

Determination 2021/025

Regarding compliance of timber shiplap weatherboards, coated with black paint, installed on a dwelling at 33A Hyde Road, Rothesay Bay, Auckland



Figure 1 – northwest corner of building including deck

Summary

This determination considers whether pine vertical timber shiplap weatherboards installed as part of alterations to an existing building, painted black, comply with the Building Code Clause B2 *Durability* as it relates to Clause E2 *External Moisture*. The determination considers a number of factors that contribute to the performance of the weatherboards.

The legislation discussed in this determination is contained in Appendix A. In this determination, unless otherwise stated, references to “Sections” are to sections of the Building Act 2004 (“the Act”) and references to “Clauses” are to clauses in Schedule 1 (“the Building Code”) of the Building Regulations 1992.

The Act and the Building Code are available at www.legislation.govt.nz. Information about the legislation, as well as past determinations, compliance documents (eg Acceptable Solutions) and guidance issued by the Ministry, is available at www.building.govt.nz.

1. The matter to be determined

- 1.1. This is a determination made under due authorisation by me, Peta Hird, Principal Advisor Determinations, Ministry of Business, Innovation and Employment (“the Ministry”), for and on behalf of the Chief Executive of the Ministry¹.
- 1.2. The parties to the determination are:
 - the owner of the property, A. Marshall (“the owner”)
 - Auckland Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.
- 1.3. The persons with an interest in the determination are:
 - The licensed building practitioner (LBP), R. Turvey, who supervised the restricted building work (“the LBP supervisor”)
 - The LBP builder, R. Bowerman, who undertook the restricted building work (“the LBP builder”)
 - A registered architect, D. Sullivan, who specified the external cladding system and paint finish (“the registered architect”).
- 1.4. This determination arises from the proposed decision² of the authority to refuse to issue a code compliance certificate for alterations undertaken to an existing residential dwelling.
- 1.5. The authority has raised concerns about the effects of black paint that has been applied to exposed surfaces of newly installed vertical timber shiplap weatherboards (“the weatherboards”) as part of the external cladding system.
- 1.6. The authority is of the view the weatherboards do not comply with Building Code Clause B2 *Durability* as it relates to Clause E2 *External Moisture* (refer to Appendix A) because, in

¹ The Building Act 2004, section 185(1)(a) provides the Chief Executive of the Ministry with the power to make determinations.

² Although an application for a code compliance certificate had not been lodged with the authority at the time of the application for determination, the authority has indicated a decision in relation to the Building Code compliance of the external cladding, taking into consideration its inspection reports issued to date, and separate correspondence to the Ministry on the issue.

the authority's view, the dark coloured paint may cause the weatherboards to cup³ and split.

- 1.7. The matter to be determined⁴ is therefore whether the authority was correct in its proposed decision to refuse to issue a code compliance certificate. In deciding this matter, I must consider whether the weatherboards that are painted black comply with Clause B2 *Durability*, as it relates to Clause E2 *External Moisture*.

Matters outside this determination

- 1.8. I have not considered any other aspects of the Act or the Building Code compliance of the building work covered by the building consent other than as outlined above.

2. The building work

- 2.1. The building is an existing detached residential dwelling situated on the front section of a sloping site in a suburban area near Rothesay Bay, Auckland.
- 2.2. There are other residential buildings in close proximity to the subject building⁵. To the east is a two-storey building approximately 11m away. To the west is a two-storey building approximately 5.3m away and to the south another two-storey building approximately 6m away. There is a small copse of trees to the northwest. The nearest building to the north is about 35m away on the opposite side of Hyde Road.
- 2.3. The street frontage of the building faces north, and the site slopes downward towards its southernmost end. The building is two-storeys in part, is a timber frame dwelling, with existing external concrete block walls on the ground floor level and vertical timber shiplap weatherboards cladding at first floor level. The weatherboard cladding is at most one storey high around each elevation.
- 2.4. Externally, there are two large timber deck areas. One deck wraps around the east and south sides of the building, and the second deck is located along the north side of the building to the right of the entranceway (see figure 1).
- 2.5. The northeast corner of the dwelling includes a new entranceway approximately 5.36m long x 2.49m wide. The entranceway has been constructed in the location where a former conservatory was removed as part of the building work (see figures 2 and 3).

³ "Cupping" of timber boards is usually as a result of a moisture imbalance through the timber and changes to atmospheric and environmental conditions, which cause the edges of the boards to be higher than the centre (forming the shape of a 'cup' or concave appearance).

⁴ Under section 177(1)(b) and (2)(d) of the Building Act 2004.

⁵ The horizontal distances to the neighbouring properties have been estimated from Google Maps NZ, www.google.co.nz/maps, (accessed 27 July 2021).



Figure 2: entranceway (northeast view)

Figure 3: entranceway (east elevation)

- 2.6. The entranceway has one glass door to the front and one floor to ceiling window to the rear. The entrance door is set back from the front elevation to create an alcove approximately 1.78m long. To the right of the entranceway alcove is a 1.8m high concrete “solar block” wall made of decorative open patterns through the face (see figure 2).
- 2.7. There are no black painted weatherboards inside the alcove, and the north elevation of the entrance is made up of aluminium fascias. The authority has not raised concerns about any of the building elements within the alcove, so they are not considered in this determination.
- 2.8. The north elevation of the dwelling has six sliding doors and two floor to ceiling glass windows. The sliding doors provide access to the north facing deck (see figure 1). The whole door assembly which is approximately 11.65m² in area was installed as part of the building work granted under the building consent, and it replaced two smaller windows.
- 2.9. The north elevation of the dwelling (excluding the entranceway) is approximately 8.24m wide x 2.2m high (from finished floor level to the soffit of the roof eaves); this equates to a total area of approximately 18.13m². Therefore, the area of the weatherboards alone across the north elevation is approximately 6.48m² (i.e. 18.13m²–11.65m²).
- 2.10. The building has a hip style roof (sloping upwards from all sides of the structure). The majority of the roof eaves have a width or overhang of approximately 600mm (including the guttering), with the exception of the entranceway where the eaves are flush to the exterior face of the wall.
- 2.11. The weatherboards installed to the entranceway and across the north elevation were part of the building consent granted to alter the building. The original vertical shiplap weatherboards to the remaining east, west and south elevations were replaced under

Schedule 1(1)⁶ of the Act (refer to Appendix A). This additional building work was undertaken at the same time as the consented building work.

- 2.12. The vertical timber shiplap weatherboards are radiata pine, measuring 187mm in width and 18mm thick. The weatherboards are also double profile, H3.1 treated⁷, bevelled at 15 degrees (on their top and bottom edges) and installed over a drained and ventilated cavity⁸ on H3.2 treated castellated cavity battens⁹. This includes a building wrap fixed to the timber framing to form the external walls. The length of the weatherboards used on the building range between approximately 2200mm long (from deck level to roof eaves) to 3000mm long (on the east side of the entranceway). The manufactured lengths are 5400mm, 6100mm and 7200mm.
- 2.13. Included in the building consent specifications is the technical literature provided by the manufacturer of the weatherboard product. This includes the following information about the application of a paint finish:
- Site prime all bare timber surfaces and cut-ends with [a specific] aerosol primer, or with two coats of premium timber primer before fixing
 - Carry out all painting work in accordance with the appropriate clauses of *AS/NZS 2311:2017 - Guide to the Painting of Buildings*
 - Apply two full coats of 100 per cent premium acrylic house paint with a gloss level of 10 per cent and a Light Reflective Value of 45 per cent or greater
 - Dark colours absorb heat from the sun. Light colours reflect significantly more heat. Testing has shown that dark colours can generate temperatures in excess of 85°C in direct sunlight, whereas light colours under the same conditions can be as much as 35°C cooler. It is recommended that the chosen colour therefore has a Light Reflective Value greater than 45 (LRV of white is 95/100, LRV of Black is 0).
- 2.14. The area of the weatherboards across the east side of the entranceway is approximately 16.08m² (i.e. 5.36m long x 3.0m high).
- 2.15. The area of weatherboards to the west side of the entranceway is approximately 3.0m² (i.e. 1.0m long x 3.0m high).

⁶ Schedule 1 – Building work for which building consent not required; schedule 1(1) – General repair, maintenance, and replacement.

⁷ New Zealand standards *NZS 3602:2003 – Timber and wood-based products for use in building*, Table 2, reference number 2A.1, clause 111.2 “weatherboards and exterior finishing timbers”.

⁸ Drained cavity: A cavity space, immediately behind a wall *cladding*, that has vents at the base of the wall. A *drained cavity* assists drying by allowing water which occasionally penetrates the wall *cladding system* to drain to the exterior of the *building*, and any remaining moisture to dry by evaporation.

⁹ A notched cavity batten which has a bevelled edge and evenly spaced notches that allow moisture drainage when fixed in a horizontal application.

2.16. A similar calculation has not been done for the south elevation of the entranceway as this will receive little to no direct sunlight. Therefore, it will not be subject to any significant temperature differences or effects of heat absorption.

2.17. The majority of the weatherboards have been painted black. In respect of the paint finish to be applied to the weatherboards, the building consent plan (sheet 19) stated:

Dark colours absorb heat from the sun. Light colours reflect significantly more heat. Use [a specific manufacturer's proprietary paint formula]¹⁰ for painting exterior cladding.

Although the building consent plans don't confirm specifically which colour paint is to be used, plan sheet number 11 does indicate the use of a black or dark grey finish is to be applied to the weatherboards.

2.18. In a correspondence to the Ministry dated 1 March 2021 the paint manufacturer describes the paint used on the weatherboards as "All Black"¹¹ with a light reflective value (LRV) of approximately 4 per cent and a total solar reflectance (TSR) rating of 23.8 per cent. The manufacturer also stated:

Application of [the manufacturer's proprietary paint formula] system will reflect more heat than the same colour made using non-cool pigmentation and reduce heat related stress on the substrate; it will not make the painted surface cool to touch. To achieve the maximum TSR, [two] coats of [the proprietary paint formula] top coat must be applied over a cool primer...

2.19. The owner provided additional technical information from the paint manufacturer in relation to the proprietary paint formula; it states:

- Using [the proprietary paint formula] will reduce the likelihood of heat related issues affecting the timber but will not eliminate them. There are many variables that are beyond [the paint manufacturer's] control, such as the condition of the timber...and the moisture content of timber
- LRV only considers how a colour looks, not how it performs. It does not consider innovations like [the manufacturer's proprietary paint formula] that look normal but reflect more heat
- All dark colours absorb a lot of light as well as heat from the infrared rays of the sun, which can cause significant temperature build-up on the surface. The [manufacturer's proprietary paint formula] technology absorbs visible light so the colour looks like normal while also reflecting energy in the near and far infrared region, which reduces heat build-up. This means [the manufacturer's proprietary paint formula] will look like a standard colour but surface heat will build-up slower and to a significantly lower level than a 'not so cool' traditional colour.

¹⁰ The term "proprietary paint formula" has been used in this determination in lieu of the manufacturer's product specific name for its paint.

¹¹ Manufacturer's colour name: "All Black".

3. Background

- 3.1. The existing building was first constructed in 1977. The owner applied for a building consent on 15 August 2019 to alter the building. The building consent (reference number BCO10293601) was issued by the authority on 14 November 2019. The building work was described as “Alterations to the kitchen and bathrooms. Additional sitting room, office, entrance and bathrooms”.
- 3.2. The building work was commenced in early 2020, and in January 2020¹² the applicant began painting the weatherboards black. The authority conducted a number of inspections as the works progressed. Inspection reports from the authority confirm it viewed the external cladding on 3 March 2020, 15 June 2020, and 29 June 2020.
- 3.3. The inspection summary within the authority’s 3 March 2020 inspection report stated the following in respect of the external cladding:

Cedar shiplap and vertical pine ship lap. Works completed and fixed off as per product specifications/ consented details.

Kickout flashing to wall/ membrane junction to be installed.

Some areas of cladding have been replaced under General repair and maintenance under schedule 1 of the Building Act.

Cladding to be painted and sealed in accordance with the product specifications, some areas of the cladding have begun to be painted as a dark color. Page 8 of the [weatherboard manufacturer’s] Technical manual state that a paint with a LRV greater than 45% must be used. Confirmation will be required confirming the paints LRV rating for the [authority] to be satisfied. If the paint exceeds the max % then confirmation from the product manufacture[r] will be required confirming the product will still be warranted.

- 3.4. The authority’s inspection reports from 15 June 2020 and 29 June 2020 repeated the same concerns about the painting of the cladding. However, the inspection report from 29 June 2020 included the following additional comments:

Documentation has been provided stating the paint used has a LRV of 8.

The weatherboard cladding was approved when processed based on the branz appraisal¹³ provided as an alternative solution following the [weatherboard] manufactures [stet] material guidance. [The authority is] unable to confirm compliance regarding the colour to which the cladding has been painted onsite so

¹² I note that it is unclear from the applicants’ correspondence dated 6 November 2020 whether the commencement of the painting of the weatherboards relates to the building work associated with the building consent, or the replacement weatherboards to the rest of the dwelling that was undertaken in accordance with Schedule 1 of the Act.

¹³ BRANZ appraisal number 929 [2017], date of issue 12 April 2017.

[it is] unable to accept these changes as a minor variation therefore an amendment will need to be applied for.

- 3.5. The exercise of the decision by the authority to grant the building consent¹⁴ is not a matter for determination in this case. However, I note the authority has confirmed it assessed the compliance of the weatherboards in relation to the Building Code as an alternative solution based on BRANZ appraisal 929 (2017). Section 4.4 of the appraisal confirmed the “paint systems” had “not been assessed by BRANZ”. Section 4.5 of the appraisal stated that the “weatherboards and accessories must be finished with at least two coats of an exterior grade latex acrylic paint complying with any of Parts 7, 8, 9 or 10 of AS 3730”¹⁵. Section 4.5 also re-stated the information provided by the weatherboard manufacturer that it “recommends using paint with a colour which has a Light Reflectance Value (LRV) of greater than or equal to 45 [per cent]”.
- 3.6. During the course of the building work, the weatherboard manufacturer and the owner signed an agreement to disclaim the manufacturer’s product warranty in relation to the LRV rating¹⁶.
- 3.7. On 24 August 2020, responding to an earlier enquiry made by the registered architect regarding painting the cladding black, the authority stated the following:
- [The authority has] looked into the issue around [the registered architect’s] enquiry regarding the painting of [the] cladding Black and the manufacturer confirming they will not provide a warranty. The proposed change cannot be accepted and [the authority] cannot be satisfied that the proposed change will meet the performance requirements of B2: durability under normal maintenance¹⁷.
- 3.8. On 27 August 2020 the authority wrote to the registered architect again to clarify its position on the matter and expanded on their reasons why, in its view, the weatherboards do not comply with clause B2 as it relates to E2. In summary, the authority noted:

...As the manufacturer will not warranty their product, this implies the weatherboards if painted a dark colour, will not meet the building code requirements of B2 durability and therefore is non-compliant.

¹⁴ Section 177(1)(b) and (2)(a).

¹⁵ AS 3730 – Guide to properties of paints for buildings. Part 7: 2006 Latex – Exterior – Flat; Part 8: 2006 Latex – Exterior – Low Gloss; Part 9: 2006 Latex – Exterior – Semi-gloss; Part 10: 2006 Latex – Exterior – Gloss.

¹⁶ A copy of the signed agreement has not been provided to the Ministry as part of this determination

¹⁷ Refer to Clause B2.3.1, and Acceptable Solution B2/AS1, Amendment 11, effective 27 June 2019, section 2.1 – Normal Maintenance, paragraph 2.1.1 – **Normal maintenance** is that work generally recognised as necessary to achieve the expected durability for a given *building element*. The extent and nature of that maintenance will depend on the material, or system, its geographical location and position within the *building*, and can involve the replacement of components subject to accelerated wear.

...the pine weatherboard itself can not tolerate heat and will cup and shrink which will bring E2 into the equation the lap of the weatherboards will be affected along with the fact that the cupping of the boards will open the lap of the weatherboards which will, in turn, allow water ingress into the building affecting E2. Also needed to [be taken] into consideration is the huge amount of movement that takes place due to the change of temperature [that] will see the timber splitting, finger-joints opening, and nails popping.

The authority advised an option was to repaint the weatherboards a “compliant colour”.

- 3.9. On 16 October 2020, the registered architect emailed the authority on behalf of the property owner. The architect asked the authority to reconsider its position and reaffirmed its views that it believed the weatherboard cladding painted black would comply with B2, as it relates to E2. The architect stated the following:

...nowhere [in the legislation] does it reference or infer, directly or indirectly, that a warranty is required or is a means to demonstrate compliance to achieve [code compliance]; there is no basis for the [authority] to accept or reject it on this basis...

...the owner and the builder has complied with the relevant building consent and building code clauses, except for the LRV, which is a requirement of the manufacturer...The paint colour, with a lower LRV than specified, still allows the material to meet all the criteria...It complies with the details, requirements and normal maintenance descriptions...

...vertical shiplap cladding has movement due to seasonal thermal and moisture changes. Cladding experiences micro and macro movements, and the extent of those comes down to various factors, from timber formation, finger-jointed [versus] one piece milled, to moisture within the timber, which part of the wood grain it has been taken from, to primers, painting in the factory [versus] onsite, orientation of cladding, nail fixing positions etc. All these factors effect the shrinking, expanding, swelling of the timber, and do not necessarily mean the weatherboards will end up ‘cupping’ or ‘splitting’.

...Cupping does not necessarily result in compromised weathertightness [sic], it can, in some cases, just look out of place compared to other straight boards. In the case of this building work, the cladding has been installed on the [dwelling] for a couple of months, and was painted prior to the inspection that was undertaken [by the authority]. If there were damages during installation, or directly after the cladding is installed, this would have been picked up in the inspection report.

...[to] help mitigate the issue of movement of weatherboards due to thermal movement and or more site specific elements that help with maintenance for this building:

- [The manufacturer's proprietary paint formula was] used to help with the reflection of light from the painted surface.
- The cupping is restricted by the narrow width of the [weatherboards].
- Any splitting that may result from the dark paint will be clearly visible.
- The cladding is clearly and easily [able to be inspected] because of the nature of the [dwelling].
- [The] weatherboards can be easily replaced if necessary.

If the cladding is inspected regularly, the owner can at best maintain this as per [the weatherboard manufacturer's] maintenance schedule or at worst replace the damaged cladding whether it is split, cupped or damaged in any other way.

...the issue is limited to the LRV of the paint only, there is no dispute or argument that the weatherboards and system doesn't comply with the building code, consent plans and the manufacturer's documentation. The issue is relating to the paint colour and as a result has been argued it won't fulfil [Clause] B2 durability, because it may or not result in cupping or movement that could hypothetically damage, to a point, that the weathertightness of the cladding will [be] compromise[d] and fail. However, if the cladding is maintained correctly, in-line with the manufacturer's maintenance schedule, compromised or damaged boards will need to be remedied anyway, which will most likely be localised, rather than completely removing all the cladding system.

3.10. The Ministry received an application for a determination on 27 October 2020.

4. Submissions

The owner

4.1. In support of the application for determination, the owner provided manufacturers' information related to the weatherboards and the paint used, as well as a number of photographs of the dwelling in its current condition.

4.2. In an email to the Ministry dated 6 November 2020, the owner stated:

The paint has been applied for 10 months now (it was painted in summer, in January [2020]) and there is no sign of warping or otherwise on the weatherboards. [The paint manufacturer] have proven results for this paint which is formulated specifically for dark colours, and had been used successfully and extensively on [other dwellings] similar to [the owners'].

...the new area of the [dwelling] (entrance [sic] way) is easily accessible...

As the [dwelling] is [painted] black, regular cleaning is required which allows [the owner] to inspect for any signs of deterioration and remediate if required...

Prior to painting the [weatherboards] black [the owner] spoke to the [weatherboard manufacturer] who informed [the owner] that many houses have been clad in the same...product and have been painted black without problems.

4.3. In a separate email to the Ministry dated 12 May 2021, the owner:

- confirmed a waiver or modification of the Building Code¹⁸ (related to the paint finish) was not applied for at the time the building consent application was lodged with the authority
- advised there was a signed agreement between the manufacturer and the owner which the owner says “was to waive the warranty of [the proprietary paint formula], only in relation to the LRV.”
- said the weatherboard manufacturer has stated that as long as maintenance is completed, there won’t be issues with the durability and external moisture of the cladding and the remainder of the product and system complies with the BRANZ appraisal tests and specification
- confirmed the existing vertical shiplap weatherboards (i.e. those not associated directly with the building consent) were replaced as like-for-like components under Schedule 1(1) of the Act because they had exceeded the minimum durability requirements of 15 years under Clause B2.

The authority

4.4. The authority provided copies of the building consent documentation, including some of its inspection records, building consent certificate, and specification information about the weatherboards.

4.5. Its primary concern is in terms of compliance with B2.3.1(b) as it relates to E2 External Moisture; namely, the authority “has concerns that the weatherboards with only normal maintenance would fail to satisfy the performance requirements of the Building Code”.

4.6. In a correspondence to the Ministry dated 13 November 2020, the authority stated:

The application of a paint with a LRV of 8 per cent [is] well below the specified 45 per cent [and] has considerable potential due to the heightened thermal movement to cause:

- excessive cupping of the vertical weather boards which could cause the rebate to open up and be compromised and reduce its performance

¹⁸ Section 67 of the Act provides for building consent authorities to grant a waiver or modification

- the weatherboards warping, cracking or splitting prematurely
- excessive shrinking or swelling.

4.7. In respect of the current status of the building consent as of 30 April 2021, the authority confirmed that:

The final inspection has not yet passed, ie; all reasonable steps to ensure that building work has been carried out in accordance with the building consent has not been completed (s90) [Refer to Appendix A].

At this point there has been no application [received from the owner] for [a code compliance certificate] so [the authority] has not refused to issue to the CCC as such however as previously noted, without a passed final inspection an application would ultimately be refused.

5. The draft determination

- 5.1. A draft of this determination was issued to the parties and persons with an interest on 16 September 2021 for comment.
- 5.2. The owner responded on 16 September 2021 and accepted the draft determination.
- 5.3. The authority responded on 30 September 2021 and accepted the draft determination “extremely reluctantly” but made no further submission on the matter.
- 5.4. The LBP builder responded on 17 September 2021 and accepted the draft determination.
- 5.5. The LBP supervisor responded on 16 September 2021 and accepted the draft determination.
- 5.6. The registered architect responded on 28 September 2021 and accepted the draft determination.

6. Discussion

- 6.1. The matter to be determined is whether the authority was correct in its proposed decision to refuse to issue a code compliance certificate. In deciding this matter, I must consider whether the weatherboards as installed and coated with black paint comply with Clause B2 *Durability* as it relates to Clause E2 *External Moisture*. Central to this matter is whether the dark coloured paint will affect the performance of the weatherboards over a period of 15 years with only normal maintenance.
- 6.2. The proposed refusal to issue a code compliance certificate only relates to the building work granted under building consent BCO10293601. Therefore the determination only

considers the new weatherboards installed to the recently constructed entranceway and across the north elevation of the dwelling.

- 6.3. I note that at the same time that the consented building work was being undertaken, the owner took the opportunity to replace the existing vertical shiplap weatherboards with new ones along the remainder of the east, south and west elevations of the dwelling. This building work was undertaken in accordance with Schedule 1(1) of the Act. As such, it is not related to the building consent BCO10293601 and is outside the scope of this determination.

The legislation

- 6.4. All building work must comply with the Building Code to the extent required by the Act, whether or not a building consent is required in respect of that building work¹⁹.
- 6.5. The relevant clauses of the Building Code in this case are included in Appendix A.

Product warranty

- 6.6. The authority has placed a great deal of emphasis on the fact that the manufacturer of the weatherboards will not provide a warranty for its product in this case due to the black paint applied to the external surfaces. As a result, the authority stated “as the manufacturer will not warranty [its] product, this implies the weatherboards if painted a dark colour, will not meet the building code requirements of B2 durability and therefore is non-compliant”.
- 6.7. In response, the registered architect stated “nowhere [in the legislation] does it reference or infer, directly or indirectly, that a warranty is required or is a means to demonstrate compliance to achieve [code compliance]; there is no basis for the [authority] to accept or reject it on this basis...”.
- 6.8. I note that in this case the owner advised they have reached an agreement with the weatherboard manufacturer on a warranty that excludes the paint finish with a higher LRV, and that the manufacturer has indicated “that as long as maintenance is completed, there won’t be issues with the durability and external moisture of the cladding” (refer to paragraph 4.3).
- 6.9. I agree with the view presented by the registered architect; just because a manufacturer may not supply a warranty, that of itself does not necessarily imply the product or its installation does not comply with the Building Code. There are a number of other factors the authority will need to consider and not rely solely on a resolution to the issue that requires a warranty to be provided by the manufacturer.

¹⁹ Section 17 of the Act.

- 6.10. The matters for consideration by an authority in deciding to issue a code compliance certificate are in section 94 of the Act:

94 Matters for consideration by building consent authority in deciding issue of code compliance certificate

(1) A building consent authority must issue a code compliance certificate if it is satisfied, on reasonable grounds,—

(a) that the building work complies with the building consent...

- 6.11. The matters for consideration under section 94 of the Act do not extend to a decision based on whether a warranty is provided or not for a particular product. An authority must be satisfied on reasonable grounds that the building work complies with the building consent.

The building consent

- 6.12. In this case, the building consent plans and specifications clearly indicate which vertical timber shiplap weatherboards were to be used and provided details on how these were to be installed over a drained and ventilated cavity.
- 6.13. I note the authority confirmed it had assessed and “approved” the vertical shiplap weatherboard system installed over a drained and ventilated cavity “as an alternative solution”.²⁰
- 6.14. I also note the parties do not dispute that the actual weatherboards as installed comply with the building consent or the Building Code, setting aside the question of the paint. The associated inspection reports provided by the authority support that view. I have not considered the compliance of the installed weatherboards further.
- 6.15. The matter of dispute between the parties remains the dark coloured paint that has been used on the exposed surfaces of the weatherboards.
- 6.16. In this case, the weatherboard manufacturer has indicated in its technical information, which was included in the building consent specifications, that a paint finish with a light reflective value (LRV) of 45 per cent or greater was to be used on its product. It has not provided a similar minimum value for total solar reflectance (TSR).
- 6.17. In respect of the paint finish, the building consent plans and specifications did indicate which proprietary paint product was to be used, but did not go so far as to specify the actual colour of the paint. Consequently, no information was included in the building consent that stated values for LRV or TSR for the actual paint used. Because this detail was not provided in the specifications, I am of the view that in considering the proposed

²⁰ Acceptable Solution E2/AS1 – External Moisture, amendment 9, effective 27 June 2019, paragraph 9.4.1.2 states: “This Acceptable Solution is limited to the use of direct fixed vertical weatherboards in risk categories as shown in Table 3”.

refusal of the code compliance certificate for this building consent I can take into account the compliance of the weatherboards as installed and as painted.

- 6.18. Following the application for determination, it has subsequently been confirmed which specific paint has been used – it has an LRV of 4 per cent and a TSR value of 23.8 per cent (refer to paragraph 2.18).

Application of the paint finish

- 6.19. TSR measures the amount of solar energy reflected away from a painted surface. By contrast LRV measures how much of the visible spectrum of light is reflected by the painted surface. The higher the percentage number of the TSR, the more effective it is at reflecting the radiation (or heat) from the sun. When excessive heat is absorbed by timber weatherboards, this can cause warping, cracking and cupping of the boards.
- 6.20. LRV only measures visible light, whereas TSR measures the reflection of visible light, ultra-violet light and infra-red light. This is significant because ultra-violet and infra-red light generate more “energy distribution of sunlight” than visible light does alone.
- 6.21. Therefore, I am of the view that TSR is a better measure of the possible effects of the paint colour on weatherboards than LRV.
- 6.22. In this case the building consent plans and specifications stated a product specific paint (the proprietary paint formula) to be used on the vertical shiplap weatherboards.
- 6.23. The LRV rating of the proprietary paint formula is 4 per cent and therefore it does not meet the minimum 45 per cent rating in the weatherboard manufacturer’s technical manual.
- 6.24. I note the weatherboard manufacturer’s technical manual does not refer to a TSR rating or state what, if any, minimum TSR rating is required.
- 6.25. The weatherboard manufacturer was unable to confirm whether a TSR rating of 23.8 per cent or higher is a sufficient rating for energy reflection for its product.
- 6.26. Regardless, even if the weatherboard manufacturer had specified a TSR rating and it was a different value to the paint, that of itself does not necessarily mean that compliance with the Building Code has been or is likely to be compromised.
- 6.27. The Building Code is performance based and does not set ratings for any protective coatings or paint finishes in respect of Clause E2. Further, Acceptable Solution E2/AS1²¹ does not state a maximum or minimum LRV or TSR rating for paint finishes in relation to timber weatherboards.

²¹ Amendment 9, effective 27 June 2019.

- 6.28. The risk of using dark paint colours is indicated in Acceptable Solution E2/AS1²². E2/AS1 contains prescriptive requirements for reflectivity of paint colours for only flush-finished fibre-cement sheets and EIFS cladding, but not for timber weatherboards. In relation to timber weatherboards, E2/AS1 contains only informative comments at paragraph 2.4:

Risks of cracking are also associated with dark colours on painted timber wall claddings and trim.

- 6.29. In respect of timber weatherboards generally, paragraph 9.4.9 of E2/AS1 states:

Two coats of exterior grade paint shall be applied, after priming, to all exposed surfaces. Paint systems shall comply with any of Parts 7, 8, 9 or 10 of AS 3730²³.

COMMENT:

The minimum durability period for protective coatings is 5 years²⁴. Improvement in durability and stability of weatherboards can be achieved by priming all surfaces including backs of boards.

...

With tangentially-sawn weatherboards, particularly painted or stained in dark colours, cupping is possible. Providing additional fixings may help restrain the board, but will usually result in splitting of the boards.

- 6.30. The proprietary paint formula used in this case has been developed by the manufacturer to reduce heat build-up.
- 6.31. I have seen no evidence to suggest that the proprietary paint formula used in this case does not meet the requirements of AS 3730.
- 6.32. Acceptable Solution E2/AS1 does not consider the impacts proprietary paint formulas may have on reducing heat absorption. Also, the TSR metric is relatively recent, and this may explain why E2/AS1 only refers to reflectivity (LRV) in an informative context as opposed to the apparently more preferable TSR.
- 6.33. I note the technical literature provided by the manufacturer of the weatherboard product includes information about the application of a paint finish (refer to paragraph 2.13). This included specific requirements related to the priming of the timber surfaces, and carrying out all painting work in accordance with the appropriate clauses of *AS/NZS 2311:2017 - Guide to the Painting of Buildings*. I have seen no evidence to suggest that the preparation of the weatherboards and application of the proprietary paint formula have not been undertaken in accordance with either of the manufacturers' recommendations or *AS/NZS 2311*.

²² E2/AS1, paragraph 2.4, Cladding finish colours.

²³ AS 3730 - 2006: *Guide to the properties of paints for buildings*

²⁴ Building Code Clause B2 *Durability*, clause B2.3.1 (c)

Factors for consideration

6.34. The Building Code is performance-based and sets no minimum values for LRV or TSR for timber weatherboards, nor does Acceptable Solution E2/AS1. The degree of risk for using dark coloured paints on external timber cladding needs to be assessed on a case-by-case basis. That assessment should take into consideration all relevant factors, such as (but not limited to):

- the type of cladding used, its fixing details, and overall construction
- whether the wall has penetrations such as windows and doors or other features to reduce thermal stress on the cladding
- the orientation of the building
- local topography
- any surrounding features that may provide additional shading to exposed elevations of the building
- other features of the building itself that can provide shading to the external cladding (eg roof eaves)
- the elevation (height above finished ground level) and general exposure of the building to direct sunlight and solar energy
- maintenance requirements associated with the external cladding, paint finishes and protective coatings as detailed by the respective manufacturers
- ease of access for inspection, normal maintenance, and replacement of the external cladding and any protective coating and painted surfaces.

6.35. The performance requirements of Clause B2.3.1 are to ensure building elements continue to satisfy the performance requirements of the Building Code with only “normal maintenance”. Acceptable Solution B2/AS1²⁵, as well as Determination 2006/98²⁶, clearly outline what constitutes normal maintenance which should include, but not be limited to, the following:

- where applicable, following manufacturers’ maintenance recommendations
- washing down surfaces, particularly those subject to wind-driven salt spray
- re-coating...exterior protective finishes, and

²⁵ Acceptable Solution B2/AS1, amendment 11, effective 27 June 2019, section 2.1 – Normal Maintenance.

²⁶ Determination 2006/98, “Regarding of a code compliance certificate for a straw bale building with a plastered cladding system at Two Chain Road, Rolleston, Christchurch”, paragraph 8.5.

- replacing sealant, seals and gaskets in joints.

B2/AS1, paragraph 2.1.1, also provides that “the extent and nature of...maintenance will depend on the material, or system, its geographical location and position within the building, and *can involve the replacement of components subject to accelerated wear*” (emphasis added).

- 6.36. In consideration of the above factors, it is relevant to discuss the features of the building with respect to the relevant painted weatherboards (rather than to focus solely on an LRV rating, which is not a measure for consideration in compliance with the performance requirements of the Building Code).

Type of cladding

- 6.37. The type of cladding is timber vertical shiplap weatherboards measuring 187mm wide, which are 18mm thick, and incorporating a double profile. Further, the single lengths of the weatherboards ranging between 2200mm to 3000mm are not excessive (compared to the manufactured lengths of up to 7200mm).
- 6.38. I note the inspection report from 3 March 2020 stated, “works completed and fixed off as per product specifications/ consented details”.
- 6.39. I also note the comments made by the registered architect in that “vertical shiplap cladding has movement due to seasonal thermal and moisture changes. Cladding experiences micro and macro movements, and the extent of those comes down to various factors, from timber formation, finger-jointed [versus] one piece milled, to moisture within the timber, which part of the wood grain it has been taken from, to primers, painting in the factory [versus] onsite, orientation of cladding, nail fixing positions etc. All these factors effect the shrinking, expending, swelling of the timber, and do not necessarily mean the weatherboards will end up ‘cupping’ or ‘splitting’”.
- 6.40. The relatively short length of the weatherboards and how they are installed should allow for thermal expansion and contraction and possible movement due to variations in moisture content of the timber, with a low risk of “cupping” or “splitting” of the weatherboards .
- 6.41. I have also taken into consideration that the weatherboards are fixed over a drained and ventilated cavity which will assist to mitigate the impact of any ingress of external moisture if it were to occur, until such time that the weatherboards could be inspected, maintained or replaced. For this reason there is a low risk for the accumulation of external moisture that could cause undue dampness or damage to the building elements in this case.

Wall penetrations to reduce thermal stress on the cladding

- 6.42. There are no door, window or other penetrations in the east and west elevations of the entranceway to reduce thermal mass.

- 6.43. The north elevation of the dwelling is dominated by a very large area of joinery (approximately 11.65m²). The area of the weatherboards is limited to just 6.48m², which equates to approximately one-third of the total area of the north elevation.
- 6.44. The design of the building on the north elevation is such that there is a low risk of thermal stress on the weatherboards on the northern elevation. This is due in part to the overhang of the roof eaves which shades all the weatherboards across the head of the six sliding doors, and two floor to ceiling glass windows (see figure 1). This means that only a relatively small area of weatherboards in the north elevation will receive direct sunlight year round.

Orientation of the building

- 6.45. The building is orientated such that the street front elevation faces almost directly north. This will be exposed to the majority of the direct sunlight and solar energy through the day.
- 6.46. The east side of the entranceway will receive the majority of the morning sun and will receive little, if any, from midday onwards. This is the largest area of weatherboard subject to the building consent that is exposed to direct sunlight at approximately 16.08m².
- 6.47. The west side of the entranceway will receive no direct sunlight in the morning and, due to the effects of the solar block wall (see figure 2), is likely to only receive direct sunlight in the afternoon. I note this is also the smallest area of weatherboard at approximately 3.0m².

Local topography

- 6.48. The dwelling is located on an elevated section and does not receive any mitigating benefits from any surrounding natural features.

Surrounding features that may provide additional shading to exposed elevations

- 6.49. There are other two-storey buildings to the east and west of the subject property.
- 6.50. Due to the horizontal distance to the neighbouring building to the east (approximately 11m), this is unlikely to provide any shading to the east side of the entranceway.
- 6.51. I note the small copse of trees to the northwest of the building but this appears sufficiently far away that it is unlikely to provide much, if any, shading to the north elevation.
- 6.52. There are no surrounding features to the north of the building that could provide additional shading, with the exception of the solar block wall, but this is only likely to cast a shadow at certain times of the day onto the large area of the glazed doors and windows immediately adjacent to it.

Features of the building that provide shading to the external cladding

- 6.53. The 600mm overhang of the roof eaves along the north elevation of the building will provide some shading to the uppermost parts of the weatherboards. The same does not exist for the west and east sides of the entranceway as the eaves finish flush with the face of the external walls.

Building elevation and exposure

- 6.54. The entranceway and north elevation of the dwelling is a single-storey in height.
- 6.55. As noted above, the east side of the entranceway will receive direct sunlight and solar energy in the morning only. Only a small area of weatherboards on the north elevation will receive direct sunlight and solar energy through the majority of the day. The west side of the entranceway will only receive direct sunlight and solar energy in the afternoon.

Maintenance requirements

- 6.56. The weatherboard manufacturer's technical manual provides information on maintenance requirements of the product²⁷, which are set out as follows:
- in the event of movement or settlement of weatherboards, owners should make good the area by priming and touching up the area with original top coat paint
 - the weatherboards should otherwise undergo regular annual washing, and
 - painting (primer and undercoat followed by topcoat) to maintain paint protection.
- 6.57. The owner has indicated that a reality of using dark coloured paint is that it will be regularly maintained.
- 6.58. The paint manufacturer does provide information on the application of its proprietary formula paint, to a particular standard, as well as re-coating requirements and general maintenance.

Access for inspection, maintenance, and replacement

- 6.59. The building is single storey with no features, or physical obstructions adjacent to it, that would prevent easy access to the weatherboards for the purposes of inspecting, maintaining or replacement of the building elements as necessary.
- 6.60. Due to the easy access arrangements in this case, I am of the view that the maintenance requirements specified by the manufacturer are able to be carried out by the owner with relative ease, thus ensuring the ongoing performance of the weatherboards.

²⁷ Weatherboard Manufacturer's Technical Manual – Vertical Shiplap Weatherboards; dated July 2017, Sections 12, 13 and 14 (pages 10 – 12).

7. Conclusion

- 7.1. Just because a manufacturer may not supply a warranty does not necessarily on its own imply the product or its installation does not comply with the Building Code.
- 7.2. Application of the manufacturer's specially developed proprietary paint formula will reflect more heat than the same colour made using more traditional formulas. This reduces the risk of heat build-up and related stresses on the timber substrate. In this case the paint used has a TSR rating of 23.8 per cent, and there is no corresponding rating available for the weatherboards.
- 7.3. The potential of the weatherboards to "cup" or split as a result of them being coated using the black proprietary paint formula used in this case is a relatively low. In reaching this view I have taken into account factors such as the orientation of the building, the available shading, the building exposure, the limited area of the cladding, the size of the weatherboards, and the fixing of the cladding system over a drained and ventilated cavity.
- 7.4. The design of the single-storey building is such that there is a low risk of thermal stress (expansion and contraction) on the weatherboards.
- 7.5. The manufacturers of the weatherboards and proprietary paint formula have provided documentation related to the ongoing and normal maintenance of their respective products. In this case, I am of the view there are no impediments to the owner being able to observe the performance of the cladding and carry out the maintenance specified.
- 7.6. Taking into account all the available evidence and the relevant factors in this case, I am of the view that the building work, in respect of the paint finish applied to the weatherboards in this case, complies with Clause B2 as it relates to Clause E2. Therefore, I conclude the authority was incorrect to propose to refuse the issue of the code compliance certificate on the basis of the paint colour used, and the authority must now make a new decision taking into account the findings of this determination.

8. Decision

- 8.1. In accordance with section 188(1)(b) of the Building Act 2004, I determine that:
 - the weatherboards installed under building consent BCO10293601, painted black, comply with Building Code Clause B2 *Durability* as it relates to Clause E2 *External Moisture*
 - the authority was incorrect to propose to refuse to issue the code compliance certificate for building consent BCO10293601 in respect of the weatherboards being painted black.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 4 November 2021.

Peta Hird

Principal Advisor Determinations

APPENDIX A

Building Act 2004

67 Territorial authority may grant a building consent subject to waivers or modifications of building code

- (1) A building consent authority that is a territorial authority may grant an application for a building consent subject to a waiver or modification of the building code.
- (2) A waiver or modification of the building code under subsection (1) may be subject to any conditions that the territorial authority considers appropriate.
- (3) The territorial authority cannot grant an application for a building consent subject to a waiver or modification of the building code relating to access and facilities for people with disabilities.

90 Inspections by building consent authority

- (1) Every building consent is subject to the conditions that agents authorised by the building consent authority for the purposes of this section are entitled, at all time during normal working hours or while building work is being done, to inspect –
 - (a) land on which building work is being or is proposed to be carried out; and
 - (b) building work that has been or is being carried out on for off the building site; and
 - (c) any building.
- (2) The provisions (if any) that are endorsed in a building consent in relation to inspection during the carrying out of building work must be taken to include the provisions of this section
- (3) In this section, **inspection** means the taking of all reasonable steps to ensure that building work is being carried out in accordance with a building consent.

94 Matters for consideration by building consent authority in deciding issue of code compliance certificate

- (1) A building consent authority must issue a code compliance certificate if it is satisfied, on reasonable grounds, -
 - (a) that the building work complies with the building consent

...

Schedule 1

(1) General repair, maintenance, and replacement

- (1) The repair and maintenance of any component or assembly incorporated in or associated with a building, provided that comparable materials are used.
- (2) Replacement of any component or assembly incorporated in or associated with a building, provided that –
 - (a) a comparable component or assembly is used; and

- (b) the replacement is in the same position.

...

Building Code

B2 [Durability]

OBJECTIVE

- B2.1 The objective of this provision is to ensure that a *building* will throughout its life continue to satisfy the other objectives of this code.

FUNCTIONAL REQUIREMENTS

- B2.2 *Building* materials, components and construction methods shall be sufficiently durable to ensure that the *building*, without reconstruction or major renovation, satisfies the other functional requirements of this code throughout the life of the *building*.

PERFORMANCE

- B2.3.1 Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the less of the specified intended life of the building, if states, or;

...

- (b) 15 years, if:

- (i) Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimney and flues) are moderately difficult to access or replace, or
- (ii) Failure if those building elements to comply with the building code would go undetected during normal use of the building, but would easily detected during normal maintenance.

E2 [External Moisture]

OBJECTIVE

- E2.1 The objective of the provision is to safeguard people for illness for injury that could result for external moisture entering the *building*.

FUNCTIONAL REQUIREMENTS

- E2.2 Buildings must be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.

PERFORMANCE

...

- E2.3.2 Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to *building elements*, or both

...

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.