MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

Determination 2015/079

Regarding the code-compliance of CCA treated laminated veneer lumber

Summary

This determination discusses the pathway to establishing compliance with Clause B2.3.1 for laminated veneer lumber CCA treated in accordance with AS1604.4:2012 and used as structural framing members in situations where hazard class H3.2 or less would be used.

1. The matter to be determined

1.1 This is a determination under Part 3 Subpart 1 of the *Building Act 2004*[1] ("the Act") made under due authorisation by me, John Gardiner, Manager Determinations and Assurance, Ministry of Business, Innovation and Employment ("the Ministry"), for and on behalf of the Chief Executive of the Ministry.

1.2 The party who applied for the determination, M Brown, is a licensed building practitioner ("the applicant"), acting through a building consultant for this determination ("the agent").

1.3 I consider the Manufacturer, Juken New Zealand Ltd ("the manufacturer"), is a person with an interest in the matter.

1.4 The applicant has applied for a determination on whether CCA treated laminated veneer lumber ("LVL") as supplied by the manufacturer is suitable for use as structural framing members in situations where hazard class H3.22 or less would be used. The application is not in respect of building work at a particular site or situation, but considers the LVL as supplied by the manufacturer, and with the following parameters (refer paragraph 2.4):

- The LVL is manufactured in accordance with AS/NZS 4357:2005[3].
- The LVL is CCA treated in accordance with AS1604.4:2012[4] to H3.
- The LVL is used as structural framing in situations where H3.2 is specified

1.5 I therefore take the view that the matter for determination under section 177(1)(a) of the Act is whether LVL supplied by the manufacturer, when manufactured and treated as described above, would comply with Clause B2.3.1(a) of the Building Code (First Schedule, Building Regulations 1992) when used as structural framing in situations where H3.2 or less is specified.

[1] The Building Act, Building Code, compliance documents, past determinations and guidance documents issued by the Ministry are all available at www.building.govt.nz or by contacting the Ministry on 0800 242 243.
[2] Hazard Class H3.2 as described in NZS3640:2003 Chemical preservation of round and sawn timber (Refer appendix
[3] AS/NZS 4357.0:2005 Structural laminated veneer lumber - Specifications
[4] AS/NZS 1604.4:2012 Specification for preservative treatment – Part 4: Laminated veneer lumber (LVL)

1.6 In this determination, I will refer to the following legislation and Standards, the relevant parts of which are set out in Appendix A.

- The *Building Act 2004* with its sections referred to as sections of the Act.
- Building Code Clause B2 Durability, specifically B2.3.1(a).
- Acceptable Solution B2/AS1 for New Zealand Building Code Clause B2
- Standards:
  - NZS 3640:2003 Chemical preservation of round and sawn timber[5]
  - NZS 3602:2003 Timber and wood-based products for use in building[6]
  - AS/NZS 1604.4:2012 Specification for preservative treatment Part 4: Laminated veneer lumber (LVL)

1.7 Limitations on this determination

1.7.1 It is important to note that the validity of this determination remains as long as the conditions in paragraph 1.4 of this determination are maintained, in particular the version of the relevant Standards referred to.

1.8 In making my decision, I have considered the submissions of the applicant and the other evidence in this matter. I have not considered any other aspects of the Act or of the Building Code.

2. The background

2.1 On 12 August 2015 the applicant wrote to the manufacturer, noting that the manufacturer had ceased production of a proprietary 'H3' LVL framing timber 'because standards no longer require it'.

2.2 On 13 August 2015 the manufacturer emailed the agent, questioning

> If we were to treat [the LVL framing timber] using CCA to H3 in accordance with AS/NZS 1604 could it be used for the type of work [the applicant] is describing if said work was in accordance with the Building Code?

2.3 An application for determination was received on 14 September 2015. On 1 October 2015 I requested the applicant clarify where the timber was intended to be used, and the durability of the glue lines/joints.

2.4 The agent responded by email on 1 and 6 October 2015 (in summary):

- The LVL timber is intended to be used as structural framing and structural members and is intended for use in circumstances described by Hazard Class 3.2 (NZS 3640:2003)
- The product is manufactured in accordance with AS/NZS 4357; this standard requires treatment be in accordance with AS 1604.4 and glue must conform to AS/NZS 2754.1 (Int):2008[7]. The adhesive used meets the requirements for Bond Type A of that standard.

[5] As modified by paragraph 3.2.3 of B2/AS1
[6] Part 1 as modified by paragraph 3.2.2 of B2/AS1
[7] AS/NZS 2754.1(Int):2008 Adhesives for timber and timber products – Adhesives for manufacture of plywood and laminated veneer lumber

3. The submissions

3.1 In a covering letter to the application, the agent set out the matter to be considered as

> … whether LVL timber (Radiata Pine) manufactured … in accordance with AS/NZS 4357:2005 and treated in accordance with AS 1604:4:2012 to H3, using CCA treatment protocol, complies with B2.3.1(a) where hazard class H3.2 or less applies.

3.2 The agent had carried out an analysis of NZS 3640 treatment protocol CCA to H3.2 and AS/NZS 1604 treatment protocol CCA to H3, and concluded that:

- The definition of H3 and H3.2 are equivalent
- This suggests that the durability performance requirements will be the same
- The penetration determination method relies on the same standard
- Minimum preservation retention value is effectively the same
- The proportion of components is the same
- The requirement for preservative retention in heartwood is less in NZS 3640 (evidence of) than AS/NZS 1604 (0.38 unbroken envelope and evidence in "core").
- The requirement for preservative retention in sapwood in AS/NZS 1604 is based on a penetration zone defined by dimensions of the product (unbroken envelope). In NZS 3640 the penetration zone is defined by the location and occurrence of sapwood.

3.3 The applicant provided copies of:

- correspondence from the applicant to the manufacturer regarding use of LVL timber, and from the manufacturer to the agent
- a table setting out the agent's comparative analysis of characteristics between H3 and H3.2
- AS/NZS 1604.4:2012
- NZS 3640:2003
- BRANZ appraisal No. 646 (2014).

3.4 A draft determination was issued to the applicant and the manufacturer on 6 November 2015.

3.5 The agent responded on 9 November 2015, accepting the draft determination and acknowledging the limitations set out in paragraph 1.7.

3.6 The manufacturer responded on 11 November, also noting the limitations and noting 'there are no aspects of the draft that [the manufacturer] takes issue with'.

4. Discussion

4.1 The legislation

4.1.1 The relevant clause of the Building Code is B2.3.1(a), which sets the performance requirements that building elements providing structural stability must comply with.

> **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:
>
> (a) the life of the building, being not less than 50 years, if:
>
> (i) those building elements (including floors, walls, and fixings) provide structural stability to the building, or

(ii) those building elements are difficult to access or replace, or

(iii) failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.

4.1.2 Section 19 of the Act provides various means as establishing compliance with the Building Code, including but not limited to compliance with the relevant Acceptable Solution (B2/AS1).

4.2 The Acceptable Solution B2/AS1

4.2.1 Paragraph 3.2.1 of the Acceptable Solution B2/AS1 states:

> The following Standards form an Acceptable Solution for B2/AS1 meeting the durability requirements of timber and wood-based building elements,
>
> a) NZS 3602 Part 1 as modified by Paragraph 3.2.2.
>
> b) NZS 3640 as modified by Paragraph 3.2.3.
>
> c) NZS 3604, with reference to NZS 3602 (and NZS 3640), as modified by Paragraph 3.2.1 a) and b) above.

(Refer to appendix B1 for the modifications noted above).

NZS 3604

4.2.2 NZS 3604 provides for LVL to be used, treated as for solid Radiata pine in accordance with NZS 3602.

> NZS 3604:
>
> 2.3.9.4 The preservative treatment for engineered wood products shall comply with NZS 3602 provided however that where engineered wood products are not already specified, the level of treatment shall be the same as that required for kiln-dried Radiata pine structural grades to comply with NZS 3602.

4.2.3 This would of course be limited to the scope of NZS 3604 buildings and the situations where H3.2 is specified for use in that standard, which does not fully address the scope sought by the applicant.

NZS 3602

4.2.4 B2/AS1 provides for the use of NZS 3602, as modified by the Acceptable Solution, as a means of establishing compliance.

4.2.5 The comment to paragraph 3.2.1 of B2/AS1 states:

> The use of different timbers or timber treatments to those referred to in NZS 3602 are outside the scope of this Acceptable Solution. Where the use of a different timber or timber treatment is proposed, it shall be separately assessed for compliance with the Building Code. For example, if imported hard-wood is to be used to surface a deck, evidence that the timber was durable for a minimum of 15 years in the expected exposure conditions is required.

4.2.6 The LVL considered in this determination is manufactured from Radiata Pine veneers glued together using phenol formaldehyde resin. The timber species falls within the scope of NZS 3602.

4.2.7 NZS 3602 identifies common situations in buildings where biological hazard exists and the timber treatments for specified species, and in some cases engineered wood products, to mitigate those risks.

> 104 Timber species, grade, quality and preservative treatment
>
> 104.4 Engineered wood products (EWP), including glue laminated timber:

> 104.4.1 Tables 1 and 2 require preservative treatment of a particular species and quality of timber used in EWP or laminated timber component. [refer paragraph 4.3.7 below for table 1]
>
> 104.4.3 Manufacture of laminated veneer lumber shall be in accordance with AS/NZS 4357.
>
> 105 Preservative Treatment
>
> 105.1 Timber and wood-based products which use those species of wood which table 1, table 2 and table 3 require to be treated shall be clearly identified in accordance with NZS 3640. … Where required, laminated veneer lumber shall be treated and branded to the requirements of AS/NZS 1604.4

4.2.8 With the manufacture of the LVL in accordance with AS/NZS 4357, the question of durability turns on the preservative treatment. Paragraph 105.1 of NZS 3602 requires LVL be treated to the requirements of AS/NZS 1604.4:2012.

AS/NZS 1604.4

4.2.9 AS/NZS 1604.4 sets out product requirements for LVL, including that it shall have an appropriate bond type. Bond type A, which the agent has stated is used by the manufacturer, is suitable for hazard classes H1 to H5 as described in AS/NZS 1604.4 (refer appendix B2.3, table 1.1).

4.2.10 Paragraph 1.9 of AS/NZS 1604.4. 'Use in New Zealand' states

> Laminated veneer lumber (LVL) treated for hazard class H3 of this Standard shall be considered as having been treated to either hazard class H3.1 or hazard class H3.2, as specified in NZS 3640, with retention in the penetration zone in accordance with this Standard and retention and penetration in heartwood and sapwood in accordance with NZS 3640. Characteristic values, as defined in NZS 3640, shall apply to both penetration and retention.

4.2.11 This establishes that LVL treated to H3 as set out in AS/NZS 1604 will be considered as having been treated to either H3.1 or H3.2 as set out in NZS 3640. (I note here that as 6.3.1 of NZS 3640 only addresses 'round, part round, or sawn timber': LVL would in any case fall outside the scope of that Standard). It follows then that it is the penetration and retention requirements set out in AS/NZS 1604 that are to be met.

4.2.12 I therefore conclude that the LVL that is subject to this determination which is manufactured in accordance with AS/NZS 4357:2005 and CCA treated in accordance with AS1604.4:20128 to H3, when used as structural framing in situations where H3.2 is specified will comply with Clause B2.3.1(a) as an Acceptable Solution under B2/AS1.

4.2.13 However, if I am wrong in this conclusion I have also considered whether the LVL would comply as an alternative solution.

4.2.14 The agent for the applicant provided a table comparing the characteristics between H3 (AS/NZS 1604.4) and H3.2 (NZS 3640) – see Appendix C. I am of the view that the comparative analysis provides a suitable basis on which to consider compliance as an alternative solution. I also agree with the agent's summary (refer paragraph 3.2), in that:

- AS/NZS 1604.4, paragraph 9 sets out H3.2 NZS 3604 as an equivalent measure for CCA treatment of LVL
- the performance requirements between these two standards is the same

[8] AS/NZS 1604.4:2012 Specification for preservative treatment – Part 4: Laminated veneer lumber (LVL)

- both AS/NZS 1604.4 and NZS 3604 refer to AS/NZS 1605 for determining penetration
- there is a negligible difference between the minimum preservation retention value (with AS/NZS 1604.4 being slightly higher)
- the proportion of CCA components is the same.

5. The decision

5.1 In accordance with section 188 of the Building Act 2004, subject to the limitations described in paragraph 1.7.1 of this determination, I hereby determine that the LVL supplied by the manufacturer, when manufactured and treated as described in paragraph 1.4 of this determination, complies with Clause B2.3.1 of the Building Code for use as structural framing in situations where H3.2 or less is specified.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 1 December 2015.

John Gardiner
Manager Determinations and Assurance

Appendix A: The legislation

A1. The relevant sections of the Act:

> **19 How compliance with building code is established**
>
> (1) A building consent authority must accept any or all of the following as establishing compliance with the building code:
>
> (a) compliance with regulations referred to in section 20:
>
> (b) compliance with an acceptable solution:
>
> (ba) compliance with a verification method:

A2. Clause B2.3.1 of the Building Code:

> **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:
>
> (a) the life of the building, being not less than 50 years, if:
>
> (i) those building elements (including floors, walls, and fixings) provide structural stability to the building, or
>
> (ii) those building elements are difficult to access or replace, or
>
> (iii) failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.

Appendix B: The Acceptable Solution and Standards

B.1 Relevant paragraphs of Acceptable Solution B2/AS1 referred to in this determination:

3.2.2 Modification to NZS 3602

3.2.2.1 Level of treatment references to Radiata pine and Douglas fir solid timber in Table 1 categories 'C', 'D' and 'E' and Table 2 category 'B' shall be replaced by Tables 1A and 2A below. Table 1A and Table 2A are to be read with NZS 3602 sections 108 to 111 inclusive, with the amendments in Paragraph 3.2.2.3 below.

Other references to Radiata pine, Douglas fir solid timber and engineered wood products in NZS 3602, including Table 1 categories 'A', & 'B'; Table 2 category 'A'; and Table 3 are unaltered.

Laminated veneer lumber (LVL) treated using LOSP borne azoles as specified for H3.1 in NZS 3640 Table 6.2 satisfies the minimum treatment requirement of H 1.2.

3.2.3 Amendments to NZS 3640.

3.2.3.1 Delete comment C3.1 and replace with the following as normative text:

3.1.1 NZBC clause B2.3.1 refers to minimum durability requirements for building elements. Timber used for structural purposes is required to be durable in-service for the life of the building, being not less than 50 years unless the building has a specified intended life.

This is applicable to hazard classes H1.2, H3.2, H4, H5, and H6. Structural timber refers to timber that has been graded to characteristic strength and stiffness properties.

The minimum requirement for a H1.2 treatment for timber framing is to provide protection in-service but the preservative treatment is not designed for extended exposure to elevated moisture content.

Timber used for non-structural purposes, such as H1.1 and H3.1 is required to be durable in-service for a minimum of 5 years and 15 years respectively.

3.2.3.2 Delete clause 6.3.1.1 and replace with:

6.3.1.1 Complete sapwood penetration shall be achieved.

B.2 Relevant paragraphs of the Standards referred to in this determination:

B2.1 NZS3640:2003

1 Scope and interpretation

1.1 Scope

1.1.2

The requirements for hazard class H1.1 and H1.2 apply to all species for which hazard class H1.1 and H1.2 is specified in NZS 3602. Hazard classes H2, H3.1, H3.2, H4, H5 and H6 apply only to Pinus species.

Some special requirements are also included for softwood Laminated Veneer Lumber (LVL). Refer to AS/NZS 1604 Parts 2 to 5 with the exception of H1.2 treatment for which this Standard will apply.

2 Definitions

HAZARD CLASS. Describes an environment or condition categorized environments or conditions of use where timber is at particular risk of biodegradation by one or more biological agents (e.g. fungi, insects, bacteria or marine organisms).

3.1 Hazard classifications

Hazard class	Exposure	Service conditions	Biological hazard	Typical uses
H3.2	Exposed to the weather, above ground, or protected from the weather but with a risk of moisture entrapment	Periodic wetting, not in contact with the ground, more critical end uses	Decay fungi and borers	All H3.1 uses, plus structural and decking – see NZS 3602

3.2 Selection of timber treatment

NZS3602 sets out the requirements for the level of treatment needed for particular uses of timber. …

3.3 Preservative penetration and retention

3.3.1 *Penetration*

The penetration of the preservative into timber shall be checked using a chemical reagent appropriate to the preservative being tested in accordance with AS/NZS 1605. The preservative shall be found throughout the wood to the required depth.

…

3.3.2 *Retention*

The retention of preservative shall be determined by chemical analysis in accordance with AS/NZS 1605 where available … Alternative analytical methods may be submitted to Standards New Zealand as part of the approval process …

4 Preservatives

4.2 Fixed waterborne preservatives

C4.2 These preservatives are deposited in the wood in a relatively insoluble form and are therefore suitable for use where leaching by water may occur.

4.2.1 *Copper chrome arsenate (CCA)*

4.2.1.1 *Situation*

CCA preservatives are suitable for use in all hazard classes. Preservative penetration and retention shall be as required by section 6.

6 Hazard class specifications

6.3 Hazard classes H3.1 and H3.2

… H3.2 applies to timber used in situations above ground, exposed to weather, or protected from the weather but with a risk of moisture entrapment. This classification is for more critical end uses and includes exposed joists and decking.

Timber treated to hazard class H3.1 and G3.2 shall comply with the requirements of this clause. The description of hazard class, preservative and the branding shall be as described in sections 3, 4 and 5.

B2.2 NZS3604

2.3.9 Engineered wood products

2.3.9.1 Engineered wood products shall be either laminated veneer lumber (LVL), or glue laminated timber manufactured using Radiata pine or Douglas fir.

2.3.9.2

LVL shall be manufactured in accordance with AS/NZS 4357 (Parts 0 to 4).

2.3.9.4

The preservative treatment for engineered wood products shall comply with NZS 3602 provided however that where engineered wood products are not already specified, the level of treatment shall be the same as that required for kiln-dried Radiata pine structural grades to comply with NZS 3602.

B2.3 AS/NZS 1604.4:2012

1.6 Product requirements

Laminated veneer lumber (LVL) shall be manufactured in accordance with the AS/NZS 4357 series, where appropriate, and shall have a bond type appropriate for the preservative treatement in accordance with this Standard.

Laminated veneer lumber (LVL) shall have an appropriate bond type complying with AS/NZS 2754.1 (Int) and suitable for the following hazard exposures:

(a) Bond type A..... Hazard classes H1 to H5.

(b) …

1.7 Selection of hazard class

Table 1.1 – Hazard class selection

Hazard class	Exposure	Specific service conditions	Biological hazard	Typical uses
…				
H3	Outside, above ground	Subject to periodic moderate wetting and leaching	Moderate decay, borers and termites	Exterior beams (see note 3)
…				

3 such exterior beams should be protected from the weather, particularly in critical applications (see AS 1684.2 or AS 1684.3).

1.9 Use in New Zealand

…

Laminated veneer lumber (LVL) treated for hazard class H3 of this Standard shall be considered as having been treated to either hazard class H3.1 or hazard class H3.2, as specified in NZS 3640, with retention in the penetration zone in accordance with this Standard and retention and penetration in heartwood and sapwood in accordance with NZS 3640. Characteristic values, as defined in NZS 3640, shall apply to both penetration and retention.

4 Hazard class H3

4.2 Preservative penetration requirement

All lyctid –susceptible material shall be fully preservative penetrated. If the species of timber used is of a natural durability class 1 outside above ground, as rated in AS 5604, preservative penetration of the heartwood is not required. Otherwise, either of the following penetration patters [i.e., Item (a) or (b)] shall apply:

(a) *Envelope penetration:*

(i) *Sapwood*

The preservative shall penetrate all sapwood in the following zones:

(A) Within 15 mm from the surface.

(B) Within 20 mm from the edges.

(C) Within 150 mm from the ends.

(ii) *Heartwood of natural durability class 2, 3 or 4 outside above ground*

The preservative shall penetrate all heartwood of natural durability class 2, 3 or 4 outside above ground, as rated in AS 5604, in accordance with …, except that untreated heartwood of natural durability class 2, 3 or 4 outside above ground shall be permitted provided it is not within 10 mm of the face, back, end or edge, AND it does not exceed 35% of the cross-section at any point within the penetration zone.

(iii) *Heartwood of natural durability class 2, 3 or 4 outside above ground and all sapwood*

All heartwood of natural durability class 2, 3 or 4 outside above ground, as rated in AS 5604, and all sapwood in any veneer shall show evidence of preservative penetration

…

OR

(b) *Veneer penetration*

All heartwood of natural durability class 2, 3 or 4 outside above ground, as rated in AS 5604, and all sapwood in any veneer shall show evidence of preservative penetration.

4.3 Preservative retention requirement

The preservative retention in the penetration zone of the treated laminated veneer lumber (LVL) shall be not less than that specified in Table H3.1.

Table H3.1 Minimum preservative retention in the penetration zone – Hazard class H3 (Individual piece; percent mass/mass based on the oven-dried mass of the test sample)

Waterborne					Oil …
…	Copper chromium arsenic (Cu + Cr + As)	…	…	…	
	0.380				

Appendix C:

Table 1 – Comparison of characteristics between H3 (as determined by AS/NZS1604.4) and H3.2 (as determined by NZS3640)

	H3 (AS/NZS 1604.4:2012)	**H3.2 (NZS 3640:2003)**
Definition as per relevant standard	Refer: Table 1.1, page 9 Exposure – outside, above ground Specific service conditions – Subject to periodic moderate wetting & leaching Biological hazard - Moderate decay, borer & termites Typical uses – Exterior beams (should be protected from weather)	Refer: Table 3.1 page 12 Exposure – exposed to the weather above ground, or protected from the weather but with a risk of moisture entrapment Specific service conditions – Periodic wetting, not in contact with the ground Biological hazard - Decay fungi & borer Typical uses – All H3.1 uses, plus structural and decking – see NZS3602
Minimum preservation retention in the penetration/analysis zone	Refer: Table H3.1, page 18 0.380 (Cu + Cr + As)	Refer: Table 6.2, page 29 0.370 (Cu + Cr + As)
Relative proportions of CCA components	Refer: Table B2 AS/NZS 1604.1:2012[9], page 28 Copper: 23 – 25% Chromium: 38 – 25% Arsenic: 30 – 37%	Refer Table 4.1, page 15 Copper: 23 – 25% Chromium: 38 – 25% Arsenic: 30 – 37%
Penetration and retention requirements	Refer: clause 4.2(a) and 4.3, page 17 4.2(a) For envelope treatment (i) Sapwood The preservative shall penetrate all sapwood in the following zones a) Within 15 mm from the surface b) Within 20 mm from the edges c) Within 150 mm from the ends ii) Heartwood The preservative shall penetrate all heartwood … outside above ground … in accordance with clause 4.2(a)(i), except that untreated heartwood … shall be permitted provided it is not within 10 mm of the face, back, end or edge AND it does not exceed 35% of the	Refer: Paragraphs 6.3.1.1.2, 6.3.1.2 and 6.3.3, page 28 6.3.1.1.2 Heartwood For timber treated in final shape and form, no minimum heartwood penetration is specified. Where timber is not treated in final shape and form, there shall be evidence of penetration to a depth of 5mm after machining. Untreated heartwood shall be permitted if it comprises less than 20% of the cross-section of the piece, does not extend through the piece from one surface to the opposite surface, and does not exceed half the

[9] I take this reference to be AS 1604.1-2012 Specification for preservative treatment - Sawn and round timber

	cross section at any point within the penetration zone. (iii) Heartwood … and sapwood. All heartwood … and sapwood in any veneer shall show evidence of preservative penetration. All envelope treated LVL shall carry a warning that a suitable remedial treatment (such as an appropriate brush-on preservative) shall be applied to the fresh-cut surfaces (as per clause 7.4, page 23) 4.3 Preservative retention requirement The preservative retention in the penetration zone of the treated LVL shall be not less than that specified on table H3.1	dimension of any side of the cross-section. 6.3.1.2 Analysis zones – sapwood a) The analysis zone shall be the outer 25mm from any sapwood face or the full depth of sapwood where sapwood depth is less than 25mm 6.3.1.3 Penetration retention requirement The retention of preservative in the analysis zone of the treated timber shall be not less than specified in table 6.2
Penetration determination	As per AS/NZS 1605.3:2006 section 2	As per AS/NZS 1605