



HORIZONTAL SHIPLAP WEATHERBOARD CLADDING SPECIFICATION



**SUPPLIERS OF AUSTRALIAN
HARDWOOD TIMBER SOLUTIONS
*THAT DON'T COST THE EARTH***

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LMA TIMBER WEATHERBOARD - OVERVIEW

LMA Timbers hardwood cladding solutions are a mix of class 1 (40 year plus durability) Australian hardwood timbers that have been milled in accordance with NZS 3617 Branz Bulletin 411. These timbers include Grey / Red Iron Bark, Tallowwood, White Mahogany and Spotted Gum. Specifications for all of these timbers are included in this document.

The timber species is Australian Eucalyptus Class 1 hardwood - not to be confused with New Zealand Eucalyptus which is a lot softer and is generally a class 3 timber. The hardwood cladding is kiln dried to between 9-14% moisture (to meet MPI guidelines) and is milled to precision allowing for a superior finish / minimal movement compared to other timber cladding options.

A report on the claddings durability has been undertaken and is included within this specification / documentation. The cladding has been used for decades in Australia and outperforms many other timber claddings available in New Zealand due to its class 1 rating.

Building consents have been issued all over New Zealand for the hardwood cladding as an alternative cladding solution. CodeMark / Branz appraisal is currently being pursued. Example Council Consents of BCN_2018_4315 (Christchurch Council), BC161351 (Waimakariri Council) BC182180 (Selwyn Council) and BCO10313586 (Auckland Council) where the hardwood has been used as a primary cladding as an alternative build solution.

Any further information can be sought from Martin Thompson - Managing Director at LMA Timber.

Contact Details:

Email: martin@lmatimber.co.nz

Phone: 021 398800

Address: 66 Wickham Street, Bromley, Christchurch, New Zealand.

LMA TIMBER HARDWOOD HORIZONTAL WEATHERBOARD SYSTEM

PURPOSE

LMA Timber supplies the Hardwood Horizontal Weatherboard system for use as an external cladding system. The system comprises weatherboards, external corner moulds, internal corner moulds, cover battens, scribes, eave moulds, and fixing screws.

EXPLANATION

LMA Timber's Hardwood Horizontal Weatherboard timbers are milled from a mixture of Australian and Fijian hardwood timbers that are classified as Class 1 and Class 2 natural durability under AS 5604-2005.

Timbers used include Grey/Red Iron Bark, Tallowwood, White Mahogany, Fijian Mahogany, Silvertop Ash and Spotted Gum. The timber is kiln-dried to a moisture content of between 9–14% before being factory coated with Intergrain Universal Timber Oil for further durability. Clad Lap joints and ends must be sealed with oil before installation.

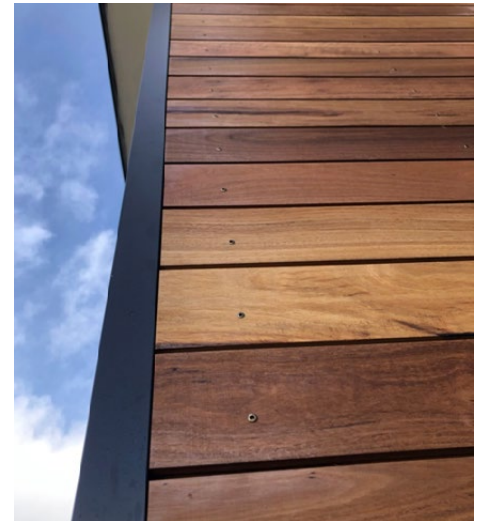
The weatherboard profiles of Shiplap, Rusticated, Rebated bevelback and Non-rebated bevelback are in accordance with NZS 3617:1979 and BRANZ Bulletin 411, with installation in accordance with LMA Timber details incorporating a drained and ventilated cavity and a flashing system that meets the requirements of Acceptable Solution E2/AS1.

The weatherboards come with a dressed or sawn finish and the following effective covers:

- 115 mm – Horizontal Shiplap, Rusticated and Rebated bevelback
- 108 mm – Non-rebated bevelback.

SCOPE AND LIMITATIONS OF USE

Scope	Limitations
Location In wind zones up to and including extra high as defined in NZS 3604:2011 or to a design wind pressure (ULS) of 2.1 kPa. In all exposure zones as defined in NZS 3604:2011. At least 1 m from a relevant or notional boundary.	➤ Use in microclimatic conditions, as defined in NZS 3604:2011, is excluded. ➤ Fixings must be Würth ASSY®plus A2 decking screw or in accordance with Table 24 of E2/AS1.
Building In conjunction with a primary structure that complies with the NZ Building Code or existing buildings where the designer and/or installer have satisfied themselves that the existing building is suitable for the intended building work. On timber or lightweight steel-framing. As an external cladding system.	➤ A thermal break must be installed if the framing is lightweight steel. ➤ The building must be within the scope of paragraph 1.1 of E2/AS1. ➤ The building must be less than 10 m in building height. ➤ The building must have a risk score of less than or equal to 20 when evaluated against the E2/AS1 risk matrix. ➤ The cladding must be installed over a drained and ventilated cavity. ➤ In conjunction with a flexible building wrap or rigid underlay in accordance with Clauses 9.1.5 to 9.1.7 of E2/AS1 that meets the requirements of Table 23 or is a proprietary product with a current Product Certificate. ➤ With joinery that meets the requirements of NZS 4211.



For further assistance please contact:

- ☎ 021 398 800
- ✉ info@lmatimber.co.nz
- 🌐 www.lmatimber.co.nz



USEFUL INFORMATION

For information on the design, installation, and maintenance of the Hardwood Horizontal Weatherboard system and for our warranty, refer to www.lmatimber.co.nz.

PERFORMANCE CLAIMS

If designed, installed, and maintained in accordance with all LMA Timber requirements, the Hardwood Horizontal Weatherboard system will comply with or contribute to compliance with the following performance claims:

NZ Building Code clauses	BASIS OF COMPLIANCE	
	Compliance statement	Demonstrated by
B1 STRUCTURE B1.3.1, B1.3.2, B1.3.3 (a, e, f, h, j, m, q, and in respect of UV radiation), B1.3.4 (a, b, c, d)	ALTERNATIVE SOLUTION	<ul style="list-style-type: none"> Dimensions – profiles in accordance with NZS 3617:1979. Paragraph 104.1.1 of NZS 3602:2003 (cited in NZS 3604:2011, cited in Acceptable Solution B1/ AS1) and paragraph 5.1 of NZS 3617:1979 for the required dimensions of weatherboards [LMA Timber, n.d.a; n.d.b; n.d.c; n.d.d]. Strength grade F22/F27 to NZS 3618-1:1984 has significantly greater strength than NZS 3602:2003 materials (e.g., radiata pine) [LMA Timber, n.d.a; n.d.b; n.d.c; n.d.d].
B2 DURABILITY B2.3.1(b)	VERIFICATION METHOD B2/VM1	<ul style="list-style-type: none"> Durability assessment by timber durability expert concludes durability requirements are met, based on durability testing and 26 year in-service history in Australia [University of Sunshine Coast, 05/07/2021]. Class 1 and 2 durability to AS 5604-2005 [Timber Queensland, 03/2014]. Durability assessment concludes the hardwood used and its moisture content is comparable to H3.1 treated timber as per NZS 3602:2003 Table 2A [ADarchitecture, n.d.].
E2 EXTERNAL MOISTURE E2.3.2, E2.3.3, E2.3.5, E2.3.7 (a, b, c)	ALTERNATIVE SOLUTION	<ul style="list-style-type: none"> Profiles in accordance with NZS 3617:1979, cited in E2/AS1, paragraph 9.4.1.1 [LMA Timber, n.d.a; n.d.b; n.d.c; n.d.d]. Rusticated weatherboard system and Bevelback Weatherboard system installation details in accordance with E2/AS1 [LMA Timber, n.d.a; n.d.b; n.d.c]. Horizontal Shiplap weatherboard weathergroove and half housing joint comparable to rusticated weatherboard [LMA Timber, n.d.d]. Horizontal Shiplap weatherboard system installation details identical to E2/AS1 Rusticated weatherboard system details [LMA Timber, n.d.d].
F2 HAZARDOUS BUILDING MATERIALS F2.3.1	ALTERNATIVE SOLUTION	<ul style="list-style-type: none"> Timber is untreated. Oil finish claimed not dangerous by manufacturer with V.O.C. <605 g/l [Intergrain, 13/03/2020]. Use in accordance with supplier's instructions.

SOURCES OF INFORMATION

- LMA Timber. [n.d.a] *Rusticated Shiplap Weatherboard Cladding Specification*.
- LMA Timber. [n.d.b] *Rebated Bevelback Weatherboard Cladding Specification*.
- LMA Timber. [n.d.c] *Non Rebated Bevelback Weatherboard Cladding Specification*.
- LMA Timber. [n.d.d] *Horizontal Shiplap Weatherboard Cladding Specification*.
- Timber Queensland. [03/2014] *Technical Data Sheet - Species, Properties, and Uses – 16B*.
- ADarchitecture. [n.d.] *Supporting documentation for Alternative Solution to NZBC:B2 & E2 Australian Hardwood Timbers (e.g Spotted Gum Grey Iron Bark) to achieve 15 year durability for use as Vertical / Horizontal Shiplap weatherboards on cavity*.
- University of Sunshine Coast. [05/07/2021] *Australian Hardwood Cladding*.
- Intergrain. [13/03/2020] *Datasheet - Intergrain Universal Timber Oil Matt*. Document no. AU_DW02675. Version 1.0.

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COMPLIANCE DOCUMENTATION
FOR THIS PASS™.

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- Where a standard is referenced it is to be read as amended by the acceptable solution or verification method as applicable.
- Sources of information also include the Building Act 2004 and its regulations, including the Building Code (Schedule 1 of the Building Regulations 1992), Acceptable Solutions and Verification Methods, and relevant cited standards.
- The quality and assurance that the supplied products meet the performance claims stated in this pass™ are the responsibility of the company that is the holder of this pass™.

LMA Timber confirms that if Hardwood Horizontal Cladding system is used in accordance with the requirements of this pass™ the product will comply with the NZ Building Code and other performance claims set out in this pass™ and the company has met all of its obligations under s14 G of the Building Act.

Date of first issue: 17/05/2023

Date of current issue: 22/05/2023

NZBN: 9429046749680

Kevin Brunton

Kevin Brunton, Technical Director, TBB confirms that this pass has been prepared on behalf of LMA Timber and in accordance with MBIE PTS guidelines and in accordance with the TBB pass™ process which is within the scope of TBB's ISO 9001 certification.

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281 Dyers Road, Bromley, Christchurch 8062 > info@lmatimber.co.nz > 021 398 800 > www.lmatimber.co.nz

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VERSION: 1.1

Uncontrolled in printed format

Supporting documentation for Alternative Solution to NZBC:B2 & E2 Australian Hardwood Timbers (e.g Spotted Gum Grey Iron Bark) to achieve 15 year durability for use as Vertical / Horizontal Shiplap weatherboards on cavity

Several references are used to illustrate compliance:

1. Comparison with NZBC Acceptable Solution B2/AS1. 1.
2. Comparison with Timber Queensland “Species, Properties and Uses” TDS 16a and 16b
3. Commentary on NZBC Acceptable Solution E2/AS1.
4. Reference to alternative solutions provided by other weatherboard suppliers
5. Reference to previous Consent issued

Timber: Class 1 Australian Eucalyptus such as Spotted Gum, Iron Bark (Red & Grey), Tallowwood, White Mahogany, Blackbutt - HEARTWOOD

Location: Weatherboards

Durability requirement: 15 Years

Means of compliance: Comparison with TDS16a and TDS16b cypress species (acceptable solution) with a durability class 1 (above ground) >40 years. Heart timber comparable with Lawson Cypress/ Pinus Radiata treated to H3.1 (Table 2A NZS 3602:2003)

Protection: none required (as per Clause 111.2.5 NZS 3602:2003) Suggest application of Dulux Intragrain or similar wood oil be used to retain colour and appearance. 1 coat factory applied plus 1 coat after installation.

NZBC E2/AS1 only provides an acceptable solution for direct fix vertical shiplap weatherboard cladding. A cavity solution was not included primarily because at the time of publication, castellated battens were not available or at least not widely used.

The desire from most architects and designers, as well as insurance companies, is to provide a cavity solution for cladding as this provides a greater degree of protection. Cavity installations can have a high score using the NZBC E2 Risk Matrix. It is therefore logical to assume that vertical shiplap weatherboards fitted over a cavity meet the requirements of NZBC E2 as an alternative solution. Castellated structural cavity battens are now widely available to enable the appropriate installation of vertical shiplap weatherboards.

There are several suppliers with approved alternative solutions for Vertical and Horizontal Shiplap weatherboards on cavity (e.g. Hermpac, Abodo, JSC and Rosenfeld Kidson). It is reasonable to assume that that LMA timber weatherboards also comply given the installation methodology (including fixings and flashings) is fundamentally the same.

As further evidence of acceptability, the Kapiti Coast District Council has previously issued a consent for Vertical Shiplap weatherboards on cavity. Refer to BC 210518 - 123Manly St, Paraparaumu Beach.

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
2. LMAH001 Profile weatherboard directly matches the NZS3617 profile Fig 5 except for the thickness that is increased from 19mm to 22mm and width increased to 139mm from 135mm. This variation is comparable to the standard profile except for the increased width, thickness and bevelled joint to allow water to run off., as this is proposed for increased stability with these hardwoods.
3. Fixings as per Table 24 E2/AS1
4. Compatibility of materials as per Tables 20-22 E2/AS1
5. Flashing as per Clause 4.0 E2/AS1
6. Rigid and flexible underlay as per Table 23 and Clauses 9.1.5 to 9.1.7 E2/AS1 or proprietary approved alternative
7. The weatherboard system relies on the joinery meeting the requirements of NZS 4211 for the relevant building wind zone or wind pressure
8. For Structural Cavity battens Cladding must have MIN 30mm penetration into cavity battens



LMA HORIZONTAL SHIPLAP HARDWOOD CLADDING DRAWING INDEX

Product	Sheet No.	Sheet Name	Issue Date
LMA	HOR_00	Horizontal Shiplap Hardwood Cladding Profile	11/2020
LMA	HOR_01	Window Head Detail_Aluminium Joinery	11/2020
LMA	HOR_02	Window Sill Detail_Aluminium Joinery	11/2020
LMA	HOR_03	Window Jamb Detail_Aluminium Joinery	11/2020
LMA	HOR_04	Window Jamb Detail_Aluminium Joinery	11/2020
LMA	HOR_05	Door Head Detail_Aluminium Joinery	11/2020
LMA	HOR_06	Door Sill Detail_Aluminium Joinery	11/2020
LMA	HOR_07	Door Jamb Detail_Aluminium Joinery	11/2020
LMA	HOR_08	Internal Corner_Mould	11/2020
LMA	HOR_09	External Corner_Boxed	11/2020
LMA	HOR_10	External Corner_Cover batten	11/2020
LMA	HOR_11	External Corner_Mould	11/2020
LMA	HOR_12	Enclosed Deck Balustrade to Wall Junction	11/2020
LMA	HOR_13	Parapet Detail	11/2020
LMA	HOR_14	Cavity at Enclosed Deck	11/2020
LMA	HOR_15	Drained Inter-Storey Joint	11/2020
LMA	HOR_16	Base of Wall_Concrete	11/2020
LMA	HOR_17	Base of Wall_Timber	11/2020
LMA	HOR_18	Scarf Join Stain Finish	11/2020
LMA	HOR_19	Roof/Wall Junction	11/2020
LMA	HOR_20	Soffit Detail_Overhang	11/2020
LMA	HOR_21	Eaves Detail_No Overhang	11/2020
LMA	HOR_22	Meter Box Detail	11/2020
LMA	HOR_23	General Nail Fixing_Stain Finish	11/2020
LMA	HOR_24	General Screw Fixing_Stain Finish	11/2020
LMA	HOR_25	Pipe Penetration Plan Detail	11/2020
LMA	HOR_26	Pipe Penetration Detail	11/2020
LMA	HOR_27	Battens Set Out	11/2020



Contact Details

P: 021 398 800
 E: info@lmatimber.co.nz
 W: www.lmatimber.co.nz
 A: 281 Dyers Road, Bromley, 8062

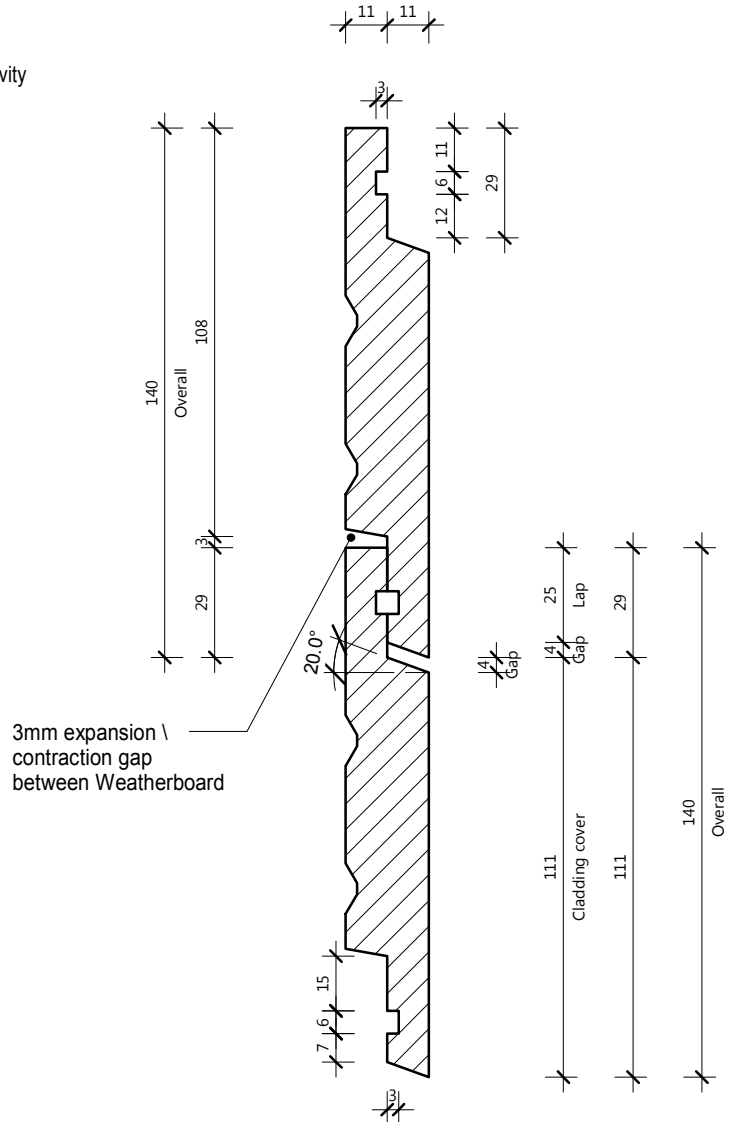
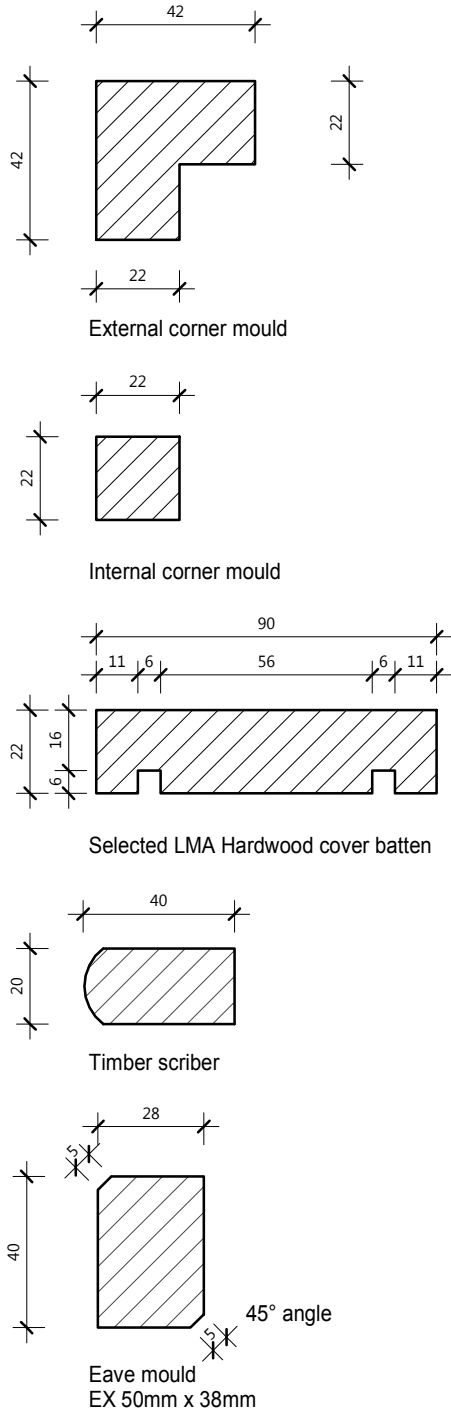
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Cover sheet

• SCALE: @A4

• DATE:09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
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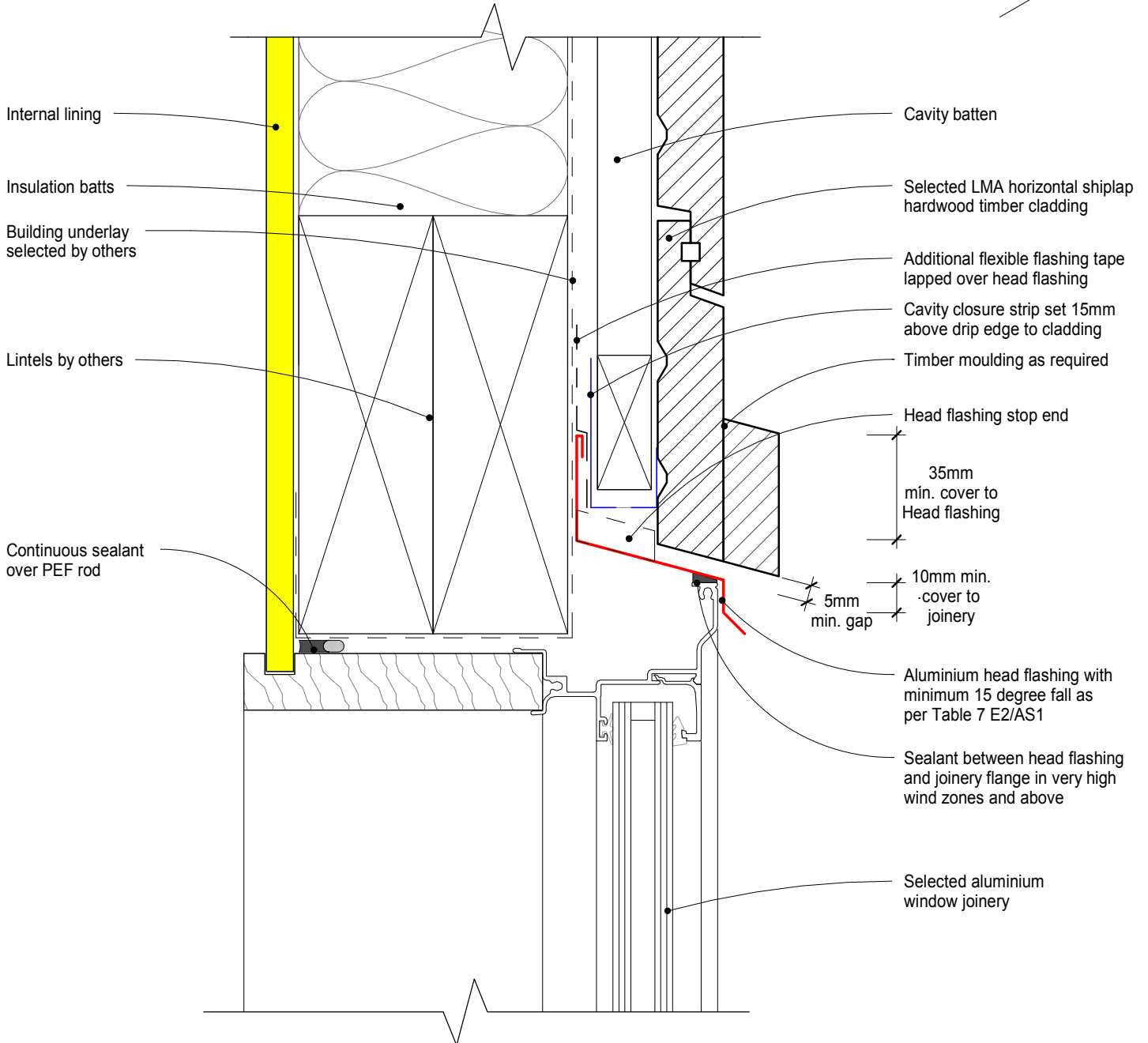
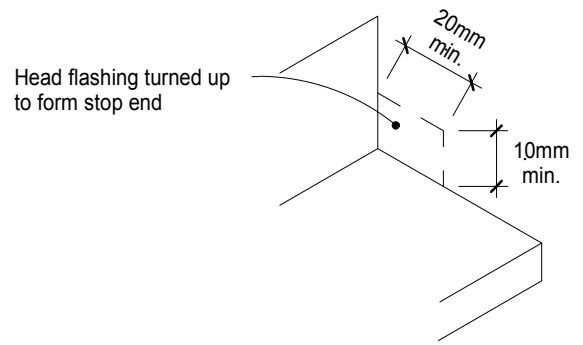
Wurth ASSY plus A2 decking screw
or as per E2/AS1 - Table 24
MIN: 30mm Penetration into stud

Contact Details

P: 021 398 800
E: info@lmatimber.co.nz
W: www.lmatimber.co.nz
A: 281 Dyers Road, Bromley, 8062

- TITLE: LMA Horizontal Shiplap Hardwood Cladding
- DRAWING: Horizontal Shiplap Hardwood Cladding Profile
- SCALE: 1 : 2@A4
- DATE: 09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
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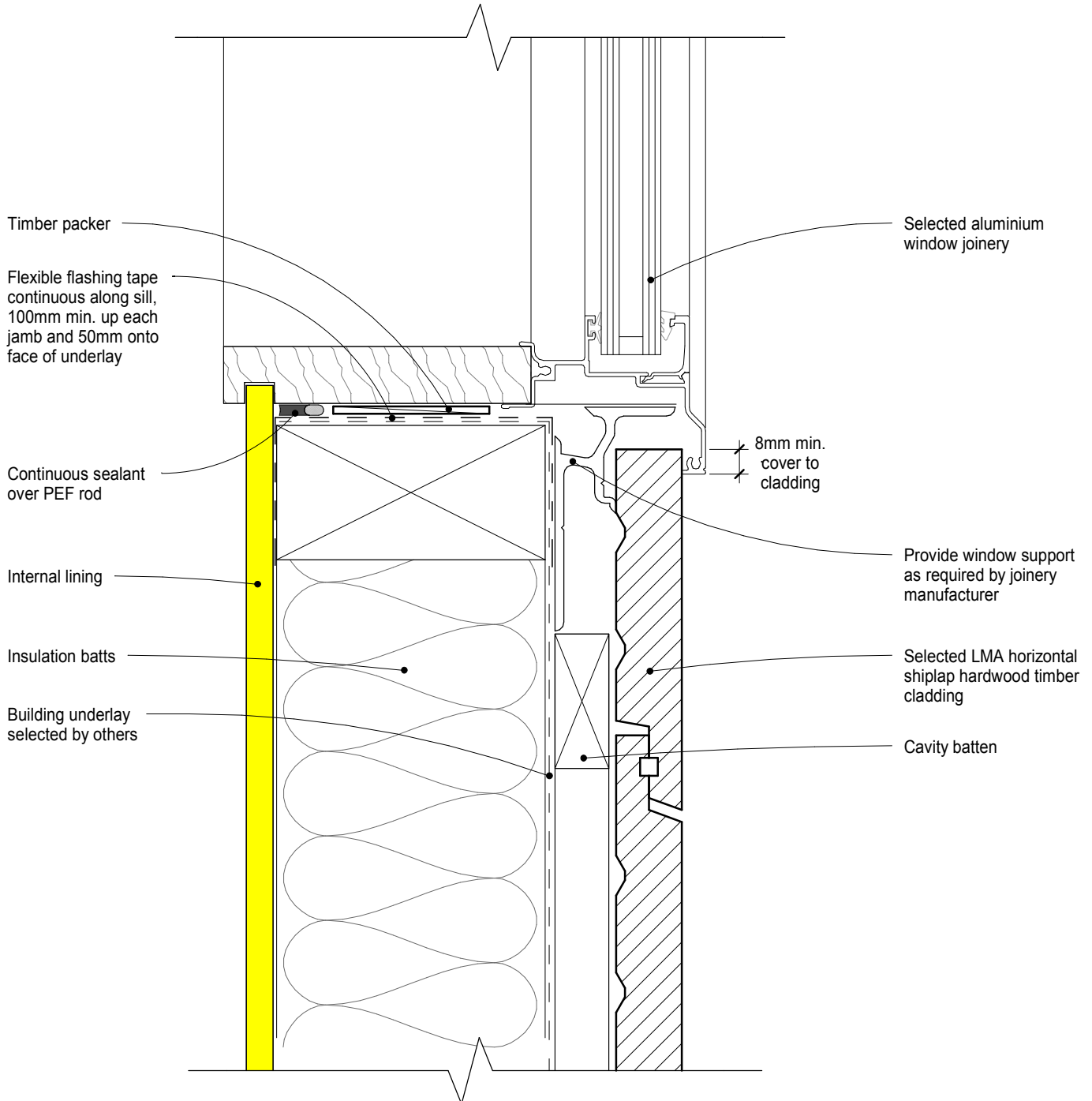
• TITLE: LMA Horizontal Shi lap Hardwood Cladding

• DRAWING: Window Head Detail_Aluminium Joinery

• SCALE: 1 : 2@A4

• DATE:09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
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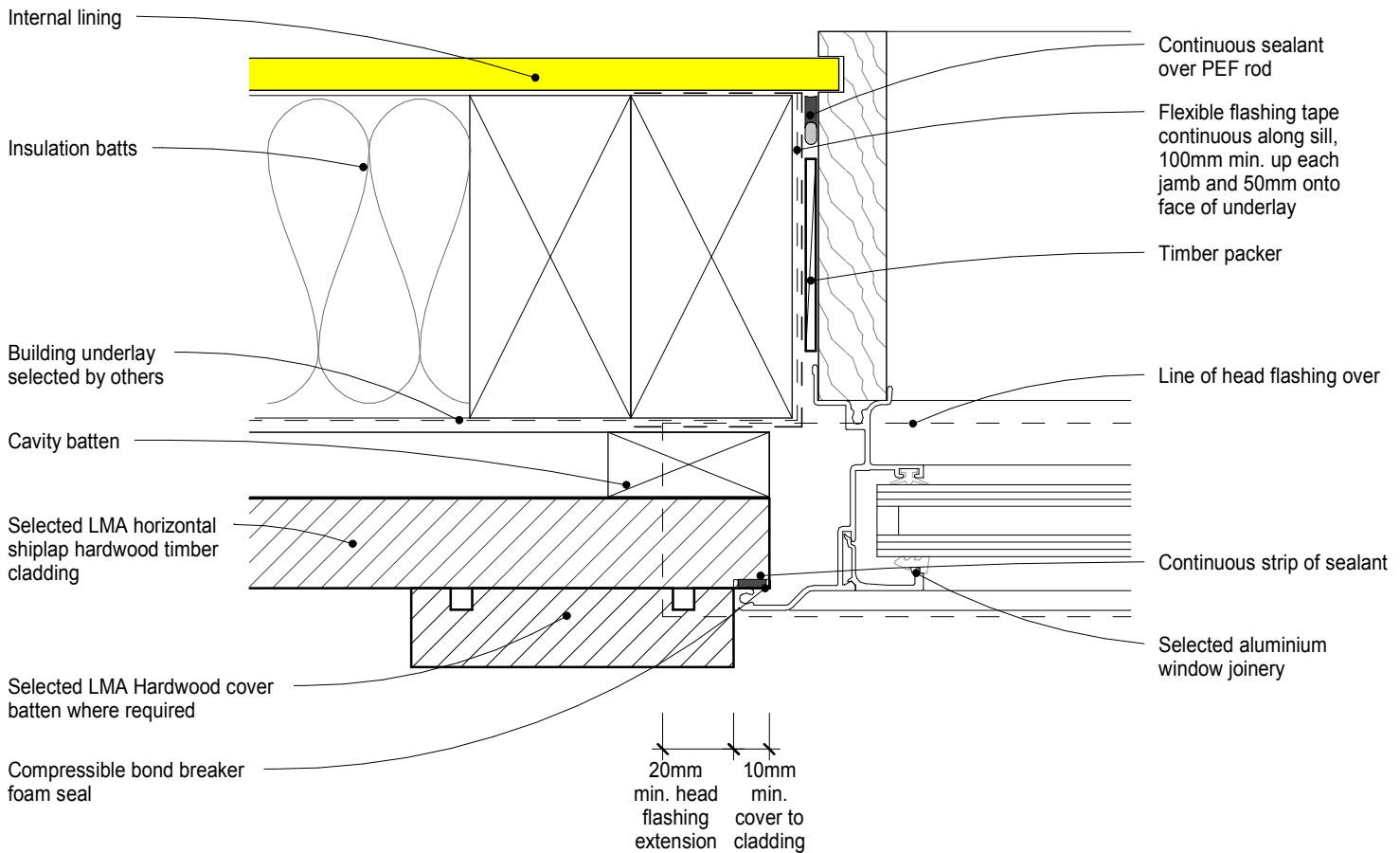
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Window Sill Detail_Aluminium Joinery

• SCALE: 1 : 2@A4

• DATE:09/06/2021

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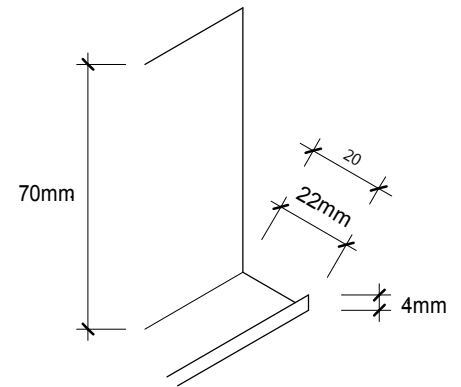
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Window Jamb Detail_Aluminium Joinery

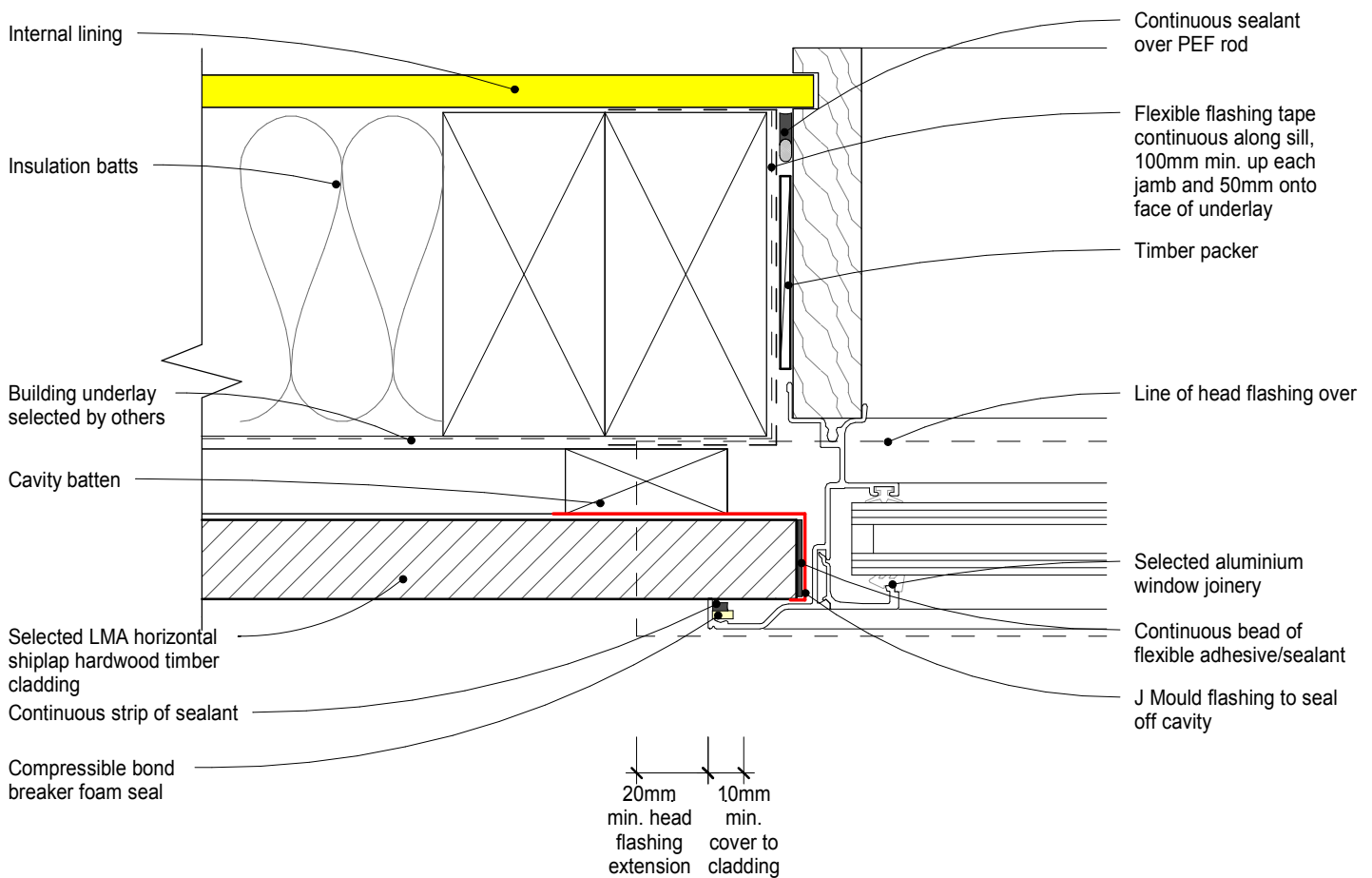
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J Mould flashing



Contact Details

P: 021 398 800
E: info@lmatimber.co.nz
W: www.lmatimber.co.nz
A: 281 Dyers Road, Bromley, 8062

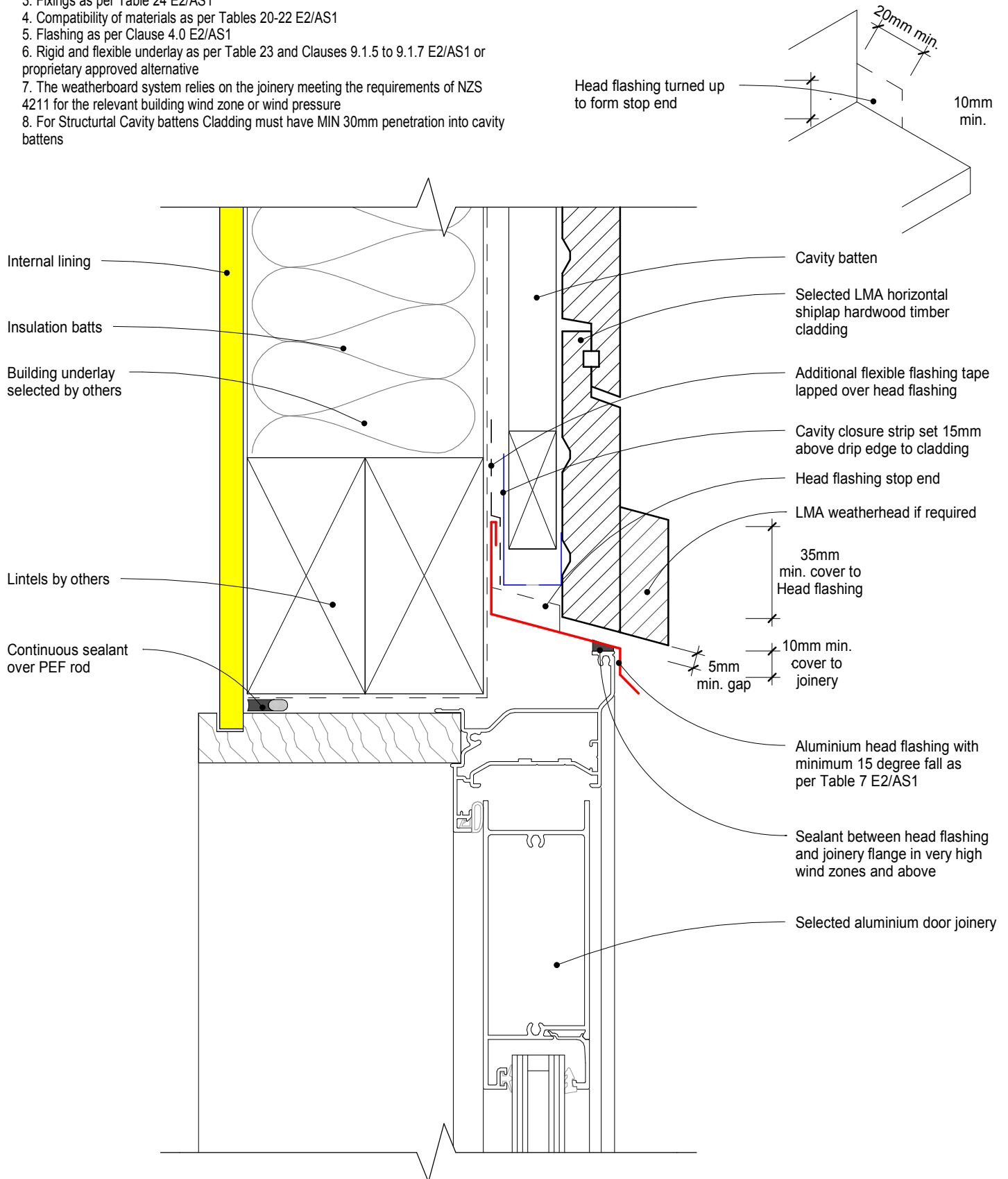
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

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W: www.lmatimber.co.nz
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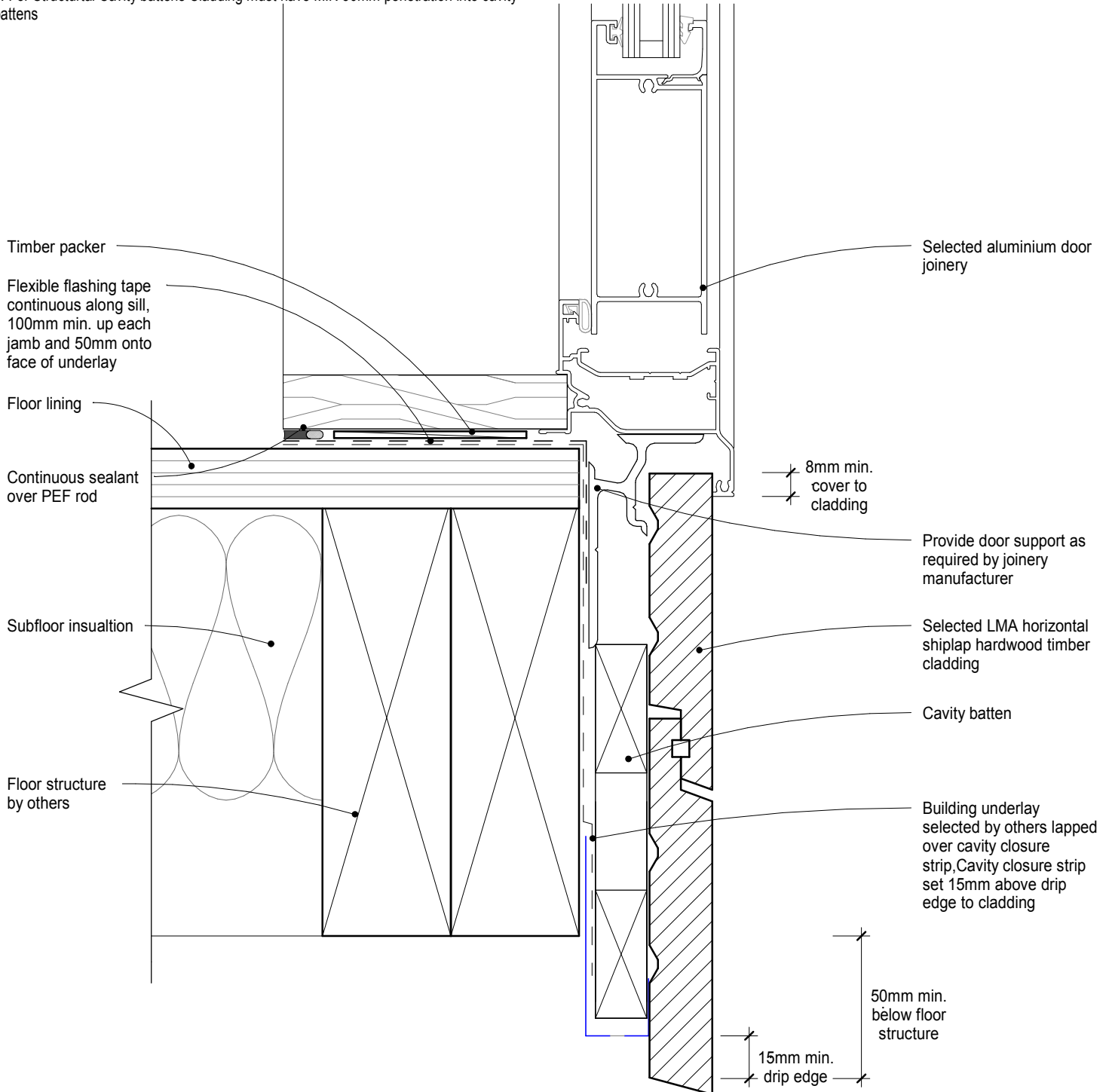
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Door Head Detail_Aluminium Joinery

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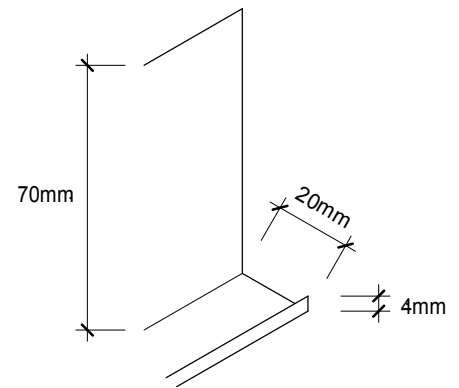
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Door Sill Detai_Aluminium Joinery

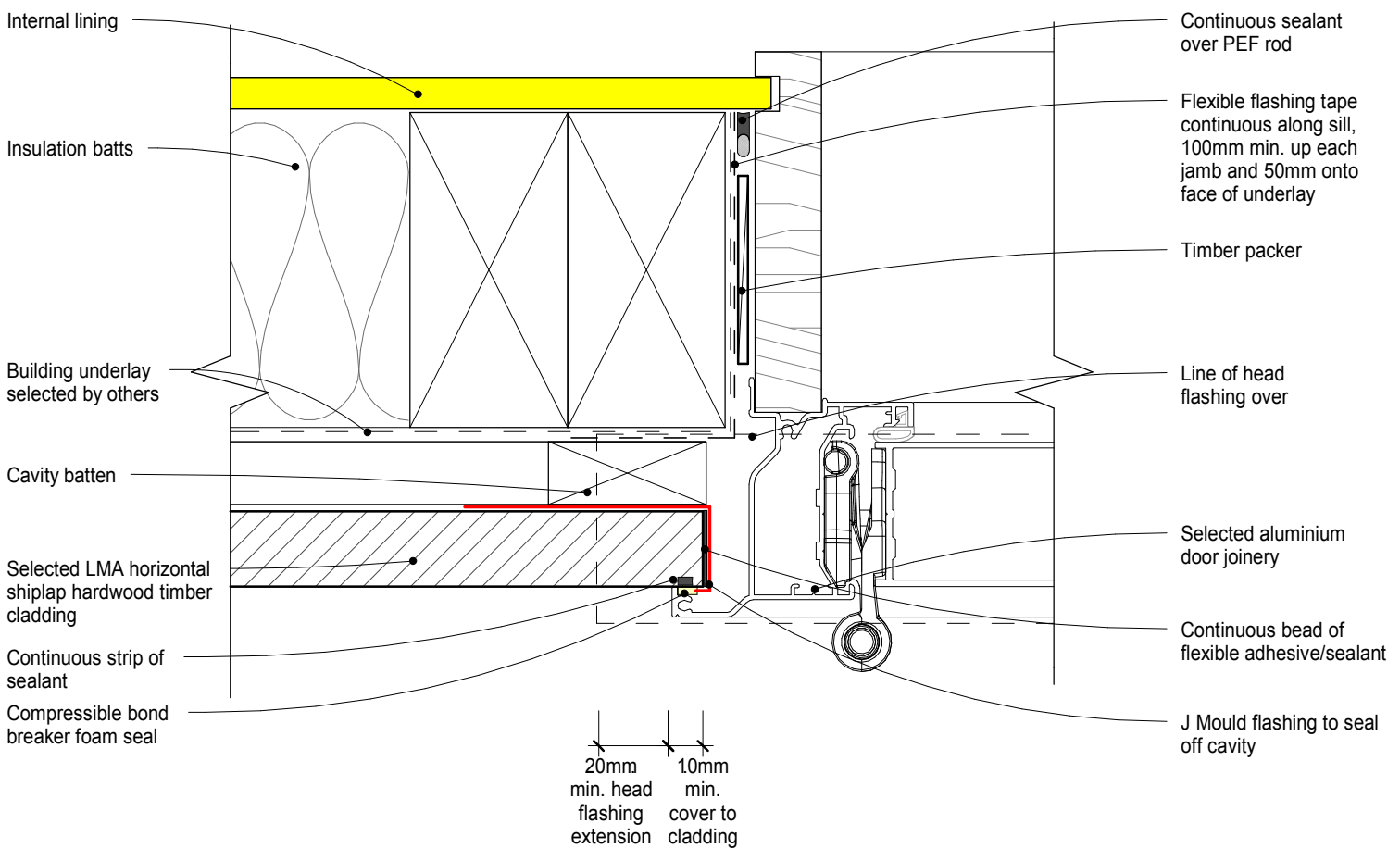
• SCALE: 1 : 2@A4

• DATE:09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
2. LMAH001 Profile weatherboard directly matches the NZS3617 profile Fig 5 except for the thickness that is increased from 19mm to 22mm and width increased to 139mm from 135mm. This variation is comparable to the standard profile except for the increased width, thickness and bevelled joint to allow water to run off., as this is proposed for increased stability with these hardwoods.
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6. Rigid and flexible underlay as per Table 23 and Clauses 9.1.5 to 9.1.7 E2/AS1 or proprietary approved alternative
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8. For Structural Cavity battens Cladding must have MIN 30mm penetration into cavity battens

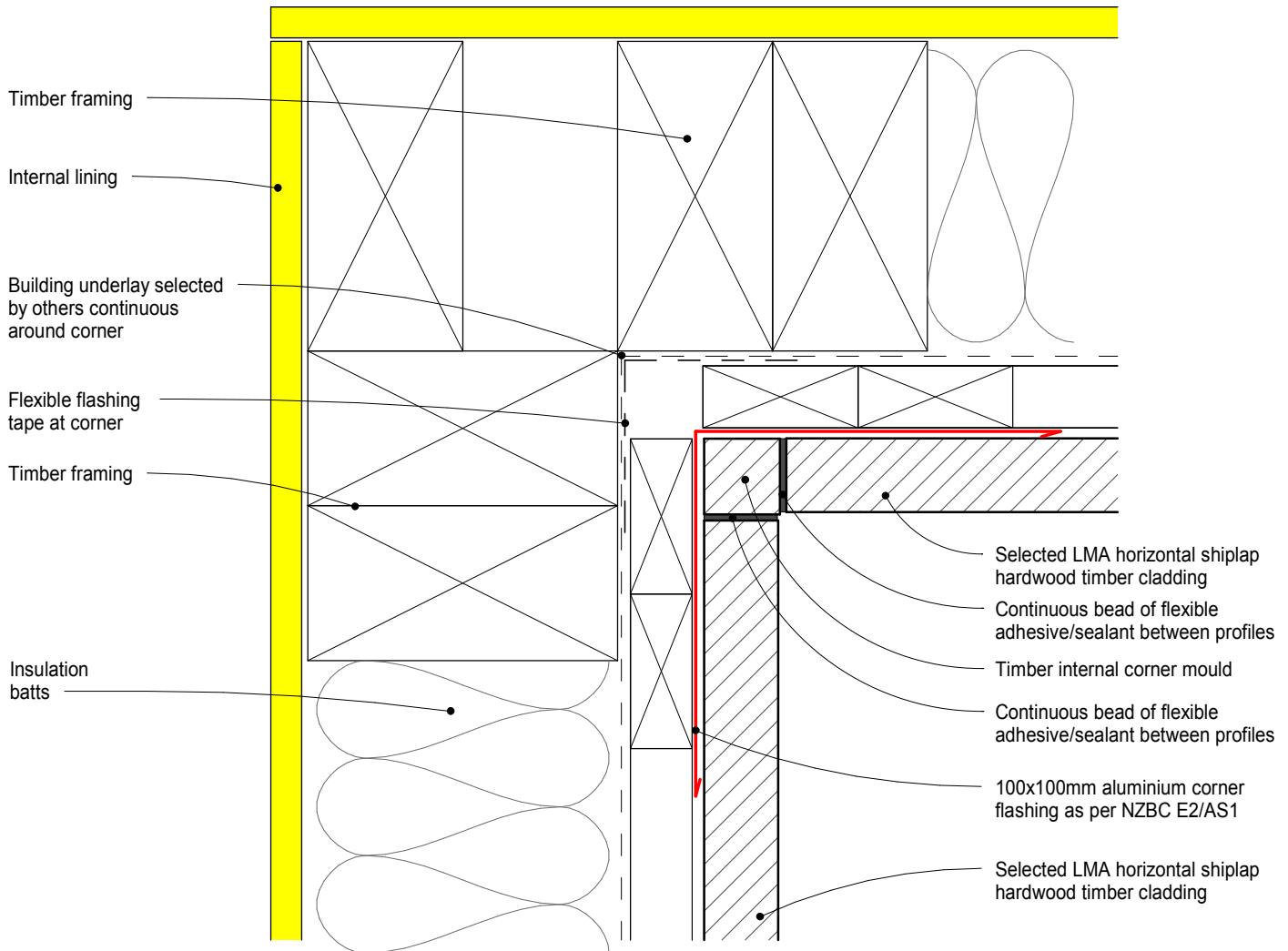


J Mould flashing



Contact Details

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Contact Details

P: 021 398 800
 E: info@lmatimber.co.nz
 W: www.lmatimber.co.nz
 A: 281 Dyers Road, Bromley, 8062

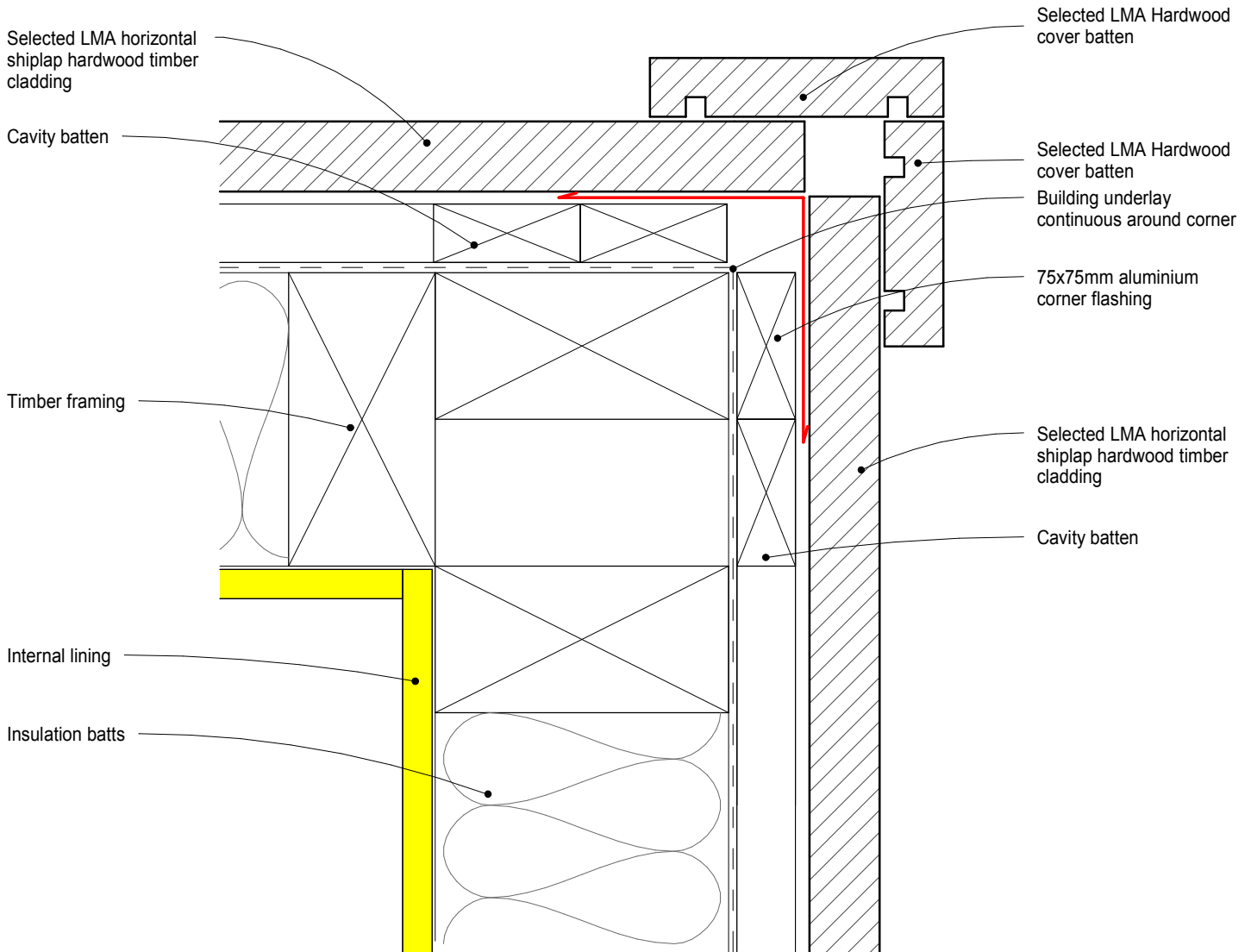
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Internal Corner_Mould

• SCALE: 1 : 2@A4

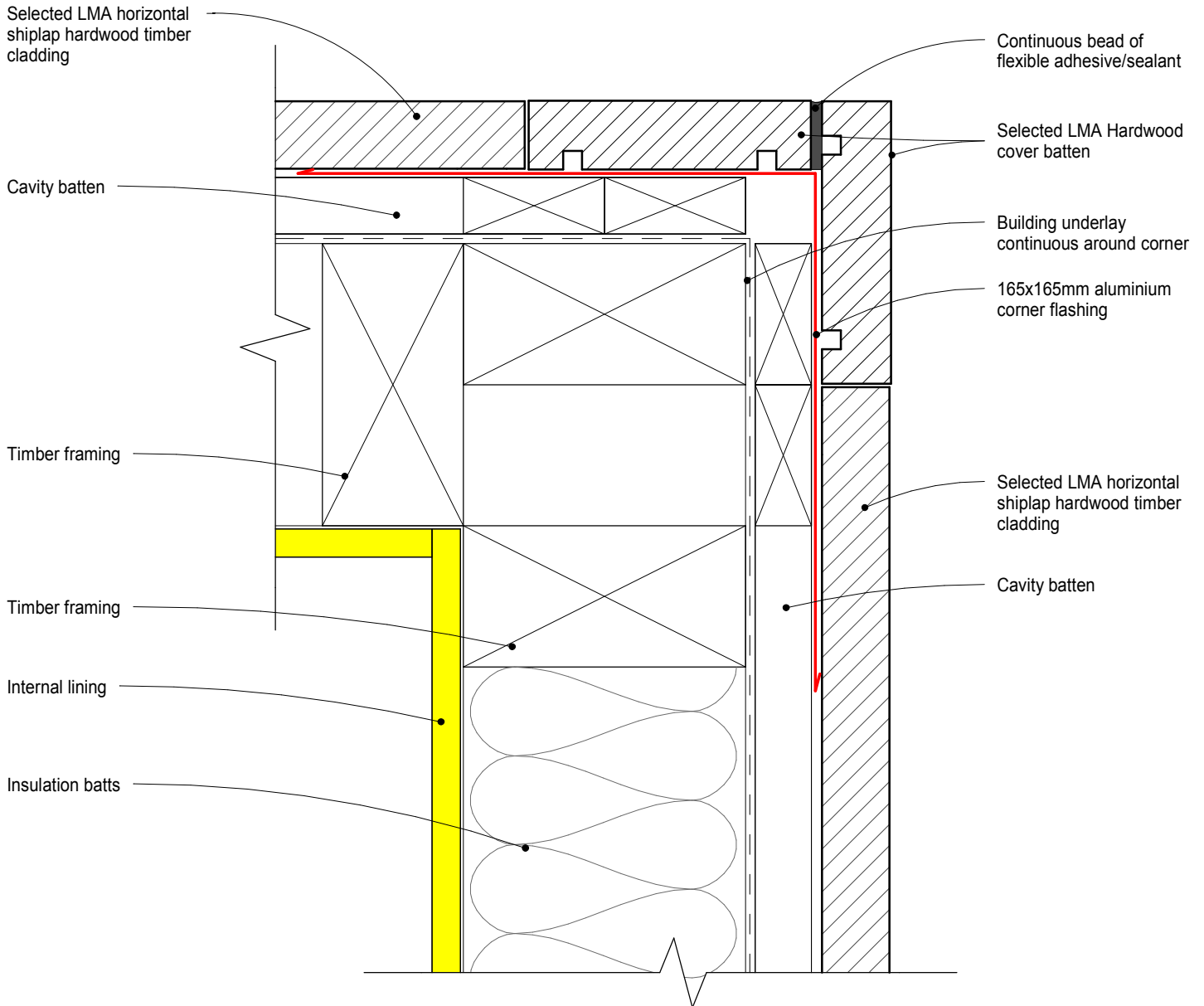
• DATE:09/06/2021

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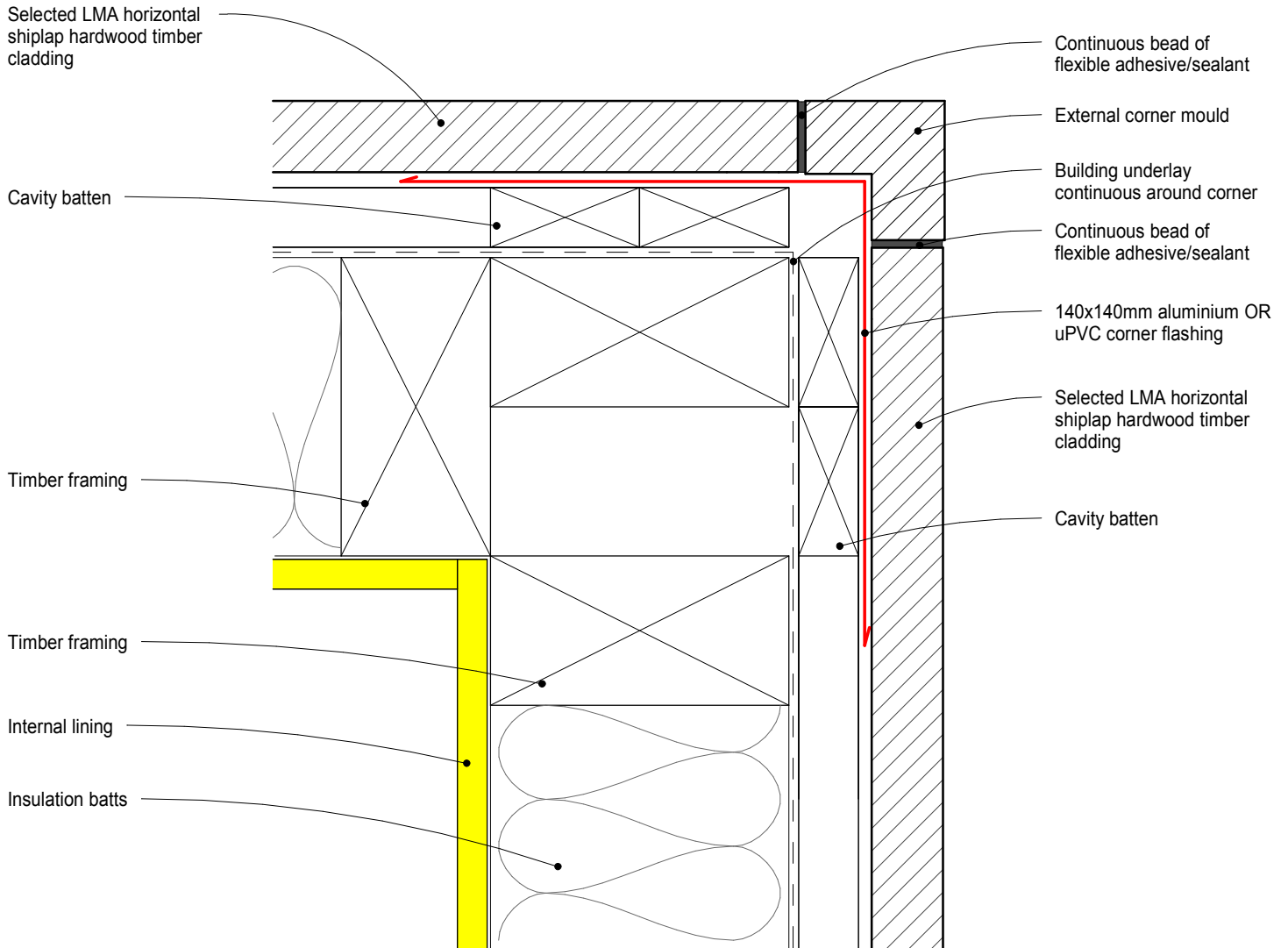
• TITLE: LMA Horizontal Shi lap Hardwood Cladding

• DRAWING: External Corner_Cover batten

• SCALE: 1 : 2@A4

• DATE:09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
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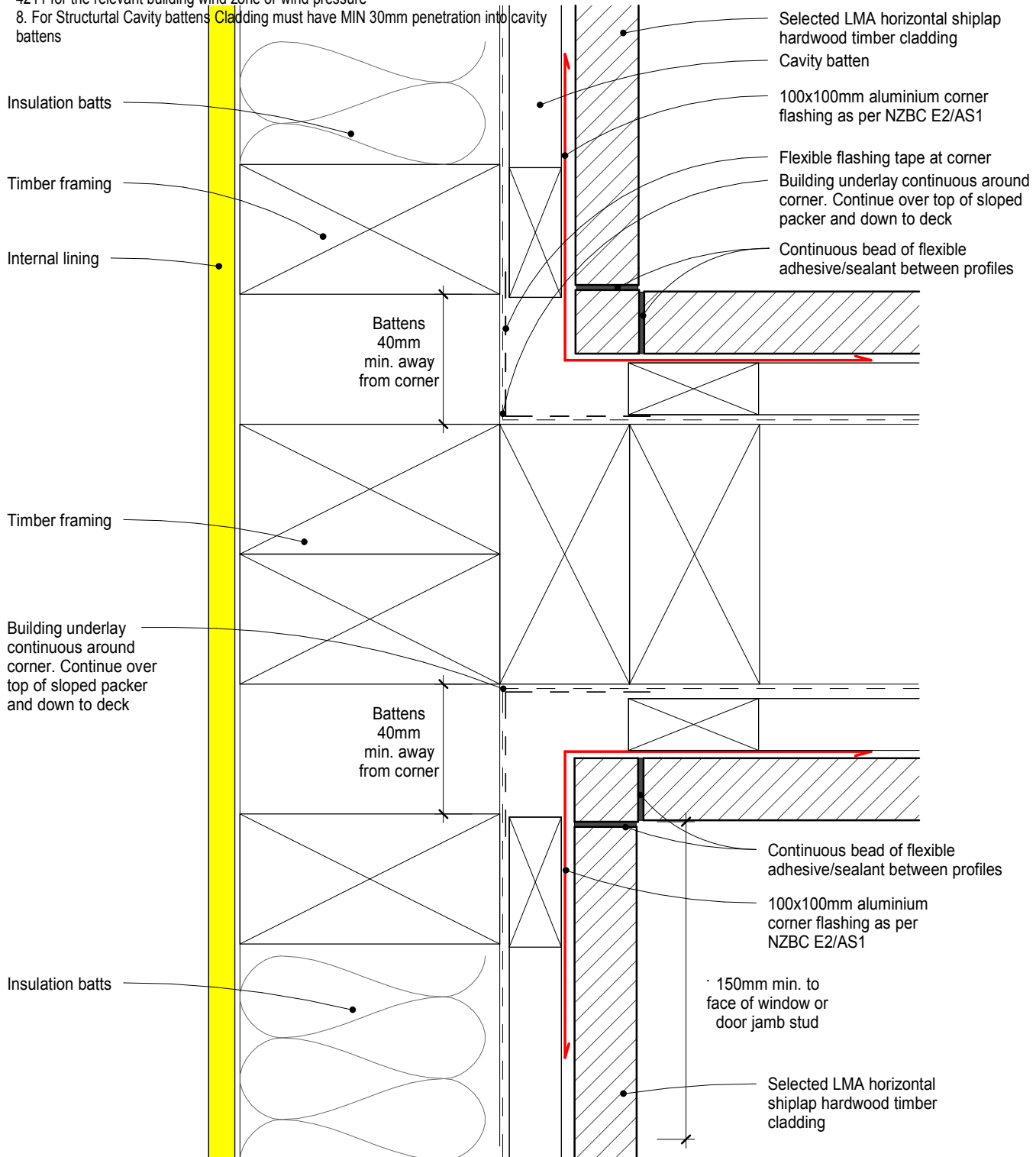
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: External Corner_Mould

• SCALE: 1 : 2@A4

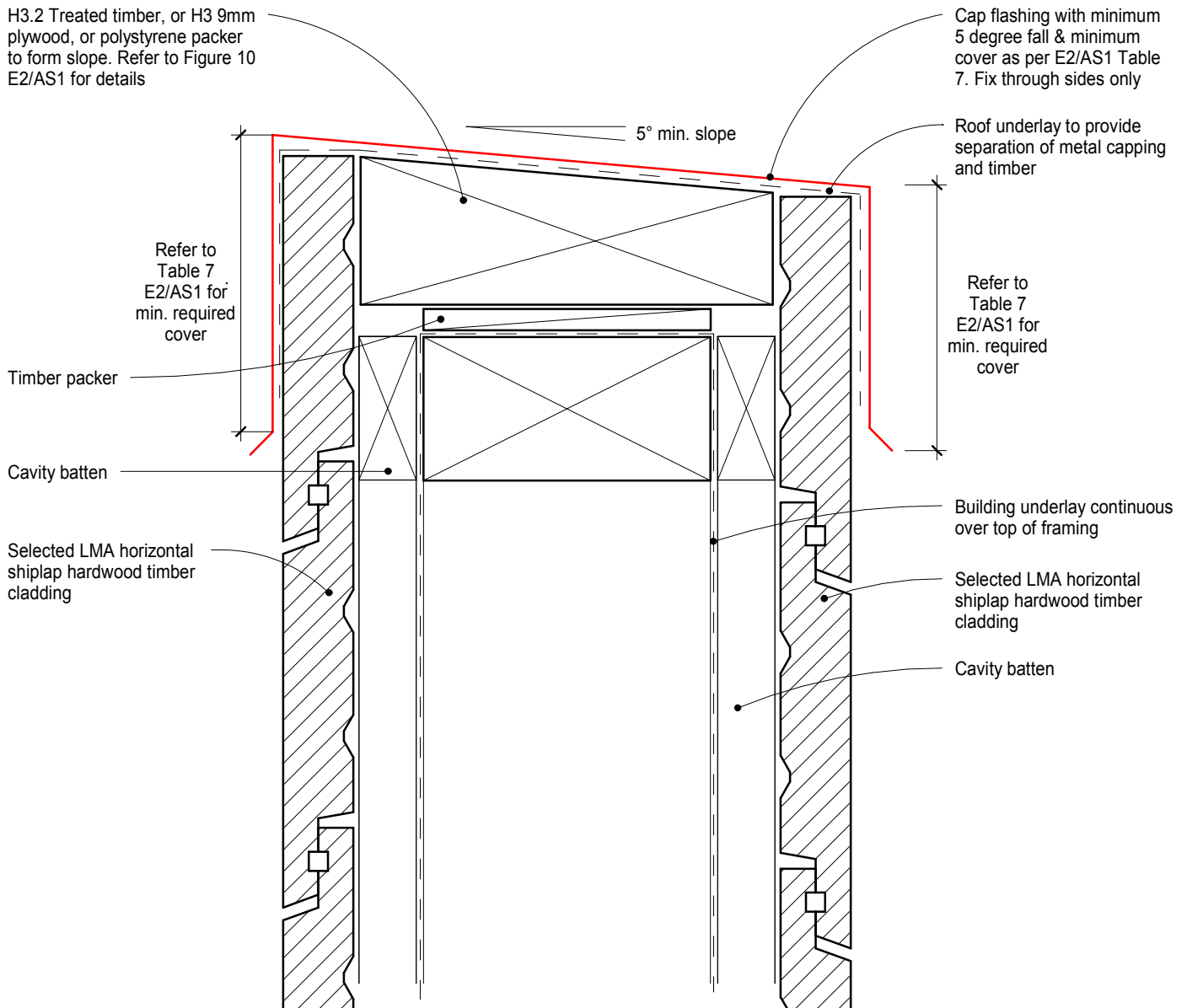
• DATE:09/06/2021

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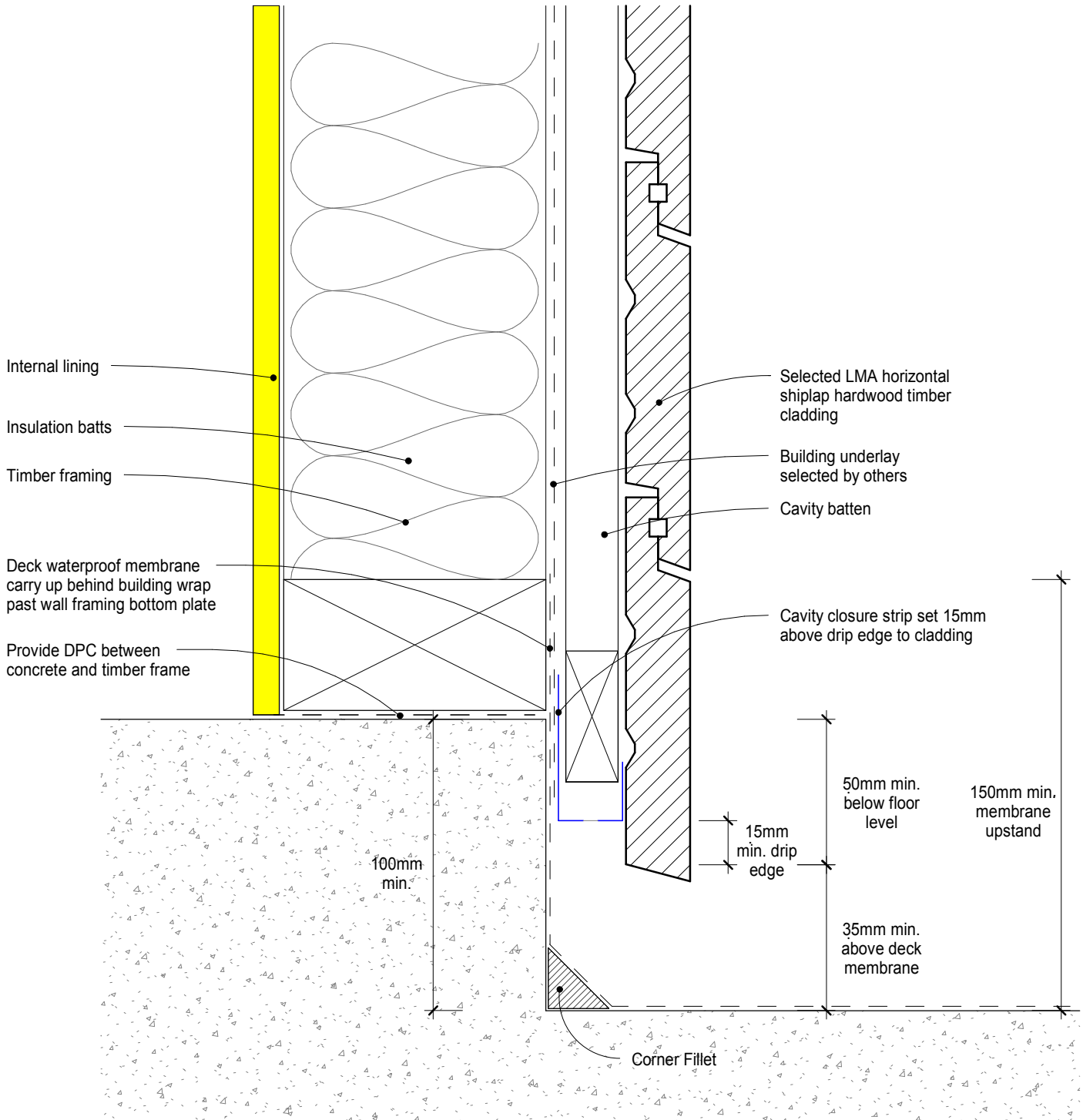
• TITLE: LMA Horizontal Shi lap Hardwood Cladding

• DRAWING: Parapet Detail

• SCALE: 1 : 2@A4

• DATE:09/06/2021

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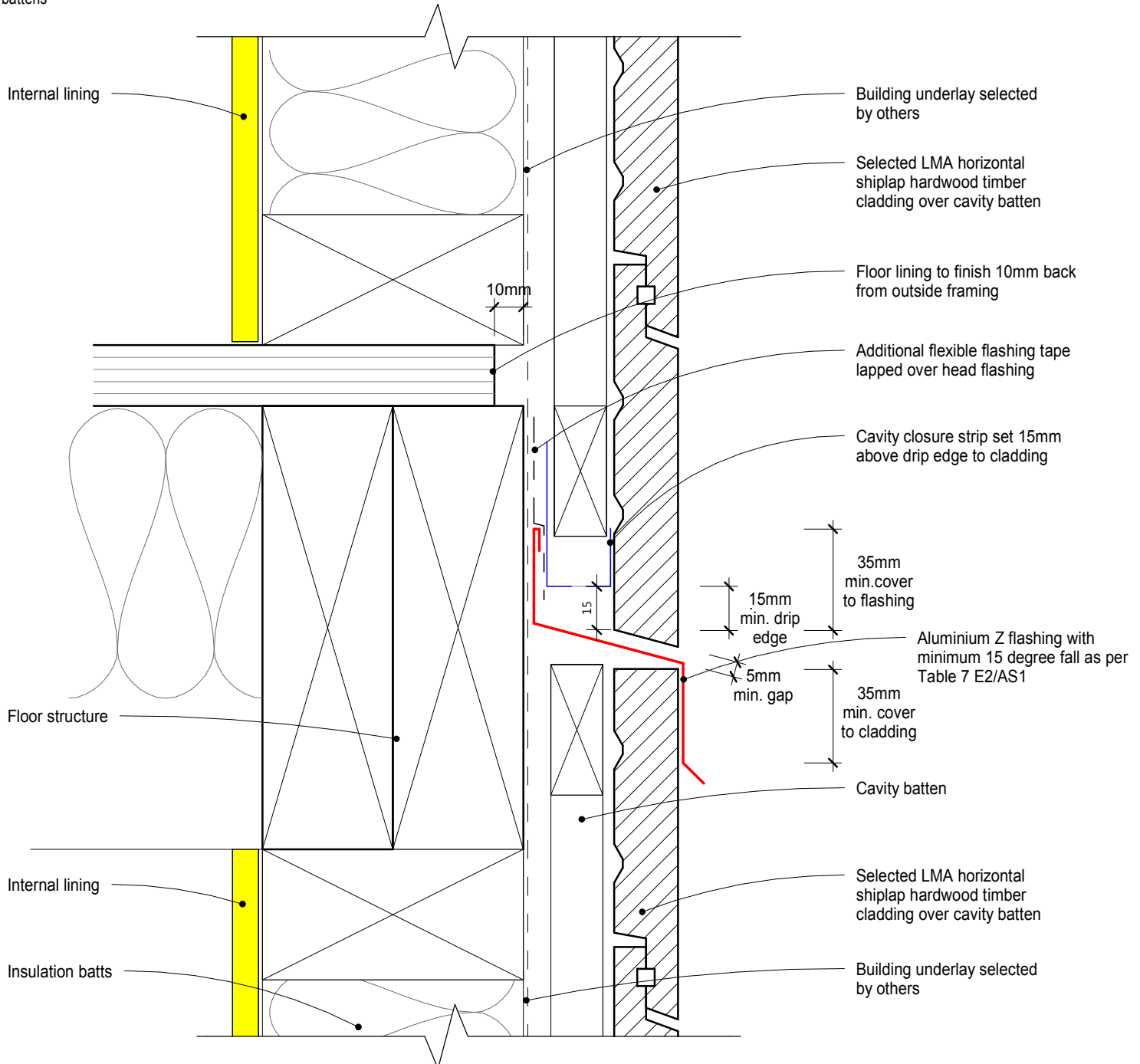
• TITLE: LMA Horizontal Shi lap Hardwood Cladding

• DRAWING: Cavity at Enclosed Deck

• SCALE: 1 : 2@A4

• DATE:09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
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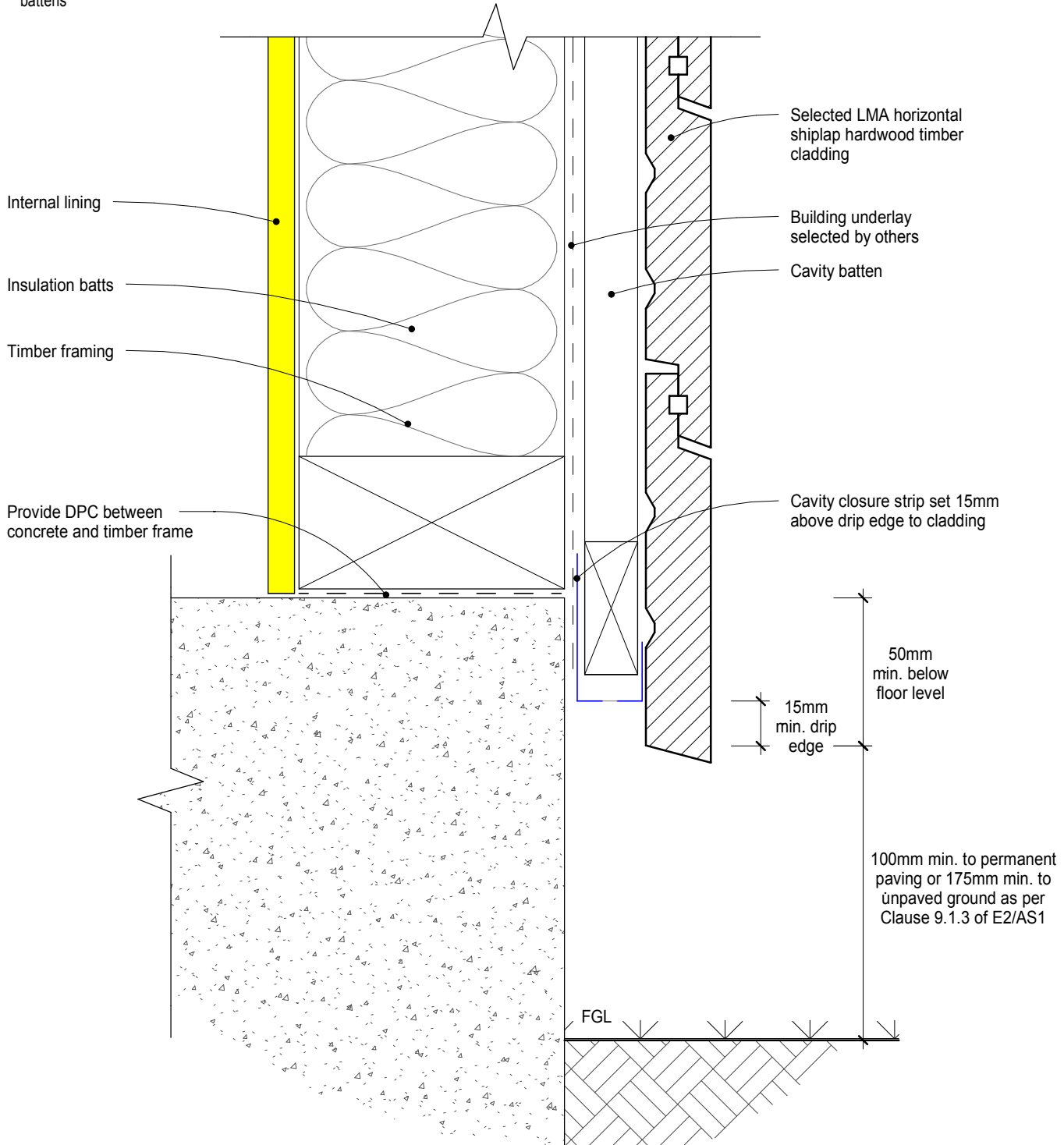
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Drained Inter-Storey Joint

• SCALE: 1 : 2@A4

• DATE: 09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
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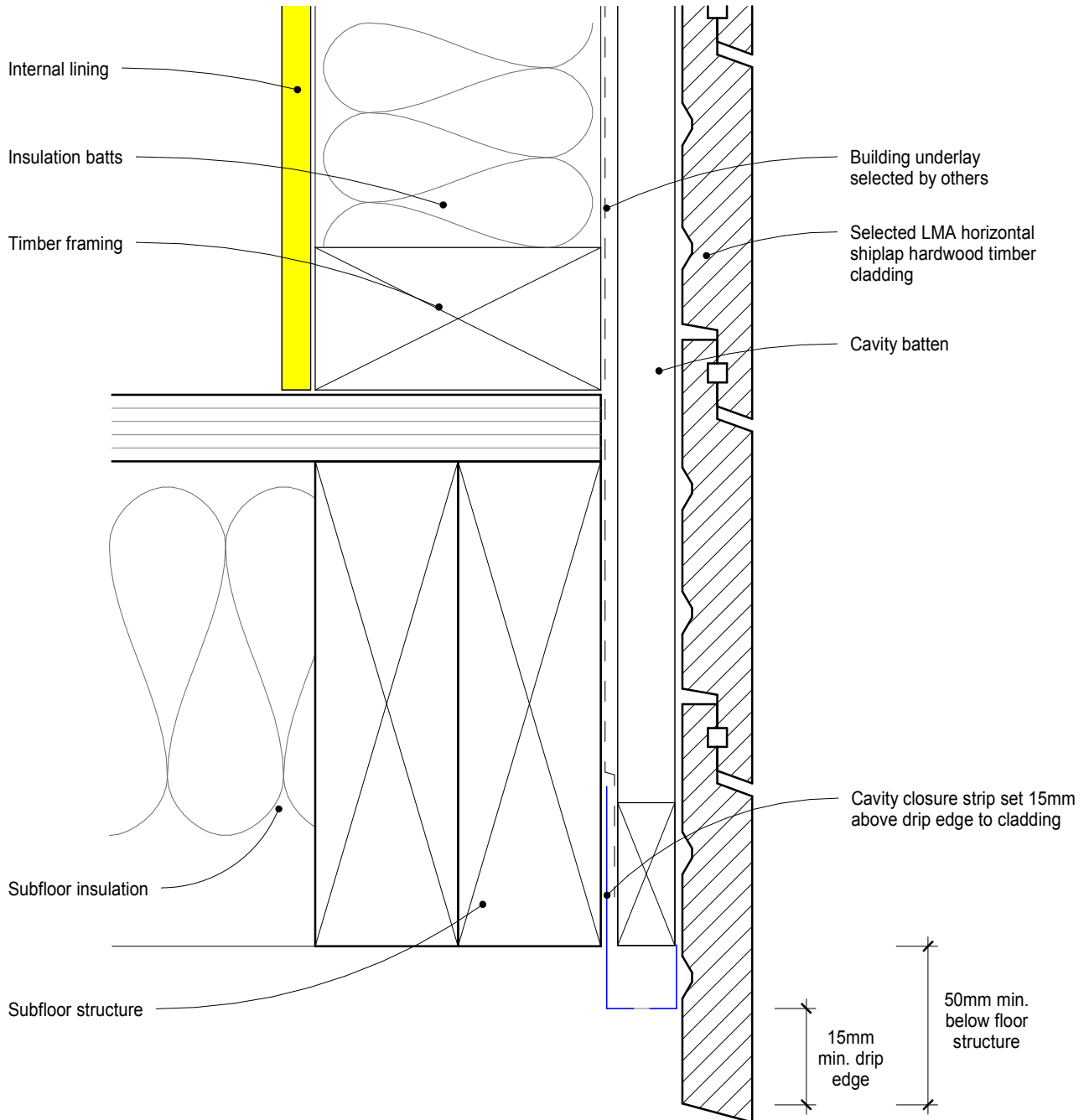
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: **Base of Wall_Concrete**

• SCALE: 1 : 2@A4

• DATE: 09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
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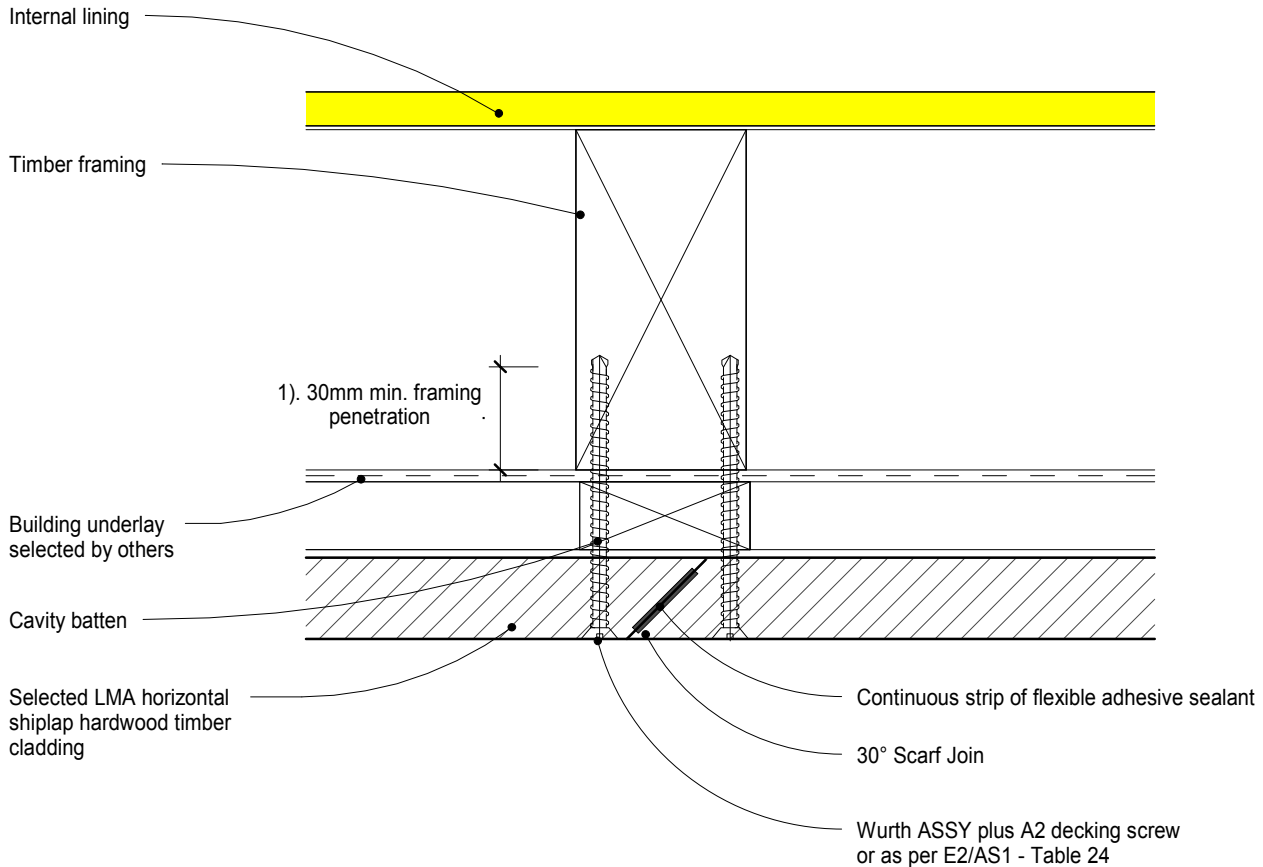
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: **Base of Wall_Timber**

• SCALE: 1 : 2@A4

• DATE:09/06/2021

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NOTE:
Cut ends of scarf joint must be double coated with oil or stain.

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E: info@lmatimber.co.nz
W: www.lmatimber.co.nz
A: 281 Dyers Road, Bromley, 8062

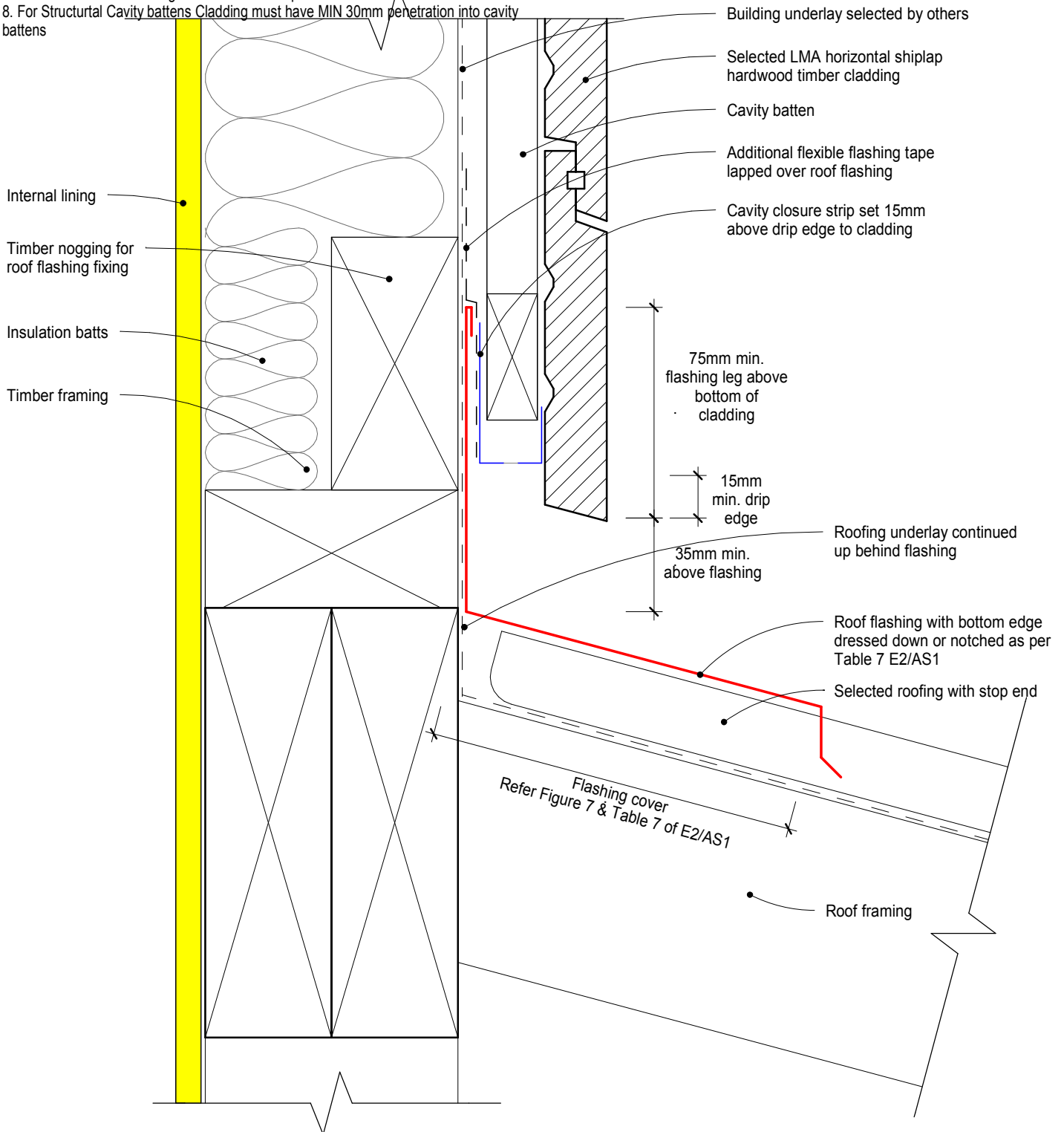
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Scarf Join Stain Finish

• SCALE: 1 : 2@A4

• DATE: 09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
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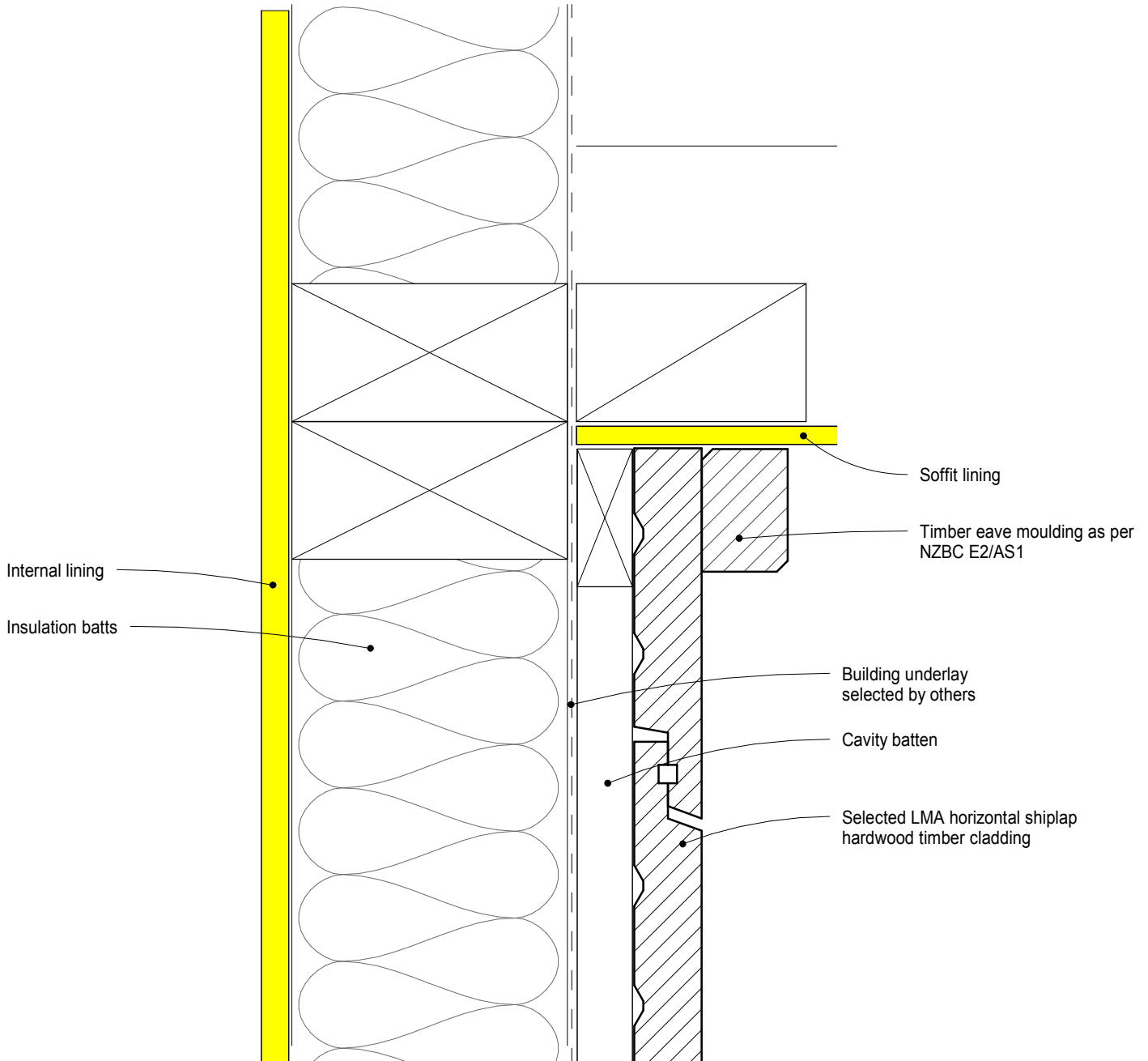
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Roof/Wall Junction

• SCALE: 1 : 2@A4

• DATE: 09/06/2021

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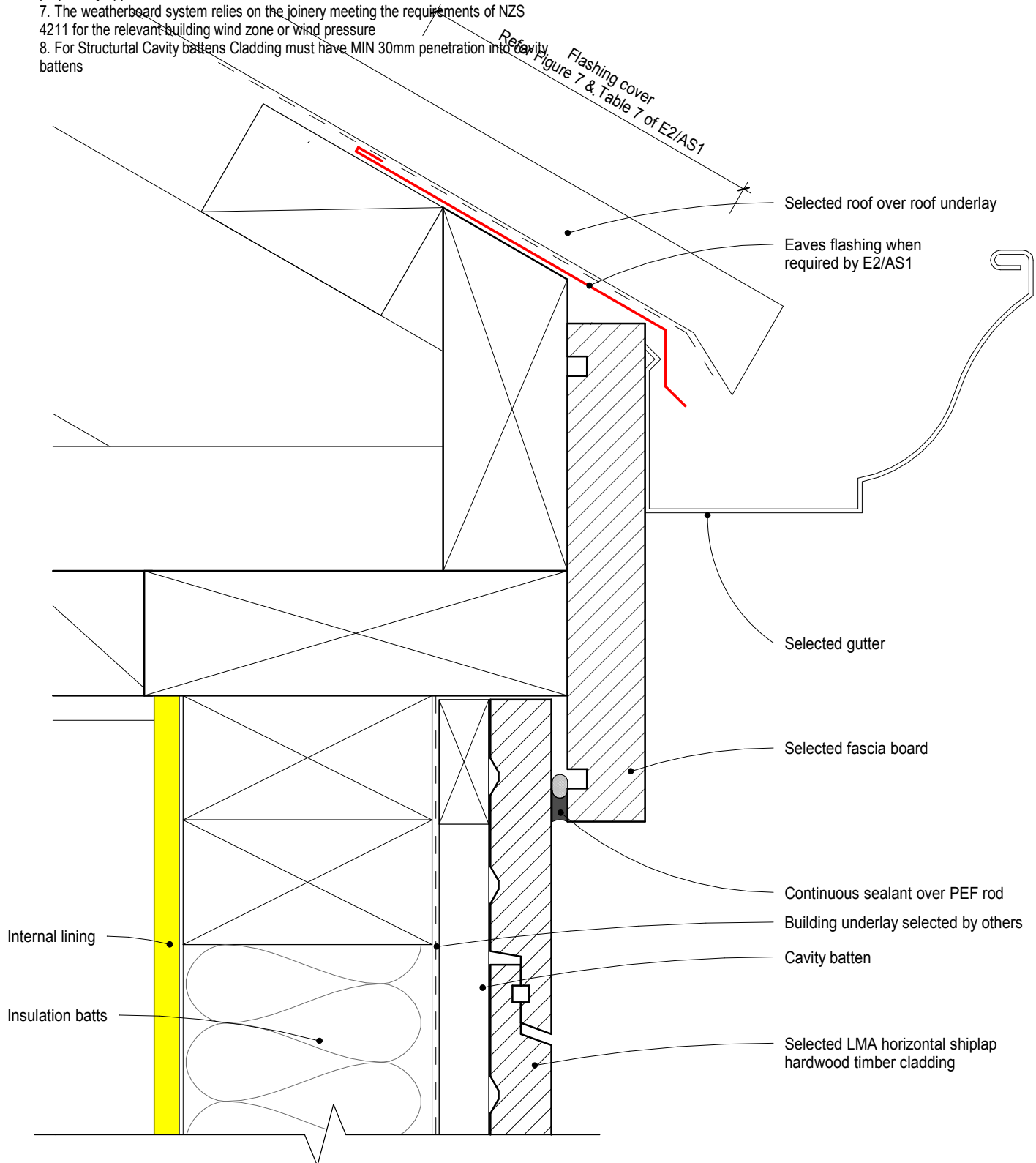
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Soffit Detail_Overhang

• SCALE: 1 : 2@A4

• DATE:09/06/2021

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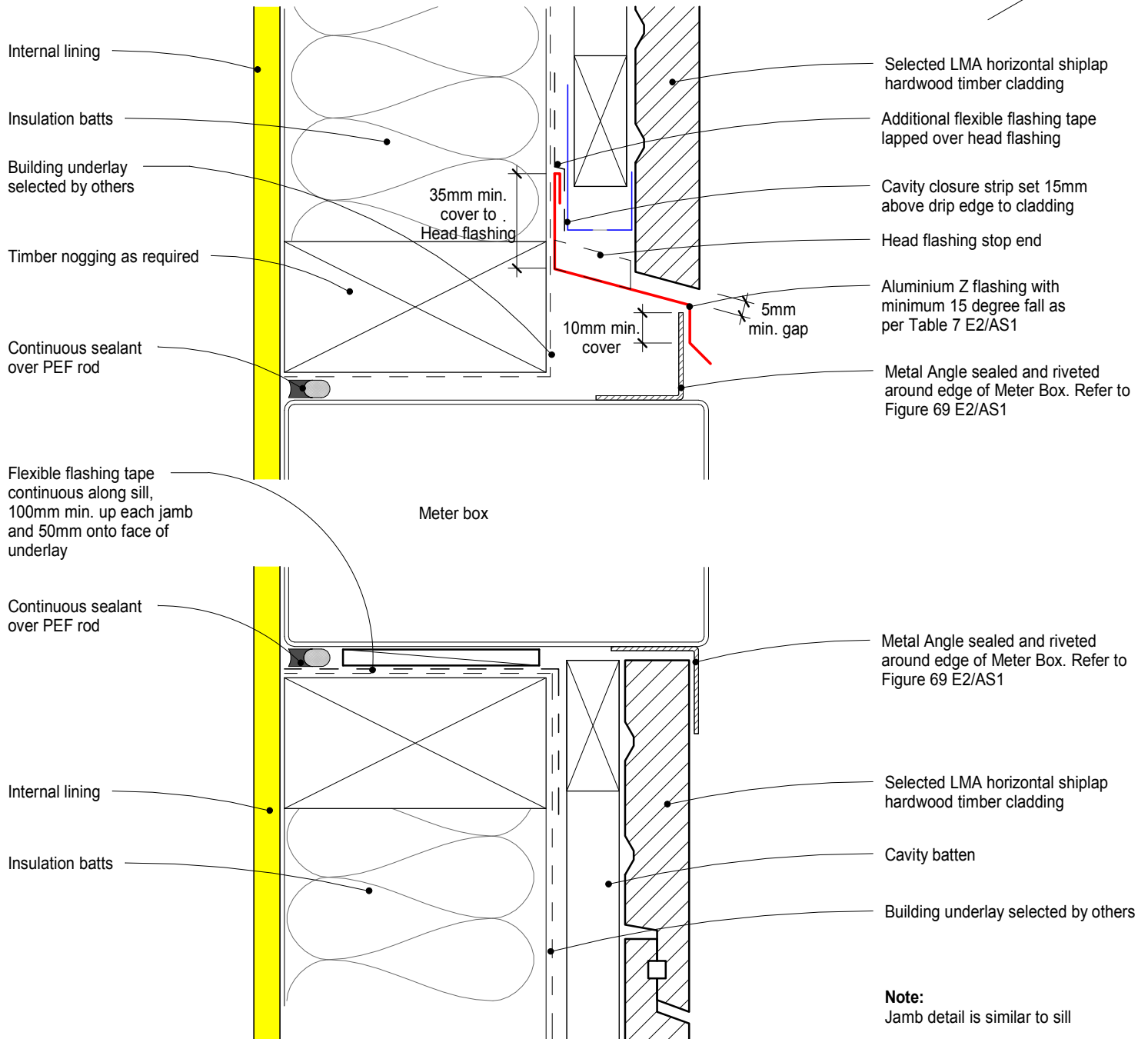
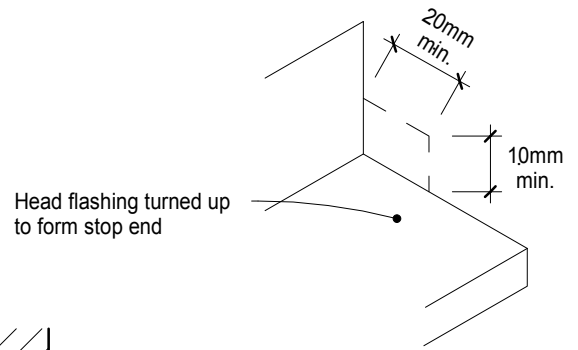
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: Eaves Detail_No Overhang

• SCALE: 1 : 2@A4

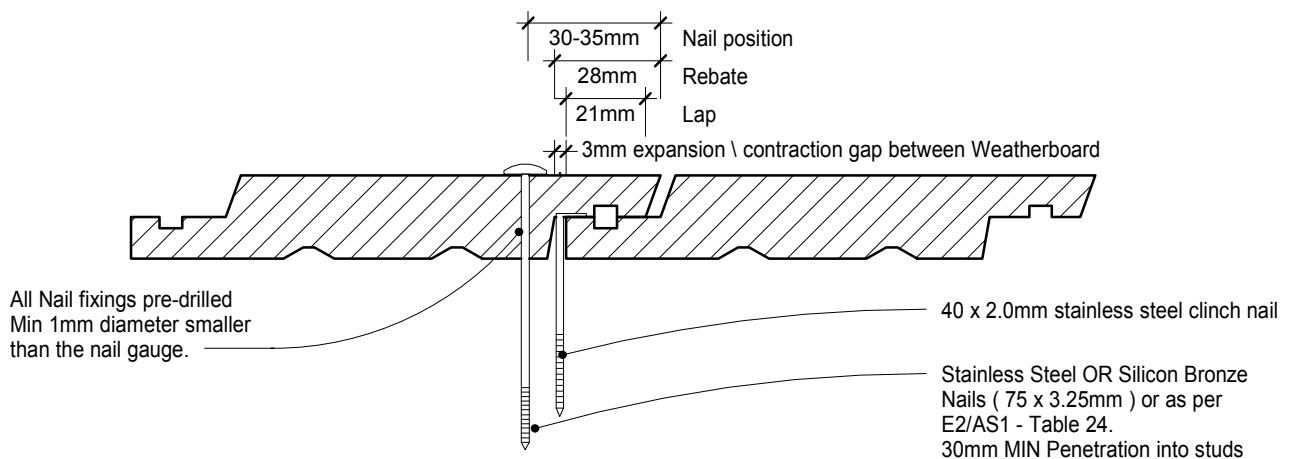
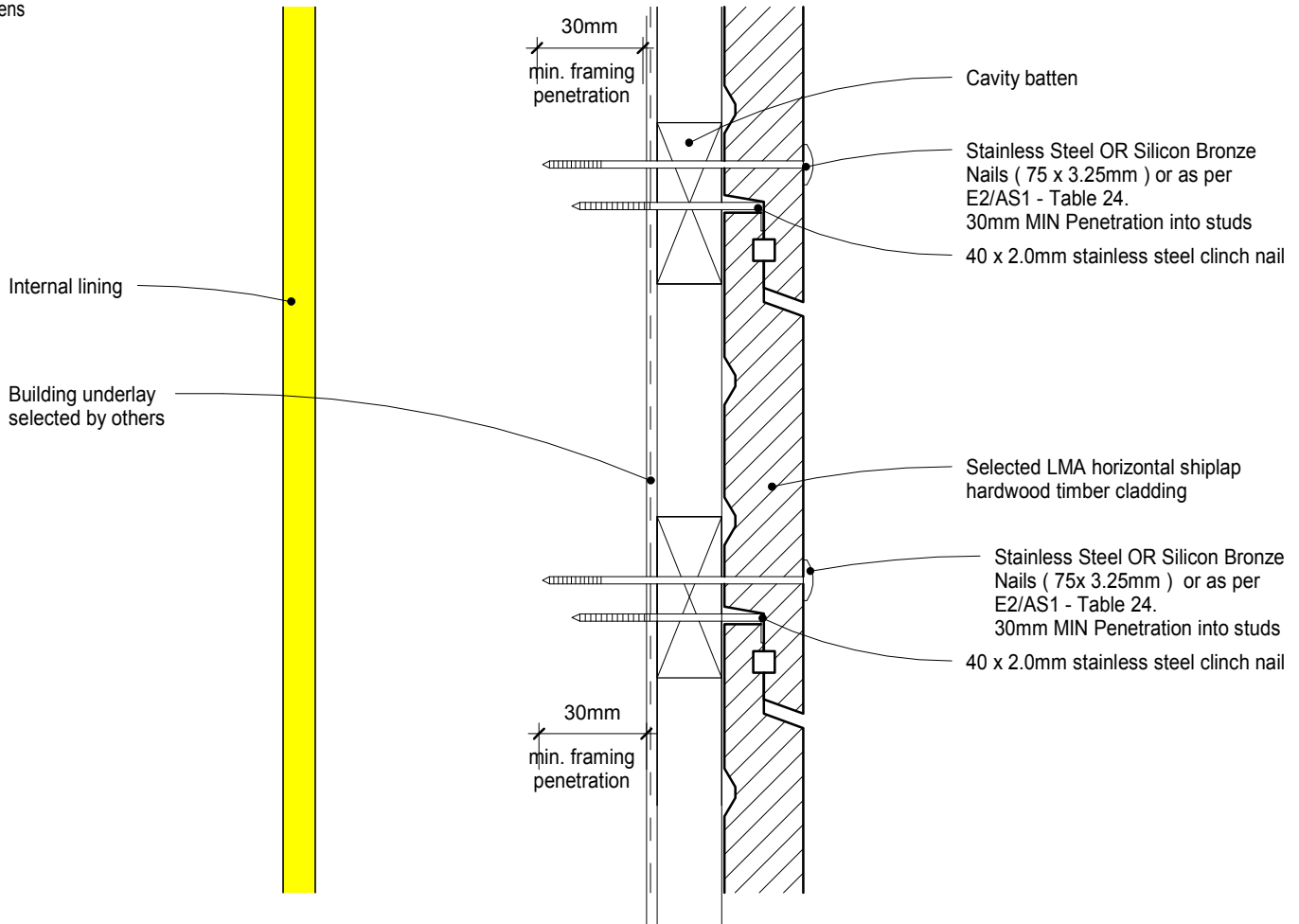
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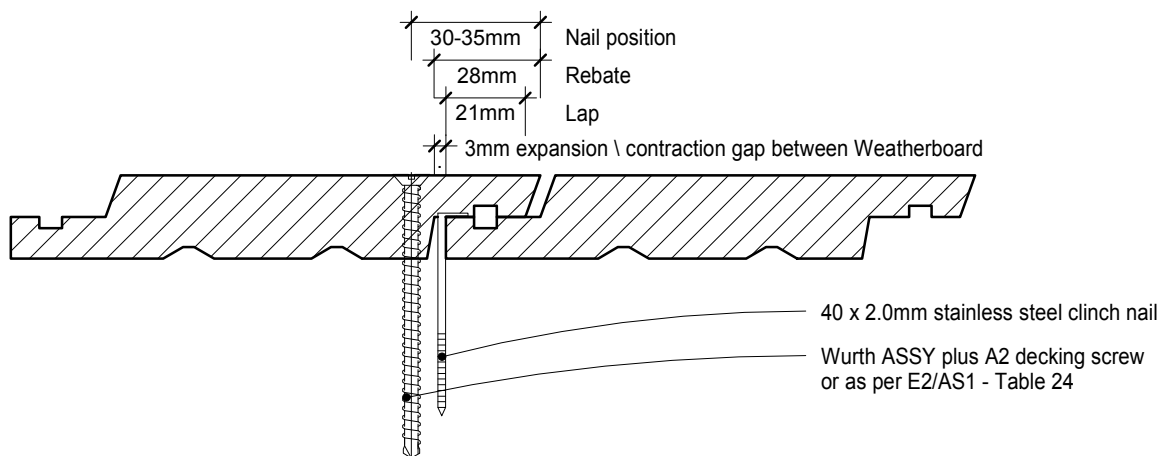
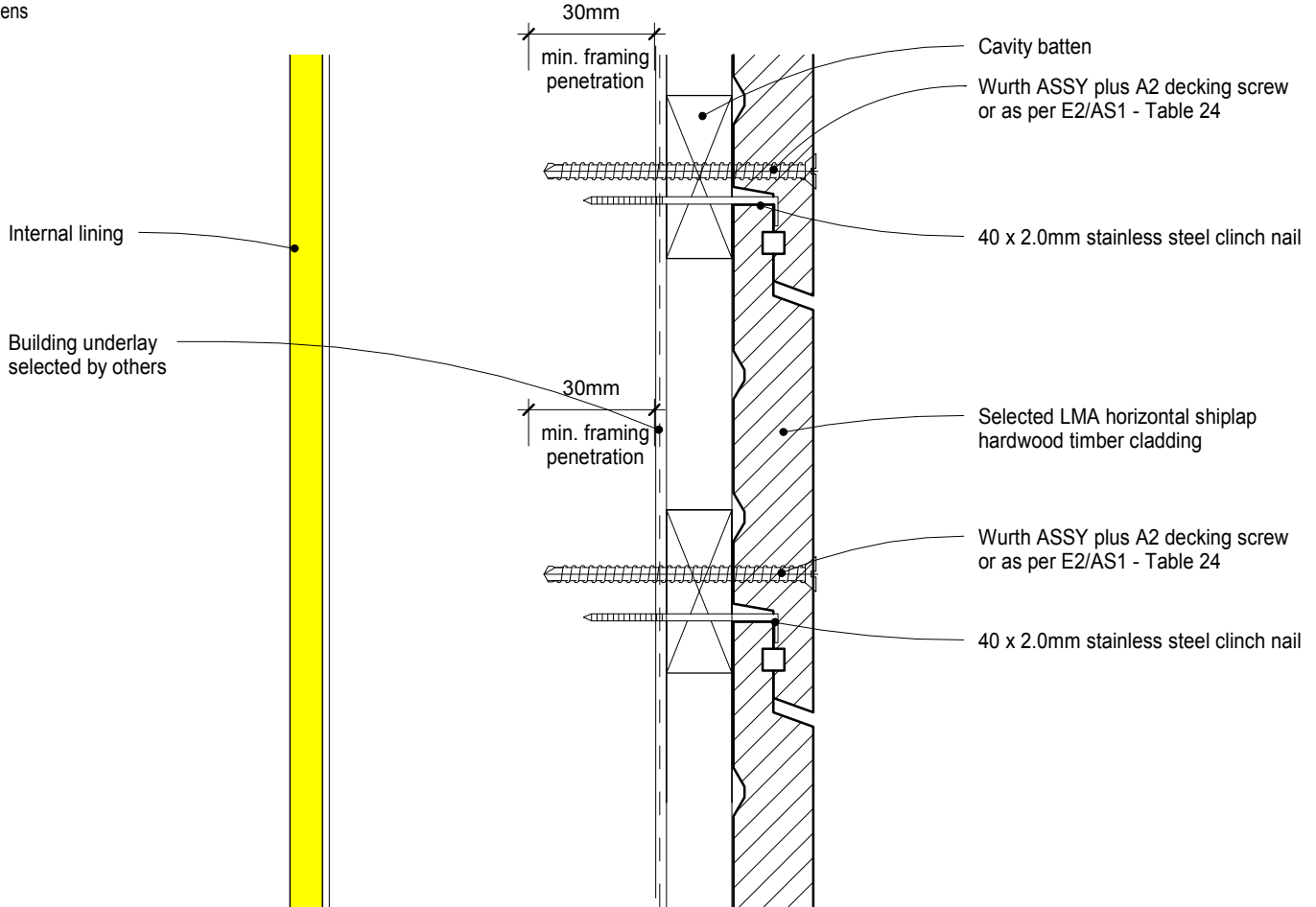
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: General Nail Fixing_ Stain Finish

• SCALE: 1 : 2@A4

• DATE: 09/06/2021

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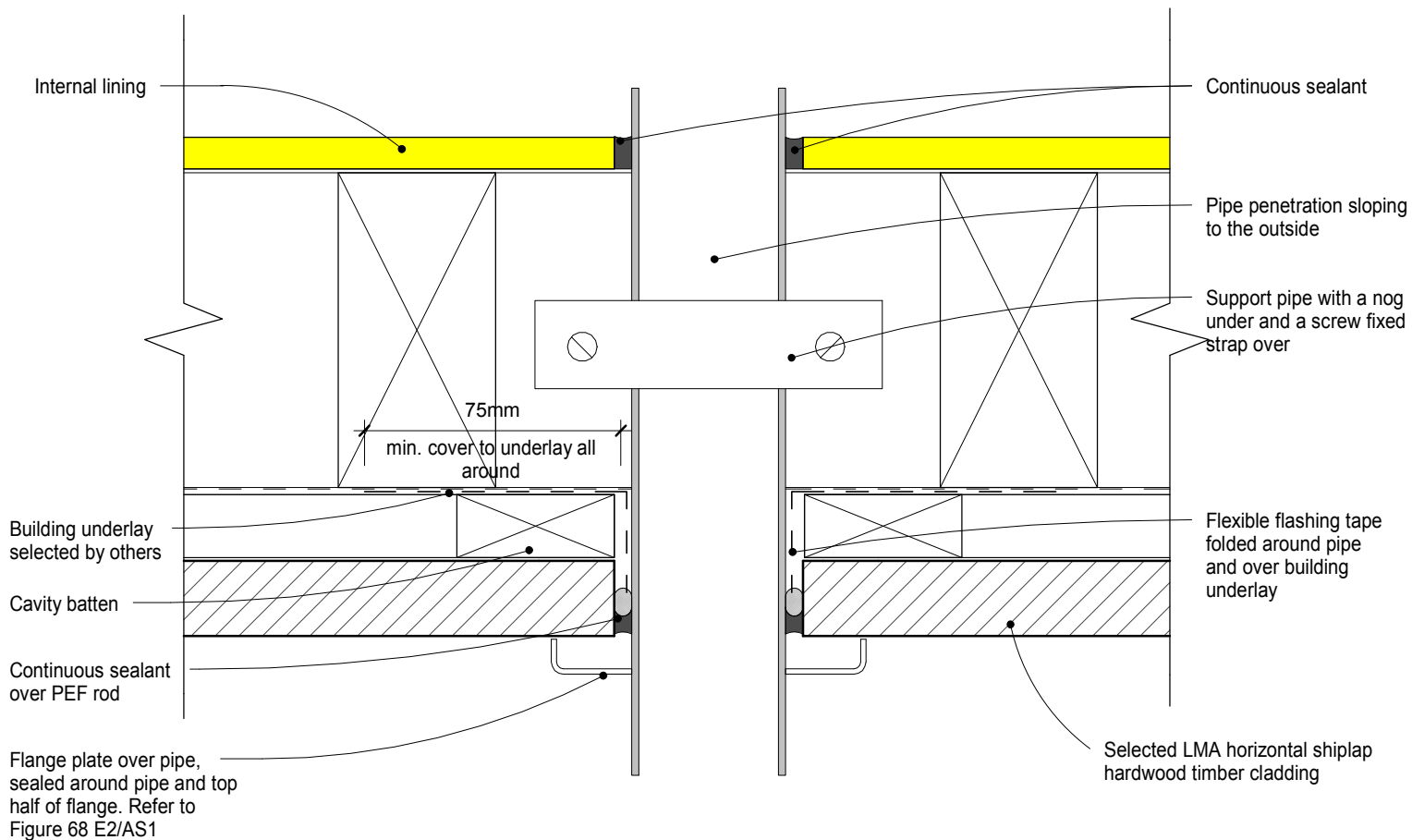
• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: General Screw Fixing_ Stain Finish

• SCALE: 1 : 2@A4

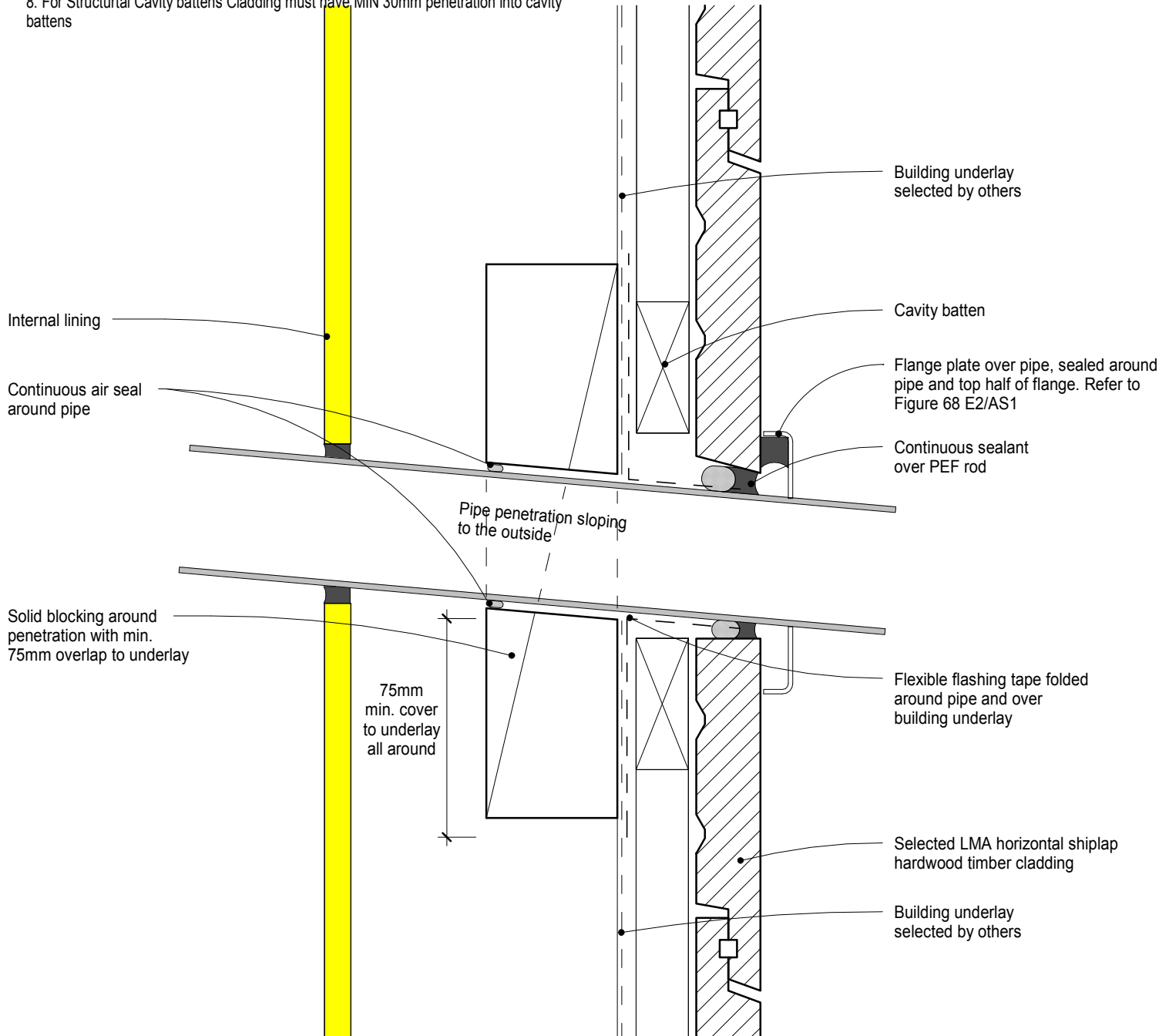
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7. The weatherboard system relies on the joinery meeting the requirements of NZS 4211 for the relevant building wind zone or wind pressure
8. For Structural Cavity battens Cladding must have MIN 30mm penetration into cavity battens



Contact Details

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
2. LMAH001 Profile weatherboard directly matches the NZS3617 profile Fig 5 except for the thickness that is increased from 19mm to 22mm and width increased to 139mm from 135mm. This variation is comparable to the standard profile except for the increased width, thickness and bevelled joint to allow water to run off., as this is proposed for increased stability with these hardwoods.
3. Fixings as per Table 24 E2/AS1
4. Compatibility of materials as per Tables 20-22 E2/AS1
5. Flashing as per Clause 4.0 E2/AS1
6. Rigid and flexible underlay as per Table 23 and Clauses 9.1.5 to 9.1.7 E2/AS1 or proprietary approved alternative
7. The weatherboard system relies on the joinery meeting the requirements of NZS 4211 for the relevant building wind zone or wind pressure
8. For Structural Cavity battens Cladding must have MIN 30mm penetration into cavity battens



Contact Details

P: 021 398 800
E: info@lmatimber.co.nz
W: www.lmatimber.co.nz
A: 281 Dyers Road, Bromley, 8062

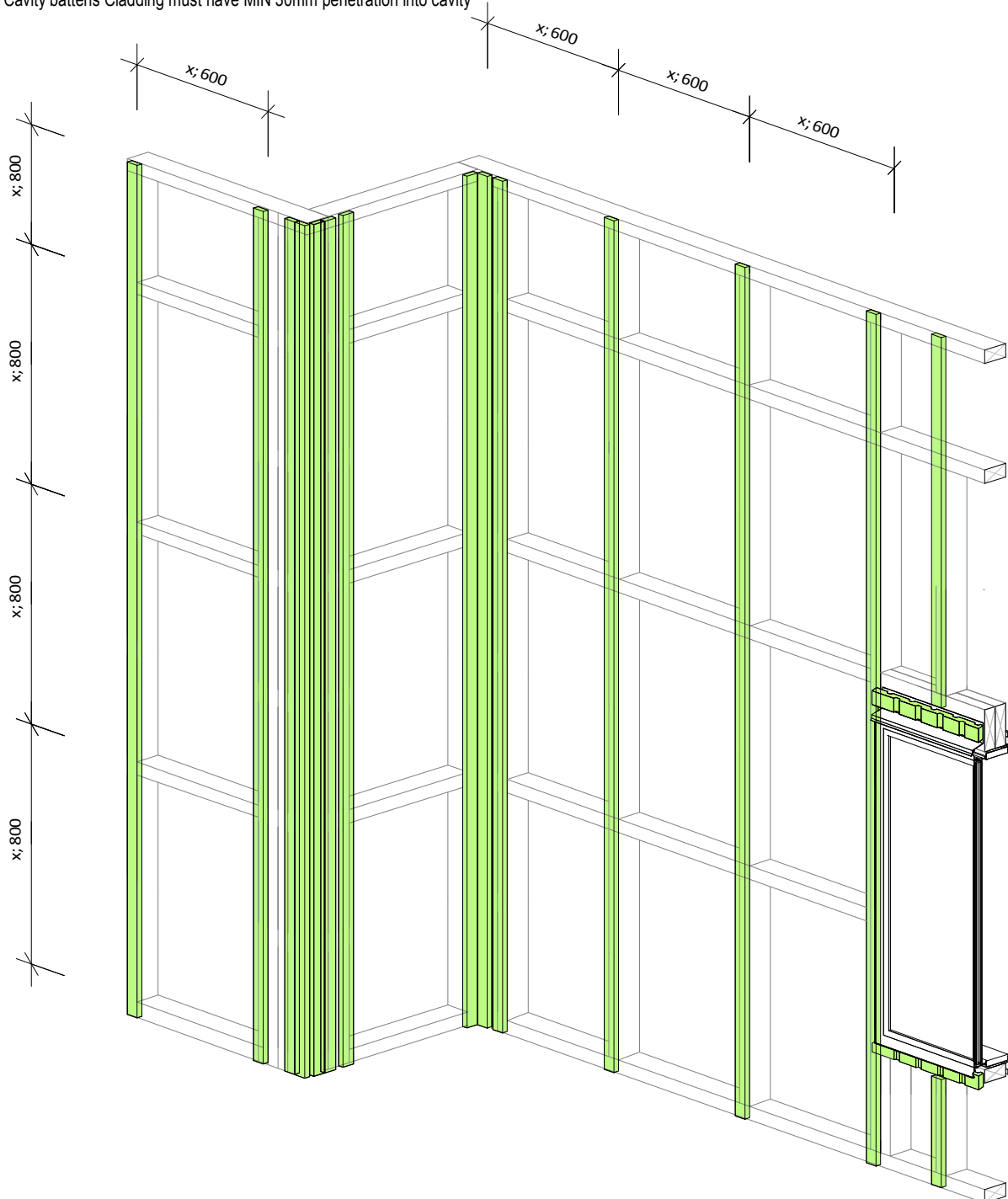
• TITLE: LMA Horizontal Shi lap Hardwood Cladding

• DRAWING: Pipe Penetration Detail

• SCALE: 1 : 2@A4

• DATE:09/06/2021

1. Scope as per Clauses 1.0 and 9.4 E2/AS1
2. LMAH001 Profile weatherboard directly matches the NZS3617 profile Fig 5 except for the thickness that is increased from 19mm to 22mm and width increased to 139mm from 135mm. This variation is comparable to the standard profile except for the increased width, thickness and bevelled joint to allow water to run off., as this is proposed for increased stability with these hardwoods.
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7. The weatherboard system relies on the joinery meeting the requirements of NZS 4211 for the relevant building wind zone or wind pressure
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Contact Details

P: 021 398 800
E: info@lmatimber.co.nz
W: www.lmatimber.co.nz
A: 281 Dyers Road, Bromley, 8062

• TITLE: LMA Horizontal Shiplap Hardwood Cladding

• DRAWING: **Battens Set Out**

• SCALE: 1 : 5@A4

• DATE: 09/06/2021



**HORIZONTAL
HARDWOOD CLADDING
INSTALLATION
AND MAINTENANCE GUIDE**

Material Storage:

The cladding will be supplied with weatherproof wrap, we recommend this is inspected for damage during transportation and any damage repaired. Packs should be stored on packers to maintain at least 150mm ground clearance, be supported on dry and clean timber bearers at maximum 900 mm centres and stored on a level surface. Once the packing straps are removed the pack should be stropped tight to maintain pack integrity especially if it is to sit for an extended period of time.

The weatherboards must be kept dry at all times either by storing within an enclosed building or when stored externally an additional secondary cover to the plastic wrapping is required. Care must be taken to avoid damage to edges, ends and the weatherboard surfaces.

Moisture Content In Timber

To meet New Zealand MPI / Customs standards, LMA Timbers Australian Hardwood must present at between 9 and 14% moisture content – this is confirmed through kiln dried certification upon custom clearance.

Throughout New Zealand, we have a variance in our EMC (Equilibrium Moisture Content). Timber is affected by this as it is the relative humidity of the air and air temperature it is in contact with causing it to shrink or expand until it finds its equilibrium.

With this in mind, we highly recommend that in order for the timber to acclimatise to its environment and to help ensure minimal movement once installed that it is stored on the actual building site for a number of weeks and filleted (6mm minimum gap between cladding boards) allowing air to freely flow between the boards.

Please ensure to keep the pack stropped tight once filleted to maintain the timbers integrity, especially if it is going to sit for an extended period of time.

Substrate prep (Refer Selected LMA Hardwood Cladding Detailing)

LMA recommends our hardwood cladding is used over a E2 compliant drained and vented cavity system. Timber castellated vertical cavity battens at 600mm max vertical spacing are recommended. Either 20mm battens fully supported by structural blocking or 40mm+ structural cavity battens are acceptable.

Installation:

Our preferred fixing is the Würth 70mm x 5.5mm Assy Plus Stainless Steel Self Drilling Decking Screw. 75mm x 3.25mm rose head annular groove S/S or Silica Bronze nails can also be used.. Pre-drilling is advised for both screw and nail options but is a must when closer than 100mm from the end of a board. Refer drawings on pages 27 and 28 of LMA Timber Vertical Shiplap Detailing Documentation. Screws and nails must penetrate a minimum of 30mm into the stud or structural cavity batten.

Placement of fixing is 35-40mm in from lap edge through the full thickness of the board as per our detailing refers.

Clinch nails must be used under the lap to maintain a 2mm expansion gap at the rear face at all times.

Timber Oiling of Laps, Weather Groove and Back

All 4 sides of the timber including lap joints and ends **must be sealed with oil**, this includes the board lap and weather groove.

LMA timber recommends using Dulux's Intergrain Natures Oil - Natural (tint colour). We have a nationwide deal with Dulux so that you receive up to 20% discount on the recommended retail price. Please use our cash trade account number when purchasing - LMA Timber 139658.

Joining of boards:

Bottom edges should be cut with an angle of 15deg+ away from the building to create a drip edge **and must be sealed**.

All board joints should be spliced horizontally with a cut angle of 30deg+ with the splice draining to the exterior face and **both cut ends sealed**. An unsupported board overhang of no more than 70mm is recommended. Please refer to page 22 of our Vertical Shiplap Detailing document - Drawing - Scarf Join Stain Finish.

All boards must be fully fixed off within a reasonable time frame to avoid any movement due to moisture exposure and thermal stresses.

Maintenance:

Building owners are responsible for the maintenance of LMA Timbers Hardwood Cladding Systems. Annual inspections must be made to ensure that all aspects of the cladding system, including flashings remain in a weatherproof condition. Any damaged areas or areas showing signs of deterioration which would allow water ingress, must be repaired immediately. Sealant, coatings, flashings or the weatherboards must be repaired in accordance with the relevant manufacturer's instructions.

Annual Timber Cleaning

Regular cleaning (at least annually) of the surface finish with water and a mild detergent is recommended to remove grime, dirt and organic growth (such as mould) to maximise the life and appearance of the cladding.

Re-coating of Oil / Stain

Our Australian Hardwood cladding is a class 1 (majority) or class 2 timber (Silvertop Ash / Fijian Mahogany) as per AS 5604-2005 Timber—natural durability ratings. This means class 1 timber has 40 year plus natural durability and technically does not require further oiling / staining for 15 years as long as our installation and maintenance guidelines are strictly followed.

However, oiling / staining the timber every 2-3 years will increase its durability to in excess of 40 years plus when the oil has a UV stabiliser. It will also help to preserve the original colour of the timber at the time of installation to minimise the silvering off effect due to the strong UV rays we experience in New Zealand.

If no oil / stain is applied over time and the timber has been installed as per the installation guidelines, the timber will naturally silver off without its 15 year durability warranty being compromised.

Health and Safety:

Cutting of LMA Timber cladding must be carried out in well ventilated areas and dust masks, gloves, eye and hearing protection must be worn.

Durability Report prepared for LMA TIMBER - 281 Dyers Road, Christchurch, NZ

**AUSTRALIAN HARDWOOD
CLADDING**

Summary

LMA Timbers Australian Hardwood Cladding complies with the 15 years' minimum service life required under the NZ Building code B2 Durability, clause B2.3.1(b), for a timber product to be used as weatherboards, fascia and moldings in an above ground, exposed to the weather, environment.

The natural durability of the hardwoods supplied is shown in the relevant Standard (AS5604) as Durability Class 1 (the highest of four classes- very durable), with an expected service life of 40 years or more in above-ground applications and therefore more than able to provide a 15-year serviceable life in NZ conditions. The durability classification and expected service life are not dependent on applying a coating but LMA Timbers supplier (Kennedys Timbers) recommends a coating of penetrative oil such as Intergrain Natural oil at time of manufacture or pre-installation. The regular application of further penetrative oil coatings after installation fully extends the long-term performance of the timber above and beyond its natural durability.

Description

LMA Timber hardwood cladding is milled from above ground Durability Class 1 Australian Eucalypt species. These include grey and red Ironbark, tallowwood, white mahogany and spotted gum. These hardwood species are graded as being class 1 durability by many resources but most notably AS 5604 - 2005 - Timber - Natural Timber Durability Ratings (Ref A). The ratings have been established from long term field exposure trials and are supported by expert opinion and observations from in-situ hardwood cladding installation over many decades in Australia and since 2017 in New Zealand.

Some of LMA Timbers eucalypt timber is reclaimed and re-sawn (as opposed to being sustainably sourced new) from the likes of hardwood telephone poles, warehousing timbers, wharf and bridge beams. LMA Timber purchases its hardwood cladding from Australia's leading reclaimed / new hardwood supplier - Kennedys Timbers which was founded back in 1995. Kennedys Timbers is one of Australia's leading suppliers of reclaimed and sustainable sourced hardwood. Kennedys Timber products including cladding have successfully performed in many high hazard exterior exposure applications across Australia including Parliament House Canberra, Hilton Hotels, Suncorp Stadium, Brisbane, Melbourne Cricket Ground, Barrangaroo, St Kilda foreshore, Shorncliffe Jetty, Elizabeth Quay, Cockle Bay wharf, Lindis Hotels as well as numerous award-winning residential projects.

Quality Systems

Kennedys Timbers have developed a comprehensive timber species identification system and production processing system in conjunction with Queensland Government Forestry Department and testing conducted through the Sunshine Coast University. These systems and processes provide confidence around the correct species identification and durability classification of timbers and are regularly audited and refined to ensure the best and latest research and technology are applied in manufacturing.

All Kennedys Timbers are graded to Australian Standards and the reclaimed/recycled timber is additionally graded to the Interim Industry grading guidelines for recycled timber (Ref B). These grading guidelines comprehensively cover all aspects of the timber appearance and natural characteristics to ensure the products supplied are both in line with these standards and are fit for purpose for their intended end use applications to ensure long term optimal and reliable performance.

Kennedys Timbers work collaboratively with Timber Queensland, Qld Department of Agriculture and Fisheries (Forestry) Industries and Sunshine Coast University, the Australian Forest and Wood Products Association and others on all aspects of timber processing and grading.

Durability

In New Zealand and Australia, different timber species are categorized into four durability classes as listed and described in AS5604. The standard shows the species supplied by LMA Timbers for Weatherboard cladding as Durability Class 1. For these species in a weatherboard (above ground) installation a probable service life of over 40 years can be expected as shown in the AS5604 table below.

Class	Probable in-ground life expectancy (years)	Probable above-ground life expectancy (years)
1	Greater than 25 years	Greater than 40 years
2	15 to 25 years	15 to 40 years
3	5 to 15 years	7 to 15 years
4	0 to 5 years	0 to 7 years

A Scion Research report in February – 2014 (Ref C) by David Page and Tripti Singh supports this and states that “*Natural durability rating refers to the timber performance both in contact with the ground and above-ground. Durability in New Zealand is measured using the Australasian natural durability classification system (AS 5604-2003), which classifies timbers into these four durability classes.*”

As such, LMA Timber hardwood cladding has been assigned a durability class of 1 for above ground exposure and this indicates a greater than 40 years average service life above ground, without any added protection of a coating.

End Use Applications

While LMA Timber promotes a wide range of above ground internal and external end-use hardwood solutions such as structural beams / posts, decking, flooring and landscaping timbers, LMA Timber are proposing the exclusive/sole use of recycled hardwood as weatherboards, installed either vertically or horizontally. As such these are all above-ground applications and therefore durability class 1 eucalypt timbers highlighted in this document would be expected to provide a service life far in excess of the 15-year NZ minimum requirement and are likely to be serviceable for in excess of 40 years.

LMA Timbers and their supplier (Kennedys Timbers) recommend that weather boards are oiled on all sides with a penetrative oil such as Intergrain Natural Oil prior to installation and regularly maintained to reduce seasonal movement, assist with maintenance and further extend the life of the cladding system. As per the Installation guide, all cut ends are to be coated with penetrative oil to seal the ends of these cuts.

Hazard Class

In New Zealand the proposed end-use situations for LMA Timbers hardwood cladding is equivalent to Hazard class H3 for a 'treated' product. This is because the hardwood cladding typically contains between 80% and 85% truewood (heartwood). Any residual sapwood is treated to H3 ACQ or equivalent to ensure any sapwood achieves the same durability as the truewood in all above ground exposed applications.

Limitations or Conditions for Use

LMA Timber hardwood cladding is only recommended for above ground uses and is not intended for in ground contact even though many of the timber species supplied have superior in-ground performance expectation exceeding 25 years.

LMA Timber hardwood cladding is to be used for non-structural applications, i.e. not for timber decking or joists.

LMA Timber hardwood cladding is available as dressed or sawn (lightly brushed face) and profiled so that the durable heartwood face is installed as the exposed outer face.

Relevant Clauses of NZ Building Code

B2 Durability must always be considered when demonstrating compliance with each of the classes of the Building Code. It ensures that a building throughout its life will continue to satisfy the performance of the building Code. It confirms the use of materials that will remain functional throughout the specified intended life of the building, but not less than 50, 15 or 5 years.

B2.3.1 Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:

(b) 15 years if: (i) Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimneys and flues) are moderately difficult to access or replace, or

(ii) Failure of those building elements to comply with the building code would go undetected during normal use of the building, but would be easily detected during normal maintenance.

Verification Method B2/VM1

1.1 In-service history

It is noteworthy the time since the initial commercialisation of Kennedys Timbers (1995) recycled and sustainably sourced above ground durability class 1 products well and truly exceeds the 15 years minimum life required for a timber product to be used as weatherboards, fascia and moldings in an above ground exposed to the weather environment. These reclaimed products have demonstrated satisfactory performance in a range of high hazard environments including extreme high wind zones across Australia for over 26 years with Australian Eucalypts such as grey / red ironbark, spotted gum, tallowwood and white mahogany also having performed for many decades indeed in some cases for as century or more as traditional cladding materials.

1.1 Durability testing

Long term above ground durability trials conducted across Australia and in New Zealand (e.g. Cookson *et al*, 2013) have clearly demonstrated the superior performance of Australian eucalypt species in exposures such as cladding with durability class 1 species clearly exceeding the building codes minimum 15 years' service life (Wang *et al*, 2008). This information is well documented in both the Australian standards and production specification sheets from Kennedys Timbers (refer LMA Timber Specification and Detailing Document).

Typically, accelerated durability testing exposes samples to higher hazards than they would be expected to experience in real life installations. Weatherboards are recognized as a low hazard end-use application. In New Zealand Durability Class 3 timbers have traditionally and successfully been used for such applications (Page and Singh, 2014 – Ref C).

Technical Details

LMA Timber hardwood cladding is milled from the Australian Eucalyptus species of grey and red ironbark, spotted gum, tallowwood and white mahogany. The timber which has had a former life is milled and graded to both Australian standards and the interim industry grading standards for recycled timber (Ref B). Any timber which is not within the grading standard is docked out and rejected. Applying this grading to recycled timber means that the long term in-situ performance will not be distinguishably different from new hardwood timber.

The timber is Kiln Dried to 9-14% moisture content to meet New Zealand's Ministry of Primary Industries (MPI) importing timber standards and written certification is provided to MPI at the time of inspection upon entry into New Zealand. With the timber being Kiln Dried, it provides for superior stability once installed limiting movement. The profiled weatherboards (max cover 115mm) are machined to various weatherboard profiles with a maximum thickness of 21 - 22mm. All profiles are to NZS 3617 standards.

In on-going independent accelerated trials of recycled material against a range of severe above ground hazards the reclaimed timbers are performing as well as newly sourced sawn reference material of the same species. It is the researcher's (Michael Powell) expert opinion that material sawn from reclaimed/recycled large section timbers will continue to perform as well as (if not better than) comparative freshly sourced material and provide real life in-situ weatherboard performance far exceeding the minimum required by NZ codes.

Installation

Information is provided in the LMA Timber Installation and Specification Guide.

Product support and maintenance requirements

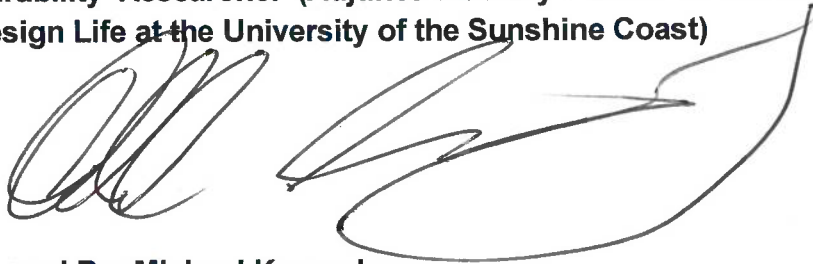
Information is provided in the LMA Timber Installation and Specification Guide.

Durability Report prepared for LMA TIMBER - 281 Dyers Road, Christchurch, NZ



Signed By: Michael Powell (05/07/2021)

Durability Researcher (Adjunct Industry Fellow in the Centre for Timber Durability and Design Life at the University of the Sunshine Coast)



Signed By: Michael Kennedy

Owner / Founder Kennedys Timbers

Relevant references:

Ref A: AS. AS 5604 - 2005 - Timber -Natural Timber Durability Ratings.

Ref B: Australian Grading Standards for Recycled Timber

Ref C: Durability of New Zealand Grown Timbers

Australian Standard™

Timber—Natural durability ratings



This Australian Standard was prepared by Committee TM-006, Timber Preservation and Durability. It was approved on behalf of the Council of Standards Australia on 28 April 2005. This Standard was published on 3 June 2005.

The following are represented on Committee TM-006:

A3P
Australian Pesticides and Veterinary Medicines Authority
Consumers' Federation of Australia
CSIRO Forestry and Forest Products
Department of Primary Industries and Fisheries
Engineers Australia
Forests NSW
Glued Laminated Timber Association of Australia
Housing Industry Association, Australia
LOSP Treated Timber Association
New Zealand Forest Research Institute
New Zealand Timber Industry Federation
New Zealand Timber Preservation Council
Plywood Association of Australasia
Timber Preservers Association of Australia
Timber Promotion Council
Timber Queensland

Additional Interests:

Dr Harry Greaves

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Australian Standard™

Timber—Natural durability ratings

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PREFACE

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee TM-006, Timber Preservation. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to provide natural durability ratings for timber species for use by producers and users of timbers products. It will reduce problems associated with the existence of different lists in different Standards that do not agree with each other.

The objectives of this revision are as follows:

- (a) Update the timber natural durability ratings to include the latest research data.
- (b) Include marine borer resistance classes.

This Standard has been drafted to provide an authoritative source for information on the natural durability of timber, and will be used as a reference by other Standards.

The natural durability ratings given in this Standard are based upon expert opinions and assessments from a wide range of sources including, but not limited to, CSIRO, state forest organizations, and port authorities.

The term 'normative' has been used in this Standard to define the application of the appendix to which it applies. A 'normative' appendix is an integral part of a Standard.

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FOREWORD

Natural durability rating may be defined as the inherent resistance of a timber species to decay, insect, and marine borer attack. In the context of this Standard, natural durability ratings refer to the timber's performance both in contact with the ground and above ground when exposed to average environmental conditions, and in southern marine waters. The performance of untreated heartwood above ground will generally be better than its performance in the ground.

Classification of the durability of a species is not something that can be done with great precision because of the variability of wood properties within species, even within the individual tree and the variable nature of the hazard to which the timber will be exposed. An in-ground classification, which is widely accepted as a general guide, is based on one developed many years ago by CSIRO Forestry and Forest Products. It is essentially a rating of the durability of the species' heartwood when in ground contact and exposed to attack by decay and termites. Because of this combined assessment, the classification does not truly reflect the special qualities of some species (e.g., brush box, which is very resistant to termites but much less so to decay). A further consideration is the size of the specimen at risk.

In the selection of species for a particular location, local experience should be used as a guide to what is practicable in the area. The extent of decay, termite and marine borer hazard varies greatly in a continent with such a wide range of climates.

All untreated sapwood has poor resistance to biological attack. General species resistance is determined largely by the extractives formed when sapwood changes into heartwood. Termites and marine borers are less easily deterred by these extractives than fungi and will attack most species, though slowly in the case of the very durable species.

STANDARDS AUSTRALIA

Australian Standard Timber—Natural durability ratings

1 SCOPE

This Standard provides natural durability ratings for a range of biological hazards for a number of Australian and imported timber species.

NOTES:

- 1 An attempt has been made to account for the more aggressive termite of the northern areas of Australia and to account for the increased durability achieved for timbers not in contact with the ground.
- 2 This Standard does not provide natural durability ratings against the following hazards:
 - (a) Physical or mechanical hazards.
 - (b) Chemical hazards.
 - (c) Fire hazards.

2 APPLICATION

The ratings given in this Standard are intended to provide the users with a relative comparison of the performance of untreated timber against the given biological hazards.

It is not intended that these ratings will be used as stand-alone criteria for determining the suitability of timber species for particular products, applications or environments. The performance and life expectancy of timber used in specific applications and environments will be greatly influenced by many other factors in addition to the natural durability ratings. These other factors include—

- (a) presence or absence of preservative treatment;
- (b) supplementary protection and maintenance;
- (c) climate;
- (d) environmental conditions;
- (e) human influence; and
- (f) manufacturing process.

This Standard is intended to assist with the development of other Standards and specifications for timber product and application.

3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- | | |
|--------|---------------------------|
| 1720 | Timber structures |
| 1720.2 | Part 2: Timber properties |

AS/NZS

- | | |
|------|---|
| 1148 | Timber—Nomenclature—Australian New Zealand and imported species |
| 1604 | Specification for preservative treatment (all Parts) |
| 4491 | Timber—Glossary of terms in timber-related Standards |

4 DEFINITIONS

For the purpose of this Standard the definitions given in AS/NZS 4491 and those below apply. Where the definitions below differ from those in AS/NZS 4491, for the purpose of this Standard those below apply.

4.1 Natural durability

The inherent resistance of a timber species to decay, or to insect or marine borer attack.

4.2 Lyctids

The commonly used term in the timber and building industries for lyctine beetles.

5 LYCTID SUSCEPTIBILITY

Appendix A lists a number of timber species that are resistant to lyctid attack. The method for detection of lyctid-susceptible sapwood shall be as specified in AS 1604.1.

NOTES:

- 1 In Queensland the Timber Utilization and Marketing Act 1987 and in New South Wales the Timber Marketing Act 1977 require approval of a preservative treatment and registration of a brand before timber, offered for sale in either of these states, can be described as preservative-treated. Detailed information about the requirements of such legislation may be obtained from the state government agencies concerned.
- 2 A number of species listed in Appendix A are deemed to be not susceptible and do not need to be tested; however, where there is doubt about a species not shown in the list, the user is referred to the test in AS 1604.1 for confirmation.
- 3 Softwoods are not lyctid-susceptible.
- 4 Attack by lyctid beetle is confined to the sapwood of certain hardwoods. The two elements that most commonly limit the susceptibility of a species are pore diameter and starch content. In only a few hardwood species are the pores too small (<90 µm) to permit attack, hence susceptibility is usually governed by starch content.
- 5 Lyctid susceptibility ratings may be obtained from the state government agencies and CSIRO Forestry and Forest Products.

6 TERMITE RESISTANCE

Appendix A lists a number of timber species that are deemed to have a high resistance to termites.

For all timber species listed as resistant, only the heartwood may be resistant to attack by termites, while untreated sapwood shall be regarded as susceptible to attack. Inner heartwood (nearer the pith) is considered less resistant to attack than the outer heartwood.

NOTES:

- 1 Different timber species have different levels of resistance to various species of termite. Local experience should be referred to for specific installations.
- 2 Within a species, timbers can vary in termite resistance from tree to tree as well as within the same tree. In addition, the termite-resistance of timber exposed above the ground may be superior to its resistance in the ground.
- 3 Resistance to termites has been drawn from in-ground durability tests on timber specimens cut from mature trees in the presence of wood-rotting fungi (see Note 4). Where data from such tests is not available, termite resistance is based on recognized durability ratings obtained from many years of experience with the particular timber in service. Reference was made to AS 1604.1, AS 1720.2 and AS/NZS 1148 in compiling the list of termite-resistant timbers given in Appendix A.
- 4 For information on termite resistance of imported timbers not listed in Appendix A, refer to Keating, W.G., and Bolza, E. Characteristics, properties and uses of timbers. Vol 1, Southeast Asia, Northern Australia and the Pacific, Inkata Press, Melbourne, Sydney and London (1982).

7 NATURAL DURABILITY AND MARINE BORER RESISTANCE CLASSES

The classification system is based on the average life expectancy (in years), as given in Tables 1 and 2, for a species used in ground, above ground and in sea and estuarine waters.

NOTES:

- 1 Consideration should be given to the fact that the classification is very broad and it is not intended to distinguish between the relative merits of species in the same classification.
- 2 Generally, marine borer hazard is more severe in the northern waters of Australia than it is in the southern waters. Experience has shown that a general rule of thumb for differentiating between northern and southern is to regard north of Perth in the west, and north of Batemans Bay in the east, as northern waters. Obviously the separation between northern waters and southern waters cannot be exact and so, care should be taken by the specifier when a site is around the line of differentiation.

TABLE 1
NATURAL DURABILITY—PROBABLE LIFE EXPECTANCY*

Class	Probable in-ground life expectancy (years)	Probable above-ground life expectancy (years)
1	Greater than 25	Greater than 40
2	15 to 25	15 to 40
3	5 to 15	7 to 15
4	0 to 5	0 to 7

* The ratings in this Table are based on expert opinions and the performance of the following test specimens:

- (a) In-ground: 50 × 50 mm test specimens at four sites around Australia.
- (b) Above-ground: 35 × 35 mm test specimens at eleven sites around Australia.

NOTES:

- 1 As further reliable evidence becomes available, these ratings may require amending.
- 2 The heartwood of an individual piece of timber may vary from the species' nominated classification.
- 3 Above-ground conditions equate to outside above-ground subject to periodic moderate wetting when ventilation and drainage are adequate.

TABLE 2
MARINE BORER RESISTANCE—PROBABLE LIFE EXPECTANCY

Class	Probable marine-borer-resistance life expectancy in southern waters (years)
1	Greater than 60
2	41 to 60
3	21 to 40
4	0 to 20, usually less than 5

NOTE: Marine borer resistance is based on natural round piles containing 350 mm diameter of heartwood in southern seas reaching from Perth in the west to Batemans Bay in the east. Only class 1 timbers can be expected to give reasonable service life (12 to 30 years) in northern waters.

APPENDIX A
TIMBER NATURAL DURABILITY RATINGS
(Normative)

A1 GENERAL

Table A1 lists species and their ratings for various aspects of natural durability.

The ratings apply only to the species indicated by their botanical/scientific names. Where a preferred common name covers more than one species and one of the species is not given a rating, ratings given to the other species shall not be applied to that species, regardless of the fact that it is included in the preferred common name with the others.

For all timbers, sapwood shall be regarded as non-durable unless preservative-treated in accordance with the AS/NZS 1604 series. Also the inner heartwood (the first few growth rings around the pith), generally, has lower natural durability than the rest of the heartwood.

NOTE: The list is by no means complete and is subject to change, particularly when the resource varies, e.g., the production from a young fast growth plantation compared with a mature, higher density resource.

A2 LEGEND TO TABLE A1

The following legend is used in Table A1:

- = no information available at publication
- D_{ig} = in-ground natural durability class
- D_{ag} = above-ground natural durability class

A3 NOTES TO TABLE A1

A3.1 Column 1—Standard common name and scientific/botanical name

The standard common names used in Table A1 to refer to the timber species are as given in AS/NZS 1148.

NOTES:

- 1 The common names listed in this Appendix may cover one or more timber species. Species that are not specifically given a rating under their botanical names are not covered by this Standard.
- 2 The nomenclature for Meranti applies to a large number of related timbers of varying natural durability. Unless the particular species can be identified, the lowest rating for this genus should be applied.

A3.2 Column 2—Lyctid susceptibility of sapwood

Lyctid susceptibility of sapwood is classified as follows:

- (a) S—Susceptible.
- (b) NS—Not susceptible.

NOTE: The Lyctid susceptibility of alpine ash timber shows a consistent variation depending on its origin as Tasmania—S, New South Wales—S, Victoria—NS. If the origin of the timber is not known with certainty, the timber should be regarded as susceptible.

A3.3 Column 3—Termite resistance of heartwood

Termite resistance of heartwood is classified as follows:

R — Resistant to termite.

NR — Not resistant to termite.

Other species not listed, or where there is no rating given (designated as '□'), should be assumed to be not resistant to termite unless evidence to the contrary is provided.

A3.4 Column 4—Natural durability class of heartwood

See Table 1, Clause 7.

A3.5 Column 5—Marine-borer resistance of heartwood

See Table 2, Clause 7.

TABLE A1
NATURAL DURABILITY RATINGS OF TIMBER SPECIES

1	2	3	4		5
Standard common name and scientific/botanical name	Lyctid susceptibility of sapwood	Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	Natural durability class of heartwood		Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
alan <i>Shorea albida</i>	S	R	2	2	—
alder, blush <i>Sloanea australis</i>	S	□	4	□	4
alder, brown <i>Caldcluvia paniculosa</i>	S	NR	4	□	4
alder, pink <i>Gillbeea adenopetala</i>	NS	NR	4	□	4
alder, rose <i>Caldcluvia australiensis</i>	NS	NR	4	□	4
almond, rose <i>Owenia venosa</i>	NS	R	1	1	—
amberoi <i>Pterocymbium</i> spp.	S	NR	4	□	4
apple, rough-barked <i>Angophora floribunda</i>	S	—	3	—	—
apple, smooth-barked <i>Angophora costata</i>	S	□	3	□	4
ash, alpine <i>Eucalyptus delegatensis</i>	(See Note in Paragraph A3.2)	NR	4	3	4
ash, Blue Mountains <i>Eucalyptus oreades</i>	NS	□	4	□	4
ash, Crow's <i>Flindersia australis</i>	S	R	1	1	—
ash, hickory <i>Flindersia afflaiana</i>	S	R	2	1	—
ash, mountain <i>Eucalyptus regnans</i>	NS	NR	4	3	4

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
ash, pink <i>Alphitonia petriei</i>	NS	NR	4	☐	4
ash, red <i>Alphitonia excelsa</i> <i>Alphitonia whitei</i>	NS	NR	2	☐	—
ash, silver <i>Flindersia bourjotiana</i> <i>Flindersia schottiana</i>	S	NR	3	☐	4
ash, silvertop <i>Eucalyptus sieberi</i>	NS	NR	3	2	4
ash, white <i>Eucalyptus fraxinoides</i>	S	NR	4	☐	4
backhousia, stony <i>Backhousia hughesii</i>	NS	NR	2	☐	—
balau (selangan batu) <i>Shorea</i> spp.	S	NR	2	1	4
balau, red <i>Shorea</i> spp.	S	NR	4	☐	—
baltic, red (pine, Scots) <i>Pinus sylvestris</i>	NS	☐	4	☐	4
baltic, white (spruce, Norway) <i>Picea abies</i>	NS	☐	4	☐	4
bamboo* (various species)	S	☐	☐	☐	—
bean, black <i>Castanospermum australe</i>	S	☐	2	☐	—
beech, myrtle <i>Nothofagus cunninghamii</i>	S	NR	4	3	4
beech, negrohead <i>Nothofagus moorei</i>	S	NR	4	☐	4
beech, silver <i>Nothofagus menziesii</i>	NS	NR	4	☐	4
beech, white <i>Gmelina</i> spp.	S	☐	☐	☐	—
beefwood <i>Grevillea striata</i>	S	NR	2	☐	—
belah <i>Allocasuarina cristata</i>	NS	☐	2	☐	—
belian <i>Eusideroxylon zwageri</i>	—	R	1	1	1
birch, white <i>Betula pubescens</i>	☐	☐	4	☐	4
birch, white, Australia <i>Schizomeria ovata</i>	S	☐	4	4	4

* Bamboo is not strictly a timber species although it may be used in building applications.

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
blackbutt <i>Eucalyptus pilularis</i>	NS	R	2	1	3
blackbutt, New England <i>Eucalyptus andrewsii</i> <i>Eucalyptus campanulata</i>	S	R	2	2	2
blackbutt, Western Australian <i>Eucalyptus patens</i>	S	R	2	1	3
blackwood <i>Acacia melanoxylon</i>	S	□	3	3	4
bloodwood, brown <i>Corymbia trachyphloia</i>	S	R	1	1	—
bloodwood, Island, Melville <i>Corymbia nesophila</i>	S	—	—	—	—
bloodwood, red <i>Corymbia gummifera</i> <i>Eucalyptus intermedia</i> <i>Eucalyptus polycarpa</i>	S	R	1	1	3
bloodwood, yellow <i>Corymbia eximia</i>	S	NR	2	□	—
bollywood <i>Cinnamomum baileyannum</i> <i>Litsea</i> spp.	S	NR	3	3	4
box, black <i>Eucalyptus largiflorens</i>	S	□	1	1	—
box, brush <i>Lophostemon confertus</i>	NS	R	3	3	2
box, grey <i>Eucalyptus microcarpa</i> <i>Eucalyptus moluccana</i> <i>Eucalyptus woollsiana</i>	S	R	1	1	2
box, grey, coast <i>Eucalyptus bosistoana</i>	S	R	1	1	3
box, ironwood <i>Choricarpia leptopetala</i> <i>Choricarpia subargentea</i>	NS	NR	3	□	4
box, kanuka <i>Tristania exiliflora</i> <i>Tristania laurina</i>	NS	NR	3	□	4
box, long-leaved <i>Eucalyptus goniocalyx</i>	S	R	3	2	—
box, red <i>Eucalyptus polyanthemus</i>	S	R	1	1	—
box, steel <i>Eucalyptus rummeryi</i>	NS	R	1	1	—

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
box, swamp <i>Lophostemon suaveolens</i>	NS	R	2	1	2
box, white <i>Eucalyptus albens</i>	NS	R	2	1	—
box, white-topped <i>Eucalyptus quadrangulata</i>	NS	R	2	2	—
box, yellow <i>Eucalyptus melliodora</i>	NS	R	1	1	—
brigalow <i>Acacia harpophylla</i>	S	R	1	1	—
brownbarrel <i>Eucalyptus fastigata</i>	S	NR	4	3	4
bullich <i>Eucalyptus megacarpa</i>	S	NR	3	2	4
cadaga <i>Eucalyptus torelliana</i>	S	NR	2	□	—
calantas <i>Toona calantas</i>	S	□	2	1	—
calophyllum <i>Calophyllum</i> spp.	S	NR	4	□	4
candlebark <i>Eucalyptus rubida</i>	S	NR	4	3	4
carabeen, yellow <i>Sloanea woolsii</i>	S	NR	4	□	4
carbeen <i>Corymbia tessellaris</i> <i>Eucalyptus tessellaris</i>	S	R	1	1	—
cedar, red <i>Toona australis</i>	S	□	2	□	4
cedar, western red <i>Thuja plicata</i>	NS	R	3	2	—
cedar, yellow (Alaska) <i>Chamaecyparis nootkatensis</i>	NS	R	1	1	—
cheesewood, white <i>Alstonia scholaris</i>	S	□	4	□	4
chengal <i>Balanocarpus heimii</i>	NS	R	1	1	—
coachwood <i>Ceratopetalum apetalum</i>	NS	NR	4	□	4
cypress, black <i>Callitris endlicheri</i>	NS	R	2	1	3
cypress, white <i>Callitris glaucophylla</i>	NS	R	2	1	2

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
dabarima <i>Planchonia</i> spp.	NS	□	□	□	—
fir, amabilis <i>Abies amabilis</i>	NS	□	4	□	4
fir, Douglas (oregon) <i>Pseudotsuga menziesii</i>	NS	NR	4	4	4
gaboon <i>Aucoumea klaineana</i>	NS	NR	□	□	—
geronggang <i>Cratoxylon arborescens</i>	NS	NR	4	□	4
giam <i>Hopea</i> spp.	S	NR	2	□	—
gidgee <i>Acacia cambagei</i>	NS	NR	1	1	—
gum, blue, southern <i>Eucalyptus globulus</i>	S	NR	3	2	4
gum, blue, Sydney <i>Eucalyptus saligna</i>	S	NR	3	2	3
gum, grey <i>Eucalyptus canaliculata</i> <i>Eucalyptus major</i> <i>Eucalyptus propinqua</i> <i>Eucalyptus punctata</i>	NS	R	1	1	2
gum, grey, mountain <i>Eucalyptus cypellocarpa</i>	S	NR	3	2	4
gum, Maiden's <i>Eucalyptus maidenii</i>	S	NR	3	2	4
gum, manna <i>Eucalyptus viminalis</i>	S	NR	4	3	4
gum, mountain <i>Eucalyptus dalrympleana</i>	S	NR	4	3	4
gum, pink <i>Eucalyptus fasciculosa</i>	S	NR	3	□	4
gum, poplar <i>Eucalyptus alba</i>	—	NR	3	3	4
gum, red, forest <i>Eucalyptus blakelyi</i> <i>Eucalyptus tereticornis</i>	NS	R	1	1	2
gum, red, narrow-leaved <i>Eucalyptus seeana</i>	S	R	2	□	—
gum, red, river <i>Eucalyptus camaldulensis</i>	S	R	2	1	2
gum, rose <i>Eucalyptus grandis</i>	NS	NR	3	2	4

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
gum, round-leaved <i>Eucalyptus deanei</i>	S	□	3	□	—
gum, salmon <i>Eucalyptus salmonophloia</i>	NS	R	2	1	—
gum, scribbly <i>Eucalyptus haemastoma</i> <i>Eucalyptus micrantha</i> <i>Eucalyptus racemosa</i> <i>Eucalyptus rossii</i> <i>Eucalyptus signata</i>	NS	R	3	2	—
gum, shining <i>Eucalyptus nitens</i>	S	NR	4	3	4
gum, spotted <i>Corymbia maculata</i> <i>Corymbia citriodora</i> <i>Eucalyptus henryi</i>	S	R	2	1	4
gum, sugar <i>Eucalyptus cladocalyx</i>	S	R	1	1	—
gum, swamp <i>Eucalyptus camphora</i>	S	NR	4	□	4
gum, white, Dunn's <i>Eucalyptus dunnii</i>	S	□	4	□	4
gum, yellow <i>Eucalyptus leucoxylon</i>	S	R	2	2	—
hardwood, Johnston River <i>Backhousia bancroftii</i>	S	NR	3	2	4
hemlock, western <i>Tsuga heterophylla</i>	NS	NR	4	4	4
hollywood, yellow <i>Premna lignum-vitae</i>	NS	□	1	1	—
ironbark, Caley's <i>Eucalyptus caleyi</i>	S	R	□	1	—
ironbark, grey <i>Eucalyptus drepanophylla</i> <i>Eucalyptus paniculata</i> <i>Eucalyptus siderophloia</i>	NS	R	1	1	3
ironbark, gum-topped <i>Eucalyptus decorticans</i>	NS	R	1	1	—
ironbark, red <i>Eucalyptus sideroxylon</i>	S	R	1	1	2
ironbark, red, broad-leaved <i>Eucalyptus fibrosa</i> subsp. <i>fibrosa</i>	NS	R	1	1	—
ironbark, red, narrow-leaved <i>Eucalyptus crebra</i>	NS	R	1	1	—

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
ironbark, silver-leaved <i>Eucalyptus melanophloia</i>	NS	R	1	1	—
ironwood, Cooktown <i>Erythrophloeum chlorostachys</i>	S	R	1	1	—
jam, raspberry <i>Acacia acuminata</i>	NS	R	1	1	2
jarrah <i>Eucalyptus marginata</i>	S	R	2	2	3
jelutong <i>Dyera costulata</i>	S	□	4	□	4
kamarere <i>Eucalyptus deglupta</i>	S	NR	4	□	4
kapur <i>Dryobalanops</i> spp.	NS	NR	3	2	4
karri <i>Eucalyptus diversicolor</i>	NS	NR	3	2	4
kauri, New Zealand <i>Agathis australis</i>	NS	□	2	□	4
kauri, Queensland <i>Agathis atropurpurea</i> <i>Agathis microstachya</i> <i>Agathis robusta</i>	NS	NR	4	4	4
kempas <i>Koompassia malaccensis</i>	S	NR	3	□	4
keruing <i>Dipterocarpus</i> spp.	S	NR	3	3	4
kwila (merbau) <i>Intsia bijuga</i>	S	R	3	1	3
laurel, camphor <i>Cinnamomum camphora</i>	S	□	□	□	—
lumbayau (mengkulang) <i>Heritiera</i> spp.	S	NR	4	□	4
mahogany, African <i>Khaya</i> spp.	S	□	3	□	—
mahogany, American <i>Swietenia mahogani</i>	S	□	3	□	—
mahogany, brush <i>Geissois benthamii</i>	S	NR	4	□	4
mahogany, red <i>Eucalyptus pellita</i> <i>Eucalyptus resinifera</i>	S	R	2	1	2
mahogany, red, Philippine, <i>Shorea</i> spp.	S	NR	4	3	4

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
mahogany, southern <i>Eucalyptus botryoides</i>	NS	R	3	2	—
mahogany, white <i>Eucalyptus acmenoides</i> <i>Eucalyptus tenuipes</i> <i>Eucalyptus umbra</i> subsp. <i>Carnea</i>	NS	R	1	1	2
malas <i>Homalium foetidum</i>	NS	NR	3	□	4
mallet, brown <i>Eucalyptus astringens</i>	NS	R	2	1	—
malletwood <i>Rhodamnia argentea</i> <i>Rhodamnia costata</i>	NS	NR	3	□	4
malletwood, brown <i>Rhodamnia rubescens</i>	NS	NR	3	□	4
malletwood, silver <i>Rhodamnia acuminata</i>	NS	NR	3	□	4
mangrove, grey <i>Avicennia marina</i>	NS	NR	4	□	4
maple, Queensland <i>Flindersia brayleyana</i>	NS	NR	4	□	4
maple, rose <i>Cryptocarya erythroxylon</i>	S	NR	4	□	4
maple, scented <i>Flindersia laevis</i>	NS	NR	3	□	4
maple, sugar (rock) <i>Acer saccharum</i>	S	□	4	□	4
marri <i>Corymbia calophylla</i> <i>Eucalyptus calophylla</i>	S	NR	3	3	4
medang tabak <i>Dactyloctenium aegyptium</i>	NS	NR	□	□	—
meranti, bakau <i>Shorea</i> spp.	S	NR	4	□	4
meranti, dark-red <i>Shorea</i> spp.	S	NR	4	3	4
meranti, light-red <i>Shorea</i> spp.	S	NR	4	4	4
meranti, white <i>Shorea</i> spp.	S	NR	4	□	4
meranti, yellow <i>Shorea</i> spp.	S	R	4	□	4
mersawa <i>Anisoptera</i> spp.	S	NR	4	3	4

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
messmate <i>Eucalyptus obliqua</i>	S	NR	3	3	4
messmate, Gympie <i>Eucalyptus cloeziana</i>	NS	R	1	1	—
mulga <i>Acacia aneura</i>	□	□	2	□	—
myall <i>Acacia pendula</i>	NS	NR	2	□	—
nyatoh <i>Palaquium</i> and <i>Payena</i> spp.	NS	□	4	□	4
oak, bull <i>Allocasuarina luehmannii</i>	NS	R	1	1	—
oak, European <i>Quercus</i> spp.	S	□	2	□	—
oak, silky, northern <i>Cardwellia sublimis</i>	S	NR	4	□	4
oak, silky, southern <i>Grevillea robusta</i>	S	□	□	□	—
oak, tulip, blush <i>Argyrodendron actinophyllum</i>	S	NR	4	□	4
oak, tulip, brown <i>Argyrodendron polyandrum</i> <i>Argyrodendron trifoliolatum</i>	S	NR	4	□	4
oak, tulip, red <i>Argyrodendron peralatum</i> ,	S	NR	4	□	4
oak, white, American <i>Quercus alba</i>	S	NR	4	□	4
Paulownia <i>Paulownia</i> spp.	S	NR	4	4	4
penda, brown <i>Xanthostemon chrysanthus</i>	NS	R	2	1	2
penda, red <i>Xanthostemon whitei</i>	NS	R	2	1	2
penda, southern <i>Xanthostemon, oppositifolius</i>	NS	NR	2	1	2
penda, yellow <i>Ristantia pachysperma</i>	NS	NR	3	□	2
peppermint, black <i>Eucalyptus amygdalina</i>	S	NR	4	3	4
peppermint, broad-leaved <i>Eucalyptus dives</i>	S	NR	3	2	4

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
peppermint, narrow-leaved <i>Eucalyptus australiana</i> <i>Eucalyptus radiata</i> <i>Eucalyptus robertsonii</i>	S	NR	3	3	4
peppermint, Queensland <i>Eucalyptus exserta</i>	S	R	1	1	—
peppermint, river <i>Eucalyptus elata</i>	S	NR	4	3	4
peppermint, white <i>Eucalyptus pulchella</i>	S	NR	3	□	4
pine, black <i>Prumnopitys amara</i>	NS	—	4	—	—
pine, brown <i>Podocarpus elatus</i>	NS	□	□	□	3
pine, bunya <i>Araucaria bidwillii</i>	NS	NR	4	4	4
pine, Canary Island <i>Pinus canariensis</i>	NS	NR	4	4	4
pine, Caribbean <i>Pinus caribaea</i>	NS	R	4	4	4
pine, celery-top <i>Phyllocladus asplenifolius</i>	NS	R	3	2	—
pine, Corsican <i>Pinus nigra</i>	NS	□	4	4	4
pine, hoop <i>Araucaria cunninghamii</i>	NS	NR	4	4	4
pine, Huon <i>Lagarostrobos franklinii</i>	NS	R	3	3	4
pine, King William <i>Athrotaxis selaginoides</i>	NS	R	2	2	4
pine, klinki <i>Araucaria hunsteinii</i>	NS	NR	4	□	4
pine, loblolly <i>Pinus taeda</i>	NS	NR	4	4	4
pine, longleaf <i>Pinus palustris</i>	NS	NR	4	4	4
pine, maritime <i>Pinus pinaster</i>	NS	R	4	4	4
pine, NZ white (kahikatea) <i>Dacrycarpus dacrydioides</i>	NS	□	4	□	4
pine, patula <i>Pinus patula</i>	NS	□	4	4	4
pine, ponderosa <i>Pinus ponderosa</i>	NS	□	4	4	4

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
pine, radiata <i>Pinus radiata</i>	NS	NR	4	4	4
pine, Scots <i>Pinus sylvestris</i>	NS	□	4	□	4
pine, slash <i>Pinus elliotii</i>	NS	R	4	4	4
pine, slash, Caribbean hybrid <i>Pinus elliotii</i> , <i>P. caribaea</i>	NS	R	4	4	4
pine, white, western <i>Pinus monticola</i>	NS	□	4	□	4
planchonella <i>Planchonella chartacea</i>	S	NR	4	□	4
planchonina <i>Planchonia</i> spp.	NS	NR	□	□	—
poplar, balsam <i>Populus</i> spp.	S	NR	4	□	4
poplar, pink <i>Euroschinus falcata</i>	S	NR	4	□	4
quandong, silver <i>Elaeocarpus angustifolius</i> <i>Elaeocarpus grandis</i>	S	NR	4	□	4
ramin <i>Gonystylus</i> spp.	S	NR	4	4	4
redwood <i>Sequoia sempervirens</i>	NS	R	2	1	4
rimu <i>Dacrydium cupressinum</i>	NS	□	4	□	4
rosewood, New Guinea <i>Pterocarpus indicus</i>	S	R	3	2	—
rustyjacket <i>Eucalyptus peltata</i>	S	NR	2	2	—
saffronheart <i>Halfordia kendack</i> <i>Halfordia scleroxyla</i>	NS	R	1	1	—
sandalbox <i>Eremophila, mitchellii</i>	NS	R	1	1	—
sassafras <i>Daphnandra dielsii</i> <i>Daphnandra micrantha</i> <i>Daphnandra repandula</i> <i>Doryphora aromatica</i> <i>Doryphora sassafras</i>	NS	NR	4	□	4
sassafras, grey <i>Dryadodaphne novoguineensis</i>	NS	NR	□	□	—

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
satinash, grey <i>Syzygium claviflorum</i> <i>Syzygium gustavioides</i>	S	NR	3	□	4
satinash, rose <i>Syzygium crebrinerve</i> <i>Eugenia francisii</i>	S	□	3	□	—
satinay <i>Syncarpia hillii</i>	NS	R	2	1	1
satinbox <i>Phebalium squameum</i>	NS	□	2	2	—
sepetir <i>Copaifera</i> spp. <i>Pseudosindora</i> spp. <i>Sindora</i> spp.	S	NR	4	□	4
sheoak, beach <i>Allocasuarina equisetifolia</i>	NS	□	3	□	—
sheoak, black <i>Allocasuarina littoralis</i>	NS	□	3	□	4
sheoak, river <i>Casuarina cunninghamiana</i>	NS	□	□	□	—
sheoak, rose <i>Allocasuarina torulosa</i>	NS	□	2	□	—
sheoak, swamp <i>Casuarina glauca</i>	NS	□	□	□	—
silkwood, maple <i>Flindersia pimenteliana</i>	NS	NR	4	□	4
spruce, Norway <i>Picea abies</i>	NS	□	4	□	4
spruce, Sitka <i>Picea sitchensis</i>	NS	□	4	□	4
stringybark, Blackdown <i>Eucalyptus sphaerocarpa</i>	NS	R	2	1	—
stringybark, blue-leaved <i>Eucalyptus agglomerata</i>	NS	NR	3	3	4
stringybark, brown <i>Eucalyptus baxteri</i> <i>Eucalyptus blaxlandii</i> <i>Eucalyptus capitellata</i>	NS	NR	3	2	4
stringybark, Darwin <i>Eucalyptus tetradonta</i>	S	R	1	1	—
stringybark, diehard <i>Eucalyptus cameronii</i>	□	□	3	□	—
stringybark, red <i>Eucalyptus macrorhyncha</i>	S	R	3	2	3

(continued)

TABLE A1 (continued)

1 Standard common name and scientific/botanical name	2 Lyctid susceptibility of sapwood	3 Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	4 Natural durability class of heartwood		5 Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
stringybark, silvertop <i>Eucalyptus laevopinea</i>	NS	NR	3	3	4
stringybark, white <i>Eucalyptus eugenoides</i> <i>Eucalyptus globoidea</i> <i>Eucalyptus phaeotricha</i>	NS	R — —	3 2 □	2 □ □	3
stringybark, yellow <i>Eucalyptus muelleriana</i>	NS	R	3	2	3
sycamore, silver <i>Cryptocarya glaucescens</i>	NS	NR	4	□	4
tallowwood <i>Eucalyptus microcorys</i>	S	R	1	1	3
taun <i>Pometia</i> spp.	S	NR	3	2	4
teak, Burmese <i>Tectona grandis</i>	S	R	2	1	—
tea-tree, broad-leaved <i>Melaleuca leucadendron</i> <i>Melaleuca quinquenervia</i> <i>Melaleuca viridiflora</i>	S	□	3	□	3
tea-tree, river <i>Melaleuca bracteata</i>	NS	□	3	□	—
tingle, red <i>Eucalyptus jacksonii</i>	NS	□	3	3	4
tingle, yellow <i>Eucalyptus guilfoylei</i>	NS	□	2	1	—
touriga, red <i>Calophyllum costatum</i>	NS	NR	4	□	4
tuart <i>Eucalyptus gomphocephala</i>	S	R	2	1	4
turpentine <i>Syncarpia glomulifera</i>	NS	R	2	1	1
vitex <i>Vitex cofassus</i>	NS	NR	□	□	—
walnut, New South Wales <i>Endiandra virens</i>	NS	□	4	□	4
walnut, Queensland <i>Endiandra palmerstonii</i>	S	□	4	□	4
walnut, yellow <i>Beilschmiedia bancroftii</i>	S	NR	4	□	4
wandoo <i>Eucalyptus wandoo</i>	NS	R	1	1	3
wandoo, powderbark <i>Eucalyptus accedens</i>	NS	R	1	1	—

(continued)

TABLE A1 (continued)

1	2	3	4		5
Standard common name and scientific/botanical name	Lyctid susceptibility of sapwood	Termite resistance of heartwood (inside above ground— applicable to H2 in AS 1604 series)	Natural durability class of heartwood		Marine- borer resistance of heartwood
			In-ground contact, D_{ig}	Outside above ground, D_{ag}	
wattle, ironwood <i>Acacia estrophiolata</i> <i>Acacia excelsa</i>	NS	□	2	□	—
woollybutt <i>Eucalyptus longifolia</i>	S	R	1	1	—
woollybutt, northern <i>Eucalyptus miniata</i>	S	NR	2	□	—
yapunyah <i>Eucalyptus ochrophloia</i>	S	□	1	1	—
yapunyah, mountain <i>Eucalyptus thozetiana</i>	NS	R	1	1	—
yarran <i>Acacia homalophylla</i>	NS	□	□	□	—
yate <i>Eucalyptus cornuta</i>	NS	□	2	1	—
yate, swamp <i>Eucalyptus occidentalis</i>	—	—	—	—	4
yertchuk <i>Eucalyptus considiniana</i>	NS	R	2	1	—

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MARKET KNOWLEDGE &
DEVELOPMENT

PROJECT NUMBER: PN06.1039

JULY 2008

Interim Industry Standard Recycled Timber – Visually Graded Recycled Decorative Products

This standard can also be viewed on the FWPA website

www.fwpa.com.au

Level 4, 10-16 Queen Street

Melbourne VIC 3000, Australia

T +61 (0)3 9614 7544 F +61 (0)3 9614 6822

E info@fwpa.com.au W www.fwpa.com.au



Market Knowledge and Development

PROJECT NUMBER: PN06.1039

Interim Industry Standard
**Recycled Timber –
Visually Graded Recycled
Decorative Products**

PREPARED BY

David Hayward

Colin MacKenzie

Timber Queensland Ltd



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Forest and Wood Products Australia

Level 4, 10–16 Queen Street

Melbourne, Vic 3000

Web: www.fwpa.com.au

Preface

This Interim Industry Standard was prepared under a project supported by Forest and Wood Products Australia and the Department of Tourism, Regional Development and Infrastructure - Queensland, with input and development from stakeholders, including industry associations, representatives of the recycled timber industry, government, researchers and specifiers.

The objective of this Interim Standard is to provide recycled timber manufacturers, suppliers and users with requirements for visually grading recycled hardwood timber intended for use in decorative applications. The Standard is an Interim Standard, as this is the first time national visual grading rules have been developed for recycled timber in Australia. It is intended that after a period of application and use, the Interim Standard will be reviewed and amended and then will be submitted to Standards Australia for consideration for development as a formal Australian Standard.

Specifiers and purchasers of recycled timber should be aware of the following key points and considerations prior to specifying or ordering recycled timber:–

- a) Recycled timber is sourced from a disparate range of buildings, structures and products from a wide geographical area and from a wide range of environmental exposures. The resulting products obtainable from recycled timber will therefore reflect previous use, and availability of individual species/species mixes, grades and products may change with time.
- b) Detailed discussions between purchasers and suppliers prior to specifying or ordering recycled timber is the key to a successful commercial transaction
- c) Where practical, prior inspection should be undertaken of a realistic representative sample of recycled timber product and that the grade/quality is agreed upon in writing between purchaser and supplier. The use of actual samples, electronic images etc, where available, may assist in facilitating satisfactory placement and delivery of the order.
- d) It should be noted that the grades available under this standard do not include 'Clear' or 'Select' grade etc. All the grades in this standard are specific to recycled timber and include recycled timber features.

In respect of the application of this Standard, statements expressed in mandatory terms in notes to tables or diagrams are deemed to be requirements of this Standard.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of this Standard, whereas an 'informative' appendix is only for information and guidance.

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Scope and general

1.1 SCOPE

This industry standard applies to recycled hardwood only and sets grade descriptions for decorative recycled timber products. Recycled timber is timber that has been previously used and served its initial purpose. Recycled timber may be recovered from use for re-use either in its original size or re-manufactured to smaller dimensions.

The Standard covers products that:–

- (a) are manufactured from timber that has been sawn from larger members (e.g. girders, roof framing) into products such as flooring, cladding, lining, bench tops, joinery/ furniture stock
- (b) have been recovered from previous use and will be re-used without further sawing or machining (e.g. flooring)
- (c) are to be lightly-loaded non structural members of larger cross section (e.g. decorative beams and posts)

1.2 APPLICATION

Three grade descriptions provided in this Standard are for use with the sawn and milled timber products as specified in AS 2796.1 (e.g. flooring, cladding, lining, boards etc), where these products are sawn or milled from larger members. By agreement between purchaser and supplier these grade descriptions may also be applied to the products specified in AS 2796.1 that have been recovered from previous use and will be re-used without further sawing or machining.

NOTE:

See Clause 3.1 (b) for requirements for products recovered from previous use to be re-used without further processing.

A fourth grade description is provided in this Standard for lightly-loaded larger cross section non structural members.

This Standard also recognises that recycled hardwood will contain many features covered by the grade descriptions in AS 2796.2, however recycled timber also contains many valued features that are either not covered or would be excluded by the grade descriptions in AS 2796.2. The grade descriptions given in this Standard are to be used independently of AS 2796.2 but this does not preclude the specification and grading of recycled timber to AS 2796.2, where agreed to between purchaser and supplier.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

1604 Timber – Preservative-treated – Sawn and round

1684 Residential timber framed construction

2796.1 Timber – Hardwood – Sawn and milled products. Part 1: Product specification

2796.1 Timber – Hardwood – Sawn and milled products. Part 2: Grade descriptions

AS/NZS

1080.1 Timber – Methods of Test – Method 1: Moisture content

1080.2 Timber – Methods of Test – Method 2: Slope of grain (Parts 1 to 3)

4491 Timber – Glossary of terms in timber related Standards

INDUSTRY STANDARDS

FWPA PN06.1039 – Recycled Timber – Visually Stress Graded Recycled Timber for Structural Purposes

1.4 DEFINITIONS

For the purpose of this Standard, the definitions given in AS/NZS 4491 and those in Appendix A apply. Where the definitions in Appendix A differ from those in AS/NZS 4491, for the purposes of this Standard those in Appendix A apply.

1.5 GRADES

1.5.1 Grades

The grades specified in this Standard are primarily based on features and the desired aesthetic appearance of recycled timber. The grades applying to recycled sawn and milled timber referred to as the 'recycled feature grades' are as follows (appropriate abbreviations in brackets):

- (a) RECYCLED FEATURE GRADE 1 – (RFG1)
- (b) RECYCLED FEATURE GRADE 2 – (RFG2)
- (c) RECYCLED FEATURE GRADE 3 – (RFG3)

In addition to the above, one grade description is provided for larger end section, lightly-loaded, non structural members.

- (d) RECYCLED DECORATIVE (RDG)

Recycled structural timber shall be graded in accordance with FWPA PN06.1039 – Recycled Timber – Visually Stress Graded Recycled Timber for Structural Purposes

NOTE:

For products manufactured from timber that has been sawn from larger members other grades may be specified by agreement between the purchaser and supplier as provided for in AS 2796.1.

This Standard does not preclude the use of grades other than those described herein, provided that it can be shown that these other grades satisfy the performance requirements for that product. Any such other grade shall be adequately documented and the product identified in accordance with Clause 1.6 (see also Clause 1.7)

Other grades may be specified by agreement between the purchaser and supplier, however adequate strength shall be maintained for flooring and light decking.

1.5.2 Ordering

The order shall nominate as applicable the grade, species or species mix and surface finish (refer clause 2.5).

1.6 IDENTIFICATION

Where a parcel or member is graded as complying with this standard, the following details shall be clearly stated on the invoice:–

- (a) The name of this standard
- (b) The grade
- (c) The species, or that mixed species have been supplied, if applicable
- (d) The durability class if applicable
- (e) If graded as seasoned, the word 'SEASONED' or the abbreviation 'S'
- (f) If preservative treated, additional branding in accordance with AS 1604.

Alternatively, if the timber is branded, labeled, stamped or marked to indicate that it complies with this Standard, the information in (a) to (f) shall be legibly marked on each piece.

1.7 CLAIM OF COMPLIANCE

In any statement or claim of compliance with this Standard, one of the following shall apply:

- (a) Reference to one of the grades described in this Standard is a claim of compliance with the general requirements, product requirements and grading requirements set out in this Standard for that specific grade and that the product is of recycled timber.
- (b) Reference to this standard and a grade other than those described in this Standard is a claim of compliance with the general requirements and product requirements set out in this Standard and the requirements of the other grade and that the product is of recycled timber. It is also a claim that product performance (e.g. structural adequacy for flooring) is appropriate for the intended use.

NOTE:

Manufacturers making a statement of compliance with this Standard on a product, packaging, or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

General requirements

2.1 TIMBER SPECIES

Decorative recycled hardwood products shall be supplied in parcels or as individual members complying with one of the following, as applicable:–

- (a) Mixed hardwoods where the species are similar in properties or appearance (colour), or in both.
- (b) Mixed hardwoods where the species are deliberately selected with dissimilar appearance.
- (c) Single species.

NOTE:

Products from recycled hardwood timber of individual species may not be readily available. Also, individual species identification may require specialist services.

2.2 SAPWOOD AND LOW DURABILITY HEARTWOOD

Some products covered by this Standard could be used in exposed situations or other areas of significant decay risk. Untreated sapwood and low durability heartwood are not restricted by the grading rules in this Standard except for limits on Lyctid susceptible sapwood.

However, building codes and AS 1684 restrict the use of low durability timber including untreated sapwood where such timber is not suitably protected from the ingress of moisture.

NOTES:

- 1 Where products are used in weather-exposed or other hazardous situations, the presence of untreated sapwood and untreated heartwood of low durability requires ongoing maintenance to ensure an adequate service life.
- 2 The untreated sapwood of any species is considered non-durable when exposed to the weather or the ingress of moisture, regardless of the durability rating of the heartwood of that species.
- 3 To achieve maximum service life, any untreated sapwood must be protected from weather exposure and the ingress of moisture.

2.3 SAPWOOD SUSCEPTIBLE TO LYCTID BORER

Sapwood susceptible to Lyctid borers shall be immunised against such attack in accordance with AS 1604.

NOTES:

- 1 The method for the detection of Lyctid susceptible sapwood is given in AS 1604.
- 2 Guidelines for the immunization of susceptible sapwood are given in AS 1604 and further information is available from state forestry departments and the CSIRO.

2.4 PRESERVATIVE TREATMENT

Where timber is preservative treated, treatment shall be in accordance with AS 1604.

If products are preservative-treated with a waterborne preservative, the moisture content of the products will increase. Products so treated shall be re-seasoned to comply with the seasoning requirements for those products.

NOTE:

Generally, only the sapwood of hardwoods can be impregnated with preservative

2.5 SURFACE FINISH AND FINISH IMPERFECTIONS

2.5.1 Surface Finish

When graded recycled timber is specified to this Standard, the surface finish may be:–

- (a) as in its recovered state or,
- (b) a remanufactured surface (e.g. ground, wire brushed, sawn or machined etc)

2.5.2 Machining and surface imperfections

When products covered by this Standard are manufactured from timber that has been sawn or milled from larger recycled members, the following machining and surface imperfection limitations apply.

Machining imperfections and surface imperfections on exposed surfaces shall not exceed the limits specified in Table 2.1, or as otherwise specified. Machining imperfections and surface finish imperfections on concealed surfaces, which do not prevent the proper fixing of the product or unduly impair its strength, are permitted.

Table 2.1 Machining and surface finish imperfections

Imperfection	Internal Products		External Products
	Sanded after installation	Not sanded after installation	
Skip, hit and miss	Permitted once per board and not deeper than 0.5 mm	Not permitted	Not permitted
Cutter marks	Must exceed 10 in number per 30 mm	Must exceed 15 in number per 30 mm	Must exceed 10 in number per 30 mm
Raised grain, ridges, torn grain	Permitted when not deeper than 0.5 mm	Permitted when not higher or deeper than 0.5 mm	Permitted when not deeper than 0.5 mm
Chip marks or roller marks	Permitted up to two-thirds the length	Permitted up to one-third the length	
Pause marks or glazed surfaces	Permitted provided that each occurs not more than once per piece		
Knot chipping	Permitted up to 3 mm in width		
Torn corners and edges, gouge, kick out	Not permitted		

2.6 END-MATCHED PRODUCT

Tongues and grooves at the ends of end-matched products shall be milled across the ends of the board cleanly, at right angles to the longitudinal axis of the board with the tongue and groove dimensions and tolerances appropriate to the product.

NOTE:

The end matching need not be of the same profile as the tongue and groove on the edge of the board (e.g. in secret nail profiles) and may be manufactured either left hand or right hand.

2.7 PLUGGING AND PATCHING

Plugging and patching of products shall be permitted by agreement between purchaser and supplier. Where used, plugs and patches shall be of materials such as glued plugs, epoxy resins or similar suited to their intended applications.

Product requirements

3.1 GENERAL

When grading products (other than lightly-loaded non structural members) to this Standard and

- (a) the product is manufactured from timber that has been sawn from larger members then the product requirements set out in Sections 3 to 10 of AS 2796.1 shall apply, or where
- (b) the product has been recovered from previous use and will be re-used without further sawing or machining, then the requirements of sections 3 to 10 of AS 2796.1 do not apply, except for the applicable clauses for moisture content, or if there is specific agreement between purchaser and supplier to apply these requirements.

When grading lightly-loaded non structural members the product requirements of AS 2796.1 do not apply and aspects relating to product requirements (e.g. moisture content and tolerances etc) are as set out in Clause 3.2.

NOTE:

Product specification aspects generally have a significant affect on product performance. For example high moisture content material often results in high in-service shrinkage, distortion and increased checking.

3.2 LIGHTLY-LOADED NON STRUCTURAL MEMBERS

3.2.1 General

Recycled lightly loaded non structural members must meet the minimum dimensional requirements specified in the order in terms of length, depth and width, except where permitted characteristics, want, wane or hit and miss occurs, measured at any point in the length of a piece.

3.2.2 Bow, Spring

Bow and spring shall be evenly distributed and shall not exceed 25 mm per 3.6 m length of the piece or equivalent curvature in other lengths.

3.2.3 Moisture Content

The moisture content in these larger cross section members may be variable due to past history and whether any re-sawing has taken place. This Standard does not impose any specific moisture content requirements on these members. From a utility perspective moisture content needs to be considered as in-service stability may be affected and more pronounced checking may occur depending on the member supplied.

3.3 RESIDUAL FIXINGS

Unless otherwise agreed between the purchaser and supplier, recycled timber shall be supplied relatively free of nails, screws, bolts, brackets or similar fixings.

NOTE:

It may not be practical or possible to detect and remove 100% of all fixings that can occur in recycled timber and indeed some purchasers may deem retention of some residual fixings as a desirable feature.

Grading requirements

4.1 GRADING METHOD

4.1.1 General

Each piece shall be graded on the face, back, edges and ends, as appropriate, in accordance with this Section, and the appropriate grade description given in Section 5.

4.1.2 Basis

Grading is based on visual assessment of individual pieces. The amount (size) of a feature or group of features (within a piece) is compared to the maximum amount of that feature permitted for the grade.

The maximum amount of features permitted is set out in a grade description. All features in the piece shall comply with the limits given in the grade description. Grade descriptions are primarily based on features and desired aesthetic appearance. They are also based on utility considerations.

4.1.3 Grade limits

The grade descriptions describe material containing the maximum amount of permitted feature for the particular grade. Each parcel shall contain a range of material such that not all of the material contains the maximum amount of permitted feature for the grade.

4.1.4 Variation in assessment

Within any parcel, grading differences may occur if the parcel is re-graded by another grader or inspector. If the differences relate to less than 5% of the pieces and grade limits in these disputed pieces are not considered to exceed grade limits by more than 10%, then this is considered to be an acceptable variation.

4.1.5 Grading and profile check

A check of the grading of the timber may be required some time after the grading undertaken by the producer or supplier.

Where the purpose of the check is to estimate the accuracy of the previous grading or machining, reasonable allowance shall be made for changes that may have occurred since that time. These changes may include but are not limited to –

- (a) change in dimensions and tolerances due to moisture uptake or loss (swelling or shrinkage);
- (b) increase in distortion (bow, spring, twist and cup);
- (c) increase in, or development of features due to subsequent processes (e.g., sanding)
- (d) in unseasoned products or where significant moisture gradients exist, an increase in, or development of, seasoning checks, splits, end splits and shakes;

NOTES:

- 1 Critical changes may arise due to moisture content change. For example, the formation of large checks affecting the structural adequacy of the piece or excessive twist affecting the utility of the piece. Such changes in a piece may be cause for rejection of the piece with respect to its final application.
- 2 Where timber products are sanded after installation, reasonable allowance should be made for features on the exposed surface that become larger or appear as a result of the removal of the original surface.

4.2 MEASUREMENT OF FEATURES

The measurement of features shall be as given in Appendix B.

4.3 COMBINATION OF FEATURES

Combination of features shall be limited in products where adequate strength is a consideration (e.g. flooring on joists or battens but not overlay flooring installed over a structural sub-floor). In such cases, a combination of features shall be permitted if the combination is less than that of one feature of the maximum permissible size.

A combination exists when two or more features occur in a length of the piece such that there is less than twice the width of the piece between them (see Figure 4.1). Features in combination are not necessarily on the same surface.

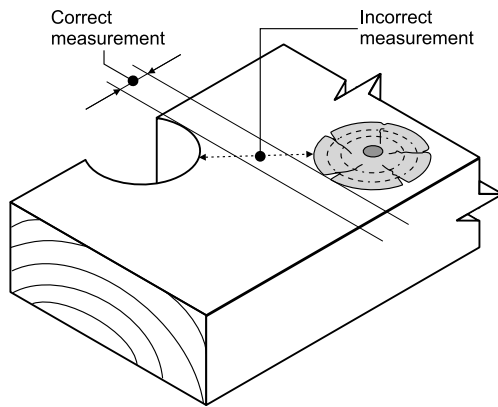
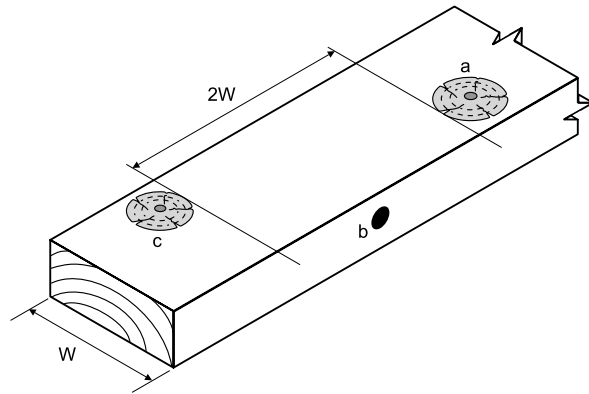


Figure 4.1 Measurement of distances between features.

The distance between the features shall be measured parallel to the length of the piece, between lines drawn at 90° to the arrises (see Figure 4.2).

If bow, spring, twist, or cup is present in the piece, each shall be measured separately and deemed not to be in combination with each other or with any other feature.



NOTES:

1. c and b are in combination; a and b are in combination and a and c are not in combination
2. Given that knot 'a' is 90% of its allowance, bolt hole 'b' is 15% of its allowance and knot 'c' is 85% of its allowance, the combination of 'b' and 'c' complies but the combination 'a' and 'b' do not.

Figure 4.2 Examples of combinations.

Grade descriptions

5.1 RECYCLED FEATURE GRADES

5.1.1 General

Products supplied to the 'feature grades' of this Standard shall comply with the general requirements of Section 2, product requirements specified in Section 3 and grading requirements of Section 4 of this Standard.

5.1.2 Features not permitted

On any surface, each piece of hardwood in the 'recycled feature grades' outlined in clause 1.5.1 shall be free of the following features:

- (a) Enclosed termite galleries.
- (b) Heart shakes.
- (c) Shakes.
- (d) Cross-fractures, cross-shakes.
- (e) Splits.
- (f) End splits.
- (g) Decay, primary rot.
- (h) Lyctid susceptible sapwood.

Except, for overlay flooring that is not required to provide a structural function, splits and end splits are permitted.

5.1.3 Permissible features

The permissible features and associated limits in each piece of hardwood in the 'feature grades' outlined in clause 1.5.1 are provided in Table 5.1

Table 5.1 Grade limits for Recycled Feature Grades

Feature	RECYCLED FEATURE GRADE 1 (RFG1)	RECYCLED FEATURE GRADE 2 (RFG2)	RECYCLED FEATURE GRADE 3 (RFG3)
ON EXPOSED SURFACES			
Tight Knots and any associated voids; individually or in aggregate	Not exceeding the lesser of 30 mm and 1/4 of the surface on which it occurs	Not exceeding the lesser of 40 mm and 1/3 of the surface on which it occurs	Not exceeding the lesser of 50 mm and 3/8 of the surface on which it occurs
Loose Knots	Not permitted unless secured with glue	As for holes	As for holes
Holes (borer, nail, scrow, bolt holes, non-enclosed termite galleries and other holes)			
• up to 4 mm dia	Not more than 6 holes per 1.0 m length	Not more than 10 holes per 1.0 m length	Not more than 20 holes per 1.0 m length
• over 4 mm to 10 mm	Not more than 2 holes per 1.0 m length and in flooring and light decking to be plugged	Not more than 4 holes per 1.0 m length and in flooring and light decking to be plugged	Not more than 6 holes per 1.0 m length and in flooring and light decking to be plugged
• over 10 mm to 25 mm	Not more than 1 hole per 1.0 m length and in flooring and light decking to be plugged	Not more than 2 holes per 1.0 m length and in flooring and light decking to be plugged	Not more than 3 holes per 1.0 m length and in flooring and light decking to be plugged
Slope of grain	Not exceeding 1 in 8	Not exceeding 1 in 8	Not exceeding 1 in 8
Tight gum veins	Quartersawn: surface width measured across feature, not exceeding 3mm and aggregate length not more than ½ length of the piece Backsawn: Surface width across the feature not exceeding 20 mm, depth not exceeding 2 mm and length not exceeding 250 mm	Quartersawn: surface width measured across feature, not exceeding 5mm Backsawn: Surface width across the feature not exceeding 60 mm, depth not exceeding 2 mm and length not exceeding 1.0 m	Quartersawn: surface width measured across feature, not exceeding 5mm Backsawn: Unlimited across the face, depth not exceeding 2 mm
Loose gum veins	Not one surface to another Not intersecting an end Surface width measured across the feature not exceeding 3 mm Length not exceeding 250 mm.	Not one surface to another Not intersecting an end Surface width measured across the feature not exceeding 4 mm Length not exceeding 500 mm	Not one surface to another Not intersecting an end Surface width measured across the feature not exceeding 5 mm Length not exceeding 1.0m
Gum pockets, latex pockets and overgrowth of injury	Surface width measured across the feature not exceeding 10 mm, length not exceeding 50 mm and depth not exceeding 2 mm when backsawn and not one surface to another when quartersawn	Surface width measured across the feature not exceeding 15 mm, length not exceeding 75 mm and depth not exceeding 2 mm when backsawn and not one surface to another when quartersawn	Surface width measured across the feature not exceeding 20 mm, length not exceeding 100 mm and depth not exceeding 2 mm when backsawn and not one surface to another when quartersawn
Knot checks	Permitted	Permitted	Permitted
Checks other than internal	Width not exceeding 1 mm Individual length not exceeding 500 mm	Width not exceeding 2 mm Individual length not exceeding 1.0 m	Width not exceeding 3 mm Individual length not exceeding 1.0 m
Stain Natural discolouration	Unlimited	Unlimited	Unlimited
Other discolouration including sticker marks	Unlimited	Unlimited	Unlimited
Black speck	Unlimited	Unlimited	Unlimited
Non-lyctid susceptible sapwood (which includes appropriately treated sapwood)	Unlimited	Unlimited	Unlimited
Burls	Unlimited	Unlimited	Unlimited
Hobnails	Unlimited	Unlimited	Unlimited
Bow, Spring and Twist and Cup	Refer Tables	Refer Tables	Refer Tables
Wane, wane and mechanical damage	Not permitted unless associated with past use and does not prevent the proper fixing of the product or unduly impair its strength	Not permitted unless associated with past use and does not prevent the proper fixing of the product or unduly impair its strength	Not permitted unless associated with past use and does not prevent the proper fixing of the product or unduly impair its strength
ON CONCEALED SURFACES			
Features listed above	To the limits on the exposed surface of recycled feature grade 3	To the limits on the exposed surface of recycled feature grade 3	To the limits on the exposed surface of recycled feature grade 3

5.1.4 Bow

Table 5.1.4 Maximum permissible bow

Product	Length	Width				
		15 mm	19 mm	25 mm	35 mm	45 mm
Joinery, dressed boards	1.2	2	2	1	1	1
	1.8	5	4	2	1	1
	2.4	10	7	3	2	2
	3.0	15	10	5	2	2
	3.6	22	14	7	4	3
	4.2	30	20	10	6	4
	4.8	40	25	13	8	6
	5.4	50	30	16	11	8
Strip flooring, light decking, lining boards, mouldings, bargeboards, sawn boards for feedstock, overlay	1.2	6	5	4	3	2
	1.8	13	11	9	7	5
	2.4	22	19	16	13	10
	3.0	35	10	25	20	15
	3.6	50	45	35	30	22
	4.2	70	60	40	40	30
	4.8	90	75	50	50	40
	5.4	110	95	65	65	50

5.1.5 Spring

Table 5.1.5 Maximum Permissible Spring

Product	Length	Width					
		60 mm	80 mm	90 mm	120 mm	140 mm	150 mm
Joinery, dressed boards	1.2	2	2	2	1	1	1
	1.8	5	4	4	2	1	1
	2.4	10	7	6	3	2	1
	3.0	15	12	10	5	2	2
	3.6	22	17	15	7	4	3
	4.2	30	23	20	10	6	4
	4.8	40	30	25	13	8	6
	5.4	50	37	30	16	11	8
Light decking, lining boards, cladding, fascia	1.2	5	4	3	2	2	1
	1.8	11	8	7	5	4	2
	2.4	19	15	13	10	6	3
	3.0	30	23	20	15	10	5
	3.6	45	35	30	22	15	7
	4.2	60	47	40	30	20	10
	4.8	75	58	50	40	25	13
	5.4	95	75	65	50	30	16
Strip flooring, mouldings, sawn boards for strip flooring	1.2	6	5	5	4	3	2
	1.8	14	12	11	9	7	5
	2.4	25	21	19	16	13	10
	3.0	40	33	30	25	20	15
	3.6	60	50	45	35	30	22
	4.2	80	67	60	50	40	30
	4.8	100	83	75	65	50	40
	5.4	130	106	95	80	65	50

5.1.6 Twist and Cup

Table 5.1.6 Maximum Permissible Twist and Cup

Length (m)	Twist per 25 mm of width (mm)		Cup, per 100 mm of width
	Up to 25 mm of thickness	Over 25 mm of thickness	
1.2	1	0.5	1.0
2.4	2	1	
3.0	2.5	1.25	
3.6	3	1.5	
4.2	3.5	1.75	
4.8	4	2	
5.4	4.5	2.25	
6.0	5	2.5	

5.2 RECYCLED DECORATIVE GRADE

5.2.1 General

Products supplied to Recycled Decorative Grade of this Standard shall comply with the general requirements of Section 2, product requirements specified in Section 3 and grading requirements of Section 4 of this Standard. This grade only applies to larger end-section members such as beams and posts that are lightly-loaded and not required to have any significant structural load carrying capacity .

5.2.2 Features not permitted

On any surface, each piece of hardwood in Recycled Decorative Grade as outlined in Clause 1.5.1 shall be free of the following features:

- (a) Cross-fractures, cross-shakes.
- (b) Lyctid susceptible sapwood.

5.2.3 Permissible features

The permissible features and associated limits in each piece of hardwood in the Recycled Decorative Grade outlined in Clause 1.5.1 are provided in Table 5.2.

The limits provided in Table 5.2 are intended as maximums to ensure satisfactory structural performance for these lightly loaded members. For product intended for use in external weather exposed applications, durability based aspects including limiting 'open' characteristics such as checks, shakes and holes on surfaces where moisture could accumulate or be trapped should also be considered and further limited as appropriate. Requirements for connections and joints may also impose the need for additional restrictions.

The grade limits given in Table 5.2 do not preclude the use of grades other than those described provided that it can be shown that these other grades satisfy the performance requirements for that product. Any such other grade shall be agreed between purchaser and supplier and be adequately documented and the product identified in accordance with Clause 1.6.

Table 5.2 Grade limits for Recycled Decorative Grade (RDG)

Feature	RECYCLED DECORATIVE GRADE (RD)
ON EXPOSED SURFACES	
Knots (Tight, loose, sound or unsound)	Permitted up to ¼ of the width of the surface on which they occur
Holes and notches	Permitted up to ¼ of the width of the surface on which they occur
Longitudinal checks, shakes, heart shakes and splits	Up to 15 mm width, permitted provided they do not extend from one surface to another and not greater than L/2
End splits	Permitted up to 15 mm in width and up to 250 mm in length
Tight gum veins	Unlimited
Loose gum veins and pockets	Up to 15 mm width, permitted provided they do not extend from one surface to another and exceeding one-half of the length of the piece
Stain and discoloration	Unlimited
Slope of grain	Not exceeding 1 in 6
Wane, wane and mechanical damage	Permitted up to ¼ of the surface on which it occurs and not more than one-half of the length of the piece
Sound heart	Unlimited
Unsound heart, pipe etc	Not exceeding 1/9 of the cross-sectional area
Bow and Spring	Shall not exceed 25 mm per 3.6 m length of the piece or equivalent curvature in other lengths

Definitions (normative)

Arris

The sharp intersection of two surfaces, e.g., the face and edge of a piece of timber (see Figure A1).

Backsawn

Timber that has been sawn or cut so that the average inclination of the growth rings to the wide faces is less than 45 degrees.

Bargeboard

Sawn or dressed boards that form a decorative capping at each end of a gable roof. Depending on the roof design and construction requirements, they can be fixed to either the side of the flying rafters, the top chord of a truss, or directly to the ends of the roof outriggers. They are fixed at an angle corresponding to the slope of the roof and, at their lower ends, are usually fixed to the end of the fascia.

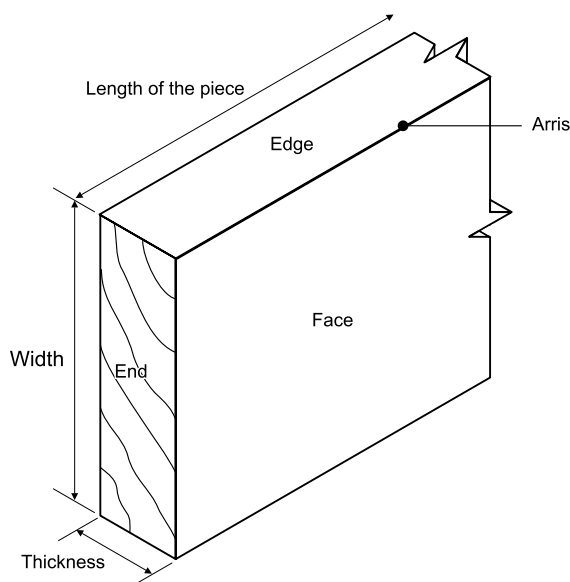


Figure A1 Timber surfaces and Arris.

Board width

For the purpose of grading, the overall finished width of the piece, including any tongue

Bow

A deviation in the longitudinal direction of the piece causing the face to curve away from its intended flat plane (see Figure B2.1).

Check

Separation of fibres radially across growth rings and along the grain forming a fissure but not extending from one surface to another. Types include the following (see Figure B3.4):

- (a) **End check** – A check occurring at the end of a piece.
- (b) **Heart check** – A check extending from the pith outwards in any direction but not reaching the surface of the piece.
- (c) **Surface check** – A check confined mainly to the surface of the piece but of no appreciable depth, that is, depth not exceeding 10 percent of the thickness of the piece.

Cladding

Dressed or sawn boards that form part of the external wall covering whose function includes keeping weather out of a structure.

Concealed surface

That part of a surface intended to be concealed from view when the product is fixed into position or is assembled.

Cover width

The actual width that will become the exposed surface when a product is fixed into position

Exposed surface

That part of a surface intended to be exposed to view when the product is fixed into position or is assembled.

Fascia

Sawn or dressed boards that form part of the decorative perimeter of the roof. They serve a dual purpose, being decorative, in that they can hide as well as support internal spouting (box guttering), and functional, in that they can be used to support external spouting while still being decorative. They are fixed horizontally to the ends of the rafters or trusses and serve to both hide the ends of the rafters or trusses and to support the outside edge of the under-eaves.

Fracture, cross

A fracture not in the direction of the fibres and resembling a breakage of the fibre.

Gum pocket

A cavity that contains or has contained gum or kino (see Figure B3.3).

Gum vein

A ribbon of gum or kino between growth rings that may be bridged radially at short intervals by wood tissue (see Figure B3.3).

Gum vein, loose

A gum vein associated with extensive discontinuity of wood tissue.

Gum vein, tight

A gum vein that is bridged radially at close intervals with woody tissue and not associated with extensive discontinuity of wood tissue.

Heart

The portion of a log that is near the growth centre (pith or log centre) and which is of reduced strength.

Heartwood

Wood which in the living tree had ceased to contain living cells and in which the reserve materials, e.g. starch, had been removed or changed into more durable substance.

Hole

A hole extending partially or entirely through the piece and attributable to any cause as follows:

- (a) **Borer hole** – A small hole in timber caused by the larval or adult stage of a wood boring insect, e.g., Lyctid, Anobiid, Bostrychid, Platypodid or Lymexylid.
- (b) **Grub hole** – A hole or excavation usually larger than a borer hole made by the larval or adult stage of an insect, e.g., Cerambycid, Buprestid or Lepidoptera.
- (c) **Pinhole** – Usually stained, made by a pinhole borer, i.e. Platypodid or Lymexylid.
- (d) **Plugged hole** – A hole filled by inserting a piece of wood, or other appropriate filler (e.g. epoxy resin).
- (e) **Termite hole** – See termite gallery.
- (f) **Nail hole** – Remaining from past fixing and may have associated discolouration
- (g) **Bolt hole** – Remaining from past fixing and may have associated discolouration

Knot

A section of a branch that is embedded in the wood of a tree trunk or of a larger branch (see Figure B3.1). Knots are defined with respect to their position on a cross-section of a piece or by their appearance on a surface:

- (a) **Defective knot** – A loose or unsound knot.
- (b) **Loose knot** – A knot that is not held firmly in place by growth and which cannot be relied upon to remain in place in the piece.
- (c) **Sound knot** – A knot solid across its face, as hard as the surrounding tissue and free from decay.
- (d) **Unsound knot** – A knot more or less decayed and softer than the surrounding tissue; not solid across the face; checked or split.

Light decking

Dressed, sawn or reeded boards, produced with or without chamfered or rounded arrises, primarily intended for domestic deck purposes; not to be confused with bridge and wharf decking.

Lining

Dressed or sawn boards that are intended to form part of the interior wall or ceiling covering of a structure.

Lyctid

The commonly used term in the timber and building industries for the lyctine beetles.

Moulding

A piece of timber machined to a specified profile for use in finishing or decorating.

Overlap

The difference between board width and cover width of weatherboards, chamferboards and some lining board profiles.

Overlay strip flooring

A milled product intended to be installed over a solid supporting substrate to give the appearance of strip flooring.

Quartersawn

Timber that has been sawn or cut so that the average inclination of the growth rings to the wide faces is more than 45 degrees.

Sapwood

The outer layers of the wood of a tree, which, when the tree was living, contained tissue in which water and food materials were conveyed and stored; generally lighter in colour than the heartwood (see Figure A1).

Shake

A partial or complete dislocation, breakage or longitudinal separation of wood fibres due to causes other than drying and usually originating either in the standing tree or in the log during felling or conversion as in the following:

- (a) **Heart shake** – A shake extending from the pith of a tree (see Appendix 3.5).
- (b) **Ring shake** – A shake following a growth ring. Also referred to as a shell shake or cup shake and the timber may be described as shelly (see Appendix 3.5).
- (c) **Star shake** – A number of adjoining heart shakes in the form of a star.

Shell-off

Missing material resulting from a ring shake.

Split

A longitudinal separation of wood fibres, which extends through a piece from one surface to another in sawn timber or through round timber.

Split, end

A split at the end of a log or piece.

Spring

A deviation in the longitudinal direction of the piece causing the edge to curve away from its intended flat plane (see Figure B2.2).

Strip flooring

Flooring made from machined timber with tongued and grooved joints intended to be installed over joists, battens or an underlay. This may be end-matched.

Termite gallery

An irregularly shaped passage or burrow excavated by termites in the bark or wood. An enclosed termite gallery is one that is not completely open to visual inspection throughout its entire length.

Thickness (T)

The smaller dimension of the cross-section of a piece of timber (see Figure A1).

Twist

A spiral distortion along the length of a piece of timber (see Figure B9).

Wane

The presence of the original underbark surface with or without bark, on any face or edge of a piece of timber (see Figure B3.6).

Want

The absence of wood, other than wane, from the corner or surface of a piece of timber (see Figure B3.6).

Warp

A distortion that is generally regular, part or all of the surface having become curved.

Width (W)

The larger dimension in the cross-section of a piece (see Figure A1).

Measurement of Board Dimensions, Distortion & Features (Normative)

B1 Measurement of board dimensions

Cross-sectional dimensions of rectangular sections and profiled sections shall be measured as shown in Figures B1.1 for moulded sections and B1.2 for tongue and groove sections.

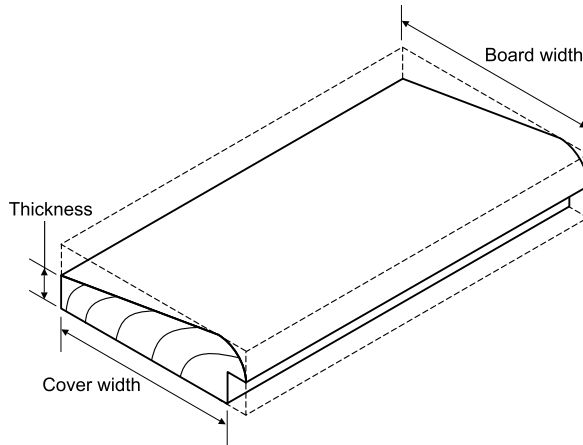


Figure B1.1 Moulded section dimensions

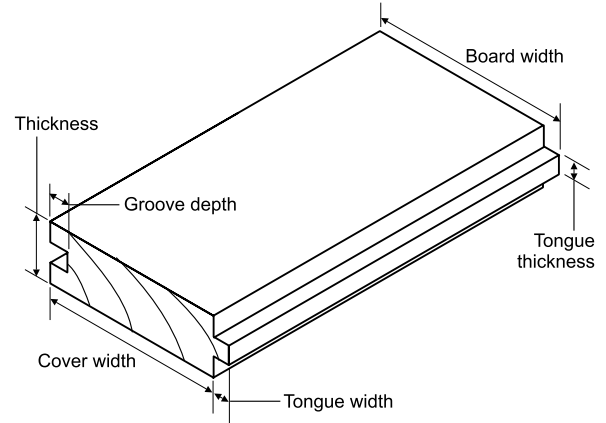


Figure B1.2 T&G section dimensions

B2 Measurement of distortion

When a piece has a combination of at least two of bow, spring, twist and cup, care needs to be exercised to measure each separately.

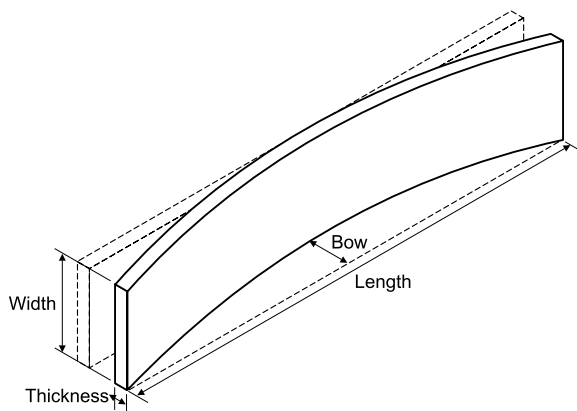


Figure B2.1 Bow

Bow and spring

Bow and spring shall be measured as the maximum distance perpendicular to the surface of any point on the face (bow) or edge (spring) from a straight line joining the arris at one end to the same arris at the other end (see Figures B2.1 and B2.2).

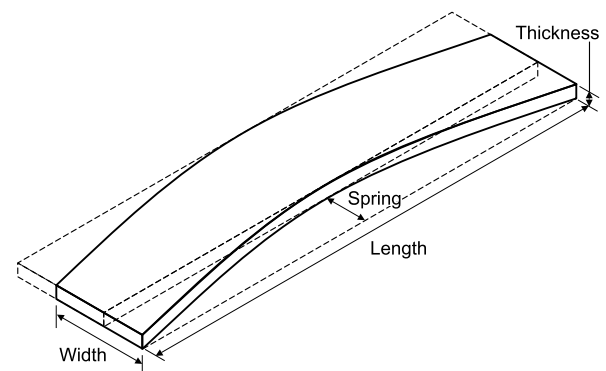


Figure B2.2 Spring

Twist

Twist shall be measured by placing the piece so that three of the corners of one face are in contact with a flat surface and measuring the perpendicular distance from the fourth corner to the flat surface (see Figure B2.3).

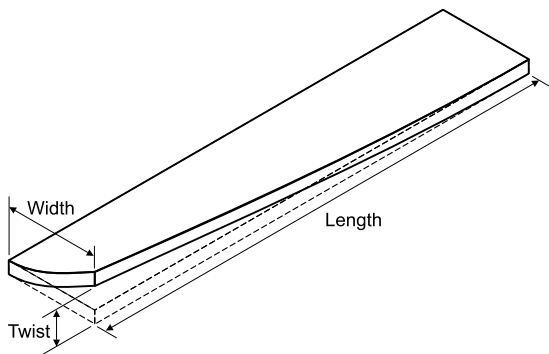


Figure B2.3 Twist

Cup

Cup shall be measured on the concave surface as the maximum perpendicular distance of any point on the surface of the piece from a straight line joining the arrises of that surface (see Figure B2.4).

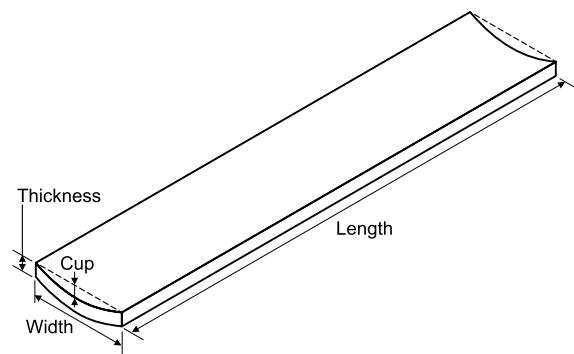


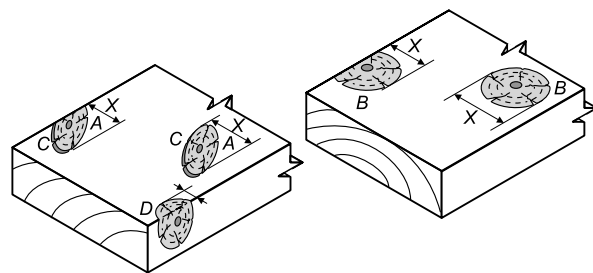
Figure B2.4 Cup

B3 Measurement of Features

Knots in sawn and milled timber

These include the following:

- Sound knots and knot holes** – The size shall be the width as measured between lines enclosing the knot or hole and parallel to the arrises of the piece (see Figure 3.1).
- Arris knots** – The size shall be the dimension of the knot that forms the lesser proportion of the surfaces on which it occurs, as measured between lines touching the boundaries of the knot on both surfaces and parallel to the arris that intersects the knot (see Figure 3.1).



A=oval knot, B=round knot, C=encasement, D=arris knot, X=size

Figure B3.1 Knots in sawn and milled timber

Slope of grain

Slope of grain shall be determined by one of the methods described in AS/NZS 1080.2.1, AS/NZS 1080.2.2 or AS/NZS 1080.2.3, and shall be measured over a distance sufficient to determine the general slope. Localized variations, where the grain deviates over less than half the surface, may be disregarded. Grain deviation around knots shall be disregarded providing such deviation does not significantly affect the general slope within the piece (see Figure B3.2).

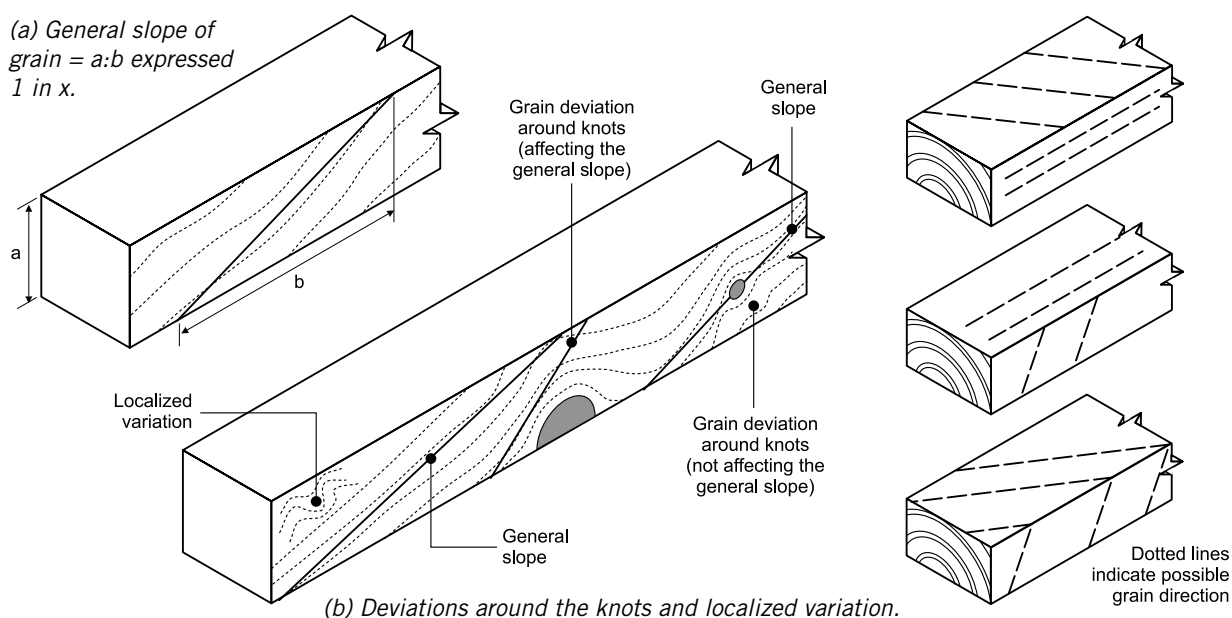


Figure B3.2 Slope of grain

Gum pockets, gum veins, overgrowths of injury and primary rot

The widths of gum pockets, gum veins, overgrowths of injury and primary rot shall be measured radially (see Figure B3.3).

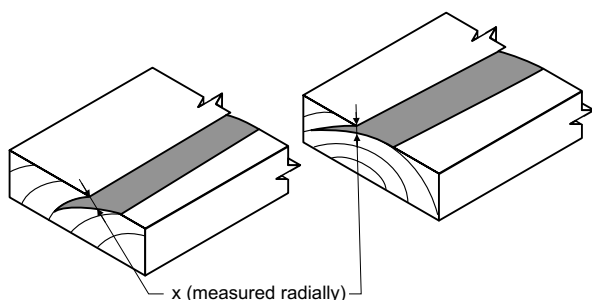


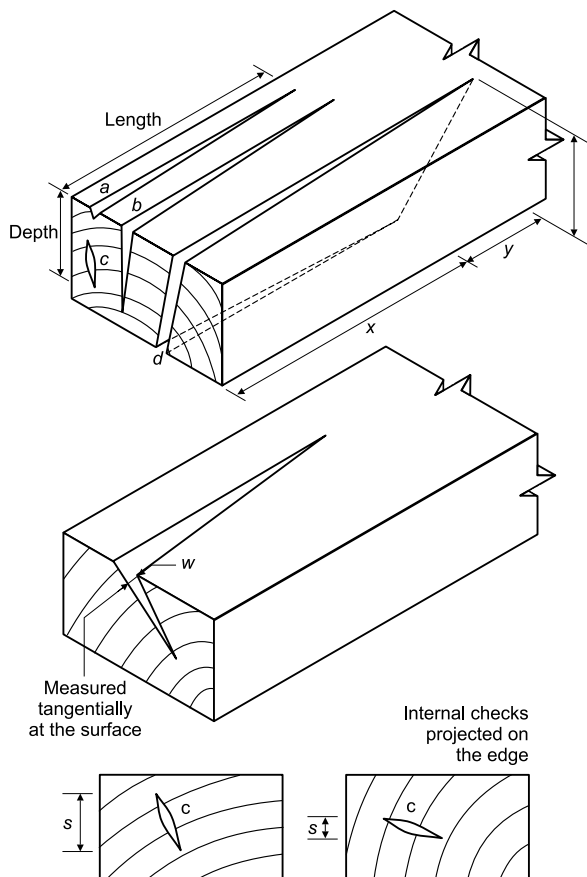
Figure B3.3 Gum pockets, gum veins, bark pockets, overgrowths of injury

Checks

The measurement of checks shall be as follows (see Figure B3.4):

- (a) For checks other than internal checks, the width shall be measured tangentially at the surface at 90 degrees to the longitudinal direction of the check. The length shall be measured parallel to the arrises.
- (b) For internal checks, the size shall be measured at their projected length *s*, on the thickness of the piece.

Checks are not to be confused with shakes (see Figure B3.5).



Legend: a=surface check, b=check, c=internal check, d=split, w=width of check measured tangentially, x=length of split, y=length of check, s=projected length.

Figure C.4 Checks and splits

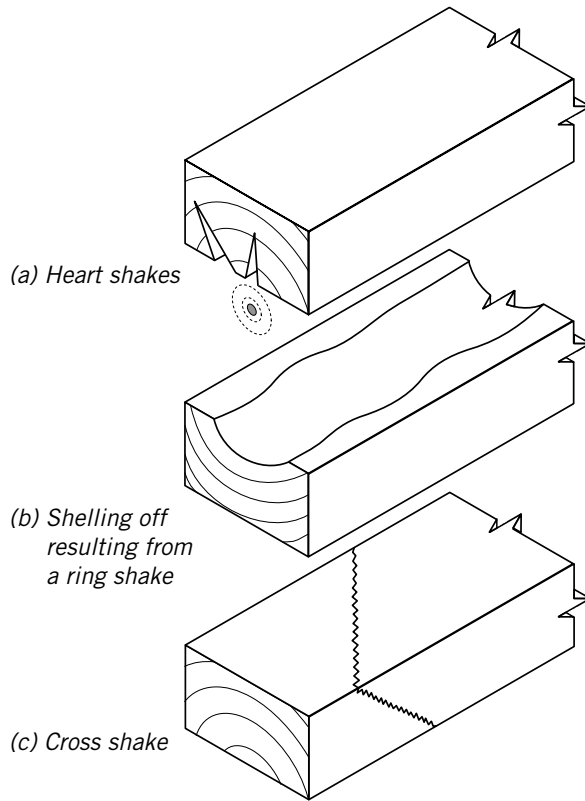


Figure B3.5 Shakes

Wane, want and lyctid-susceptible sapwood

Wane, want and Lyctid-susceptible sapwood shall be measured as the amount by which the cross-section of the piece is deficient or is Lyctid-susceptible sapwood (see Figure B3.6).

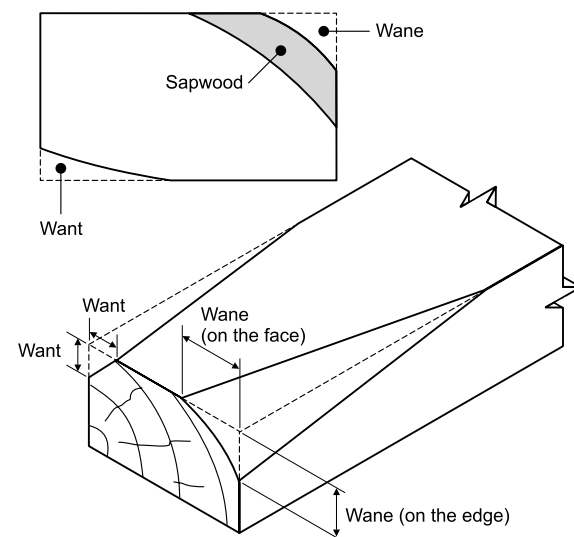


Figure B3.6 Wane, want and sapwood

Guidelines for specifiers and purchasers of recycled timber (Informative)

When enquiring about or ordering recycled timber products in accordance with this standard, the following particulars should be supplied, where appropriate, preferably in this sequence:–

- (a) The product required e.g. flooring, light decking, furniture stock, lightly loaded decorative members such as pergola beam etc)
- (b) If a milled product, the profile, cover width and thickness
- (c) The grade of product in accordance with this Standard or alternative written agreed grade between purchaser and supplier
- (d) Any special requirements such as moisture content or natural durability and/or preservative treatment where durability is an issue
- (e) Any special requirements in respect of colour or colour matching. (Inspection and agreement of a representative sample is strongly recommended)
- (f) Hole plugging required/not required
- (g) Surface finish (sawn, dressed, brushed, wired etc)
- (h) Lengths (set, multiple, lineal etc)
- (i) Pre-delivery finishing (coatings, sealers, end grain anti split plates etc)
- (j) Packaging requirements (wrapping, blocks, corner strap protection, pack size/weight)
- (k) Place and time of delivery and
- (l) Delivery and on-site storage requirements (e.g. protection from the weather)

Images of recycled decorative timber products (Informative)

D1 Examples of the use of Recycled Feature Grade Timber



D1 Examples of the use of Recycled Feature Grade Timber *continued*



D2 Examples of the use of Recycled Decorative Grade Timber ('Lightly loaded' non-structural timber)



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Timber Queensland Ltd

Durability of New Zealand grown timbers

David Page and Tripti Singh

Data collected over many years and from field sites throughout New Zealand were used to classify the durability of timber from locally grown species. The durability classifications were based on in-ground tests of small stakes. The suitability of individual species for a range of end uses has been measured using a combination of field and 'in-service' tests around the country. These data support the use of naturally durable species as an alternative to preservative treated radiata pine. Suggested uses for the species, their suitability to meet the requirements of NZS 3602 (2003) and likely limitations are discussed.

While the in-ground durability classification provides a useful guide for above-ground uses other factors such as coatings, orientation and exposure to rainfall have a major influence on the durability of components in above-ground situations. Timber from naturally durable species exhibits more variable resistance to decay organisms than that from radiata pine treated commercially with preservatives. We found that the durability classification of some locally grown timbers may be different to that of imported timber of the same species.

There are very few species currently grown in New Zealand that will consistently meet the durability requirements for use as house piles or marine timbers. Hardwoods, particularly eucalyptus species, dominate the list of species suitable for use in moderate-high decay hazard situations such as fence posts and decking where a minimum service life of less than 50 years is required. Timber stability is important in low decay hazard uses such as weatherboards and joinery. Hence softwoods such as cypresses may be preferred for that type of use.

Durability testing

Naturally durable timber is an attractive alternative to replace or minimise the use of toxic chemical-based biocides for wood protection. Testing of the durability of locally grown timber species and their suitability for various uses in buildings has been carried out at Scion for the past 60 years and is ongoing (FRI, 1982, 1997). Originally samples for testing were taken from the general population of individual species, but more recently some selection has started in an effort to find clones with above-average durability.

Classification system

Natural durability rating refers to the timber performance both in contact with the ground and above-ground. Durability in New Zealand is measured using the Australasian natural durability classification

system (AS 5604-2003), which classifies timbers into four durability classes:

- Class 1 – very durable
- Class 2 – durable
- Class 3 – moderately durable
- Class 4 – non-durable.

The benchmark testing system used is ground contact stakes, usually 50 or 20 millimetres square. All species are classified on the basis of the heartwood durability because sapwood, regardless of tree species, is non-durable. The proportion of sapwood in a tree may also influence the suitability of a species for particular end uses. For example, Robinia (*Robinia pseudoacacia*) usually has very little sapwood whereas pine species normally have a high sapwood proportion and heartwood of low to moderate durability. Robinia does not therefore require preservative treatment, but timber from pine species requires it before use in outdoor environments.

Field and in-service tests

In tests conducted by Scion, suitability for various end uses has been measured using a combination of field and in-service tests around the country. These take into account various factors as well as durability such as stability, strength, wear resistance and compatibility with coatings.

Field tests are simulated commodity tests established at Scion field test sites and may include timber from experimental or commercial production. In-service tests involve commercially produced timber components installed in buildings and other structures throughout the country. These field and in-service tests have been used to confirm the suitability of the species for above-ground end uses, as shown in Table 1.

While a particular species may perform well in these tests, other factors such as susceptibility of the growing tree to fungal and insects attack or specific site and establishment requirements could well restrict planting and subsequent utilisation. The list of species tested for durability does not include many timber species grown in this country.

There are many species in parks and small woodlots that are occasionally sawn locally or have yet to become available in commercial quantities. These include *Eucalyptus bosistoana* and some of the other species being grown under the Dryland Forests Initiative – see www.info@nzdfir.org.nz. Many of the indigenous species listed here are now seldom available. Beech species from managed forests and totara from managed woodlots in the far north may be available in small quantities.

Recycled timber from both locally grown and imported species is available sporadically, but when used in exterior situations may be less reliable than freshly cut timber.

Supplies of species other than Douglas fir and radiata pine are often localised and of variable quality. This means that heartwood of a suitable quality for

uses such as joinery, weatherboards and decking is not always available. Territorial authorities may also regard these species as an 'alternative solution' under the building code and require documentation from local tests of strength and durability before they will permit their use.



Far left and above: Field test site located at Whakarewarewa, Scion, Rotorua. Far right: Service test for a locally grown western red cedar building with split shakes on the roof and gable ends

Table 1: In-ground natural durability classification for the heartwood of NZ-grown species (50 mm square stakes)

Class 1 (very durable) >25 years	Class 2 (durable) 15-25 years	Class 3 (moderately durable) 5-15 years	Class 3 (moderately durable) 5-15 years	Class 4 (non-durable) <5 years
Hardwoods	Hardwoods	Hardwoods	Softwoods	Hardwoods
<i>Eucalyptus cladocalyx</i>	<i>E. amygdalina</i>	Black beech ²	Japanese cedar ²	<i>Paulownia elongata</i>
Robinia	<i>E. botryoides</i>	Blackwood ²	Kaikawaka ²	<i>Paulownia tomentosa</i>
	<i>E. cornuta</i>	<i>E. globulus</i> ²	Kauri ²	Poplar
	<i>E. globoidea</i>	<i>E. sieberi</i> ²	Larch ²	Tawa
	<i>E. muelleriana</i>	Gleditsia ²	Lawson cypress ²	Silver wattle
	<i>E. pilularis</i>	Southern rata ²	Lusitanica ²	
Softwoods	<i>E. radiata</i> (p)	<i>E. fastigata</i> ¹	Macrocarpa ²	Softwoods
Silver pine	<i>E. saligna</i>	<i>E. delegatensis</i> ¹	Matai ²	<i>P. nigra</i>
Totara	European oak	<i>E. fraxinoides</i> ¹	Redwood ²	
	Hard beech	<i>E. obliqua</i> ¹	Rimu ²	
	Mountain beech	<i>E. pyrocarpa</i> ¹	Tanekaha ²	
	Red beech	<i>E. viminalis</i> ¹	Western red cedar ²	
	Sweet chestnut	<i>E. regnans</i> ¹	Douglas fir ¹	
		Hinau ¹	Leyland cypress ¹ (p)	
		Mangeao ¹	Miro ¹	
		Pukatea ¹	<i>Pinus contorta</i> ¹	
		Silver beech ¹	<i>P. muricata</i> ¹	
			<i>P. radiata</i> ¹	
			<i>P. strobus</i> ¹	
			<i>P. ponderosa</i> ¹	

¹ Species with durability towards the lower end of the range.

² Species with durability towards the upper end of the range.

(p) Provisional classification, species still in test.

Variability associated with exposure conditions

Ground contact durability is influenced by climate and soil conditions – decay is faster in warmer, moist environments. Hence many of the stake durability tests have been duplicated at several sites around the country and results are combined for durability classification.

In above-ground situations there is usually less of a decay hazard than within-ground, but exposure conditions can vary widely. For example, unshaded north-facing walls are exposed to more temperature variations than south-facing walls. Also exposed decking has wide horizontal surfaces that have the potential to absorb and trap more water than the near-vertical surfaces of weatherboards.

The rule of thumb is that a species placed in Class 3 on the basis of stake test results may have an average life similar to Class 2 stakes when used away from ground contact, but this will depend very much on exposure conditions, as shown in Table 2. Coatings, particularly paint coatings, can have a major influence on durability by preventing wetting of the wood. They can have the reverse effect if not well maintained because water

penetrating through breaks in a coating may remain trapped in the wood, increasing the potential for decay.

Table 2: Expected life (years) of naturally durable timbers based on 50 mm or 20 mm square testing samples

Durability Class	Ground contact stakes		Exposed above ground	
	50 mm	20 mm	50 mm	20 mm
Class 1	> 25	> 10	> 40	> 25
Class 2	15 – 25	6 – 10	20 – 40	15 – 25
Class 3	5 – 15	2 – 6	10 – 20	7 – 15
Class 4	0 – 5	0 – 2	0 – 10	0 – 7

Most Class 3 species are only suitable for use away from ground contact. Species in that durability class are loosely divided into two groups, having a durability towards the top or the bottom of the range. Species towards the top of the range are generally suitable for non-structural exterior uses, but those towards the bottom are only suitable for exterior use where they receive some protection from the weather and are in low decay hazard situations.

Table 3: In-ground stake durability variation for three Class 2 eucalyptus species

Species	Tree 1	Tree 2	Tree 3	Tree 4	Tree 5	Average
<i>E. pilularis</i>	13.3 (5 – 21)	6.6 (3 – 13)	10.9 (3 – 17)	5.7 (1 – 12)	10.4 (5 – 12)	9.9
<i>E. muelleriana</i>	10.7 (6 – 20)	6.2 (2 – 16)	6.6 (2 – 15)	8.2 (3 – 13)	9.4 (4 – 18)	9.2
<i>E. globoidea</i>	12.4 (6 – 20)	14.3 (5 – 24)	12.0 (3 – 32)	9.4 (3 – 18)	14.3 (5 – 21)	9.8

Variability within species

Durability is variable from tree-to-tree of the same species and may be influenced by genetics, growing conditions, climate and wood age, among other factors. An illustration of the type of variation that can be expected within and between species in the same durability class is given in Table 3.

The average life in years for 20 millimetre square heartwood stakes from each tree is shown, with the overall average for the species in this test in the last column. Note that the number of stakes from each tree varied. Figures in parenthesis show the range of durability (in years) for stakes from each tree. For a species to be classified as of Class 2 durability the average life of 20 millimetre square stakes would need to be six to 10 years. The stakes used in this test were all heartwood and were installed in the same plot at the same time. Hence exposure conditions were similar for all groups.

The average life for each species was at the upper end of the range for Class 2 durability, but *E. pilularis* tree 4 was only of Class 3 durability. *E. pilularis* tree 2 and *E. muelleriana* trees 2 and 3 were at the lower end of the Class 2 durability range, whereas three of the *E. pilularis*, one of the *E. muelleriana* and four of the *E. globoidea* trees were of Class 1 durability.

The figures in parenthesis probably best illustrate the variation in durability with some stakes failing after only one or two years. At the other end of the scale, at least one stake from each tree lasted 12 years or more and one *E. globoidea* stake survived for 32 years.

Suitability for various end uses

Regulations require that timber used in building structural situations should have a minimum life of 50 years. Timber used in non-structural situations should have a minimum life of 15 years if used externally and five years if used internally.

Ground contact posts, piles and poles

Very few species, including those in the Class 1 durability range, would consistently have a minimum life of 50 years when used in ground contact situations in New Zealand unless they are of large cross-sectional dimensions (more than 200 millimetres). The Australian Timber Service Life Design Guide indicates

that 200 millimetre diameter Class 1 durability poles would have an expected life of 30 to 45 years in south-eastern Australia, an area where the climatic conditions are similar to those in New Zealand. Hence naturally durable species are now seldom used for house piles or poles unless they are supported on steel brackets away from ground contact.

Fence posts have no regulatory minimum life requirement, but 75 to 100 millimetre thick heartwood posts would be expected to last at least 15 years with an average life of 25 to 30 years. Generally Class 1 and Class 2 species will meet this requirement, although occasional failures of Class 2 species inside 15 years are likely.

Split or round posts from young trees are likely to be less reliable than split or sawn posts from mature trees, and in all cases sapwood on posts is likely to rot away within five to 10 years. Species towards the top of the Class 3 range, such as *macrocarpa*, are often used in ground contact situations. The average life of these is likely to be 15 to 20 years, with early failures occurring in five to 10 years.

Decking and above-ground fence components

These end uses often include moderate-severe decay hazards where timber components are in close contact and in frequently damp situations. The minimum durability requirement for decking is 15 years, but there is no minimum requirement for fence materials. Class 2 species are generally satisfactory for this, although some decay is likely within that time. Thickness may be important because thin (19 millimetre finished thickness) decking of Class 2 species may have an average life of less than 15 years in wetter shaded areas where there is a higher decay hazard.

Class 2 species should be suitable for fence rails and battens, although some decay is likely to develop at rail/post and rail/batten joins in 10 to 15 years. Upper range Class 3 species, such as *macrocarpa*, may be satisfactory as decking in partly protected situations. However occasional failures of individual boards are likely in 10 to 15 years in more exposed situations. Lower range Class 3 species used in these situations, such as Douglas fir, are often unreliable and likely to fail in the five to 15-year timeframe.

Framing for decking is required to have a 50-year minimum life. In situations where it is partly protected

from the weather, framing of Class 2 durability may meet this requirement but earlier failures could be expected where the framing is fully exposed to the weather. Class 1 durable species are more reliable in these situations and in other external structures, such as pergolas, if 50-year durability is a minimum requirement.

Weatherboards and exterior finishing timbers

These are usually exposed to relatively low decay hazards and are often partly protected by paint or other building elements such as eaves. Stability and appearance are often more important to the eventual service life of these timbers than the durability of the wood. Note that:

- Species in the upper durability range within Class 3 such as the cypresses, western red cedar and redwood are traditional timbers for this type of end use and are relatively stable. Hence heartwood can be used uncoated or stain-coated where a more rustic or 'natural' appearance is desired
- Species in the lower end of the Class 3 range, such as Douglas fir and larch, are less reliable in damp areas and require protection such as paint. Boards containing sapwood should not be used externally unless completely protected from the weather.

External windows and doors

These are usually exposed to low or moderate decay hazards and are commonly protected by paint coatings. Stability and durability are equally important. Hence species such as imported western red cedar and redwood have often been used for this purpose. Species in the upper section of Class 3, western red cedar, redwood and the cypresses are all suitable for this purpose where timber of a suitable grade is available.

Specialty uses

- **Marine piles** – timber immersed in saltwater is subject to damage from a variety of marine boring organisms and no locally grown species have shown prolonged resistance to them (Carr, 1953). There are reports of totara and silver pine having a life of more than 10 years in areas where marine borers are less active. Specially preservative treated (Treatment hazard class H6) and a few naturally resistant imported species, for example turpentine (*Syncarpia glomifolia*) from Australia and greenheart (*Ocotea rodiaei*) from tropical America, are the only suitable species for this use.
- **Freshwater timbers** – timber immersed in freshwater usually reaches a moisture content above that at which most decay fungi will attack it. For this reason, sunken logs of non-durable species have remained sound for many years in lakes and rivers. The heartwood of Class 1 and 2 durable species is adequate for most freshwater situations. The section out of the water remains vulnerable to damage by decay fungi. Structural components therefore probably require Class 1

durability if a 50-year life is required and non-structural components Class 2 durability to meet a 15-year minimum requirement.

- **Roof shingles and shakes** – the local traditional species for wooden roof shingles and shakes were totara, kaikawaka and kauri (they were largely replaced by imported western red cedar and Alaskan yellow cedar shingles). Locally grown western red cedar and some of the more durable eucalyptus species, for example *E. saligna*, have been tested as shingles but are less durable and not as stable as the imported species. Quarter-sawn heartwood of locally grown cypresses gave slightly better results, and would probably meet the minimum durability requirement of 15 years on steeper pitched roofs when combined with a well-designed installation system.

Conclusion

Classification and predication of in-service performances of naturally durable timber is much more difficult than preservative treated timber due to the variability of wood properties within and between trees of the same species and the variable nature of the hazard to which the timber will be exposed. A combination of field test and in-service testing has been used to classify the suitability of locally grown timber for various end-uses and to show that they are a suitable substitute for preservative treated timber.

Acknowledgements

This is an update of earlier *What's New in Forest Research* FRI Bulletins 112 (1982) and 245 (1997). It is based on data collected by Jackie van-der Waals, Ian Simpson and many earlier members of the Scion Wood Preservation Group.

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- Dave Page is Technical Officer and Tripti Singh is Scientist/Project Leader (Bioactives and Wood Preservation) at Scion in Rotorua.*

Modelling wood processing options for New Zealand: Economic impact analysis

Luke Barry and Peter Hall

Abstract

A national-level financial model was used in the WoodScape study to analyse the potential of a range of traditional and emerging wood processing technologies. The model inputs industry sourced techno-economic data on wood processing options and macroeconomic impacts from across New Zealand and, where necessary, the rest of the world to assess the increase in GDP, employment and export earnings from processing wood harvested in this country. This identified a number of traditional and emerging technologies, which offer potentially significant increases for both the individual firm and the wider economy. The WoodScape modelling shows that GDP could increase by almost NZ\$1.1 billion per annum, almost 4,500 extra jobs could be created, and export earnings could rise by an estimated NZ\$2 billion. This was estimated by applying a conservative average increase in GDP, employment and export earnings across WoodScape technologies from onshore processing of an extra 11 million cubic metres of typically exported logs. Increased wood processing has an important role in New Zealand's economic growth. The WoodScape study found that most wood processing options can make a significant contribution to GDP. A number of the options also look attractive for investment based on their return on capital (>20 per cent), cash flow and the market opportunity for their products. Several wood processing options show a labour productivity greater than \$200 per hour of employment, comparable to the highest performing sectors of the economy.

Background

The economic impacts reported here were developed from the WoodScape study. WoodScape (2012) looked at a wide range of wood processing options to determine those that would be likely to perform well in New Zealand based on the operating conditions at the time of the study (2012). An important measure of performance was return on capital employed (ROCE). A summary of the ROCE results from the model used in the study is presented in Figure 1.

This data shows a range of technologies that have ROCE results above 10 per cent. There is a trend for larger-scale operations to perform better than the same technology at a smaller scale. There are a number of engineered wood product, and fuel and chemical, options that look promising although some are not developed to full commercial operations yet.

The ROCE results are highly sensitive to foreign exchange fluctuations as well as product and feedstock price changes. The primary resource considered was the logs which are currently being exported (A and K grade). Additional processing capacity is assumed to be targeted at the export market as the domestic market is largely saturated and cannot absorb the volume of product that could be generated by the development of processing on a scale that could take a substantial proportion of the 2012 export log volume (~13.0 million cubic metres per annum). The export log volume has risen since the original study/report was published and is now ~16 million cubic metres per annum.

The log export market is a crucial outlet for domestic log supply surplus, but the wood processing sector also

has the potential to add significant value to each log harvested. More onshore processing, starting with the initial increases in production and employment from this, will have a multiplicative effect throughout the economy. The purpose of this paper is to quantify and discuss the macroeconomic contribution resulting from increased wood processing across a range of wood processing options.

The scale of the opportunity is significant as New Zealand exported around 50 per cent (~13 million cubic metres per annum) of its ~26.5 million cubic metres per annum log harvest in 2012. Increased onshore processing of this log supply is an important part of the Woodco Strategic Action Plan (SAP). The plan states its goal is to increase export earnings from forestry and wood processing to \$12 billion per annum by 2022, up from its current \$5 billion. These figures for gross export earnings should not be confused with GDP figures, this being a lower figure as it is based on the value added by profitable processing and not the gross income from any processing.

Macroeconomic multipliers

A macroeconomic impact or effect refers to changes in economic activity in relation to a change in gross output. A macroeconomic multiplier is the ratio of the sum of impacts, for example direct plus indirect, to the direct impact. The effects of an increase in wood processing production in New Zealand are multiple and are generally broken down into three categories:

- **Direct** – additional domestic manufacturing, perhaps as a result of a sustained increase in offshore demand, requires manufacturers to purchase more

Timber is an organic material with a wide variety of physical and mechanical properties. It is important that a timber species is selected which has the properties suitable for its intended use.

The information should be used as a guide only as there can be significant variation within a species.

Plantation grown hardwoods which are becoming more readily available may also have different properties.

This data sheet includes a schedule of the most common timber species available in Australia. Where a species group has been included, the properties scheduled are based on that of the lowest rated species in the group.

For a more comprehensive list of timber species, properties and acceptable uses, refer to Construction Timbers in Queensland (CTIQ) www.daff.qld.gov.au.

STANDARD NAME AND BOTANICAL NAME

The names listed in the schedule are those generally defined in AS1148-2001, TIMBER-NOMENCLATURE-AUSTRALIAN, NEW ZEALAND AND IMPORTED SPECIES. However some botanical names have been changed to reflect recent botanical classification changes. Some species may be known by other names in some regions.

STRENGTH GROUP

Strength Groups are groupings of species with similar properties (e.g. density, strength and modulus of elasticity) in accordance with AS 2878, TIMBERS - CLASSIFICATION INTO STRENGTH GROUPS.

The schedule lists the strength groups **S1** (highest) through to **S7** (lowest) for unseasoned timber, and **SD1** (highest) through to **SD7** (lowest) for seasoned timber.

Visual stress grading of structural members utilise the strength group of the species modified by the strength reducing characteristics (knots, sloping grain etc.) of the particular member.

JOINT GROUP

The joint group is a classification of species for joint design, based primarily on density. **J1** (unseasoned) and **JD1** (seasoned) species have the highest joint strength properties and **J6** (unseasoned) **JD6** (seasoned) the lowest.

DENSITY

Density is listed in the schedule for unseasoned (U/S) and seasoned (S) timber. The seasoned density is based on a moisture content of 12%. The unseasoned density is very approximate as it will depend on the moisture content at the time of measurement. It has been provided only as a guide to determine the self weight of an unseasoned member.

HARDNESS

Hardness is a measure of a species resistance to indentation, wear or abrasion. It also gives an indication of the difficulty of sawing and planing. It is measured in kN and is determined by the Janka hardness test (the higher the number, the greater hardness).

TOUGHNESS

Toughness is a measure of timbers ability to resist shocks and blows, and is synonymous with impact strength. For the purpose of this schedule, the simplified classifications **L** (low), **M** (medium) and **H** (high) have been adopted.

Specific toughness classifications (Nm) are scheduled in AS 1720.2, SAA TIMBER STRUCTURES CODE PART 2: TIMBER PROPERTIES.

MOISTURE CONTENT

"Green" timber (when it is freshly sawn) has a very high moisture content. Timber will dry down to the "equilibrium moisture content" of the surrounding environment.

Moisture content influences strength properties, stiffness, hardness, abrasion resistance, machining properties, thermal conductivity, dimensional stability, resistance to decay and nail holding ability.

Moisture content is expressed as a percentage of the weight of water over the oven-dry weight of the wood. For the purpose of this schedule, "Seasoned" timber means having a moisture content of 12%.

SHRINKAGE

As timber dries, it shrinks. Shrinkage is the percentage reduction in dimension from 'green' (above 25%) to 12% moisture content.

The schedule provides the shrinkage values for the tangential direction. Radial shrinkage is approximately half the tangential. Longitudinal shrinkage in most species is much lower and generally is between 0.1% and 0.3%. However, the effect of grain distortion and reaction wood, such as around knots, can sometimes result in noticeable longitudinal shrinkage.



Tangential

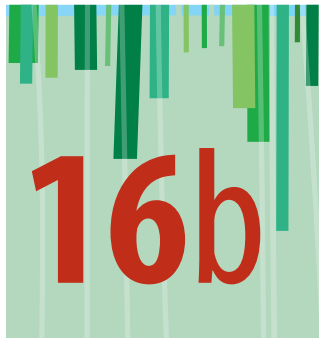


Radial



TECHNICAL DATA SHEET
ISSUED BY TIMBER QUEENSLAND

SPECIES, PROPERTIES AND USES
SPECIES TABLES



RECOMMENDED PRACTICE // MARCH 2014

To be read in conjunction with TDS 16a

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15														
Standard Trade Name	Botanical Name	Strength Group		Joint Group		Density (kg/m ³)		Hardness (Seasoned kN)	Toughness	Tangential Shrinkage %	#Durability Class (*Termite Resistant)	Lyctid Susceptibility	Bushfire Rated	Colour														
		Unseasoned	Seasoned	Unseasoned	Seasoned	Unseasoned	Seasoned								Unseasoned	Seasoned												
		Unseasoned	Seasoned	Unseasoned	Seasoned	Unseasoned	Seasoned	Unseasoned	Seasoned	Unseasoned	Seasoned	Unseasoned	Seasoned	Unseasoned	Seasoned													
ash, alpine	Eucalyptus delegatensis	S4	SD4	J3	JD3	1050	650	5.0	M	M	8.5	0.35	4/3	S	-	-	0	0	-	0	0	-	0	-	0	R	Availability varies region by region	
ash, crows	Flindersia australis	S2	SD3	J1	JD1	1050	950	11.0	M	M	4.2	-	1/1	S	-	-	0	0	-	0	-	0	-	0	-	0	L	
ash, mountain	Eucalyptus regnans	S4	S	J3	JD3	1050	650	4.9	M	M	13.3	0.36	4/3	NS	-	-	0	0	-	0	-	0	-	0	-	0	R	
ash, silvertop	Eucalyptus sieberi	S3	SD3	J2	JD2	1100	850	9.8	M	M	10.6	0.36	3/2	NS	✓	W-P	-	0	-	0	-	0	-	0	-	0	L	
batai, yellow (selangan batu)	Shorea spp.	S2	SD3	J2	JD2	1150	900	-	-	-	7.0	-	2/1	S	-	R	-	0	0	0	0	0	0	0	0	-	R	
bangkirai	Shorea laevifolia	S3	SD3	-	-	1050	850	-	-	-	5.0	-	2/2	S	-	W	-	0	0	0	0	0	0	0	0	-	L	
belian (ulin)	Eusideroxylon zwageri	S1	SD1	-	-	1300	1000	13.0 -	-	-	4.5	-	1/1	NS	-	B	-	0	0	0	0	0	0	0	0	-	L	
beech, myrtle	Nothofagus cunninghamii	S4	SD5	J3	JD3	1100	700	5.9	-	-	4.7	0.32	4/3	NS	-	P	-	0	0	0	0	0	0	0	0	-	L	
bloodwood, red	Corymbia intermedia	S3	SD3	-	-	1150	900	8.8	-	-	4.0	-	1*/1	S	-	R	0	-	0	0	0	0	0	0	0	-	L	
blackbutt	Eucalyptus pilularis	S2	SD2	J2	JD2	1150	900	8.9	M	M	7.3	0.37	2*/1	NS	✓	W	-	0	0	0	0	0	0	0	0	-	R	
blackbutt, New England	Eucalyptus andrewsii	S3	SD3	J3	JD3	1150	850	9.2	M	M	11.4	0.36	2*/2	S	-	W	-	0	0	0	0	0	0	0	0	-	R	
blackbutt, W.A.	Eucalyptus patens	S4	SD5	J2	JD2	1100	850	6.9	L	L	10.0	-	2/1	S	-	B	-	0	0	0	0	0	0	0	0	-	L	
blackwood	Acacia melanoxylon	S4	SD4	J3	JD3	1050	650	4.9	-	-	3.9	0.27	3/-	S	-	B	-	0	0	0	0	0	0	0	0	-	R	
box, brush	Lophostemon confertus	S3	SD3	J2	JD2	1100	900	9.1	M	M	9.7	0.38	3*/3	NS	-	B	-	0	0	0	0	0	0	0	0	-	L	
box, grey coast	Eucalyptus bosistoana	S1	SD1	J1	JD1	1200	1100	13.1	H	H	8.2	0.42	1*/1	S	-	W	0	-	0	0	0	0	0	0	0	-	R	
brownbarrell	Eucalyptus fastigata	S4	SD4	J3	JD3	1100	750	5.5	M	M	11.8	0.34	4/3	S	-	W	-	0	0	0	0	0	0	0	0	-	L	
calantas (kalantas)	Toona calantas	S6	SD7	-	JD4	-	500	-	L	L	7.0	-	2/1	S	-	R	-	0	0	0	0	0	0	0	0	-	R	
candlebark	Eucalyptus rubida	S5	SD5	J3	JD3	1100	750	5.9	M	M	12.2	0.34	3/3	S	-	P	-	0	0	0	0	0	0	0	0	-	L	
cedar, western red	Thuja plicata	S7	SD8	-	JD6	-	350	-	L	L	3.0	-	3*/2	NS	-	W-B	-	0	0	0	0	0	0	0	0	-	R	
cypress	Callitris glaucophylla	S5	SD6	J3	JD3	850	700	6.1	L	L	2.5	0.26	2*/1	NS	-	WB	-	0	0	0	0	0	0	0	0	-	R	
fir, Douglas (oregon)	Pseudotsuga menziesii	S5	SD5	J4	JD4	710	550	3.0	L	L	4.0	-	4/4	NS	-	W	-	0	0	0	0	0	0	0	0	-	R	
gum, blue southern	Eucalyptus globulus	S3	SD3	J2	JD2	1150	1000	11.5	M	M	7.7	0.40	3/2	S	-	W	-	0	0	0	0	0	0	0	0	-	R	
gum, blue Sydney	Eucalyptus saligna	S3	SD3	J2	JD2	1100	850	8.1	M	M	9.5	0.35	3/2	S	-	P	-	0	0	0	0	0	0	0	0	-	R	
gum, grey	Eucalyptus propinqua	S1	SD2	J1	JD1	1250	1050	14.0	M	M	7.0	-	1/1	NS	-	R	0	0	0	0	0	0	0	0	0	-	R	
gum, grey mountain	Eucalyptus cycellocarpa	S3	SD2	J2	JD2	1100	900	10.3	M	M	11.9	0.39	3/2	S	-	P	-	0	0	0	0	0	0	0	0	-	R	
gum, mamba	Eucalyptus viminalis	S4	SD4	J3	JD3	1100	800	5.8	M	M	12.0	0.34	4/3	S	-	P	-	0	0	0	0	0	0	0	0	-	R	
gum, mountain	Eucalyptus dalympleana	S4	SD5	J3	JD3	1100	700	5.7	M	M	11.5	0.35	4/3	S	-	P	-	0	0	0	0	0	0	0	0	-	L	
gum, red, forest	Eucalyptus tereticornis	S3	SD4	J1	JD1	1150	1000	11.3	M	M	8.6	0.34	1*/1	NS	-	R	0	0	0	0	0	0	0	0	0	-	R	

Durability Class - Inground/above ground

% Unit Tangential Movement (UTM)

Percentage (%) unit tangential movement is the percentage dimensional change for each 1% moisture content change (between 25% and 3% moisture content).

Movement = U.T.M. x (% change in moisture content) x (board width ÷ 100)

DURABILITY

Durability of timber is the ability to perform its task for a required period of time. This means its performance when exposed to hazards such as decay (fungi) and insects (termites and borers).

Timber species have different natural durability characteristics. Species are given a durability classification based upon their expected service life in the ground or outside above the ground when exposed to hazards.

Class	Rating	Expected Service Life (yrs)	
		In Ground	Outside above Ground
1	High	>25	>40
2	Reasonably High	15-25	15 to 40
3	Moderate	5-15	7 to 15
4	Low	<5	<7

The durability classifications apply to the heartwood (true wood) of a species. The sapwood of all timber, irrespective of species, is not durable and can be regarded as durability Class 4.

The sapwood of most species can be made durable by impregnation with chemicals.

Note: Only the sapwood of timber can be impregnated and therefore treatment will not change the natural durability of the true wood (heartwood) of a species.

Species marked '*' are termite resistant in accordance with AS 3660.1

LYCTID SUSCEPTIBILITY

The susceptibility of the sapwood of individual hardwood species to attack by lyctid borers is classified as follows:

S = Susceptible

NS = Not Susceptible

It is recommended that timber containing lyctid susceptible sapwood be treated to a min H1 level in accordance with AS1604.

FIRE HAZARD PROPERTIES

For interior flooring and lining in Class 2 to 9 Buildings, the Building Code of Australia (BCA) has specific requirements. Refer to TDS 30.

BUSHFIRE RATED

✓ indicates that untreated timber of this species is rated as a 'bushfire resisting timber' in accordance with AS3959 - Construction of Buildings in Bushfire Prone Areas.

COLOUR

The colour of seasoned heartwood can vary between species and often within a species. In most cases, the colour of sapwood is either a lighter shade of the heartwood or a white/cream colour. The information in the schedule should be used as a general guide only.

W = white, yellow, pale straw to light brown

P = pink, to pink brown

R = light to dark red

B = brown, chocolate, mottled or streaky.

COMMON USES

The schedule lists common uses of species but not necessarily all uses for which a species is suitable. The listing does not include uses where an individual species is used in a species mix. It assumes that normal good design, workmanship, finishing and maintenance practices will be followed. To ensure compliance with The Building Code of Australia, refer also to CTIQ which is 'called up' for timber used in Queensland.

The schedule includes:-

- (i) **In Ground:**
Conditions of use include in or on the ground, or in persistently damp or badly ventilated situations, e.g. embedded poles or posts, landscaping timber.
- (ii) **Framing Above Ground - Exposed:**
Conditions of use include framing exposed to the weather, but clear of the ground and well ventilated, e.g. sub-floor framing to decks, verandah posts etc.
- (iii) **Framing Above Ground - Protected:**
Fully protected from the weather and other dampness, and well ventilated e.g. wall framing with weatherproof cladding.
- (iv) **Decking:**
Exposed to weather, clear of the ground and well ventilated, e.g. verandah flooring, boardwalks, wharves.
- (v) **Cladding:**
Exposed to the weather and clear of the ground.
- (vi) **Internal Flooring:**
Fully protected from the weather. Consideration may need to be given to species hardness and toughness relative to the specific application.
- (vii) **Panelling:**
Wall and ceiling linings fully protected from the weather.
- (viii) **External Joinery:**
Exposed to the weather (or not fully protected), e.g. window sills, external door, window frames, handrails, balusters, stairs and newel posts.
- (ix) **Internal Joinery:**
Fully protected from the weather, e.g. door jambs, mouldings, internal staircase material, railings.

Uses are indicated as follows:

O = commonly used

P = commonly used but preservative treated

S = commonly used but should be seasoned.

AVAILABILITY

This schedule provides guidance on availability. This will vary in local areas and with time. Specific advice should be sought from local timber suppliers or Timber Queensland.

R = regular

L = limited.



**TIMBER
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We build Queensland

Timber Queensland Limited

ACN 092 686 756 | ABN 50 092 686 756

500 Brunswick Street, Fortitude Valley
Brisbane Queensland 4006

Phone (07) 3254 1989

Fax (07) 3358 7999

PO Box 2014, Fortitude Valley BC Qld 4006

admin@timberqueensland.com.au

www.timberqueensland.com.au

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GREY IRONBARK



GREY IRONBARK

GREY IRONBARK IS THE PINNACLE OF VERSATILE AUSTRALIAN HARDWOODS.

This versatility has seen it expand into a new, limitless range of applications including cladding, flooring, decking and joinery products as well as feature posts and beams.

With a deep patina, the colour palette of the Grey Ironbark varies from a mahogany like appearance to pale and dark shades of brown and rich reds.

Suitable for high exposure applications due to its exceptional durability and incredible strength. Grey Ironbark is the top choice for exterior exposed applications.

Today Grey Ironbark is also recognised for its rich, warm colouring and stunning patina, revealing its adaptability and suitability as an internal building material.



COMMON NAME	Grey Ironbark
LOOK & FEATURES	Moderately coarse & even texture, heavy, hard & compact
BOTANICAL NAME	Eucalyptus paniculata Eucalyptus siderophloia
COLOUR	Pale through to dark brown with occasional darker reds
COMMON USES	Cladding, flooring and decking, joinery, feature posts and beams, framework

PROPERTIES

DENSITY (KG/M3)	
GD	1250
ADD	1100
HARDNESS KN (JANKA)	
Green	11
Dry	16.3
DURABILITY CLASS	1
STRENGTH GROUP	S1/SD1
JOINT GROUP	J1/JD1
SHRINKAGE	
Radial % (approx.)	4.5
Tangential % (approx)	7.5
STRUCTURAL GRADES	
Unseasoned	F14/F17/F22
Seasoned	F27/F34+
TOUGHNESS (NM)	
Green	High
Dry	High
EARLY FIRE HAZARD INDICES	
Ignitability	13
Spread of Flame	3
Smoke Development	3
TERMITE RESISTANT	(toAS3660) Yes
LYCTID SUSCEPTIBLE SAPWOOD	No

RED IRONBARK



RED IRONBARK

THE STRENGTH AND DURABILITY OF THIS AUSTRALIAN HARDWOOD HAS SEEN IT USED THROUGHOUT THE AGES AS A PREFERRED STRUCTURAL TIMBER.

Red Ironbark is a very strong Australian hardwood that originated from QLD and NSW. Today Red Ironbark is used for all manner of building construction materials from poles to posts and beams and is ideal for hardwearing areas such as flooring and decking. Whilst being quite hard to work with due to its density and hardness it also polishes to a high sheen and as such is frequently used for furniture, benchtops, bars and even in boat-building.

The heartwood is a deep rich dark red to red-brown in colour. The sapwood by contrast is a pale yellow. The timber's texture is fine with an interlocked grain.



COMMON NAME	Red Ironbark
LOOK & FEATURES	Highly durable with a medium and even texture
BOTANICAL NAME	Eucalyptus sideroxyton, Eucalyptus creba fibrosa
COLOUR	The heartwood colour is deep red. Sapwood is very distinctive, being pale yellow in colour
COMMON USES	A wide range of external applications including heavy engineering, marine structures, poles, sleepers, framework, flooring and decking

PROPERTIES

DENSITY (KG/M3)	
GD	1200
ADD	1100
HARDNESS KN (JANKA)	
Green	N/A
Dry	11.9
DURABILITY CLASS	1
STRENGTH GROUP	S2/SD3
JOINT GROUP	J1/JD1
SHRINKAGE	
Radial % (approx.)	3.5
Tangential % (approx.)	7
STRUCTURAL GRADES	
Unseasoned	F11/F14/F17
Seasoned	F22/F27
TOUGHNESS (NM)	
Green	High
Dry	Medium/High
EARLY FIRE HAZARD INDICES	
Ignitability	Not available
Spread of Flame	Not available
Smoke Development	Not available
TERMITE RESISTANT	(toAS3660) Yes
LYCTID SUSCEPTIBLE SAPWOOD	Yes

TALLOWWOOD



TALLOWWOOD

HAS A WIDE VARIETY OF USES HOWEVER PARTICULARLY IMPRESSIVE RESULTS ARE ACHIEVED WHEN FEATURED AS INTERNAL FLOORING/ CLADDING AND/OR EXTERNAL FEATURE TIMBERS.

Other applications include decking, linings, exposed structures, poles, bridge timbers, joinery and outdoor furniture. Tallowwood heartwood is pale to yellowish-brown.

This wood has a fairly coarse texture with an interlocking grain. As the word 'tallow' suggests, the timber of this species feels greasy to the touch. Tallowwood is reasonably easy to work however gluing can be difficult due to the greasy nature of the timber. Tallowwood accepts paint, stain and polish readily and fixing with standard fixings and fasteners presents no problems.

Generally, Tallowwood is an extremely tough and durable Australian timber used widely in external applications such as decking.



COMMON NAME	Tallowwood
LOOK & FEATURES	Fairly close-grained timber, free of gum vein
BOTANICAL NAME	Eucalyptus microcorys
COLOUR	Pale to yellowish-brown
COMMON USES	Decking, flooring, cladding, domestic structures, heavy commercial construction, posts, joinery and outdoor furniture

PROPERTIES

DENSITY (KG/M3)	
GD	1200
ADD	1000
HARDNESS KN (JANKA)	
Green	7.6
Dry	8.6
DURABILITY CLASS	
1	
STRENGTH GROUP	
S2/SD2	
JOINT GROUP	
J1/JD2	
SHRINKAGE	
Radial % (approx.)	4.0
Tangential % (approx.)	6.0
STRUCTURAL GRADES	
Unseasoned	F11/F14/F17
Seasoned	F22/F27
TOUGHNESS (NM)	
Green	Medium
Dry	Medium
EARLY FIRE HAZARD INDICES	
Ignitability	12
Spread of Flame	5
Smoke Development	4
TERMITE RESISTANT	(to AS3660) Yes
LYCTID SUSCEPTIBLE SAPWOOD	Yes

SPOTTED GUM



SPOTTED GUM

IS AN EXTREMELY ADAPTABLE AND NATURALLY STRONG TIMBER WHICH MAKES IT IDEALLY SUITED TO NUMEROUS APPLICATIONS.

Once predominantly used only as a structural timber, considering its natural beauty and sheer strength, it's not surprising Spotted Gum has found favour in many aesthetic, and architectural applications with extremely impressive results.

Due to its significant versatility and durability you will find Spotted Gum used in a wide variety of applications. From building and construction, including structural components, flooring, cladding, and decking through to furniture (indoor and outdoor), landscaping, poles, beams, the list goes on.

Widely used for power poles, bridge timbers and general construction, Spotted Gum is one of the most widely available Kennedy's in Australia today.

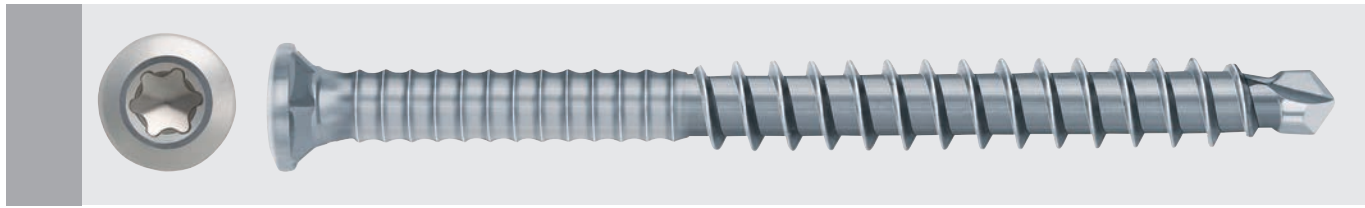


COMMON NAME	Spotted Gum
LOOK & FEATURES	Backsawn grain, Fiddleback, Distinctive sapwood, gum veins
BOTANICAL NAME	Corymbia maculata
COLOUR	Light coffee brown to dark chocolate with some reddish tinges
COMMON USES	Building and construction, structural timbers, flooring, cladding, decking, furniture, landscaping, posts and beams

PROPERTIES

DENSITY (KG/M3)	
GD	1200
ADD	1100
HARDNESS KN (JANKA)	
Green	8.0
Dry	10.1
DURABILITY CLASS	
1	
STRENGTH GROUP	
S1/SD1	
JOINT GROUP	
J1/JD1	
SHRINKAGE	
Radial % (approx.)	4.5
Tangential % (approx.)	6.0
STRUCTURAL GRADES	
Unseasoned	F11/F14/F17
Seasoned	F22/F27
TOUGHNESS (NM)	
Green	High
Dry	High
EARLY FIRE HAZARD INDICES	
Ignitability	13
Spread of Flame	3
Smoke Development	3
TERMITE RESISTANT	(toAS3660) Yes
LYCTID SUSCEPTIBLE SAPWOOD	Yes

ASSY® PLUS A2 Decking Screw



Pre-drilling is recommended for hardwoods*.

Material: A2/304

Small countersunk head with under-head pockets.

- The head can be sunk very easily and cleanly with a small diameter.
- The under-head pockets pick up protruding chips.
- However, with tropical hardwoods, countersinking of the surface is recommended, as the wood has very short chips.

Grooved shaft.

- Provides for additional screw strength as austenitic stainless steel (A2) cannot be hardened. This virtually eliminates the possibility of the screw tearing off.

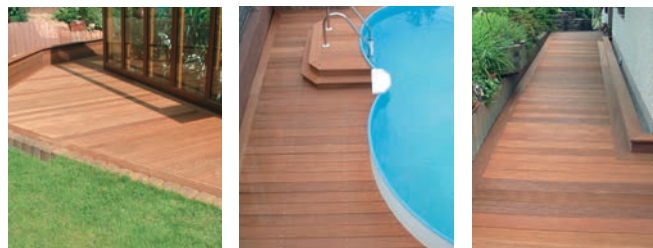
Drilling tip.

- Splitting and tearing of the wood is prevented.

AW drive.

- Excellent snug fit of the bit in the screw drive, which allows the screw to be set very easily.
- Wobbling impacts and sliding of the bit from the screw is prevented when screwing in.

* Screwing on of hardwood decking planks: Preliminary tests are required for hardwoods. Pre-drilling of the wood may be necessary depending on the density and moisture level of the wood. It is recommended that the processing device be operated at a low speed.



The screw for fastening decking boards. Many types of wood can be processed without pre-drilling thanks to the drilling tip.

d mm	L mm	b mm	d _k mm	Drive	A2/304	P. Qty.
					Art. No.	
5.5	50	27	7.5	AW® 20	0166 115 550	250/1,000
	70	37			0166 115 570	250
	90	38	7.7		0166 115 590	100



ETA-11/0190

ASSY® PLUS Antique Decking Screw



For precise fastening of patio boards. Drill tip allows many types of wood to be processed without pre-drilling. The patio screws are made of A2 stainless steel and are colour-matched to the wood look. They are ideally suited for patio and façade construction outdoors.

d mm	L mm	(d _h)	Drive	A2/304	P. Qty.
				Art. No.	
5.5	60	7.7	AW® 20	0166 015 560	250
	70			0166 015 570	250

Introduction

Drilling,
Deburring

Sawing,
Cutting,
Abrasive

Lubricating,
Cleaning,
Maintenance

Sealing,
Bonding,
Painting

Fasteners,
Fittings,
Fixings

Safety,
Protection

Assortments

Hand Tools

High Performance Pre-oiling Technology



Introducing the new Intergrain® Industrial Uni Timber Oil.

Uni Timber Oil is a high performance, oil-based timber finish designed for industrial applications. It can be applied to most timber types, and can be top coated on-site with most water-based or oil-based finishes.

Perfect for home-owners:

- Can be over-coated with most water-based or oil-based decking finishes – no compatibility issues for on-site application
- Deeply penetrating - dries quickly and doesn't feel greasy
- Light pigment offers protection from UV and looks great from day one.

Material Code: 702-W0353-200L

For more information on the entire Intergrain range,
FREECALL 1800 630 285 or visit intergrain.com.au

Intergrain and Ceetec are registered trademarks.

Designed for professionals:

- Engineered for industrial coating machines, such as vacuum containers and Ceetec® machines
- Can also be brushed, rolled or sprayed
- Penetrates fast for easy wet stacking and wrapping
- Available in economical 200L drums.

Intergrain.

TRADE & INDUSTRIAL

Next-generation Timber Coating Machine

ENQUIRE ABOUT
AN ON-SITE
DEMONSTRATION

The Ceetec IPT380 is now available in Australia

- ◆ Machine coating capacity of up to 180 lineal metres per minute
- ◆ Built-in touch screen, standard programs, with adjustable brushes and feed speed
- ◆ Uniform quality and four-sided coverage
- ◆ Easy and quick cleaning with optional automatic washing program



Ceetec timber coating machinery is proudly distributed in Australia and New Zealand by Intergrain® Timber Finishes. Intergrain is a registered trademark.

For more information on Ceetec equipment solutions, contact +61 466 421 400.



Intergrain Universal Timber Oil Matt

AU_DW02675




Description
Intergrain Universal Timber Oil is a high performance solvent based timber oil designed for industrial application. Universal Timber Oil can be applied to any timber type and can be top coated onsite with most water-based or solvent based oils or stains.

Features
<ul style="list-style-type: none"> Lightly pigmented penetrating oil. Combustible, instead of flammable Formulated for industrial applications

Benefits
<ul style="list-style-type: none"> Not classified as a Dangerous Goods. Can be wet stacked Top coat with solvent or water based on site

Uses
As a pre-coat or primer for all exterior timber

Performance Guide			
Weather	Good	Salt	Unaffected by splash and spillage
Water	Good	Abrasion	Good

Typical Properties			
Gloss Level	Matt	Thinner	White Spirit
Components	1	Number Of Coats	1
V.O.C. Level	<605 g/l		
Clean Up	Other: White Spirit To avoid spontaneous combustion of contaminated application cloths, soak application cloths in water or immediately spread used application cloths flat in a cool, well ventilated area to dry completely before disposal. Do not scrunch up or place cloths on top of each other		
Application Method	 Brush  Roller  Pad	Other: Vacuum Coater, Brushing Machine	
Application Conditions	Solids By Volume 24 Wet Film Per Coat (microns) Dry Film Per Coat (microns) Recoat Time (min) Theoretical Spread Rate (m²/L)	Min Max	Recommended 24 hours 16
Typical Properties Notes	COVERAGE Application rate is dependent on application method and porosity of the timber DRYING TIME Drying times are given at 25°C and 50% relative humidity. Lower temperatures or higher humidity can lead to extended drying times.		

Application Guide	
Surface Preparation	<ul style="list-style-type: none"> Ensure substrate is clean, dry and free from dirt, dust, grease and grime.

Health And Safety			
MSDS Number	DLXGHCEN003500	Using Safety Precautions	May cause an allergic skin reaction. May cause drowsiness or dizziness. Keep out of reach of children. Read label before use. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Avoid breathing dust, fume, gas, mist, vapours or spray.. Use only outdoors or in a well-ventilated area. Contaminated work clothing should not be allowed out of the workplace. Wear protective clothing, gloves, eye/face protection and suitable respirator..
Health Effects	FIRST AID: If poisoning occurs, contact a Doctor or Poisons Information Centre (Phone Australia 131 126; New Zealand 0800 764 766). If medical advice is needed, have product container or label at hand. SWALLOWED: If swallowed, do NOT induce vomiting. Give a glass of water. Seek medical advice. EYE: If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor. SKIN: If skin contact occurs, remove contaminated clothing and wash skin thoroughly. If irritation occurs seek medical advice. INHALED: Remove from contaminated area. Apply artificial respiration if not breathing. Seek medical advice.	Flammability	Combustible liquid.
Fire Suppression	If material is involved in a fire use water fog (or if unavailable fine water spray), alcohol resistant foam, standard foam, dry agent (carbon dioxide, dry chemical powder).	Protective Equipment	Wear protective clothing, gloves, eye/face protection and suitable respirator.
Storage	Keep out of reach of children.	Disposal	Refer to State/Territory Land Waste Management Authority for disposal
Other	Emergency Tel: Australia – 1800 033 111 New Zealand – 0800 734 607		
In the case of emergency, please call 1800 033 111			

Transport And Storage	
Pack A	702W0353
Size 200	Weight 180
Flash Point	>60C

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