Thermory Vertical Shiplap Weatherboards

Weathertight Evaluation for where E2/AS1 risk score is 6-12

Version 1.0. April 2021.

TIMBERLINE

GENERAL

INTRODUCTION

The Thermory claddings are thermally modified timber weatherboard claddings manufactured from PEFC and FSC (if requested) certified North American and European White Ash (Thermory Ash) and European Scots Pine (Thermory Nordic Pine).

Thermally modified means that the timber is heat-treated at 3215 °C with no chemicals added. This changes the physical properties of the timber making it more stable and more resistant to rot.

Timberline Thermory cladding is generally installed in accordance with Acceptable Solution (E2/AS1). E2/AS1 provides for the use of vertical shiplap weatherboards, direct fixed, with a risk matrix score £6.

This document has been prepared to provide assurance of code compliance where the E2/AS1 risk matrix is 6-12 and where the Thermory vertical shiplap cladding is installed over a ventilated cavity. Assurance has been established through the evaluation of risk mitigation, and comparison of three systems with the BRANZ reference profile.

BUILDING CODE

BUILDING CODE CLAUSE E2 (EXTERNAL MOISTURE)

This section lists the applicable E2 performance clauses in respect of the Thermory cladding systems.

- Clause E2.3.2 Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both.
- Clause E2.3.3 Walls, floors and structural elements in contact with, or in close proximity to the ground, must not absorb moisture in quantities that could cause undue dampness, damage to building elements, or both.
- Clause E2.3.4 Building elements susceptible to damage must be protected from the adverse effects of moisture entering the space below suspended floors.
- Clause E2.3.5 Concealed spaces and cavities in buildings must be constructed in a way that prevents external moisture from being accumulated or transferred and causing condensation, fungal growth, or the degradation of building elements.
- Clause E2.3.7 Building elements must be constructed in a way that makes due allowance for the following:
  a. the consequences of failure
  b. the effects of uncertainties resulting from construction or from the sequence in which different aspects of construction occur
  c. variation in the properties of materials and in the characteristics of the site.

COMPLIANCE EVALUATION FOR USES WHERE THE RISK MATRIX IS 6-12

THE E2/AS1 RISK MATRIX

Acceptable Solution E2/AS1 provides a methodology that assigns risk scores to buildings based on weathertightness risk features and specifies suitable types of claddings to be used based on the risk score assigned.

VERTICAL SHIPLAP WEATHERBOARD RISK

Table 3, E2/AS1, provides for vertical shiplap weatherboards to be used, only up to a risk score of 6 or less. BRANZ has provided their opinion as to the associated risks that have resulted in the limitation of use[1].

- Shiplap board cladding systems are very air leaky. The thin section of board that overlaps the adjoining board tends to move and distort, and this allows air to enter at the lap. There is also the potential for rainwater to be driven in at the lap, but this distortion lets water drain out as well.
- There is a vertical gap between the boards, and while this is quite small, it does allow some air circulation and vertical drainage to occur.
- While shiplap boards have good potential for air entry, they do not have the void of bevel-back boards, as they fit hard to the wall frame (with a high contact area with the wall underlay) and consequently do not have as good a drainage and drying capacity.
- Because of this, vertical shiplap timber weatherboards have a higher risk of weathertightness failure than bevel-back boards and can only be direct-fixed on buildings with a risk score of 6 and below when using E2/AS1 as a means of compliance. As it is difficult to install these boards over a cavity, they should not be used on buildings with higher risk scores than this.

Mitigation of risk

The following table considers the issues and identifies mitigating features that address the risks:

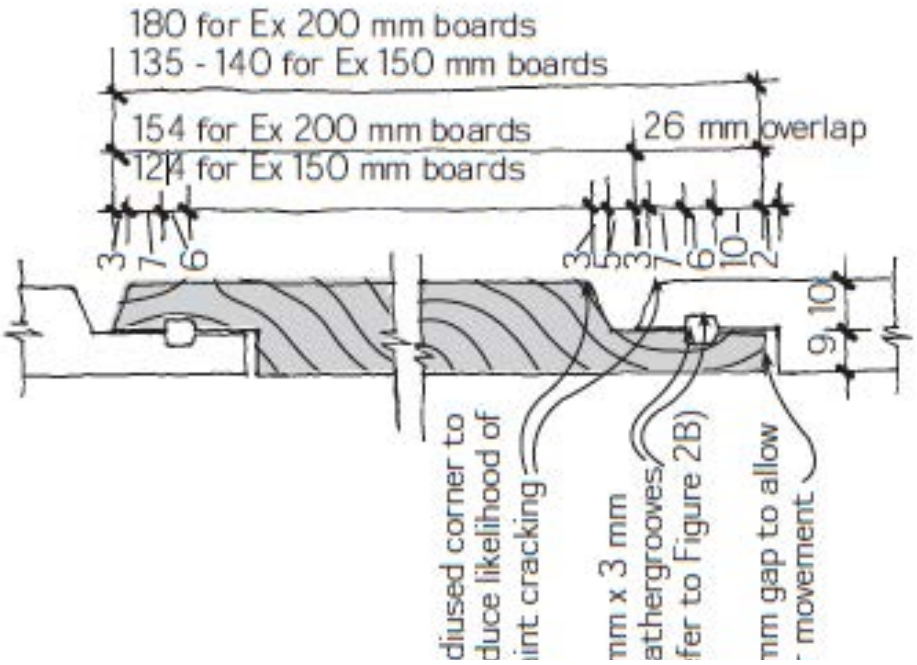
Risk	Mitigations	Outcome
Distortion down the lap, with potential for driven rain to enter.	Use of a more stable timber to prevent distortion. Install nogs @ max 480 centres to the primary structure.	Reduces the likelihood of driven rain. Provides increased structural support to minimise deflection.
Reduction in drainage & drying capacity since fitted hard against the wall framing, with high contact area against the wall underlay.	Installed over a drained and ventilated cavity using castellated timber battens with bevelled slope.	No contact is made with the wall framing. Separation from the wall lining is provided.
Poor drainage and drying capacity.	Installed over a drained and ventilated cavity using castellated timber battens with bevelled slope.	Increased airflow for drainage and drying.
Difficult to install over a cavity.	Introduction of castellated timber battens with an 18° bevel slope. Acceptance and in-service performance of vertical timber cladding systems which can be specified for use up to an Acceptable Solution E2/AS1 risk score of 20.	Vertical shiplap weatherboards can be effectively installed over a cavity.

1 BRANZ. (9/09/2014). Weatherboards

PROFILE EVALUATION

BRANZ Bulletin BU411

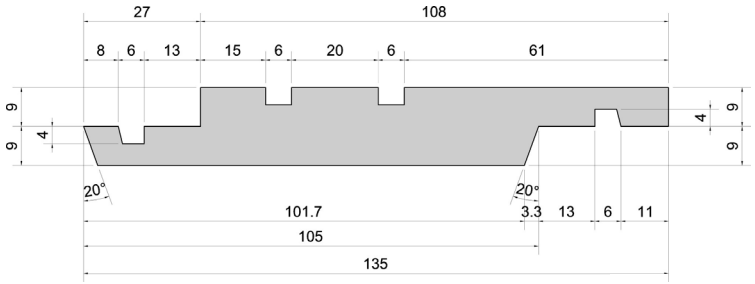
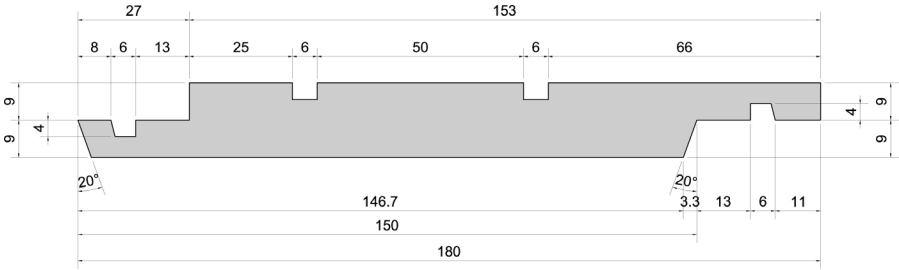
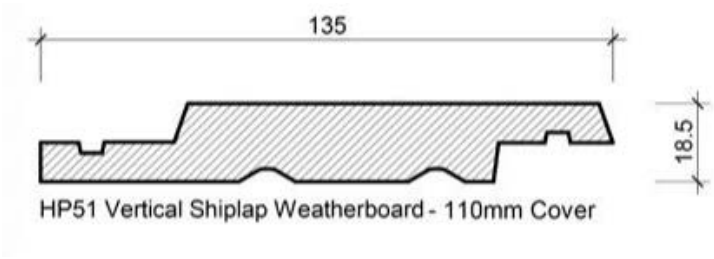
The BRANZ Bulletin BU411 provides recommendations for profiles for weatherboards. For vertical shiplap these are as follows:

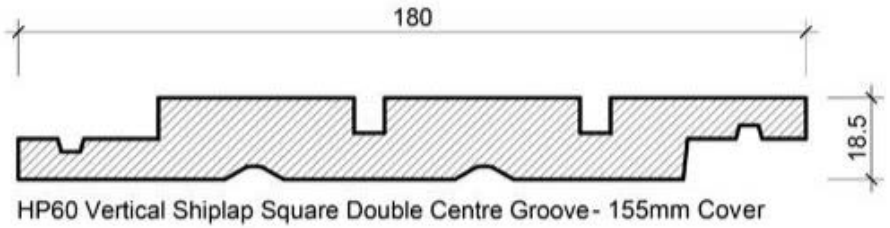
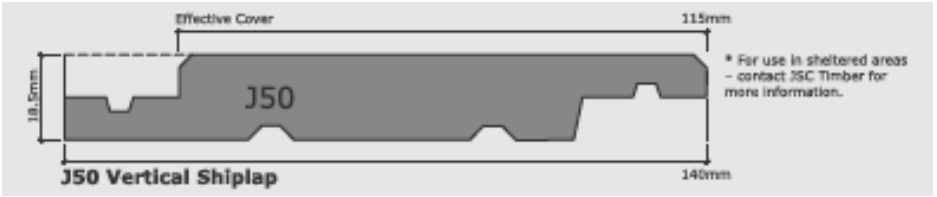
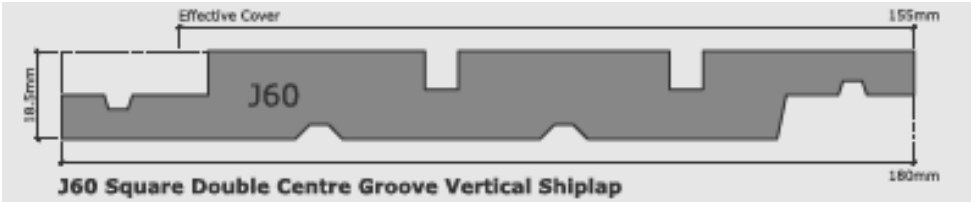


This profile is regarded as the reference profile in considering the following 3 vertical shiplap cladding systems.

- Thermory cladding profile
- Herman Pacific Vertical Shiplap Weatherboard System
- JSC Western Red Cedar Verticlad

COMPARISON OF SYSTEMS WITH REFERENCE TO PROFILE

Profile description	Profile	Comparison to reference profile	Means of compliance
Thermory vertical shiplap profiles 135 mm square shiplap weatherboard › Thickness – 18 mm › Cover – 108 mm › Lap – 27 mm › Expansion gap – 3 mm › W/groove – 6 mm x 4 mm		› Lap 2 mm greater. › Depth of weather groove 1 mm deeper. › Board 1 mm thinner.	ALTERNATIVE SOLUTION This comparison
180 mm square shiplap weatherboard › Thickness – 18 mm › Cover – 153 mm › Lap – 27 mm › Expansion gap – 3 mm › W/groove – 6 mm x 4 mm			
Herman Pacific vertical shiplap profiles 135 mm vertical shiplap weatherboard › Thickness – 18.5 mm › Cover – 110 mm › Lap – 25 mm › Expansion gap – unknown › W/groove – unknown		› Lap 1 mm less. › Depth of weather groove not available. › Board 0.5 mm thinner.	CodeMark Certificate GM-CM30036-RevL dated 27/08/2020 and BRANZ Appraisal No. 828 (2020).

Profile description	Profile	Comparison to reference profile	Means of compliance
Herman Pacific vertical shiplap profiles *continued* 180 mm square double centre groove vertical shiplap weatherboard › Thickness – 18.5 mm › Cover – 155 mm › Lap – 25 mm › Expansion gap – unknown › W/groove – unknown	 HP60 Vertical Shiplap Square Double Centre Groove- 155mm Cover	as above	CodeMark Certificate GM-CM30036-RevL dated 27/08/2020 and BRANZ Appraisal No. 828 (2020).
JSC vertical shiplap profiles 140 mm vertical shiplap weatherboard › Thickness – 18.5 mm › Cover – 115 › Lap – 25mm › Expansion gap – unknown › W/groove – unknown	 **J50 Vertical Shiplap**	› Lap 1 mm less. › Depth of weather groove not available. › Board 0.5 mm thinner.	CodeMark certificate GM-CM30084-RevD1 dated 11/02/2020.
180 mm square double centre groove vertical shiplap weatherboard › Thickness- 18.5 mm › Cover- 155 mm › Lap- 25 mm › Expansion gap- unknown › W/groove- unknown	 **J60 Square Double Centre Groove Vertical Shiplap**		

EVALUATION AND CONCLUDING COMMENTS REGARDING COMPARISON OF PROFILES

The following table evaluates the differences between the Thermory vertical shiplap weatherboard profiles with the example profiles and the reference profiles.

Identified difference	Possible impact	Mitigation	Reference documents
The Thermory profile is thinner by 0.5 mm than examples 1 and 2 and 1 mm thinner than the reference profile.	Greater deflection under wind loads. Reduction in strength.	Nordic Pine has the highest shear and compressive strength of the pine family, with a tensile strength of +/- 3.2 mPa. Western Red Cedar is +/- 1.5 mPa. The Thermal modification of the cell structure changes the physical properties of the Nordic Pine, making it more stable.	Finnish Forest Research Institute. [11/2006] *Nordic Scots Pine evaluates. Selected Competing Species and Non-Wood Substitute Materials in Mechanical Wood Products* https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.467.1578&rep=rep1&type=pdf
The Thermory profile has a lap of 2 mm greater than examples 1 and 2 and 1 mm greater than the reference profile.	Increase in surface tension.	The added lap will enhance the weatherboard systems ability to manage wind-driven rain.	BRANZ. [04/2001] *Bulletin BU411 Recommended Timber Cladding Profiles.*
The Thermory profile has 6 mm weather grooves, which is the same width as the reference profiles but is 1 mm deeper. No dimensional information was available for examples 1 and 2.	Improved weathertightness performance.	6 mm is in keeping with the reference profile.	BRANZ Department of Research. [07/2015] *Weathergrooves-do they work?* https://www.buildmagazine.org.nz/assets/Uploads/Build-148-80-Research-Weathergrooves-Do-They-Work.pdf?

CONCLUSION

The Thermory vertical shiplap weatherboard profiles are comparable with the BRANZ reference profiles and the two example vertical shiplap profiles that are CodeMark Accredited.

Risks identified by BRANZ are simply mitigated through the installation methodology and the characteristics of thermally modified timber.

There are minor differences between the profiles and the reference profile. These differences have not been considered a compliance issue in the case of Herman Pacific or JSC Timber systems and so it follows that it is not significant in the case of the Thermory system.

Based on the analysis and conclusions reached in this document, Timberline has concluded that their system may be used up to a risk matrix score of 12 subject to the conditions and limitations contained in the pass™.

MORE INFO

REFERENCES

- BRANZ. [04/2001] *Bulletin BU411 Recommended Timber Cladding Profiles.*
- BRANZ. [9/09/2014] *Weatherboards.* Retrieved from https://www.weathertight.org.nz/new-buildings/detail-solutions/wall-cladding-selection/weatherboards/. [Accessed 23/02/2021].
- Ministry of Business, Innovation and Employment. [27/06/2019] *Verification Methods E2/VM1 and Acceptable Solution E2/AS1, E2/AS2 and E2/AS3.*
- Finnish Forest Research Institute. [11/2006] *Nordic Scots Pine vs. Selected Competing Species and Non-Wood Substitute Materials in Mechanical Wood Properties.* Retrieved from https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.467.1578&rep=rep1&type=pdf. [Accessed 23/02/2021].

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