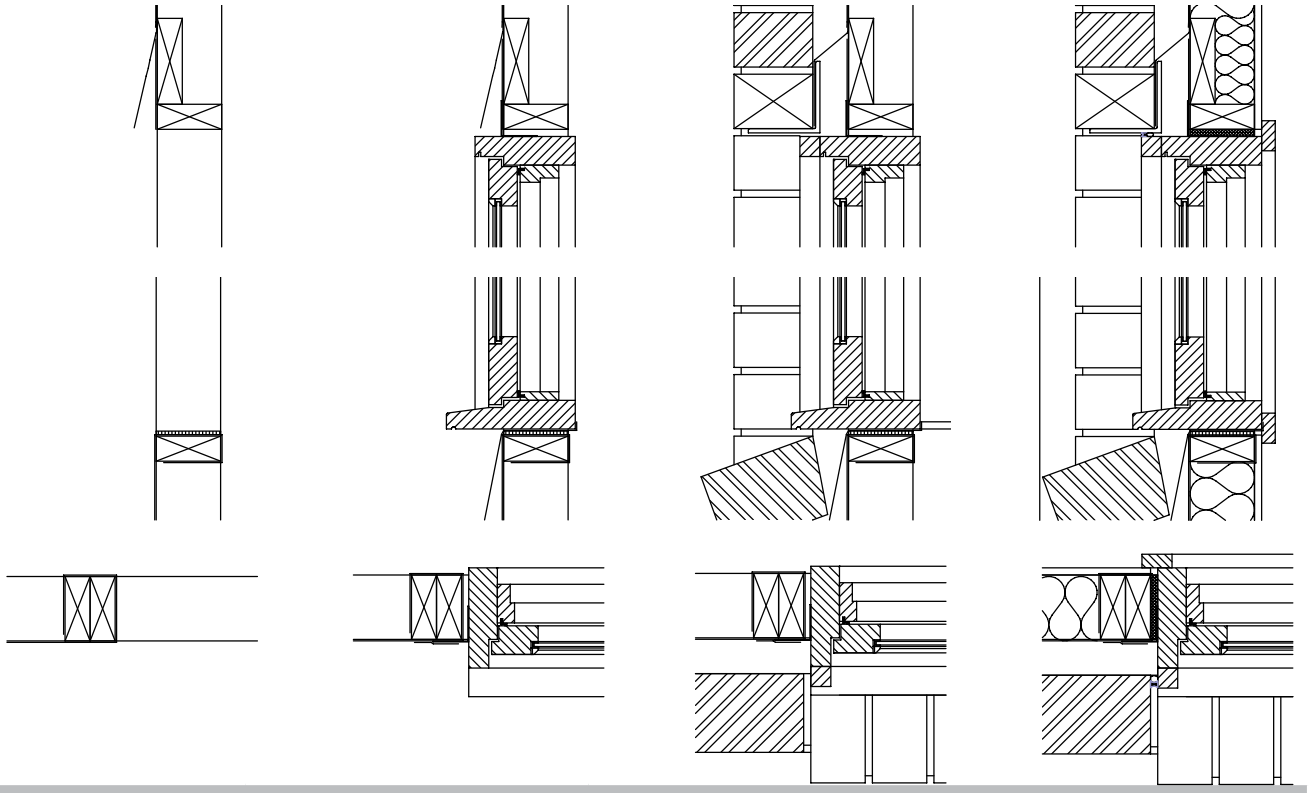
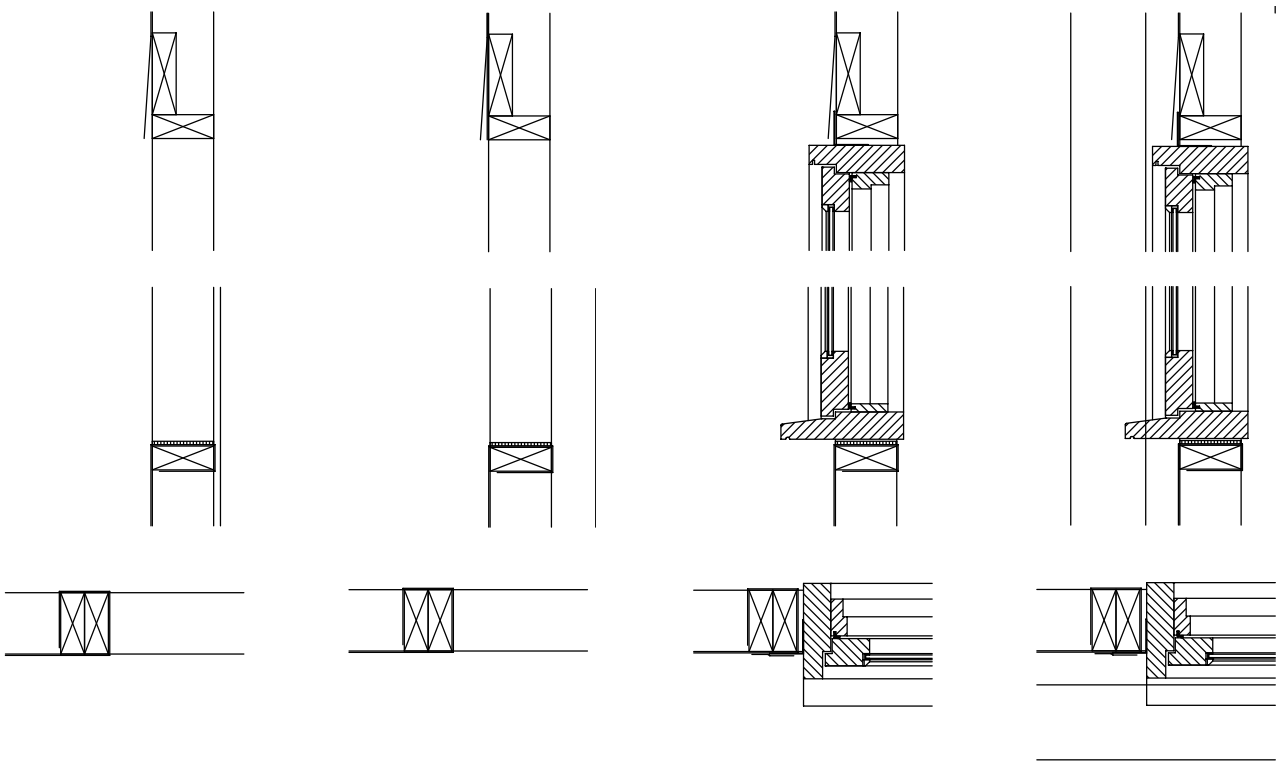


Figure 8 Installation sequence for weatherboards

STEP ONE STEP TWO STEP THREE STEP FOUR



INSTALLING A HUNG DOOR

Doors supplied hung in a frame should be installed as described above, except that internal doors do not require flashing. A joinery door can be hung in a frame assembled on site.

Determine the swing direction, the hinged side of the door and the number of hinges.

Standard height doors should have three hinges per door. Doors taller than 2040 mm high should have four hinges.

Ensure the door fits the frame, and both fit the opening.

The door generally requires an even 3 mm clearance between the leaf and the frame on all sides. So, the size of the opening in the door frame should be 6 mm larger in each direction than the door.

If required, trim the door evenly on each face to fit the frame. Avoid trimming more than 10 mm from any edge of the joinery. Doors to be painted require slightly more clearance. Doors that are to be on extended butt hinges require even slightly more clearance to allow for its opening swing. Both the door and the frame should be square.

Clearances from the frame to the opening are given in Table TB.1.

Fit the frame to the opening.

Generally follow the guidelines above. Ensure that the frame is flat without twist. Back fix screws into the joinery wherever possible. Avoid back-nailing as it will deform the frame. Where back-fixing is not possible, fix on the line of any floating stops.

Fixings for any external doors should be hot tip galvanized steel in accordance with service condition No. 2 of AS 1789, stainless steel in accordance with AS 1449, or silicone bronze. Do not use uncoated steel fixings on any part of an external unit.

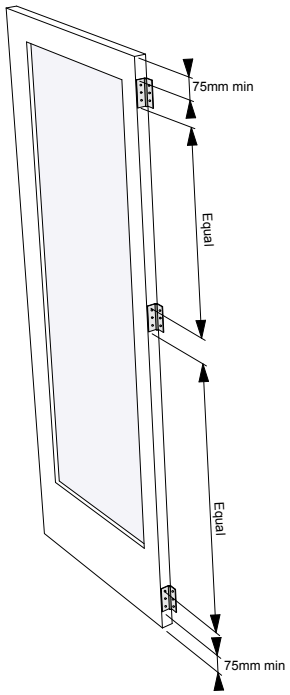
Fixing hinges to the door.

Fit the selected hinges to the door. With butt hinges, one leaf of the hinge is set into the jamb while the other is set into mortise in the door. The width of the hinge has to be chosen to ensure the door opens clear of any surrounding jamb or other impediments.

The top and bottom hinges should be positioned an equal distance in from the top or bottom of the door, ideally between 75 -150 mm from the outside edge of the door to the outside edge of the hinge. Additional hinges should be evenly spaced between these two.

For butt hinges, set the hinge into the wood of the door so that it is flush when fixed to the door. Fit off all hinges.

Figure 9 Hinge positions on a door



Fixing hinges to the jamb.

Accurately measure the distance for the top of the door to the top edge of each hinge. Add 3 mm to each measurement and mark these distances carefully on the door jamb. Each mark is the top of the hinges on the door. The 3 mm provides the clearance at the top of the door.

Rebate the jamb to accept the hinges so that they finish flush when fixed.

Stand the door perpendicular to the door opening with the hinges close to the rebated jamb. Propping under the door with a wedge, fit the top hinge in place with one screw, before fixing the bottom hinge then the intermediate hinges each with only one screw.

Check the swing of the door, ensuring it has an even clearance on the top and sides, and a suitable clearance at the bottom. Adjust the hinge or screw positions as necessary before installing the remainder of the screws.

Check the door again. If the jamb has floating stops, these the door stop bead is fitted to the line of the door to allow a soft close.

FINISHING ALL JOINERY

Re-prime any unit immediately if the primer coat is removed during installation.

Timber products should be sealed with 2 coats to all faces and edges within 30 days of delivery.

Factory finished windows should be checked for any on-site damage to the finish and any small areas made good in accordance.

PROTECTION

Protect the installed joinery with plastic or cardboard. Avoid splattering with mortar, concrete, render and other objects that can damage the unit during construction. With pre-finished and pre-glazed windows the manufacturers' protection should be left in place unless its removal is necessary.

Do not stand in the windows or doors, or use them as supports for scaffolding. If a door must be used for essential access, build a protective cover to protect the joinery.

Table 1 Generic products performance: Effect of material and glazing					
		COOLING	HEATING	Total Window System Values - NRFC	
Glazing ID	Frame	%impr.	%impr.	Uw	SHGCw
GENERIC STANDARD INDUSTRY TYPICAL WINDOW - SINGLE GLAZED					
3Clr	Generic: Aluminium	0%	0%	7.7	0.78
3Clr	Generic: Timber	21%	24%	5.5	0.69
5Toned	Generic: Timber	38%	16%	5.4	0.50
5SToned	Generic: Timber	40%	15%	5.4	0.47
6.38LE	Generic: Timber	52%	33%	3.7	0.41
GENERIC STANDARD INDUSTRY TYPICAL WINDOW - DOUBLE GLAZED					
3/6/3	Generic: Aluminium	21%	26%	5.4	0.69
3/6/3	Generic: Timber	38%	47%	3.3	0.61
3/12/3	Generic: Timber	40%	51%	3.0	0.61
3/12/4LE	Generic: Timber	48%	59%	2.1	0.58
5Stoned/6/5	Generic: Timber	55%	37%	3.3	0.41
Source: 2009 WERS Certified Product Directory - ARFC.					

Key:			
GLAZING ID	GLAZING DESCRIPTION	GLAZING ID	GLAZING DESCRIPTION
3Clr	3mm single clear	3/6/3	3mm clear/6mm air/3mm clear
6.38LE	6.38 laminate low-e	3/12/3	3mm clear/12mm air/3mm clear
5Toned	5mm toned	3/12/4LE	3mm clear/12mm air/4mm low-e
5STONED	5mm Super toned	5Stoned/6/5	5mm Super toned/6mm air/5mm clear

Notes:
1. Uw is the whole window U-value
2. SHGCw is the whole window solar heat gain coefficient
3. Tvw is the whole window visible (light) transmittance
4. Percentage improvement figures are compared with using base-case Generic Window 1 (3mm clear in standard aluminium frame)
5. A negative percentage improvement figure indicates performance worse than the base-case window
6. A positive percentage improvement figure indicates performance better than the base-case window
7. Maximum air infiltration is 5.0L/s.m2 at a positive pressure difference of 75 Pa as measured according to AS 2047
8. Static performance (Uw SHGCw Tvw Tdw) calculated using Window 5.2 and Therm 5.2 software (LBNL), 2000-2003
9. Annual energy performance (% improvements) calculated using Nationwide House Energy Rating Software (NatHERS) according to procedures of WERS 2008.
10. Results disclosed at National Fenestration Rating Council (NFRC) regulations

Table 2 Products Performance: Effect of configuration.

Results are averages of 2009/2010 test results for each product type from up to 8 companies.

		COOLING	HEATING	Total Window System Values - NFRC	
Glazing ID	Frame	%impr.	%impr.	Uw	SHGCw
3Clr	Generic: Aluminium	0%	0%	7.7	0.78
3Clr	Timber: Sliding	29%	29%	4.9	0.63
3Clr	Timber: Double hung	30%	31%	5.0	0.62
3Clr	Timber: Awning	35%	50%	4.8	0.57
3Clr	Timber: Casement	38%	53%	4.6	0.56
DG 3/6/3	Generic: Aluminium	21%	26%	5.4	0.69
DG 3/6/3	Timber: Sliding	45%	49%	3.0	0.56
DG 3/6/3	Timber: Double hung	49%	50%	2.8	0.52
DG 3/6/3	Timber: Awning	50%	71%	2.8	0.51
DG 3/6/3	Timber: Casement	57%	72%	2.4	0.44

Source: WERS Product reports. www.wers.net

Key:

GLAZING ID	GLAZING DESCRIPTION	GLAZING ID	GLAZING DESCRIPTION
3Clr	3mm single clear	3/6/3	3mm clear/6mm air/3mm clear
6.38LE	6.38 laminate low-e	3/12/3	3mm clear/12mm air/3 mm clear
5Toned	5mm toned	3/12/4LE	3mm clear/12mm air/4 mm low-e
5SToned	5mm Super toned	5Stoned/6/5	5mm Super toned/6 mm air/5 mm clear

Notes:
1. Uw is the whole window U-value
2. SHGCw is the whole window solar heat gain coefficient
3. Tvw is the whole window visible (light) transmittance
4. Percentage improvement figures are compared with using base-case Generic Window 1 (3mm clear in standard aluminium frame)
5. A negative percentage improvement figure indicates performance worse than the base-case window
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7. Maximum air infiltration is 5.0L/s.m2 at a positive pressure difference of 75 Pa as measured according to AS 2047
8. Static performance (Uw SHGCw Tvw Tdw) calculated using Window 5.2 and Therm 5.2 software (LBNL), 2000-2003
9. Annual energy performance (% improvements) calculated using Nationwide House Energy Rating Software (NatHERS) according to procedures of WERS 2008
10. Results disclosed at National Fenestration Rating Council (NRFC) regulations

Timber's durability is a key aspect in the service life of the external windows and doors.

Timber resists decay naturally or with the assistance of added preservatives. Recently CSIRO researchers, Dr Laurie Cookson and Jenny Carr, sought to gauge the comparative durability of test window frames constructed from six species of timber: Meranti, Western red cedar and a range of ash-species eucalypts: Mountain ash; Alpine ash; Messmate; and Silvertop ash.

Six window frames were made of each species and exposed to accelerated decay testing. The timber was used untreated or treated with either boron when unseasoned, or LOSP when seasoned. Two LOSP formulations were used: one based on an azole, the other on tri-butyl tin (TBTN).

After eight years of exposure, the windows were examined and rated on an 8 to 0 scale based on the amount of cross-section lost to decay. A rating of 8 means the frame was sound while 0 equalled a destroyed frame. A specimen rated 3 was regarded as unserviceable.

LOSP TREATED TIMBER WINDOWS

- Only light decay was found in eucalypt windows treated with LOSP (azole) and then painted. Cut ends resealed by a three minute dip in LOSP (azole) were generally sound.
- LOSP (azole) treated eucalypt windows gave almost equal performance to LOSP (azole) treated Meranti, and equal or better performance to untreated Western red cedar.
- LOSP (TBTN) Mountain ash windows performed much worse than LOSP (azole) treated windows of the same species.
- Mountain ash windows dipped in LOSP (azole) for three minutes before assembly performed much better than untreated windows.

Table 2 Performance of painted windows treated with LOSP (azole) and Western red cedar

SPECIES	DURABILITY	TREATMENT	MEAN PERFORMANCE (std dev.)
Meranti (Shorea)	3-4	LOSP (azole)	7.9 (0.1)
Messmate (E.obliqua)	3	LOSP (azole)	7.8 (0.2)
Silvertop ash (E. sieberi)	2	LOSP (azole)	7.7 (0.2)
Alpine ash (E. delgatensis)	3	LOSP (azole)	7.3 (0.1)
Mountain ash (E. regnans)	3	LOSP (azole)	7.4 (0.3)
Mountain ash (E. regnans)	3	LOSP (azole, dip treatment)	7.1 (0.6)
Mountain ash (E. regnans)	3	LOSP (TBTN)	4.5 (2.8)
Western red cedar (T.plicata)	2	untreated	7.4 (0.8)

Rating scale: 8 = sound, 0 = destroyed

PAINTING

- Painting improved the long term performance of untreated and treated windows. Similar unpainted windows developed more decay.

Table 3 Performance of windows painted and unpainted

SPECIES	DURABILITY	TREATMENT	MEAN PERFORMANCE (std dev.)
Mountain ash (E.regnans)	3	LOSP (azole), painted	7.4 (0.3)
Mountain ash (E.regnans)	3	LOSP (azole), unpainted	4.5 (2.5)
Mountain ash (E.regnans)	3	untreated, painted	0.9 (1.0)
Mountain ash (E.regnans)	3	untreated, unpainted	0.6 (0.8)
Western red cedar (T. plicata)	2	untreated, painted	7.4 (0.8)

Rating scale: 8 = sound, 0 = destroyed

BORON TREATMENT

- Messmate and Mountain ash timbers treated with boron when unseasoned generally performed as well as LOSP (azole) treated Mountain ash. Similar boron-treated Alpine ash windows also generally performed well.
- The retention of boron achieved in Silvertop ash did not improve decay resistance.

Table 4 Performance of painted windows treated with boron to H1 and Western red cedar

SPECIES	DURABILITY	TREATMENT	MEAN PERFORMANCE (std dev.)
Mountain ash (E.regnans)	3	boron	7.4 (0.5)
Messmate (E.obliqua)	3	boron	7.4 (0.3)
Alpine Ash (E. delegatensis)	3	boron	7.0 (1.6)
Silvertop ash (E.sieberi)	2	boron	6.0 (1.4)
Western red cedar (T.plicata)	2	untreated	7.4 (0.8)

Rating scale: 8 = sound, 0 = destroyed

OTHER TREATMENT OPTIONS

- Least decay in all window types was found in untreated Mountain ash windows containing No-Rot® diffusible preservative rods. These rods were inserted into holes drilled near either end of Mountain ash sections and replenished after five years.

Table 5 Performance of other treatments and Western red cedar

SPECIES	DURABILITY	TREATMENT	MEAN PERFORMANCE (std dev.)
Mountain ash (E.regnans)	3	No-rot rods	8.0 (0.1)
Western red cedar (T.plicata)	2	untreated	7.4 (0.8)

Rating scale: 8 = sound, 0 = destroyed

BASIC PERFORMANCE

- The decay rate in untreated windows generally corresponded to the species' durability rating.

Table 6 Performance of untreated painted windows by species

SPECIES	DURABILITY	TREATMENT	MEAN PERFORMANCE (std dev.)
Western red cedar (T. plicata)	2	untreated	7.4 (0.8)
Messmate (E.obliqua)	3	untreated	6.6 (1.1)
Silvertop ash (E.sieberi)	2	untreated	6.4 (1.2)
Meranti (Shorea)	3-4	untreated	2.0 (1.0)
Mountain ash (E.regnans)	3	untreated	0.9 (1.0)
Alpine ash (E.delegatensis)	3	untreated	0.7 (1.0)

Rating scale: 8 = sound, 0 = destroyed

METHODOLOGY

This trial sought to gauge the comparative durability of test window frames constructed from six species of timber: Meranti, Western red cedar and ash-species eucalypts: Mountain ash; Alpine ash; Messmate; and Silvertop ash. The timber was used untreated or treated with either vacuum pressure impregnated boron when unseasoned, or LOSP when seasoned. Two LOSP formulations were used: one based on an azole, the other on tri-butyl tin (TBTN). The treatments are detailed in Table 7.

To make the windows, 80 x 30 mm sections of each species timber were assembled into 300 mm square frames. The corner joint was a rebated butt joint, joined with a single screw. A single sheet of glass was fitted into the frames and restrained with glazing beads. The glass was not sealed to the frame allowing water to run down the glass and pool under the beads. Most windows were painted cream after assembly, leaving the inside of the joints unpainted. Some frames were unpainted.

Six frames were assembled for each combination of species, treatment and paint coating and subjected to eight years of exposure. Three months of each year were spent on the roof of the CSIRO facility at Clayton, Victoria, and nine months in an accelerated field simulator (AFS). The AFS maintained conditions highly conducive to decay. The window frames were regularly wet, the temperature was kept at 28 ºC and relative humidity was maintained at 85 %.

After this exposure, the windows were inspected for decay. Each frame was dismantled and individual components probed with a knife. Some window sections were cut in half to determine decay depth. Specimens were given a performance rating of 8-0 based on the amount of cross-section lost, where 8 equalled sound and 0 equalled destroyed. A specimen rated 3 was considered to be unserviceable.

The full report of the research is available for Forest and Wood Products Australia at: www.fwpa.com.au

Table 7 Timber treatment schedule

TREATMENT	APPLICATION
boron	Vacuum pressure impregnated with boron as Diffusol® to meet H1 requirements under AS 1604.
LOSP (azole)	Commercial vacuum pressure treatment with propiconazole (Wocosen tech.) at 0.245 % m/vol, tebuconazole (Preventol A8) at 0.245 % m/vol, and permethrin at 0.26 % m/vol.
LOSP (azole, dip treatment)	A three minute dip immersion in the LOSP (azole) treatment
LOSP (TBTN)	Commercial vacuum pressure treatment with Timberlife® (235WR), containing TBTN (active Sn 0.99% m/vol) at 4.6% m/vol and permethrin at 0.26% m/vol
No-rot rods	Preschem No-Rot® diffusible preservative rods installed 35 mm back from each rebate

To make the windows, 80 x 30 mm sections of each species timber were assembled into 300 mm square frames. The corner joint was a rebated butt joint, joined with a single screw. A single sheet of glass was fitted into the frames and restrained with glazing beads. The glass was not sealed and this allowed water to run down the glass and pool under the beads. Most windows were painted cream after assembly. Some were unpainted.

Six frames were assembled for each combination of species, treatment and paint coating and subjected to eight years of exposure. Three months of each year were spent on the roof of the CSIRO facility at Clayton, Victoria, and nine months in an accelerated field simulator (AFS) at the same site. The ASF maintained conditions highly condusive to decay. The window frames were regularly wet, the temperature was kept at 28 ºC and relative humidity was maintained at 85 %.

After this exposure, the windows were inspected for decay. Each frame was dismantled and individual components probed with a knife. Some window sections were cut in half to determine decay depth. Specimens were given a performance rating of 8-0 based on the amount of cross-section lost, where 8 equalled sound and 0 equalled destroyed. A specimen rated 3 was considered to be unserviceable.

KEY POINTS
Installation of external windows and doors. Unless allowed otherwise, external window and doors are unacceptable if they are not installed and flashed to the manufacturer's installation instructions.
Weather-tightness of windows, doors and window and door frames. Window and door frame installations are unacceptable if they allow water to penetrate into rooms under normal weather conditions.
Internal door clearances. Unless otherwise required, the installation of a door is unacceptable if, within three months of completion, clearances between door leaves and frames and between adjacent door leaves are not uniform and less than 2 mm or greater than 5 mm in width. The installation of a door is unacceptable if, unless provided for ventilation or allowing removal of the door, the clearance between the door and the nominated floor finish when installed is greater than 20 mm.

Table 9.1 Distortion of doors

ITEM OF DISTORTION	LIMIT
Twist measured diagonally across the door	5 mm
Bending along the door height: up to 2150 mm high	4 mm
Bending along the door height: between 2150 and 2400 mm high	6 mm
Bending along the door height: over 2400 mm high	7 mm
Bending across the door width: up to 1200 mm wide	2 mm
Surface misalignment, at the meeting edge of double swing or French doors, when closed.	5 mm

GENERAL
Sealing of door edges. External door leaves are unacceptable if they are not sealed all the way round to prevent moisture entering the timber.
Operation of doors and windows. Doors and windows are unacceptable if they bind or jam as a result of builder's work or do not operate as intended by the manufacturer.
Bowed window heads, sill and jambs. Sill, heads or jambs that have a bow from a flat surface greater than the amount allowed in AS 2047 – Windows in buildings are unacceptable. All clearances shall be sufficient to enable installation of the windows to be plumb, level and not allow loads to be imposed on the frame.
Size of window assemblies. Window assemblies are unacceptable if their size is not within 3 mm of the agreed size, or the maximum difference between diagonals is more than 4 mm.
Brick sill, sill tiles and shrinkage allowance for timber framing. Distortion of windows frames or the dislodgement of sill bricks due to inadequate shrinkage allowance are defects. Brickwork is unacceptable if at the time of construction, the clearance between the timber sill and any brickwork sill is less than 5 mm for a single or lower storey and 10 mm in an upper storey.
Cleaning. Building works are unacceptable if the windows are not cleaned on completion.

Adapted from 'Guide to Standards and Tolerances 2007" produced in collaboration with the Victorian Building Commission, the Office of Fair Trading NSW, the Tasmanian and the ACT governments.

Material safety with timber and timber products

TECHNICAL SHEET E

Always use and work with Timbers safely. Timber and timber products have to be handled and machined safely on building sites and in workshops. The two main safety considerations are:

- The control of wood dust; and
- Handling species or products with known toxicological effects.

KEY POINTS	
Control of wood dust	Many hazards are associated with wood dust production. Wood dust can cause a range of skin, eye, lung and other aliments and complaints. All work with timber should be carried out in such a way as to minimise the generation of dust. Generally, all sawdust needs to collected at the point of generation. Machining should be done with equipment fitted with exhaust extraction. Hand power tools should be fitted with dust bags and used in well-ventilated areas. A vacuum cleaner with a HEPA filter or wet mop should be used to clean work areas. A dry sweeping method should not be used.
Specific species or products effects	The dust of some species and products may be poisonous or carcinogenic. This guide provides a list of potential timber hazards. Many tropical timbers are spalted (i.e. black lines are present within the timber). These black lines are caused by fungus. Any timber with fungal spores will grow fungus in a bag. When this timber is worked (by hand or machine) the dust may be toxic. Apart from the effects of the wood itself, risks posed by the use of chemicals in wood treatment, preservation and finishing should be considered. The National code of practice for the safe handling of timber preservatives and treated timber provides detailed guidance and can be downloaded from www.nohsc.gov.au. Medium and high-density fibreboards (MDF) are made using up to 13% formaldehyde resin. Formaldehyde is classified as a probable human carcinogen and may be released during machining. The softwood dust from this product is a sensitiser and may cause allergic dermatitis or asthma. Respiratory protection as specified on the Material Safety Data Sheet (MSDS) for fibreboard must be worn when machining. The risk of nasal or paranasal sinus cancers is increased if the work practices noted in the MSDS are not followed. Material Safety Data Sheet (MSDS) for fibreboard can be downloaded from www.woodpanels.org.au.

GENERAL PRECAUTIONS

- Avoid using wood with known toxicological properties.
- Reduce dust to a minimum by collecting it at the source of generation.
- Ensure that dust extraction units are functioning properly.
- Hand power tools should be fitted to mobile dust extractions units. Dust bags may still release fine wood particles into the work place.
- Where dust is a problem, wear eye protection and an efficient respirator and ensure that there is adequate ventilation.
- Always wear protective clothing, including shirts with long sleeves and high collars, long trousers, shoes or boots.
- Use barrier creams (silicone-free and fatty) before, during and after work.
- Always wash hands prior to going to the toilet since some wood dust may irritate the genitals and anus.
- Always wash hands prior to eating.
- Ensure that all wounds are clean and well covered before work.
- Clean the workshop machines and tools regularly to prevent dust build-up.
- Suspect that a health problem may be related to your workshop if the symptoms improve during holidays or absences from the workshop.

Table 1 List of Potential Timber Hazards		
TIMBER HAZARD	EFFECT	SYMPTOM
Boxwood Sap or latex.	Primary skin irritant, dermatitis.	Skin irritation, eruption.
Timbers usually with acrid smell, eg Black Bean.	Cumulative contact dermatitis.	Dermatitis, secondary infection.
Oregon and green Jarrah handling and splinters.	Mechanical trauma, dermatitis.	Dermatitis, secondary infection.
Blackwood, Eucalyptus, Silky Oak, Jarrah, Oregon, Mulga, and Shorea sap.	Mucosal irritation.	Rhinitis, sneezing, asthma, tight chest and coughing.
Blackwood, Stringy-bark.	Pulmonary allergic and hypersensitivity reactions.	Nasal inflammation, bronchial asthma.
Ebony and some fungi.	Pulmonary allergic and hypersensitivity reactions. 'Wood Trimmers Disease' or 'Farmer Disease'.	Severe respiratory problems within 4 to 8 hours. Symptoms similar to flu. Repeated exposure leads to fibrosis of lungs.
Certain hardwoods such as Beech and English Oak are sensitisers.	Sensitisation can cause allergic reactions	Skin rash or inflammation. Nasal inflammation, bronchial asthma
Western Red Cedar wood dust is a sensitiser.	Pulmonary allergic and hypersensitivity reactions. Nasal and paranasal cancer (with long term exposure).	Skin rash or inflammation. Nasal inflammation, bronchial asthma.
Oleander sap and latex is poisonous.	Primary skin irritant, dermatitis.	Skin irritation, eruption, poisoning.

References:

Materials, Design and Technology (MDT) Safety Guide, Tasmanian Department of Education, November 2002

KEY POINTS

Timber is a hygroscopic material. It absorbs and gives off moisture to remain in equilibrium with the surrounding atmosphere. As timber absorbs moisture, it expands. As it loses moisture, it contracts.

Timber used for high quality joinery needs to be seasoned to a moisture content suitable for its intended end use.

The moisture content of timber delivered to the joinery should be assessed and recorded. Timber without a suitable moisture content should be rejected or racked until the moisture content is suitable.

Dry timber needs to be stored suitably. It should be kept under cover at all times.

GENERAL

Timber for high-value joinery such as timber windows and doors has to be:

- dried to a moisture content suitably for the application and
- stored and handled to maintain that moisture content until it is positioned in service.

While timber drying is a complex scientific and engineering field, the basic principles of drying and storage are clear and relatively simple.

MOISTURE AND WOOD PROPERTIES

The presence of water in wood

Under ordinary conditions, all wood contains some water. The amount of water contained in wood is known as its moisture content. The moisture content is important as many other parameters such as stability, shrinkage, strength, stiffness and durability have direct relationships to the timber's moisture content.

The moisture content (MC) of a piece of timber is defined as the weight of water contained in the piece expressed as a percentage of its oven dry weight.

$$MC\% = (\text{Weight of water in timber} / \text{Oven dry weight of timber}) \times 100$$

While the moisture content in freshly sawn timber can be more than 100%, in use, the moisture content of a piece of wood will eventually reach equilibrium with the surrounding atmosphere. This is called the Equilibrium Moisture Content (EMC). The value of the EMC depends primarily on the relative humidity and temperature of the surrounding air.

Moisture loss and shrinkage

When drying most timbers, there is minimal shrinkage until the moisture content reaches fibre saturation point (FSP) at about 25% MC. From there on, the cells start to harden and "normal" shrinkage commences. Normal shrinkage occurs at different rates in the three primary directions of the wood:

- Tangentially, or around the growth rings,
- Radially, or perpendicular to the growth rings, and
- Longitudinally, or along the grain of the wood

Shrinkage below 25% MC occurs at a regular rate. This is called unit shrinkage and can be defined as the percentage change in dimension following a moisture content change of 1%. The unit shrinkage is generally given in both the radial direction and the tangential direction. Unit shrinkage (or "movement") is an important property for timber in high-value applications as it gives an indication of the dimensional changes that may be expected in timber in response to environmental changes.

Timber for joinery needs to be dried to its equilibrium moisture content prior to use. Otherwise, the shrinkage that occurs as it dries can cause problems such as bowing, gaps and splitting from restraints or connections. Expansion can also occur when timber re-absorbs moisture after being exposed to more moist conditions than that for which it was dried.

As timber usually shrinks more in the tangential direction than it does in the radial direction, boards can distort as timber dries. Effectively, the growth rings tend to straighten and this is most noticeable in backsawn boards.

Determing a suitable moisture content

The target moisture content for timber in joinery varies with the application.

Timber windows and external door are generally exposed on one face to external condition and on the other face to internal conditions. In this case, the moisture content of the timber should be targeted at the equilibrium content of timber outside under cover. This would normally be a moisture content between 10 and 13% in most built-up areas in Australia. This matches the requirement of to AS 2796 for hardwood and AS 4785 for softwood. Timber used in internal doors and fittings may be exposed to varying conditions, depending on the level of heating or air-conditioning in the building. In these cases, the target moisture content would be between 8 and 10%.

AS 2047 Windows in Buildings requires that moisture content of the timber be between 10 and 15% at the time of fabrication and delivery as complete assemblies. Generally, Australian producers dry hardwood to a target moisture content of between 10 - 15% MC.

Controlling moisture content.

Timber for high-value joinery such as timber windows and doors has to be dried to a moisture content suitable for the application. Timber can either be purchased dry or unseasoned.

This Technical Sheet only covers controlling the moisture content of timber purchased dry. If drying unseasoned timber, refer to the Australian Hardwood Drying Best Practice Manual, available from Forest Wood Products Australia at: www.fwpa.com.au.

The moisture content of dry timber must be determined at delivery, and maintained during the storage and production.

The expected moisture content.

Timber can be supplied at a range of moisture contents depending on the country of supply, the standards applied at manufacture, and the conditions of subsequent handling.

Australian produced timber is generally supplied to either

- AS 2796: Timber - Hardwood - Sawn and milled products; and
- AS 4785: Timber - Softwood - Sawn and milled products

AS 2796 defines three major product grades; Select, Medium Feature / Standard, and High Feature. The grades are separated by the amount of natural and production induced characteristics found in each board. Natural characteristics include gum vein, knots and hobnail while the main production induced characteristic from drying is checking.

The standard also defines acceptable amounts of bow, spring and cup in material of different product type and the target moisture content for the major product groups. These are set out in Table G7.1

Table 1 Target moisture content in AS 2796 for the major product groups

PRODUCT	REQUIRED MOISTURE CONTENT
Parquet, and Sawn or dressed furniture components	8 to 13 %
Strip flooring, Overlay strip flooring, Lining Boards, Dressed boards, Joinery Stock, Mouldings and sawn boards for Feedstock	9 to 14 %
Light decking, cladding, fascia and barge boards	10 to 18%

AS 4785 defines five major product grades; Clear, Appearance, Select, Standard and Utility grades. The standard also defines acceptable amounts of bow, spring and cup in material of different product type and the target moisture content for the major product groups. These are set out in Table G7.2 These moisture contents apply to all grades.

Table 2 Target moisture content in AS 4785 for the major product groups	
PRODUCT	REQUIRED MOISTURE CONTENT
Strip flooring, Overlay strip flooring, Lining Boards, Dressed boards, Joinery Stock, Mouldings and sawn boards for Feedstock	9 to 14 %
Light decking, cladding, fascia and barge boards	10 to 18%

DETAIL

Timber ordered from Australian producers should be supplied to comply with these standards or to a moisture content previously agreed. Timber purchased from overseas may have a range of moisture contents, depending on the standards applied at manufacture, and the conditions of subsequent handling.

The acceptable moisture content on delivery should be specified in any timber order.

Moisture content and quality at delivery

Each pack of timber delivered to the joinery should be inspected and the average moisture content assessed before it is accepted. Assessment means opening the pack and taking readings with a resistance moisture meter on boards selected at random from the top and sides of the pack. The moisture content of the packs should be within the target range established by the site and the results should be recorded against the pack number. Because timber is not a homogenous material, a single reading rarely gives a suitable indication of the moisture content. A number of readings are needed.

Capacitance meters should not be used for accepting timber and should only be used for additional spot checks.

Table G7.2 details the number of readings required for each product usage. Table 4 details the acceptable range of readings for specific target moisture contents. 90% of readings taken must be within the acceptable range. If more than the acceptable number of readings is outside the acceptable moisture content range, the extra number of readings should be taken.

If more than the acceptable number of all readings is outside the acceptable moisture content range after the extra readings have been taken, the pack should be redirected.

Table 3 Number of moisture meter checks for packs entering the joiners

INTENDED PRODUCT USAGE	NO. OF BOARDS TESTED	ACCEPTABLE NO. OUTSIDE RANGE	NO. OF EXTRA BOARDS TESTED	TOTAL ACCEPTABLE NO. OUTSIDE RANGE
Material to store in rack	5	0	5	1
Material for immediate use	10	1	5	1

Maintaining the moisture content

Dry and milled timber in store represents a considerable investment. However, the moisture content of the timber in store changes to remain in equilibrium with the ambient conditions of the surrounding environment. The ambient conditions (especially sunlight) can also change the surface quality of the boards.

Timber should ideally be stored inside in a dry and fully enclosed building. This moderates temperature variation, excludes direct sunlight, reduces air speed and controls humidity or exposure to moisture.

Timber can be stored outside a fully enclosed building in a well ventilated area under a roof, away from any pooling water. It should be stored on level bolsters at least 75 mm off any concrete surface. Packs should to be wrapped in plastic. The plastic should run over all vertical sides plus the top and be secured with tapes or straps. Any wrap that is torn or punctured should be replaced.

Timber for joinery should only be stored outside without a roof for short periods. Plastic wrapping individual packs only provides short-term protection to external conditions and should only be relied on when packs are being stacked ready for transport or moving indoors.

Moisture can enter through any unwrapped surface or the timber can sweat when exposed to sunlight. Also, the plastic breaks down relatively quickly and holds any entering moisture close to the timber. Any wrap that is torn or punctured should be replaced.

Dry material should not be stored outside without wrapping, as it degrades quickly.

MAINTAINING PACK ARRANGEMENT AND SUPPORT

Building or maintain solid and stable packs.

Any unstable stack should be rebuilt. Packs should be strapped regularly enough to maintain their shape.

Supporting the pack regularly.

Packs should be supported regularly enough on clean dry bearers so that there is no noticeable deflection in the boards.

Protecting the bottom surfaces and edges of packs.

Forklift tynes can damage the bottom layer of boards. If this happens repeatedly or packs are of high value timber, low value boards can be used as a protective or sacrificial layer. Sheet metal, cardboard, or timber protectors should be used on the corners of packs underneath the straps. This eliminates ‘strap-bite’ indentations on the corner boards.

MOISTURE CONTENT BEFORE MILLING

Before milling into joinery component, each pack of timber to be used should be inspected and average moisture content assessed. The pack should be opened and readings taken with a resistance moisture meter on boards selected at random from the top 3 rows and sides of the pack. The moisture content of the packs should be within the target range and results recorded against the project. Capacitance meters can also be used but only for additional spot checks.

Table G7.3 details the number of readings required for each product type and Table G7.4 details the acceptable range of readings for specific target moisture contents. 90% of readings taken must be within the acceptable range. If more than the acceptable number of readings is outside the acceptable moisture content range, the extra number of readings should be taken.

If more than the acceptable number of all readings are outside the acceptable moisture content range after the extra readings have been taken, the pack should not be used without the timber being racked for further drying.

Before milling into joinery component, each pack of timber to be used should be inspected and average moisture content assessed. The pack should be opened and readings taken with a resistance moisture meter on boards selected at random from top 3 rows and sides of the pack. The moisture content of the packs should be within the target range and results recorded against the project. Capacitance meters can also be used but only for additional spot checks.

Table G7.3 details the number of readings required for each product type and that 90% of readings taken must be within anacceptable range. If more than the acceptable number of readings is outside the acceptable moisture content range, the extra number of readings should be taken.

If more than the acceptable number of all readings are outside the acceptable moisture content range after the extra readings have been taken, the pack should not be used without the timber being racked for further drying.

DELIVERY AND HANDLING

Timber windows and doors are accurately designed and manufactured to produce performance-rated components. Being valuable joinery units, correct delivery and handling is essential if their potential is to be realised.

Arrange delivery to suit the construction program.

Windows and doors should be stored on site for as short-a-time as possible. This reduces the chance of damage or changes to the timber's moisture content.

Timber windows and doors are valuable and require careful protection and handling.

The way timber windows and doors are handled and delivered to site can affect their long-term performance. Good practice avoids damage, maintains quality and saves money. Treat them like furniture.

Deliver door and window joinery to site in protective wrapping or sealed cartons.

Protect the units from damage, dampness and extreme temperature or humidity changes. Ideally, they should be delivered wrapped in a covered or enclosed truck.

Restrain the units against a frame or the wall of the truck. Pack between each unit.

Avoid ropes bearing on the corners of the timber. Protect edges with packing angles.

Window and door joinery can be heavy and difficult to handle.

Units can be heavier than two people can safely carry. Allow for the available lifting capacity to match the unit's weight. Ask the fabricator for an estimate of the unit's weight before pick-up or delivery.

Lift the units by the main frame. Carry them vertically.

Do not lift by the sashes, leaves or handles. Sashes and leaves should be closed and locked.

Check the windows and doors when delivered. Preserve any protective coating.

Ensure the units match the delivery schedule and documentation, and are undamaged. Check that the protective packaging has not been damaged. Report any problems. Replace defective or damaged windows, or construction may be delayed.

Plan to store the delivered joinery immediately in a well ventilated location indoors.

This should be away from dust or potential damage. See the Storing timber windows and doors on site: Guide 2 for further advice.

Storing timber windows and doors on site

GUIDE 2

Timber windows and doors are ideal for all types of buildings. Timber windows and doors are designed and manufactured to produce accurately sized, performance-rated components. Being valuable joinery units, correct handling and storage on site is essential if their potential is to be realised.

PLANNING AND PREPARATION

Timber windows and doors are valuable and require careful protection and handling.

The way timber windows and doors are handled and stored on site can affect their long-term performance. Good practice avoids damage, maintains quality and saves money. Treat them like furniture.

Plan to store the delivered joinery in a well ventilated location indoors.

This should be away from dust or potential damage. Ideally, windows or doors should not be stored in the building under construction until wet trades are complete and concrete, masonry and plaster are dry. If windows and doors have to be stored outdoors, keep them clear off the ground on level bearers, and protected from dampness and sunlight with a tarpaulin.

Adjust the level of protection to suit the state of the windows or doors.

Windows and doors are delivered with various finishes: with a primer or stain base coat for site glazing and finishing, as glazed components ready for site finishing, or as fully glazed and finished units. Each requires different quality of storage. Generally, the more finished the unit, the more rigorous the protection that should be provided.

Prepare the storage location and offload the units directly into it.

Prior to delivery, prepare a well ventilated, clean storage area away from dust and traffic. Plan to place the joinery units there immediately on delivery. Ensure the stored units will be safe from vandalism and theft.

Arrange delivery to suit the construction program.

Windows and doors should be stored on site for as short a time as possible. This reduces the chance of damage or changes to the wood's moisture content.

MOISTURE CONTENT

Timber is a natural material. Its size varies with changes in moisture.

Timber is hydroscopic. As it absorbs moisture to remain in equilibrium with its surrounding atmosphere, it expands slightly. As it loses moisture, it shrinks slightly. The joinery unit is designed to accommodate this but it must be protected from moisture during storage. Finishes slow but do not prevent moisture movement.

Protect windows and doors from persistent damp or standing water.

The moisture content of timber needs to be maintained during storage on site and during the construction process. Do not place units directly onto green concrete slabs or near pooling water. Ensure any storage area is well ventilated.

RECEIVING THE JOINERY UNITS

Check the window and door when delivered. Preserve any protective coating.

Check the delivered joinery units. Ensure they match the delivery schedule and are undamaged. Check that the protective packaging has not been damaged. Report any problems, or construction may be delayed.

Prepare and protect the joinery units if necessary before storage.

Fully finished and wrapped units can be stored immediately. Unfinished windows and doors should receive their first sealing coat within 48 hours of delivery to site. This may be a preservative finish. If the joinery is to be built into brickwork or a wall to be rendered, it should be completely wrapped in cling plastic film after it receives a seal coat and before it is installed.

STORAGE AND PROTECTION

Store the joinery inside in a clean, dry, well ventilated location. Protect them against damage.

Treat the joinery units like a piece of furniture. Store on level bearers at least 50 mm off any concrete floor. Maintain air circulation around and between the units. If stored outside, avoid covering the units with polythene as this can create a humid environment.

Whenever possible, store joinery units in the sequence they will be needed.

Stack windows and doors with codes or identifying marks visible to avoid double handling. Avoid dragging units across each other if stacked.

Store the joinery unit square and preferably vertically.

Do not rack frames out of square. Windows which have projecting sills or have the hardware fitted should have spacers between them to support the frames and avoid damage. Retain any protective packaging and make sure it is not possible for water to pool.

INSTALLATION

Protect the windows and doors from damage during and after installation.

Keep wet cement, mortar and brick cleaning acid from contact with timber or aluminium before, during and after installation. If accidentally splashed, wash off immediately with clean water. If removal is delayed and scraping becomes necessary the surface finish may suffer. Protect the windows or doors from nearby welding, painting or plastering or from loose or wind blown debris and dust. Report damage to the site manager.

Protect door tracks and windows sills for damage and dirt.

Do not stand on the windows, or use them as a support for scaffolding, or slide material through the frame. Protect tracks and sill from planks, scaffolding and wheel barrows. Keep the tracks of sliding windows and doors clear of sand and cement droppings.

Maintain protective wrapping or bands for as long as possible.

Do not remove bands from double hung windows until after installation. Retain their protective packaging until the latest possible time but make sure it cannot collect or hold water next to the unit. Take care to avoid damaging the finish when removing any wrapping.

Installation needs to ensure that the units perform as designed and the integrity and performance of the building fabric is maintained at the join between the joinery units and the rest of envelope.

Timber windows and doors play vital roles in a building's environmental control, excluding water, providing ventilation; controlling air-infiltration and sound, and contributing to the building's thermal performance.

PLANNING AND GENERAL CONSIDERATIONS

Window and door joinery is supplied to site in varying conditions.

These range from a completely finished joinery unit to a set of preassembled components ready for site glazing and finishing. Each condition has its own special requirements.

Window and door joinery can be heavy and difficult to position.

Allow for the lifting capacity available on site to match the unit's weight and location. Units can easily be heavier than two people can safely carry. Ask your fabricator for an estimate of the weight of the units before delivery.

Windows and door are generally non-load bearing.

The dead weight and live loads generated by the units must be transferred to and carried by the supporting frame. In turn, this frame has to be designed to carry the loads without undue deflection. Loads from top-hung units, such as bi-folds, can be substantial.

FORMING THE OPENING

The opening has to provide a tolerance for movement and settlement.

Once installed, the heads should be straight and non-load bearing. Guidance on minimum allowances is given in the table below.

Table 1 Recommended minimum opening size

	HEIGHT	WIDTH
Internal	Unit + 15 mm	Unit + 15 mm
External	Unit + 20 mm	Unit + 20 mm

Check that the opening is square, has straight sides and is without twist.

Allow additional clearance to compensate for skew or hourglass openings, bows in the floor or sags in the lintel. If installing sliding or bi-fold units and the bottom of the opening is uneven, level it.

Prepare the joinery for installation.

Check the size and confirm that it will fit into the opening. Vary the opening before considering any changes to the joinery. The unit should be square, with temporary braces fitted. Remove spare keys and store them a safe place. Keep the sash and doors closed. Retain any packing or protection.

Any unpainted surfaces of the joinery should be sealed, especially surfaces inaccessible after installation. If any element has to be trimmed, any exposed edge must be treated with a compatible preservative and re-coated with primer or stain.

WEATHERPROOF

Fasten the wrap to the manufacturer's recommendation. Overlap and seal the joints with foil tape to form an air-tight layer.

Cut the wrap or sarking at the openings in an inverted "Y" pattern. Fold the edges around the jamb studs and sill trimmers and fix them to the frame. Use foil tape to seal the bottom corners. Alternately, cut, fold and position trimming pieces around the jamb studs and sill trimmers. Tape these to the foil or sarking to form a continuous layer around the opening.

FLASHINGS

Install the head flashing above the window and the sill flashing under the window.

Slit the sarking or foil layer 150 mm vertically above each jamb stud. Run the flashing across the head of the opening, extending 150 mm past the side of the opening. Tape the top of the flashing to the lintel and sarking. It should remain free to hinge until after the window is installed.

Positioned the sill flashing and return it vertically at least 10 at the back of the sill, or into a sill groove. Extend it far enough to shed water to the outside of the cladding, and at least 20 up each side of the frame.

INSTALLING WINDOWS AND PRE-HUNG DOORS

There are several methods of installing a joinery unit. The method described here involves fitting a continuous fixing angle, such as 50 x 50 x 1.2 mm galvanized steel or similar aluminium angle to the side of each jamb, and, if the cladding allows, the head of the unit. The angle also acts as the side flashing.

Check that the unit is ready to install.

The opening should be square and of sufficient size. Sarking should be fitted, head and sill flashing prepared and in place, and the units primed and squared.

Position sill packers to support the units adequately.

Generally, support the sill on impervious packers at a maximum of 150 mm from each jamb, directly underneath each mullion and at a maximum of 450 mm between, preferably directly over studs. Level the tops of the packers along the opening. Fully support the sill for sliding and bi-fold units.

Install the jamb fixing angles.

Calculate the position where the side of the unit lines up with outside face of the wall frame. Mark this location as a line on the side of each jamb. Apply a bead of sealant and fit the fixing angles. Screw fix at 450 mm centres. A head angle can also be installed, if this does not foul the head flashing detail.

Carefully position the unit in the opening.

Pack it square and plumb, with the sill level and jambs vertical. The jamb fixing angles should be tight up against the wall frame, and the head and sill flashing free. The unit should have uniform clearance all around, and be in the correct position, parallel to the inside wall face. The weight of lintels or arch bears should not be bearing on the frames.

Check that the unit is not twisted. If installed with a twist, the sashes and leaves will not sit evenly in the frame.

Fit side packers between the unit and the frame a maximum of 100 mm from the sill and the head, and in the centre of the unit at a maximum 600 spacing. Packers should be snug but not distort the unit. Do not install head packers, unless specified. When fitted, check the unit's operation prior to fixing. With tracked units, check the head and sill tracks are level, without bow or sag.

FIXING

Fixed in accordance with the manufacturer's instructions or the project specification.

Starting at a maximum of 100 mm from each end, nail through the jamb fixing angles into the jamb studs at a maximum 450 mm centres. For top-hung sliding and bi-folds, fix the head to the lintel strictly in accordance with the manufacturers recommendation.

Fixed units over 1800 mm wide with a 'sliding' fixing at the head.

Head fixing should be installed so that they provide lateral support but not vertical loads. Back fix screws into the joinery wherever possible. Fixings should be hot tip galvanized steel stainless steel, or silicone bronze. Do not use uncoated steel fixings on any part of the unit.

Checking operation after fixing.

Sash should be wound in and out. If the sash binds on either stile or mullion, packers should be adjusted under sill until sash moves freely. After installation, remove racking braces where fitted.

SEALING EXTERNAL JOINERY TO THE FRAME

To prevent air infiltration, seal the gap between the window or door frame and wall frame.

Seal the edges of the fixing angle to the sarking or foil with tape. Fill under the sill or the remaining parts of perimeter with a polythene backed sealing strip or a backer rod and caulking. Dress the head flashing around the unit and tape it to the wrap, ensuring an air and water proof finish.

Do not leave thermal bridges between the interior and exterior.

Carefully insulate the space between the joinery and wall frame. Pack it from the inside with mineral wool insulation. This will expand to fill the gap. Alternately, fill the gap with low pressure polyurethane insulating foam. Do not use high-pressure expanding foams as they can distort the frame.

FITTING INTERNAL AND EXTERNAL LININGS

Re-check that the sill and head are straight and level before fixing architraves.

Frame head clearance should be a minimum 10 mm. Plaster head and stile clearance should be a minimum 6 mm. Do not directly tile or concrete up to the sill. Maintain at least a 5 mm expansion gap.

Figure 1 Installation sequence for brick veneer

STEP ONE STEP TWO STEP THREE STEP FOUR

HEAD

SILL

PLAN

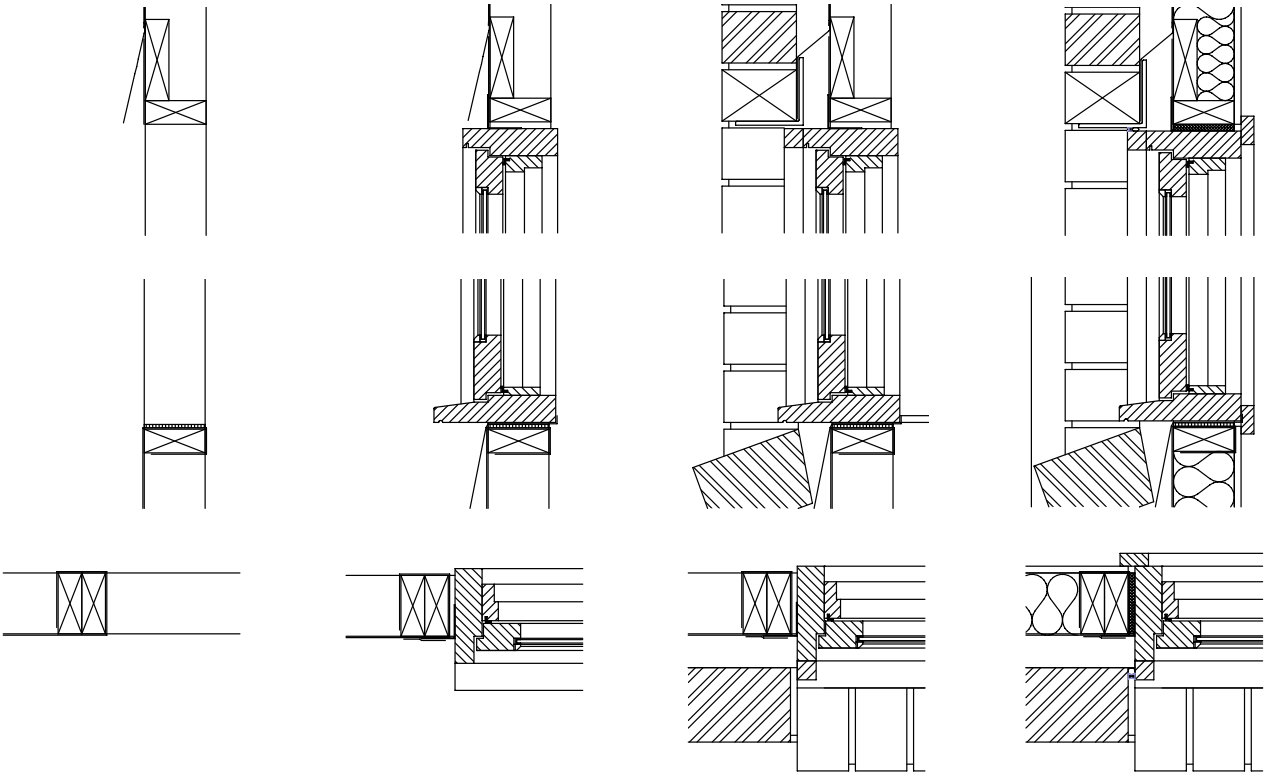


Figure 2 Installation sequence for weatherboards

STEP ONE STEP TWO STEP THREE STEP FOUR

HEAD

SILL

PLAN

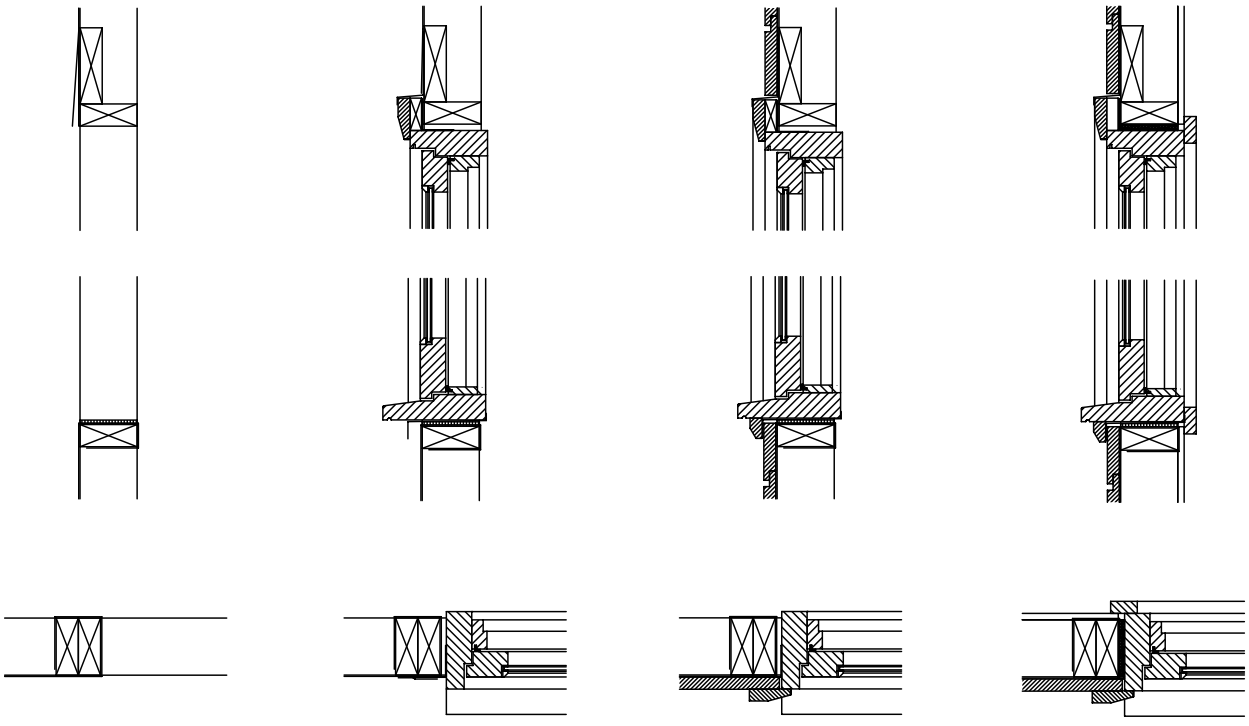


Figure 3 Window and Flashing with Wrap

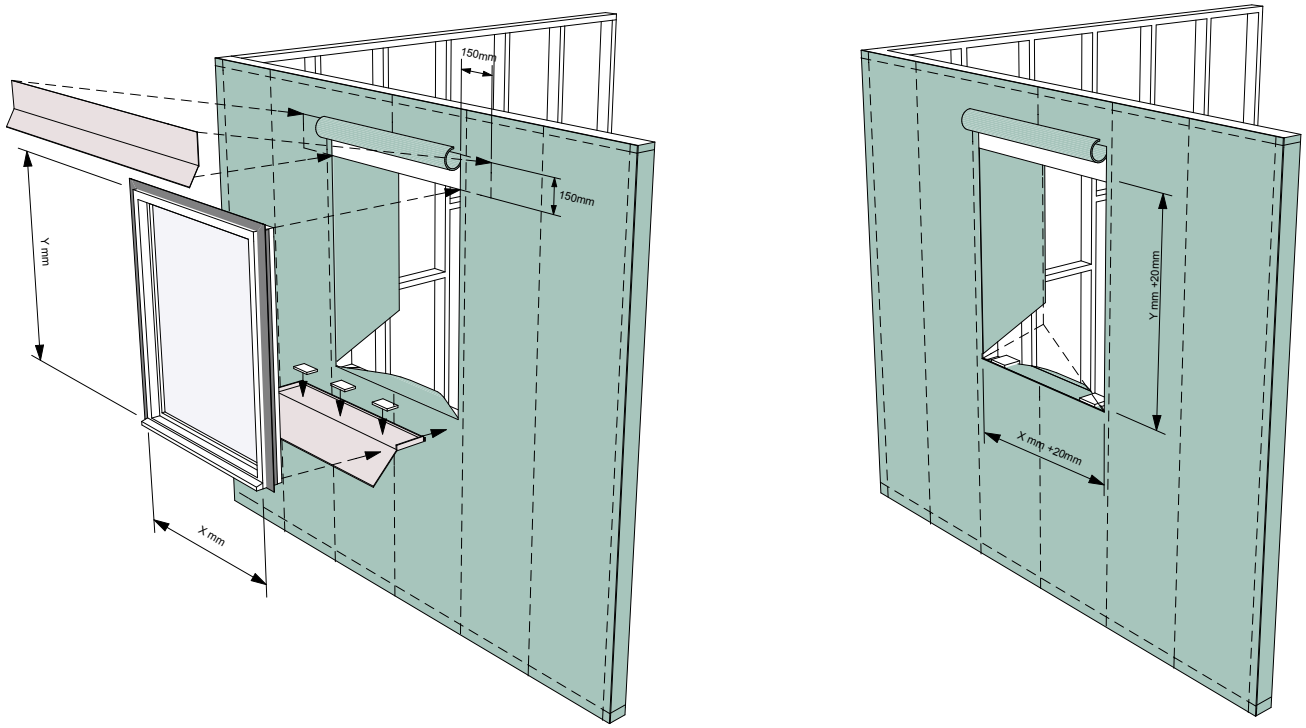
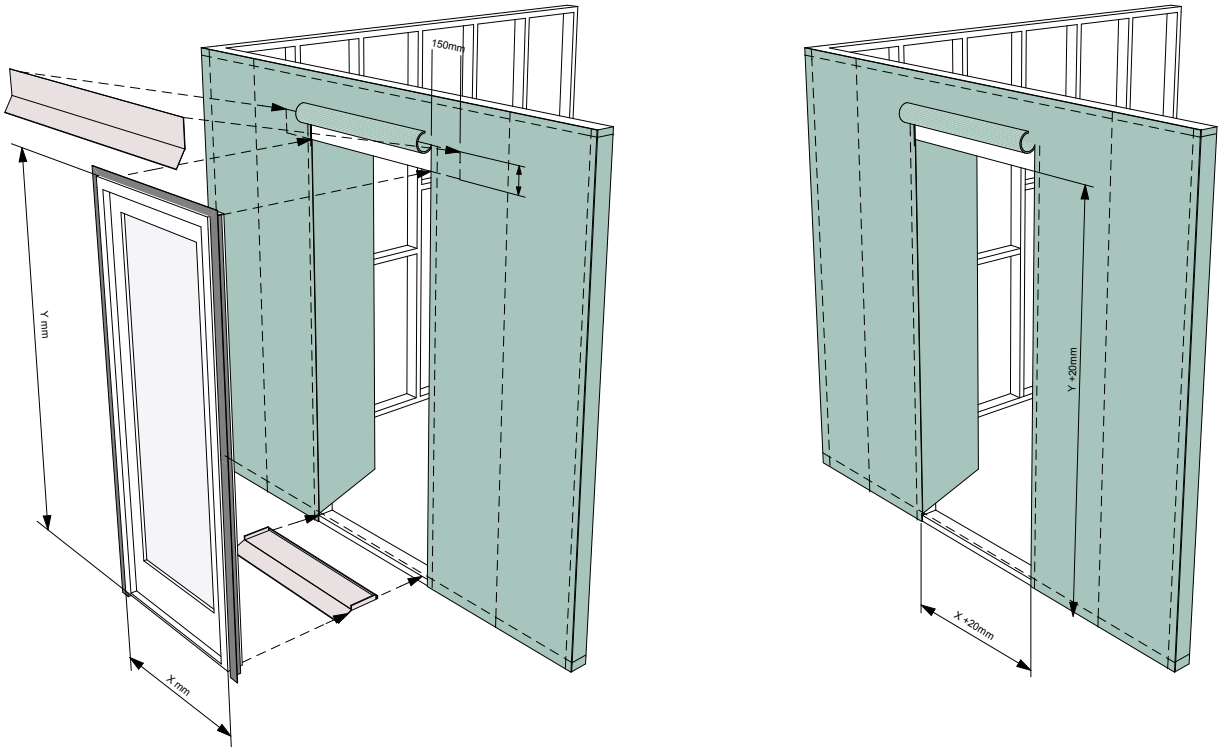


Figure 4 Door and Flashing with Wrap



The edge of the external cladding should allow room for a seal or a weather strip.

Insert a backer rod into the gap so that it finishes at least 12 mm clear of the external face of the unit and caulk. A timber weather strip or storm mould fixed to the exposed face of the frame. This should have a drainage space behind it to drain any moisture away and not be sealed at the base.

Allow a minimum of 10 mm clearance between the unit sill and external sill bricks.

FINISHING ALL JOINERY

Re-prime any unit immediately if the primer coat is removed during installation.

Timber products should be sealed with 2 coats to all faces and edges within 30 days of delivery. See Finishes on site: Guide 4.

Factory finished windows should be checked for any on-site damage to the finish and any small areas made good in accordance.

PROTECTION

Protect the installed joinery with plastic or cardboard. Avoid splattering with mortar, concrete, render and other objects that can damage the unit during construction. With pre-finished and pre-glazed windows the manufacturers' protection should be left in place unless its removal is necessary.

Do not stand in the windows or doors, or use them as supports for scaffolding. If a door must be used for access is essential, build a protective cover to protect the joinery.

INSTALLING A HUNG DOOR

Position and tolerances

Doors supplied hung in a frame should be installed as described above, except that internal doors do not require flashing. A joinery door can be hung in a frame assembled on site.

Determine the swing direction, the hinged side of the door and the number of hinges.

Standard height doors should have three hinges per door. Doors taller than 2040 mm high should have four hinges.

Ensure the door fits the frame, and both fit the opening.

The door generally requires an even 3 mm clearance between the leaf and the frame on all sides. So, the size of the opening in the door frame should be 6 mm larger in each direction than the door.

If required, trim the door evenly on each face to fit the frame. Avoid trimming more than 10 mm from any edge of the joinery. Doors to be painted require slightly more clearance. Doors that are to be on extended butt hinges require more clearance to allow for its opening swing. Both the door and the frame should be square.

Clearances from the frame to the opening are given in Table G3.1

Fit the frame to the opening.

Generally follow the guidelines above. Ensure that the frame is flat without twist. Back fix screws into the joinery wherever possible. Avoid back-nailing as it will deform the fame. Where back-fixing is not possible, fix on the line of any floating stops.

Fixings for any external doors should be hot tip galvanized steel in accordance with service condition No. 2 of AS 1789, stainless steel in accordance with AS 1449, or silicone bronze. Do not use uncoated steel fixings on any part of an external unit.

Fixing hinges to the door.

Fit the selected hinges to the door. With butt hinges, one leaf of the hinge is set into the jamb while the other is set into mortise in the door. The width of the hinge has to be chosen to ensure the door opens clear of any surrounding jamb or other impediments.

The top and bottom hinges should be positioned an equal distance in from the top or bottom of the door, ideally between 75 and 150 mm from the outside edge of the door to the outside edge of the hinge. Additional hinges should be evenly spaced between these two.

For butt hinges, set the hinge into the wood of the door so that it flush when fixed to the door. Fit off all hinges.

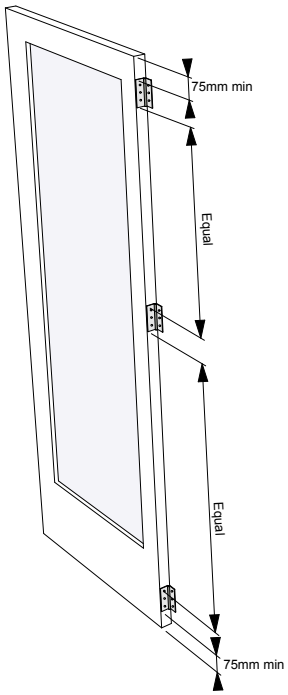


Figure 5 Hinge positions on a door

Fixing hinges to the jamb.

Accurately measure the distance for the top of the door to the top edge of each hinge. Add 3 mm to each measurement and mark these distances carefully on the door jamb. Each mark is the top of the hinges on the door. The 3 mm provides the clearance at the top of the door.

Rebate the jamb to accept the hinges so that they finish flush when fixed.

Stand the door perpendicular to the door opening with the hinges close to the rebated jamb. Propping under the door with a wedge, fit the top hinge in place with one screw, before fixing the bottom hinge then the intermediate hinges each with only one screw.

Check the swing of the door, ensuring it has an even clearance on the top and sides, and a suitable clearance at the bottom. Adjust the hinge or screw positions as necessary before installing the remainder of the screws.

Check the door again. If the jamb has floating stops, the door stop bead is fitted to the line of the door to allow a soft close.

The finish to timber doors and windows contributes significantly to the building's architectural appearance and the unit's durability and service life. Good finishing practice avoids damage, maintains quality, ensures performance and saves money. This guide deals with finishing external timber doors and windows.

The choice of colour is important for durability as well as for visual appeal. Light coloured paints will last longer and give greater protection to the wood than dark coloured paints.

Door and windows units can be either finished in the factory or finished on site. If the unit is factory-finished, the priority is protecting the finish during installation and rectifying possible damage. If the unit is site finished, it has to be prepared before installation, and then finished in place.

FINISHING ON SITE - EXTERNAL UNITS

Overview of finishes.

The main options for finishing windows and doors are: uncoated or natural wood, a transparent coating or stain finish, or painted. The options can also be mixed. For example, the frame can be painted while the sashes are clear coated. The requirements for finishes vary. Also, the performance of finishes formulations varies between products and brands. For extended durability and service life, only use quality paint or 'high build' stains.

Uncoated windows and doors.

The natural wood of timber doors and window units can be left uncoated and allowed to weather. However, this is only suitable in some circumstances and only when the ramifications are recognised.

Uncoated timber weathers with exposure to sunlight and rain and turns grey. Uneven exposure and wetting can lead to variable staining and bleaching and localised mould growth. With a suitable Durability Class 1 or 2 species in a sheltered or controlled location, this can nevertheless provide an appealing and low maintenance solution, especially for environmentally aware clients.

However, poor species selection and detailing or exposing high durability species to aggressive conditions without protection can shorten the service life of the unit and disappoint clients. If the joinery is to be left uncoated, examine a range of timber structures near the project site and note weathering and species performance. Select the species and detailing accordingly.

Transparent coating and stains.

Transparent coating and stains protect the timber while allowing the grain and texture of the wood to show through. They usually combine some or all of preservatives, fungicides, and colourants with an oil that soaks into the wood and a tougher surface coating. While these coating shed water and reduce other impacts, the surface of the wood can still weather and the surface crack or peel if the finish is exposed to sunlight over time. These coatings require maintenance every 2-4 years.

Paints.

Paints form an opaque coating over the surface of the wood, generally protecting the frame from water, sunlight and abrasion. As the timber slowly expands and contracts with changes in moisture content, the paint needs to be flexible and resist the effects of sunlight that tend to reduce its flexibility over time. When paints become hard and brittle, they can breakdown and flake away from the wood. Paint's flexibility and resistance to breakdown is usually directly related to the quality of the product and of the installation. They require maintenance every 7-10 years.

The choice of colour is important for durability as well as for visual appeal.

Generally, light coloured paints will last longer and give greater protection to the timber than dark coloured paints. Dark colours absorb and retain heat from sunlight more readily than light colours. This increases the temperature and stresses in the coating and the underlying wood, and increases the wood's decay rate.

DEALING WITH FACTORY FINISHED UNITS

Handle factory-finished units carefully and maintain their protection.

The coating on factory-finished units is highly durable and should not require refinishing for many years. Protect this coating during storage, installation, and subsequent construction. Factory-finished coating often require special repair. Non-compatible coating will often not adhere to the surface properly. If the finish is damaged, consult the supplier.

DEALING WITH SITE FINISHED UNITS

Confirm the specified finish and the state of the joinery at delivery.

Ensure the joinery manufacturer knows the specified finish. Window and door joinery is supplied to site in varying conditions. Check the coating that has already been applied in the factory. The frames may have been supplied as raw wood, but a coat of temporary preservative or a primer coat of paint has probably been applied.

Arrange delivery to suit the construction program.

Windows and doors should be stored on site for as short a time as possible. This reduces the chance of damage or changes to the woods moisture content.

Timber windows and door are valuable and require careful protection and handling.

The way timber windows and door are handled and stored on site can affect their long-term performance. Good practice avoids damage, maintains quality and saves money. Treat them like furniture. See the Storage on Site : Guide 4 for additional storage advice.

Protect frames and units at all times.

Uncoated, raw wood frames deteriorate very quickly on site. Even those with a protective temporary coat are susceptible to damage that will affect the long-term performance of subsequent coats. Apply a priming or base coat to uncoated units as soon as possible after delivery to site. If units are stored on site for an extended period, the protection coat may need to be re-applied.

Use quality paints and coatings to the manufacturer's recommendations.

The expected life of paint or other finishes depends on the quality of the coatings and the care taken in application. Good quality finishes increase the service life of the unit. Ensure compatibility between coats. Use the specified finish and do not mix brands.

Prepare a safe, dry, clean and well-ventilated area for painting.

Finishing should be carried out in dry weather when the temperature conditions are suitable. Generally, do not apply external finishes on frosty morning, before rain or in hot sunlight.

Before the first coats, prepare the surface of the joinery carefully.

Coatings bond to properly prepared timber surfaces more effectively. Fill nail recesses, lightly sand and clean the timbers immediately prior to painting. Remove dust particles with a soft dry rag including the corners. Do not use steel wool on an external unit.

Only paint the timber surfaces. Don't paint the tracks or seals.

Locks, handles, seals and other loose hardware should be removed if possible before the unit is painted. Store the removed items safely in numbered plastic bags. Do not paint balancer ropes, weather-stripping, gaskets, silicon beads or other moving parts.

Re-finish any newly cut or trimmed areas.

If any element has to be trimmed in preparation for installation, immediately treat any exposed edge with a compatible preservative and recoat with the required primer or stain.

Ensure primer surfaces and edges are in good condition before applying finishing coats.

Primed products need to be lightly sanded before the undercoat and top coats are applied. If the primer or base coat stain has deteriorated, it should be re-coated before further finishing coats are applied.

Apply the first top coat as soon as possible after delivery and before installation.

Any unpainted surfaces should be sealed with a good quality compatible primer or sealer as soon as possible, especially surfaces inaccessible after installation. Glazing rebates and backs of beads should also be sealed. Windows with factory applied primer or base coat stain should have at least one of the finishing coats applied before installation and preferable within 30 days of delivery.

Apply the selected finish to the manufacturer's specification.

Apply finishes at the recommended rate and conditions. Allow each coat to cure fully before recoating. Lightly sand and clean immediately before recoating. Do not allow painted surfaces to come in contact with other surfaces until thoroughly dry. Avoid painting on windy, very hot or very cold days.

Protect the windows and doors from damage after installation and coating.

Keep wet cement, mortar and brick cleaning acid from contact with timber or aluminium before, during and after installation. If accidentally splashed, wash off immediately with clean water. If removal is delayed and scraping becomes necessary the surface finish may suffer.

Protect door tracks and windows sills for damage and dirt.

Do not stand on the windows, or use them as a support for scaffolding, or slide material through the frame. Protect tracks and sill from planks, scaffolding and wheel barrows. Keep the tracks of sliding windows and doors clear of sand and cement droppings.

Filling for clear finishes.

Do not fill nail holes etc. until after the first coat is applied as the filler can make an unsightly smear that will be trapped under the finish and not easily removed. Stop holes after the first coat of sealer with an oil based putty that is darker than the original timber. Repeat the sealing and sanding process until and smooth even finish is achieved. All smoothing and preparation should be done at the priming / sealing stage as the top coats do not need to be sanded.

Maintaining timber windows and doors

GUIDE 5

Timber windows and doors are ideal for all types of buildings. As they form a vital and expensive part of any building, they deserve regular maintenance. This increases their service life and enhances the building's amenity.

CLEANING

Wash the windows, doors and glass regularly with a mild detergent solution or cleaner.

Wash the timber work with a water spray and wipe them with a clean, damp cloth and mild detergent solution at least 2 or 3 times a year. Rinse off with clean water. Keep the cloth free of grit. Clean the glass with a water spray followed by glass cleaner. Remove the water carefully with a rubber fin or soft, lint-free cloth.

Remove any built up dirt and grime, especially in coastal or high pollution areas.

Wash the units regularly enough to eliminate obvious dirt or salt build ups. Check the corners and returns of the sashes and frames and clean away accumulated deposits with an old tooth brush.

Do not use scrapers, abrasive cleaners, or solvents. They can damage the unit and hardware.

Avoid damaging the finishes and glass during cleaning. Don't use razor blades, scrapers, petroleum based cleaners or solvent on the sashes, doors or glass. If fitted, brassware is usually polished and clear lacquered and only requires dusting with a soft cloth and occasional application of a good quality furniture polish. Do not use abrasive metal polishes. They will remove the lacquer and can scratch the metal.

Glass should not be cleaned when it is very hot or in direct mid-summer sunlight.

Extreme temperature changes can cause the glass to crack.

Carefully clean tracks and weep holes.

Dirt on the roller tracks can cause premature wear and damage. Vacuum the bottom tracks to remove dust and grit, and wipe them with a soft cloth to remove any build-up. Some windows and door include weep holes that drain wind-driven rain and water that accumulates on the sill or behind the track. Keep these clean and clear of dirt.

REGULAR MAINTENANCE

Lubricate the hardware and moving parts regularly.

If necessary, lubricate the bottom track with a dry silica based lubricant. Avoid oil based lubricants, as these can capture dirt. Lightly grease the top tracks, and oil hinges, handles and locks as required. Hardware in coastal or high pollution areas requires regular lubrication.

Ensure seals are in place and performing efficiently.

Check and clean the seals around the sashes or doors. Compression seals will lose elasticity and become less efficient with age and exposure. If they become rigid, cracked or broken, they should be replaced with seals of similar dimension and at least equal performance.

Inspect the coating or paint finish. If it shows sign of failure, plan to maintain it.

Windows and doors fully exposed to the sunlight or weather, especially coastal winds, will need more frequent maintenance than those more protected from the weather. Paint and other finishes generally fail first on the leading top edge of the sill or the top face of the bottom element of sashes or door leaves. Look for signs of surface splits or discolouration, especially on the corners and edges.

Inspect the timber frame. If it shows sign of failure, plan to maintain it.

Look for cracks between frame elements and gaps between the beading and glass. These can trap water in the joints. Check for signs of decay, such as softness in the wood, particularly in the corners and returns. Corrosion in the fasteners often shows up as a rusty red stain seeping through the paint.

Inspect insulated glass units (IGU) for condensations. Expect to replace them if they fail.

The seals in insulated glass units have a limited life. They eventually fail and condensation forms between the panes. The units cannot be repaired and they should be replaced.

Don't live with damaged or poor performing hardware. Replace them.

Poorly performing hardware is a nuisance and can cause further damage to the unit. If handles, locks and hinges fail or are damaged, they can easily be replaced or refitted on the existing unit.

FINISHES AND COATINGS

Use quality paints and coating and maintain them properly. They will protect your joinery.

Re-coating should take place before the existing finish has deteriorated to the extent that bare wood is exposed. A poorly maintained paint film can accelerate decay. Water can enter the gaps between the paint and timber or the joints between the glass and the timber and becomes trapped.

Re-coat the finish before splits form or the paint peels.

Re-coating should take place before the existing finish has deteriorated to the extent that bare wood is exposed. A poorly maintained paint film can accelerate decay. Water can enter the gaps between the paint and timber or the joints between the glass and the timber and becomes trapped.

Prepare the surface carefully before recoating.

Modern paints and finishes generally do not require cutting back to the primer before fresh coats are applied. If the finish is intact, wash it with a detergent or weak bleach solution, lightly sand and then apply a fresh coat. Cracked areas should be sanded back to sound material. If the wood is exposed and grey, the surface should be sanded back to fresh wood. Grey, weathered surfaces will not hold paint or other coatings properly and they will fail quickly.

Ensure any new finish is compatible with previous coatings, especially factory-applied ones.

Factory applied finishes should not require refinishing for many years. Non-compatible coating on these or other finishes with not adhere to the surface and will crack and peel off quickly. Prior to any recoating, consult the suppliers of the original finish or a reputable paint supplier for advice. Follow the manufacturer's instructions closely.

Only paint the timber surfaces. Don't paint the tracks or seals.

Locks, hinges, and seals should be removed if possible before the unit is repainted. Do not paint balancer ropes, weather-stripping, gaskets, silicon beads or any other surface that comes in contact with other parts. Do not allow painted surfaces to come in contact with other surfaces until thoroughly dry.

GLASS AND GLAZING

Glasses with special surface coatings may require particular care.

Toughened glass scratches easily. Also, insulating, low-e or heat reflective glasses may have special coatings that require specific maintenance. Check with supplier.

Don't remove decals, manifestation or other safety markers on the glass.

Many significant accidents are caused by people running into large glass doors or windows, especially children. Decals and other markings help limit unnecessary injury.

Treat broken glass in a window with care.

Always cover the damaged area for safety and cover the floors to avoid damage from falling glass. Then consult a qualified glazier.

Replace the glass with the correct material. Don't compromise performance or safety.

The original glass was selected for a particular energy performance and safety rating. Any replacement glass should maintain the energy performance and at least match the current safety ratings for a new window.

Replacing the glass may not always be possible. Replacing the sash may be necessary.

Both silicone sealing and security glazing tapes probably have sufficient adhesion to make removal difficult without breaking the glass and damaging the frame. It may be easier and more economical to replace the entire sash.

TIMBER ELEMENTS

Caulk or seal any gaps to limit corrosion or decay.

Gaps in joints or around the beading can allow water to enter, encouraging corrosion and decay. These gaps need to be carefully cleaned out and any build up of paint or dirt removed with a blade or fine sharp chisel until a clean timber edge is exposed. Seal the top of the gap neatly with a flexible and paintable caulking compound, Avoid trying to fill the gap completely. When it has cured, trim and repaint the joint.

Repair decayed or damaged timber by cutting back the affected timber and patching.

Cut out the damaged section and splice matching timber into the gap. Patches used to repair damaged timber should match the existing timber species, have the grain running the same way and have the same profile. With clear finished work select patches of a similar grain and colour. When joining new timber into existing timber, splice members together to provide a maximum area for fixing. Fix with timber dowel or non-ferrous pins.

Consider replacement.

Where the timber has deteriorated and joints have decayed, the repair of the timber element could require re-fitting parts of the frame that are beyond a simple handyman task. Discuss replacement with a suitable joiner.

WADIC
Window And Door Industry Council

Window Specification Worksheet

GUIDE 6

THE PROJECT			
Builder		Ref. No.	
Client		Phone	
Address		Mobile	
Post Address		Email	

PROJECT DETAILS			
Building type	Houses / Apartments / Offices / Shop / Other		
No. Storeys		Design wind class	
Cladding		Internal lining	
Notes			

KEY STANDARDS Tick the key standards that apply to this project

- ☐ AS 1288 Glass in buildings
- ☐ AS 2047 Windows in buildings
- ☐ AS 2208 Safety glazing materials in buildings
- ☐ AS 4666 Insulating glass units
- ☐ AS 3959 Construction in bushfire prone areas
- ☐ AS 5604 Timber - Natural durability ratings

SUPPLY SECTIONS

- ☐ Workshop finished
- ☐ Primed
- ☐ Oiled
- ☐ Raw

SPECIES SELECTIONS List species types

Location	Species	Grade	Treatment
Sill			
Frame			
Sashes			
Notes			

FINISHES List finishing products

Location	External surfaces	Internal surfaces
Paint		
Clear / oil		
Stain		
Notes		

Window Specification Worksheet

GUIDE 6 continued

PERFORMANCE List requried performance level (TS)			
U-Value		SHGC	
Notes			

WINDOW SCHEDULES

No.	Config.	size				No. Off.	Glass	Finish	Screen	Special	H'ware
		height	width	reveal	sill						
W1											
W2											
W3											
W4											
W5											
W6											
W7											
W8											
W9											

WINDOW SELECTION SCHEDULES

Configuration		Glass		Finish		Screens	
f/g	Fixed glass	An	Annealed	E/P	Ext. Paint	Al.	Aluminium
d/h	Double hung	l/s	Laminated	E/Cl	Ext. Clear	T	Timber
sl	Sliding	t/s	Toughened	E/nf	Ext. no finish	F	Fixed
ca	Casement	IGU	Insulated glazing unit	St	Stained	H	Hinged
as	Awning	Low-e	Low emissivity	I/P	Int. Paint	R/U	Roll-up
b/f	Bi-fold	tn	Toned	I/Cl	Int. Clear	Sl	Sliding
pi	Pivot	Ob	Obscure	I/nf	Int. no finish	Sec	Security
lo	Louvre			Oil	Oiled	BF	Bush-fire resistant
f/lo	Fixed louvre						

GLAZING List glazing product

☐ Bead ☐ Primed ☐ Tape ☐ Other

SPECIAL CONDITIONS List special conditions

S1	Upper storey limit on opening
S2	Pool side limit on openings
S3	
S4	

Window Specification Worksheet

GUIDE 6 Continued

HARDWARE SELECTION List special hardware types	
H1	
H2	
H3	
H4	
H5	
H6	

HARDWARE FINISH

- ☐ Bright chrome
- ☐ Satin Chrome
- ☐ Gold
- ☐ Brass
- ☐ Titanium
- ☐ Antique bronze
- ☐ Stainless Steel
- ☐ Black
- ☐ White
- ☐ Brown
- ☐ Other

GENERAL NOTES

Door Specification Worksheet

GUIDE 7

THE PROJECT			
Builder		Ref. No.	
Client		Phone	
Address		Mobile	
Post Address		Email	

PROJECT DETAILS			
Building type	Houses / Apartments / Offices / Shop / Other		
No. Storeys		Design wind class	
Cladding		Internal lining	
Notes			

KEY STANDARDS Tick the key standards that apply to this project (DTG 3)

- ☐ AS 1288 Glass in buildings
- ☐ AS 2047 Windows in buildings
- ☐ AS 2208 Safety glazing materials in buildings
- ☐ AS 4666 Insulating glass units
- ☐ AS 3959 Construction in bushfire prone areas
- ☐ AS 5604 Timber - Natural durability ratings

SUPPLY SECTIONS (Guide)

- ☐ Workshop finished
- ☐ Primed
- ☐ Oiled
- ☐ Raw

SPECIES SELECTIONS List species types (DTG 2)

Location	Species	Grade	Treatment
Tread			
Frame			
Leaves			
Notes			

FINISHES List finishing products (Guide)

Location	External surfaces	Internal surfaces
Paint		
Clear / oil		
Stain		
Notes		

Door Specification Worksheet

GUIDE 7 continued

PERFORMANCE List requried performance level (TS)			
U-Value		SHGC	
Notes			

DOOR SCHEDULES

No.	Config.	size height	size width	size reveal	size tread	No. Off.	Glass	Finish	Screen	Special	H'ware
D1											
D2											
D3											
D4											
D5											
D6											
D7											
D8											
D9											

DOOR SELECTION SCHEDULES

Configuration		Glass		Finish		Screens	
sl	Sliding	An	Annealed	E/P	Ext. Paint	Al.	Aluminium
Hi	Hinged	l/s	Laminated	E/Cl	Ext. Clear	T	Timber
Fd	French doors	t/s	Toughened	E/nf	Ext. no finish	F	Fixed
b/f	Bi-fold	IGU	Insulated glazing unit	St	Stained	H	Hinged
pi	Pivot	Low-e	Low emissivity	I/P	Int. Paint	R/U	Roll-up
		tn	Toned	I/Cl	Int. Clear	Sl	Sliding
		Ob	Obscure	I/nf	Int. no finish	Sec	Security
				Oil	Oiled	BF	Bush-fire resistant

GLAZING List glazing product

☐ Bead ☐ Primed ☐ Tape ☐ Other

SPECIAL CONDITIONS List special conditions (DT3)	
S1	
S2	
S3	
S4	

HARDWARE SELECTION List special hardware types	
H1	Hinges / Sliders
H2	Locks
H3	
H4	
H5	
H6	

HARDWARE FINISH

- ☐ Bright chrome
- ☐ Satin Chrome
- ☐ Gold
- ☐ Brass
- ☐ Titanium
- ☐ Antique bronze
- ☐ Stainless Steel
- ☐ Black
- ☐ White
- ☐ Brown
- ☐ Other

GENERAL NOTES

Storing timber windows and doors on site

CARD 1

Storing timber windows and doors on site

KEY POINTS

Planning and preparation

Timber windows and doors are valuable and require careful protection and handling.

Plan to store the delivered joinery in a well ventilated location indoors.

Adjust the level of protection to suit the state of the windows or doors.

Prepare the storage location and offload the units directly into it.

Arrange delivery to suit the construction program.

Moisture Content

Timber is a natural material. Its size varies with changes in moisture.

Protect windows and doors from persistent damp or standing water.

Receiving the joinery units

Check the windows and doors when delivered. Preserve any protective coating.

If necessary, prepare and protect the joinery units before storage.

Storage and protection

Store the joinery inside in a clean, dry, well ventilated location. Protect them against damage.

Whenever possible, store joinery units in the sequence they will be needed.

Store the joinery unit square and preferably vertically.

Installation

Protect the windows and doors from damage during and after installation.

Protect door tracks and windows sills for damage and dirt.

Maintain protective wrapping or bands for as long as possible.

Installation - Doors and windows

KEY POINTS

Preparation

Window and door joinery can be heavy and difficult to position. Allow for the lifting capacity available on site to match the unit's weight and location.

Windows and door are generally non-load bearing. The loads generated must be transferred to and carried by the supporting frame.

The opening has to provide a tolerance for movement and settlement. Check that the opening is square, has straight sides and is without twist. Allow for additional clearance to any distortion.

Prepare the joinery for installation. Confirm the size fits into the opening. The unit should be square, with temporary braces fitted. Remove spare keys and keep the sash and doors closed. Retain any packing or protection. Seal any unpainted surfaces of the joinery with a good quality primer

Install the sarking, foil or building wrap as a continuous membrane. Cut at the opening and fold around the studs and trimmers. Tape to form a continuous layer around the sides and bottom of the opening.

Install the head flashing above the opening and the sill flashing under the opening.

Installing windows and pre-hung doors

Position sill packers to support the units adequately. The sills should be supported at a maximum of 150 mm from each jamb, directly underneath each mullion and at a maximum of 450 mm between these locations. Level the tops of the packers. Fully support the sill for sliding and bi-fold units.

Install the jamb fixing angles so that the unit sits in the correct position when fitted. Screw fix at 450 mm centres. A head angle can also be installed, if this does not foul the head flashing detail.

Carefully position the unit in the opening. Pack it square and plumb, with the sill level and jambs vertical. The jamb fixing angles should be tight up against the frame, and the head and sill flashing free. The joinery items should have uniform clearance on all sides. Check that the unit is not twisted.

Fit side packers at a maximum of 100 mm from the sill and the head, and in the centre of the unit at a maximum 600 spacing. Do not install head packers, unless specified.

Fix in accordance with the manufacturer's instructions or the project specification. Fix units over 1800 mm wide with a 'sliding' fixing at the head. Fixings should be hot tip galvanized steel, stainless steel in accordance with AS 1449, or silicone bronze. Do not use uncoated steel fixings.

Checking operation after fixing. If the sash binds, packers should be adjusted under sill until sash moves freely. After installation, remove racking braces where fitted.

Finishing to cladding

Dress flashing to external cladding.

Allow a minimum of 10mm clearance between the unit sill and external sill bricks.

Finishing and removing thermal bridges

To prevent air infiltration, seal the gap between the window or door frame and wall frame. Do not leave thermal bridges between the interior and exterior. Insulate gaps between the unit and the frame

Recheck that the sill and head are straight and level before fixing architraves. Frame head clearance should be a minimum 10mm. Plaster head and stile clearance should be a minimum 6mm.

Re-prime any unit immediately if the primer coat is removed during installation. Timber products should be sealed with 2 coats to all faces and edges within 30 days of delivery.

Factory finished windows should be checked for any on-site damage to the finish and repaired.

The edge of the external cladding should allow room for a seal or a weather strip. Insert a backer rod into the gap and caulk. A timber weather strip or storm mould can also be fixed to the frame.

Finishes on site

KEY POINTS

Dealing with site finished units

Confirm the specified finish and the state of the joinery at delivery. Ensure the joinery manufacturer knows the specified finish.

Arrange delivery to suit the construction program. Windows and doors should be stored on site for as short a time as possible. Store them carefully. Treat them like furniture.

Protect the frames and units at all times. A protection, priming or base coat should be applied to uncoated units as soon as possible after delivery to site.

Use quality paints and coatings to the manufacturer's recommendations. Ensure compatibility between coats. Use the specified finish and do not mix brands.

Prepare a safe, dry, clean and well-ventilated area for painting. Finishing should be carried out in dry weather when the temperature conditions are suitable.

Prepare the surface of the joinery carefully. Fill nail recesses, lightly sand and clean the timbers immediately prior to painting. Do not use steel wool on an external unit.

Only paint the timber surfaces. Don't paint the tracks, seals or loose hardware.

Apply the first top coat as soon as possible after delivery and before installation. Any unpainted surfaces should be sealed with a good quality primer or sealer as soon as possible, especially surfaces inaccessible after installation. Glazing rebates and backs of beads should also be sealed.

Apply the selected finish to the manufacturer's specification. Apply at the recommended rate in the correct conditions. Allow each coat to cure before recoating. Lightly sand between coats.

Do not allow painted surfaces to come in contact with other surfaces until thoroughly dry.

Protect the windows and doors from damage after installation and coating. Keep wet cement, mortar and brick cleaning acid from contact with timber or aluminium before, during and after installation.

Protect door tracks and windows sills for damage and dirt. Do not stand on the windows or door, or use them as a support for scaffolding, or slide material through the frame. Protect tracks and sills.

Maintaining timber windows and doors

KEY POINTS

Cleaning

Wash the windows, doors and glass regularly with a mild detergent solution or cleaner. Remove any built up dirt and grime, especially in coastal or high pollution areas. Vacuum and wipe down tracks to remove dust and grit and clean out weep holes.

Be careful about cleaned glass when it is very hot or in direct mid-summer sunlight. Extreme temperature changes can cause it to crack.

When cleaning, do not use scrapers, abrasive cleaners, or solvents. They can damage the unit and hardware.

Regular maintenance

Regularly check and lubricate the hardware and other moving parts. Don't use oil based lubricants on the bottom tracks as they capture dirt.

Ensure seals are in place and performing efficiently. They should be flexible, without cracks or splits.

Inspect the coating or paint finish. Look for signs of surface splits or discolouration, especially on the corners and edges. If the finish shows sign of failure, plan to maintain it.

Inspect the timber frame. Check for gaps in the joints or signs of decay in the timber or corrosion in the fasteners. If they show sign of failure, plan to maintain them.

Inspect insulated glass units for condensation. Expect to replace them if they fail.

Don't live with damaged or poor performing hardware. They are a nuisance and can cause further damage to the unit. Replace or re-fit them.

Maintaining finishes and coatings

Use quality paints and coating and maintain them properly. They will protect your joinery. Plan to re-coat the finish before splits form or the paint peels.

Prepare the surface carefully before re-coating and apply the coating strictly in accordance with the manufacturers' recommendations. Only paint the timber surfaces. Don't paint the tracks or seals. If possible, remove the hardware and seals before painting.

Ensure any new finish is compatible with the previous coatings. If the unit has factory applied finishes, consult the original supplier for advice.

Glass

Glasses with special surface coatings may require particular care. Consult the manufacturer for advice.

Don't remove decals, manifestation or other safety markers on the glass. They safeguard against unnecessary injury.

Treat broken glass in a window with care. Replace any broken glass with the material that complies with current standards. Don't compromise performance or safety.

Timber elements

Water needs to be excluded from the joints. Caulk or seal any gaps.

Repair decayed or damaged timber by cutting back the affected timber and patching. If the areas to be repaired are extensive or include a joint, consider replacement.