



## Determination 2019/014

### The refusal to issue a code compliance certificate due to concerns about weatherboard fixings to a house at 34 Reotahi Road, Whangarei Heads



#### Summary

This determination considers whether the weatherboard cladding to a house complies with Clauses E2 External moisture and B2 Durability. The vertical weatherboards were installed over a cavity but double-nailed. The authority refused to issue the code compliance certificate because of the double-nailing.

#### 1. The matter to be determined

1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004<sup>1</sup> (“the Act”) made under due authorisation by me, Katie Gordon, Manager Determinations, Ministry of Business, Innovation and Employment (“the Ministry”), for and on behalf of the Chief Executive of the Ministry.

1.2 The parties to the determination are:

- the licensed building practitioner<sup>2</sup> and builder of the house, who is the applicant for this determination (“the builder”), acting via a lawyer
- the owner A Adcock (“the owner”)
- Whangarei District Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.

1.3 This determination arises from the decision of the authority to refuse to issue a code compliance certificate for a recently completed house because it was not satisfied

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<sup>1</sup> The Building Act, Building Code, compliance documents, past determinations and guidance documents issued by the Ministry are all available at [www.building.govt.nz](http://www.building.govt.nz) or by contacting the Ministry on 0800 242 243.

<sup>2</sup> Licensed Building Practitioner Number BP113744

that the weatherboard wall cladding complied with certain clauses<sup>3</sup> of the Building Code (Schedule 1, Building Regulations 1992).

- 1.4 The matter to be determined<sup>4</sup> is therefore whether the authority was correct to refuse to issue a code compliance certificate due to concerns regarding the weatherboard fixings. In deciding this, I must consider whether the weatherboard fixing system complies with Clause E2 External moisture and Clause B2 Durability of the Building Code.
- 1.5 This determination is limited to the matter outlined above. It does not consider other parts of the house or compliance with other clauses of the Building Code.
- 1.6 In making my decision, I have considered the submissions of the parties, the report of the expert commissioned by the Ministry to advise on this dispute (“the expert”) and the other evidence in this matter.

## 2. The building work

- 2.1 The building work consists of a three bedroom detached house that is two storeys high in part and is situated on a steeply sloping excavated site in a very high wind zone for the purposes of NZS 3604<sup>5</sup>. The building is moderately complex in plan and form and is assessed as having a moderate to high weathertightness risk<sup>6</sup>.
- 2.2 Construction is generally conventional light timber frame, with some specifically engineered steel elements, concrete and concrete block foundations and floor slab, weatherboard and concrete masonry wall claddings and aluminium joinery. The profiled metal monopitched roofs have eaves and verge overhangs of about 300mm. The timber wall framing is treated to H1.2.<sup>7</sup>

### 2.3 The wall claddings

- 2.3.1 Except for a minor area of masonry veneer to the southwest corner, walls are clad in vertical shiplap Western Red cedar weatherboards. The weatherboards are finished with a factory-applied clear oil finish, and the cut ends are then sealed. The finished assembly is recoated 28 days after installation. I note the weatherboards have a BRANZ appraisal.
- 2.3.2 The boards are fixed through 18mm proprietary horizontal plastic battens, with an open ventilated structure forming a drained cavity, and through a 6mm thick rigid air barrier. The proprietary plastic battens also have a BRANZ Appraisal.
- 2.3.3 The rigid air barrier is a proprietary 6mm thick timber strandboard<sup>8</sup> that is a moisture-resistant, structural panel. The product description notes the panel strands are treated during the manufacturing process to provide H3.1 treated panels. In this instance, the product also provides structural bracing to the house. The CodeMark<sup>9</sup> certificate for the rigid air barrier states that if in accordance with the certificate’s conditions the product:

...will contribute to the compliance with;  
E2 External Moisture – E2.3.2, E2.3.7 (a,b,c)

<sup>3</sup> In this determination, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code.

<sup>4</sup> Under sections 177(1)(a), 177(1)(b) and 177(2)(d) of the Act.

<sup>5</sup> New Zealand Standard NZS 3604:2011 Timber Framed Buildings

<sup>6</sup> The weathertightness risk is calculated using the risk matrix within Acceptable Solution E2/AS1 External moisture

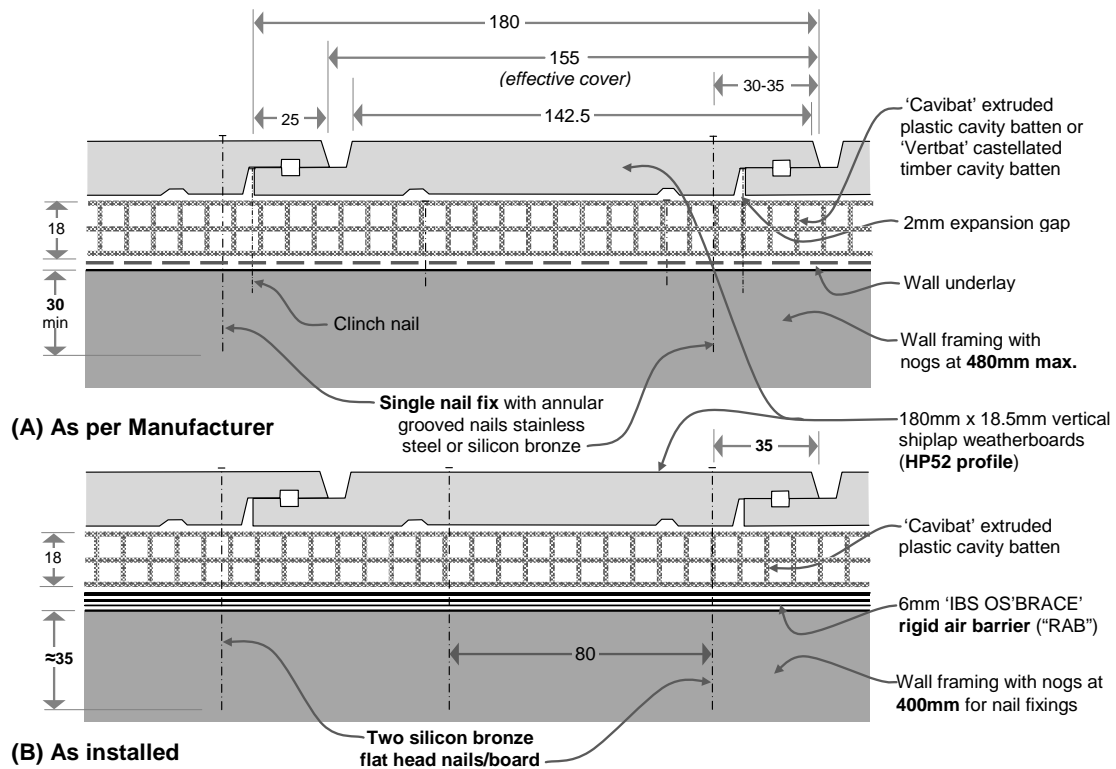
<sup>7</sup> This indicates the level of timber treatment.

<sup>8</sup> A wood-based panel consisting of layers of wood strands bonded together with a synthetic resin.

<sup>9</sup> A voluntary product certification scheme.

## 2.4 The weatherboard installation

2.4.1 The expert's investigations show that installed weatherboards are as indicated in the sketch in Figure 1(B). This can be compared to Figure 1(A), which aligns with the manufacturer's instructions.



**Figure 1: Weatherboard installation (not to scale)**

2.4.2 Although the type/size of fixings and the alignment of weathergrooves appears consistent in Figure 1, significant differences are as follows:

- Sketch 1(A): the specification calls for a single nail per board at 480mm maximum centres vertically, fixed through cavity battens and building wrap, with the nails penetrating 30mm minimum into the framing
- Sketch 1(B): the installed cladding is nailed with two nails per board at 400mm centres vertically, through extruded plastic cavity battens and 6mm thick rigid air barrier into the framing, with the nails penetrating 35mm into the framing.

2.4.3 The manufacturer's standard details include the following notes:

- All nail fixings pre-drilled minimum 1mm diameter smaller than the nail gauge.
- All [weatherboards] to be pre-coated & cut ends and edges and all fresh cut surfaces double coated and sealed before fixing...

The specifications for fixings to vertical shiplap call for either silicon bronze or stainless steel nails that are fixed as per E2/AS1<sup>10</sup> Table 24.

2.4.4 The weatherboard's nail holes are pre-drilled at 3.5mm and then nailed with a 3.15mm nail.

<sup>10</sup> Acceptable Solution E2/AS1 External Moisture

### 3. Background

- 3.1 The authority issued a building consent (No. BC1700723) on 21 September 2017 (based on the date stamp on the drawings as I have not seen a copy of the issued building consent).
- 3.2 The authority carried out inspections from December 2017 to April 2018. The pre-cladding inspection record on 18 April 2018 noted that the rigid air barrier had been installed, with the battens fixed with a 'vent strip at base'. The record noted that 'photos to be taken [at] critical junction areas as flashings are installed as cladding progresses' and stated:
- All work inspected satisfies me compliance with consented plans is confirmed. Ok to start exterior cladding given.
- 3.3 The weatherboards were installed from late April to June 2018, with the final inspection on 15 October 2018. The cladding inspection record identified that weatherboards had been double-nailed and noted this installation method did not meet the BRANZ appraisal installation instructions. The authority also identified various other items unrelated to the installation of the weatherboards that required attention and recorded the inspection as a 'fail'.
- 3.4 In an email to the builder dated 17 October 2018, the authority stated that a code compliance certificate could not be issued for the house because it had considered:
- ...the [Acceptable Solution] E2/AS1, manufacturer's insulation specifications and the BRANZ appraisal and the double nailing of the vertical weather board does not comply with the requirements in the documentation nor with the consented plans. [The authority] does not believe that this will meet the requirements of [Clause] E2 as an [Acceptable Solution] nor as an alternative solution...
- 3.5 The builder applied for a determination on 30 October 2018, which was accepted on 6 November 2018. The Ministry requested further information, which was provided by the applicant on 12 November 2018.

### 4. The submissions

- 4.1 The lawyer made a submission on behalf of the builder, describing the cladding system and its installation and referring to a past determination<sup>11</sup>. The lawyer included the following (in summary):
- In the past determination, the Ministry considered that:
    - performance of installed weatherboards does not rest on the performance of one part of the system alone
    - performance includes all the relevant factors, such as the weatherboards, the cavity, durability of the components, risk features and environmental factors
    - the combination of all relevant factors and other evidence provided reasonable grounds to conclude that the cladding complied with the Building Code.
  - The above should also be applied to the subject weatherboards, because:
    - the wide boards were fixed with two nails to reduce cupping, which would increase the risk of cracking

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<sup>11</sup> Determination 2016/043 Regarding the compliance of weatherboards as installed to a house (19 September 2016).

- the drained cavity behind the boards and the rigid air barrier improves long-term weathertightness performance
- the subject cladding system should be considered as an alternative solution proposal to meet Clauses B2 and E2 of the Building Code.
- The submission included a statement from the builder that described the cladding system, which has been incorporated into the description and noted (in summary):
  - 3.5mm diameter holes are pre-drilled in the weatherboards only to receive the 3.15mm diameter nails, which avoids additional pressure and reduces stress on the boards
  - flashings are installed to all horizontal joins
  - additional flashings have been installed to joinery jambs
  - the two other houses where a similar double nailed cladding system has been installed have shown no evidence of failure to date.
- In summary:
  - the weatherboards are installed according to good trade practice
  - the cladding system increases durability and provides added protection
  - ongoing thermal movement could cause splitting so regular monitoring and maintenance is needed
  - the subject cladding is currently weathertight, with no evidence of external moisture entering the house.

4.2 With and following the application, the lawyer forwarded copies of:

- the consent drawings
- the inspection records
- construction photographs taken during weatherboard installation in 2018
- photographs of weatherboards installed to House A and House B, which both have a similar double nailed cladding system
- the authority's email to the builder dated 17 October 2018
- some correspondence with the owner during October 2018
- builder's sketch of joinery jamb detail dated 8 November 2018
- proprietary information on technical properties of Western Red cedar
- engineering calculations and other technical information.

4.3 The authority made no submission in response to the application.

4.4 A draft determination was issued to the parties for comment on 13 March 2019.

4.5 On 26 March 2019 the authority and the builder accepted the draft determination without comment.

4.6 On 29 March 2019 the owner accepted the draft determination without comment.

## 5. The expert's report

5.1 As mentioned in paragraph 1.6, I engaged an independent expert to assist me. The expert is a member of the New Zealand Institute of Architects and inspected the cladding on 18 December 2018. The expert provided a report dated 29 January 2019, which was forwarded to the parties on the same day.

5.2 The expert noted the report was limited to assessing the compliance of double nailed weatherboards with Clauses E2 and B2. The assessment considered the adequacy of the installed weatherboard fixings as a proposed alternative solution for Clause E2. As part of the assessment, the expert also visited House A and House B, which were constructed by the builder using a similar weatherboard installation system (see paragraph 2.4).

### 5.3 The weatherboards

5.3.1 The expert noted that the subject house was 'substantially complete to post-line stage with roof cladding, joinery, internal linings installed and only external paving etc. unfinished'.

5.3.2 Commenting generally on the weatherboards, the expert noted that the board dimensions accorded generally with the specified proprietary profile and observed that:

- construction photographs show horizontal plastic battens behind the boards, which provide a drainage path down the cavity between the weatherboards and the rigid air barrier
- boards are uniformly fixed with two silicon bronze round head nails at 80mm centres per board horizontally and about 400mm centres vertically
- nails do not penetrate the laps and are finished flush with the surface, with no sign of any bruising of the surface nor any splitting of boards
- board uniformity, nail spacing, lack of damage and general high quality of the cladding fixing support the builder's description that:
  - boards were pre-coated, pinned in place and the nail lines struck
  - boards were predrilled at nail locations.

### 5.4 Weatherboard installation

5.4.1 The expert considered the as-installed details against what is specified for in the following:

- E2/AS1 as an Acceptable Solution to Clause E2 (while direct-fixed vertical weatherboards are within the scope of E2/AS1, vertical weatherboards that are fixed over a cavity are outside this scope<sup>12</sup>)
- BRANZ guidance as good trade practice.

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<sup>12</sup> Horizontal cavity battens are required to support vertical weatherboards, the design of which is not included in E2/AS1.

**Table 2: Fixings and mitigating factors**

Feature	E2/AS1	BRANZ Appraisal and Guidance	As installed	Mitigating factors
<b>Nail pattern</b>	Single	Single	<b>Double</b>	
<b>Pre-drilling</b>	Pre-drill – (only for nails at joints and ends)	Pre-drill <sup>13</sup> - (all nails)	<b>Pre-drilled<sup>14</sup> - (all nails)</b>	Not a mitigation in regard to current benchmarks
<b>Nail material</b>	Stainless steel or silicon bronze	Stainless steel or silicon bronze	<b>Silicon Bronze</b>	Silicon bronze nails fixed through plastic cavity batten. Allows more flexibility than stiffer stainless steel nails fixed directly to framing. Expected to accommodate more moisture and thermal movement before boards split.
<b>Board joints</b>	None	Scarf joints if unavoidable	<b>None observed</b>	
<b>Board finish</b>	Painted, stained or bare finish	Pre-coating or post fix coating	<b>Pre-coated, cut edges sealed and recoated on site</b>	Pre-finishing maintained low moisture content in boards during construction. Framing was kiln-dried and boards were generally at 15% moisture level at installation. No shrinkage/movement likely due to damp boards or framing drying out.

## 5.5 The use of double-nailed weatherboards on other buildings

5.5.1 As part of the assessment, the expert also visited House A and House B, which had been constructed with weatherboard cladding<sup>15</sup> that had been double nailed by the same builder.

5.5.2 In regard to House A, which was built in 2016, the expert noted (in summary):

- The coastal site is elevated and exposed to weather on all elevations, with a similar weatherboard profile in place for two years.
- Boards are uniformly fixed with two silicon bronze round head nails at 80mm centres per board horizontally and about 480mm centres vertically.
- Nails do not penetrate the laps and are finished flush with the surface, with no sign of any bruising of the surface.
- The standard of cladding installation is high, with ‘joints being true, nail lines straight, trim at joinery and base accurate’.
- A small number of short boards (about 80mm in length) below the windows and doors were split.

<sup>13</sup> The manufacturer’s instructions call for a “slightly smaller” diameter hole than the nail diameter

<sup>14</sup> A 3.5mm diameter hole was used for a 3.15mm diameter nail.

<sup>15</sup> Photographs of weatherboards to House A and House B indicate that boards are a different proprietary vertical shiplap weatherboard cladding, which have similar dimensions and details to the subject weatherboards.

- On the exposed ocean-facing elevation, one other longer board above a door had a small crack at the bottom of the board.
- In regard to comparisons with the subject house:
  - the subject house is exposed to less extreme conditions, as it is exposed to the harbour to the north, is somewhat sheltered from weather on other elevations and has eaves or roof overhangs
  - the only element of higher risk is that the subject house has a darker stain, mid-brown, while House A has a lighter stain
  - although short boards would be subject to the same risk of splitting, the consent drawings show concrete foundations beneath full height glazing – any short weatherboards would therefore be cosmetic only, with no impact on weathertightness
  - in regard to the narrow split above the window head, taking into account the other elements of the cladding system (such as the cavity, the rigid air barrier and the joinery flashings) a similar occurrence in the subject house is unlikely to result in a lack of weathertightness
  - since any splitting is expected to be of a similar order of magnitude to House A, double nailing of the subject weatherboards is unlikely to result in a breach of compliance given appropriate maintenance.

#### 5.5.3 In regard to House B, which was built in 2017, the expert noted (in summary):

- The rural site is reasonably sheltered, with a similar weatherboard profile in place for 14 months.
- Boards are uniformly fixed with two silicon bronze round head nail at 80mm centres per board horizontally and about 480mm centres vertically.
- Nails do not penetrate the laps and are finished flush with the surface, with no sign of any bruising of the surface.
- The standard of cladding installation is high, with ‘joints being true, nail lines straight, trim at joinery and base accurate’.
- No split boards were observed in the cladding to House B.

## 5.6 Manufacturer’s advice

### 5.6.1 The expert also spoke to the manufacturer’s ‘technical and specifications advisor’ and noted their following responses (in summary):

- When investigating cases of boards splitting, these had generally been where:
  - boards had been double nailed through lap joints (in majority of cases)
  - temporary fixing pins had been left in place
  - boards had not been prefinished
  - boards are black stained, which makes them prone to splitting.
- If boards have split:
  - the boards themselves would not deteriorate (rot) as a consequence
  - double-nailed boards would not be replaced under guarantee
  - with maintenance, board durability is expected to be at least 20 years.



## 5.7 The expert's conclusions

5.7.1 The expert acknowledged that 'double nailing restricts the possible shrinkage of weatherboards and makes them more vulnerable to splitting.' However, taking the particular circumstances of these weatherboards and given normal maintenance 'to ensure the ongoing performance', the expert considered that any splitting would be:

...unlikely to cause failure to comply with NZBC clauses E2 or B2 in this case, because:

- a) there are mitigating features which reduce the likelihood of boards splitting including the use of pre-coated boards, and relatively flexible nails spanning the cladding cavity, and
- b) the entire cladding system includes other features including a drained cavity which can be expected to prevent small quantities of moisture which may penetrate splits in the weatherboards reaching the interior...

## 6. Discussion

### 6.1 General

6.1.1 An Acceptable Solution is a prescriptive design solution that provides a way of complying with the Building Code. The vertical weatherboard cladding fixed over a cavity is outside the scope of E2/AS1 (see paragraph 5.4.1). Therefore, the cladding installation must be assessed as an alternative solution proposal.

6.1.2 The approach in determining whether building work is weathertight and durable and is likely to remain so, is to apply the principles of weathertightness. This involves the examination of the design of the building, the surrounding environment, design features that are intended to prevent the penetration of water and the weatherboard cladding system as installed.

6.1.3 In evaluating the construction of building elements, it is also useful to make some comparisons with any available evidence, such as the manufacturer's instructions, E2/AS1, and BRANZ guidance on weatherboard fixing, including the BRANZ appraisal for the weatherboard cladding system.

### 6.2 Weathertightness risk

6.2.1 In this instance the weathertightness of the weatherboards is dependent on the features in this house that protect the boards from the weather, features included in the weatherboard system, the workmanship of the installed cladding and the impact of failure on the underlying construction.

6.2.2 This house has the following environmental and design features, which influence the weathertightness risk of the weatherboards as they have been installed:

#### Increasing risk

- the house is built in a very high wind zone
- the house is two storeys high in part and moderately complex in plan and form, with complex roof/wall clerestory junctions and oblique eaves
- there are limited roof overhangs to protect lower wall weatherboards

#### Decreasing risk

- there are roof overhangs to shelter some upper wall weatherboards

- the cedar weatherboards are fixed through a proprietary plastic batten that allows for a drained cavity, and rigid air barrier, with aligned weathergrooves to allow drainage at board laps
- the reduced spacing of vertical fixings means the joints are less likely to open between fixings.

### 6.3 Weathertightness performance

6.3.1 Taking account of the expert's report, I make the following observations on compensating features for this particular house:

- Weatherboard cladding has been installed using good workmanship, with satisfactory junctions and intersections.
- The authority carried out satisfactory inspections of the underlying framing, rigid air barrier, flashings and cavity battens.
- Except for the double nailing of boards, the authority has made no other comment on the inadequacy of the weatherboard cladding system.
- Most of the lower walls are sheltered beneath roof overhangs, which limit exposure to rain and direct sunlight. The boards are installed in single-storey lengths that require no horizontal end joints.
- Wall framing is protected from any moisture penetrating minor cracks or splits in boards by the well-drained cavity and moisture-resistant rigid air barrier.
- The likelihood of the weatherboards moving and splitting leading to moisture ingress causing undue damage or dampness is reduced by:
  - the dimensional stability of Western Red cedar
  - the factory and site-applied penetrating oil stain finish
  - a dark stain was not used on the weatherboards
  - the weatherboard lengths do not require horizontal joints
  - the low moisture content of weatherboards, rigid air barrier and framing when installed
  - allowance for movement of silicon bronze nails spanning the 18mm cavity
  - reduction in framing movement provided by the rigid air barrier bracing panels.

6.3.2 Taking account of the above, I have reasonable grounds to conclude that the weatherboards installed to the exterior walls of this particular house are adequate in these particular circumstances.

### 6.4 Compliance with Clauses E2 and B2

6.4.1 Clause E2 requires exterior walls to prevent moisture ingress that 'could cause undue dampness, damage to building elements, or both'.

6.4.2 Clause B2 requires that building elements must, with only normal maintenance, continue to satisfy the performance requirements of the Building Code for certain periods ('durability periods') 'from the time of issue of the applicable code compliance certificate'.

- 6.4.3 The expert's report and the other evidence provide me with reasonable grounds to conclude the weatherboard cladding is currently weathertight. I am therefore able to conclude that the cladding currently complies with Clause E2 of the Building Code.
- 6.4.4 The durability requirements of Clause B2 include a requirement for wall claddings to remain weathertight for a minimum of 15 years. Due to mitigating factors that compensate for any shortcomings of the weatherboard fixing system (refer paragraph 6.3.1), I am also able to conclude the weatherboard cladding will continue to meet the requirements of Clause E2 for the required durability period, if subject to normal maintenance. Consequently, I am satisfied that the weatherboard cladding as installed complies with Clause B2 of the Building Code.
- 6.4.5 It is emphasised that each determination is conducted on a case-by-case basis. Accordingly, the fact that a particular weatherboard fixing system has been established as being code compliant in a specific instance for a specific house, does not of itself mean that the same system will be code compliant in other situations.
- 6.4.6 I leave it to the parties to resolve amending the consent to reflect the as-built work.

## **6.5 Maintenance**

- 6.5.1 The applicant has acknowledged that thermal movement leads to a potential for weatherboards to split in the future so regular monitoring and maintenance is needed. The expert has also emphasised that the report's conclusions rely on normal maintenance of the cladding system to ensure its ongoing performance.
- 6.5.2 Effective maintenance of claddings is important to ensure ongoing compliance with Clauses B2 and E2 of the Building Code and is the responsibility of the building owner. The Ministry has previously described these maintenance requirements (for example, Determination 2007/60).

## **7. The decision**

- 7.1 In accordance with section 188 of the Building Act 2004, I hereby determine that:
- the weatherboard fixing system as constructed complies with Clauses B2 Durability and E2 External moisture of the Building Code, and
  - I reverse the authority's decision to refuse the code compliance certificate, and require the authority to make a new decision taking into account the findings of this determination.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 30 April 2019.

Katie Gordon  
**Manager Determinations**