



## Determination 2017/028

# Regarding the refusal to grant building consent for the retrofitting of blown mineral fibre insulation in an 84-year-old brick veneer clad house at 66 Thomson Street, Invercargill

### Summary

This determination concerns the retro-fitting of blown mineral fibre insulation into an existing house and the authority's decision to refuse to grant building consent. The determination considers the grounds for the authority's decision, and whether there are now reasonable grounds to be satisfied that the building after the alterations will comply with the Building Code to the extent required by section 112 of the Act.

### 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, Tony Marshall, Manager Determinations and Assurance (Acting), Ministry of Business, Innovation and Employment ("the Ministry"), for and on behalf of the Chief Executive of the Ministry.

1.2 The parties to this determination are:

- the owner of the house, A & D Brammer, ("the applicants") acting through a building consultant as their agent ("the agent")
- Invercargill City Council, carrying out its duties and functions as a territorial authority or a building consent authority ("the authority").

1.3 I consider the following are persons with an interest in this matter

- Insulmax Insulation Ltd ("the insulation provider"<sup>2</sup>), who represents the applicant for the purposes of the building consent application
- BRANZ, who published guidance on retrofitting blown-in external wall insulation
- AsureQuality, the CodeMark<sup>3</sup> certification body that issued the CodeMark certificate for the design method and the insulation as a building material.

<sup>1</sup> The Building Act 2004, 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> The holder of the relevant CodeMark certificate discussed in this determination is Insulmax New Zealand Limited. As the current ownership is the same for companies, I use the term "the insulation provider" for both in this determination.

<sup>3</sup> CodeMark is a voluntary product certification scheme that provides a way to show a building product meets the requirements of the New Zealand Building Code. A product can be a building or construction method, building design or a building material.

- 1.4 The determination arises from a dispute between the parties as to whether proposed building work to retrofit blown mineral fibre insulation<sup>4</sup> (“the insulation”) in the external walls of the applicants’ house would comply with the Building Code (Schedule 1, Building Regulations 1992) to the extent required by section 112 of the Act. The authority has refused to grant building consent on the basis that it did not consider the application provided sufficient information to establish on reasonable grounds that the building work would comply.
- 1.5 The matters to be determined<sup>5</sup> are:
- the authority’s exercise of its powers of decision in refusing to grant building consent given the information before it at the time it made this decision
  - whether the proposed retro-fitting of the insulation and the existing building (as altered) will comply with the relevant clauses of the Building Code<sup>6</sup> to the extent required by the Act.
- 1.6 In making my decision I have considered the submissions of the parties, including information presented at the hearing and my observations during the site visit, and the other evidence in this matter.
- 1.7 I have not considered any other aspect of the code-compliance of the building work. I emphasise that each determination is considered on a case-by-case basis.

## **2. The proposed building work**

### **2.1 The existing building**

- 2.1.1 The building is a single storey detached dwelling built in 1933<sup>7</sup> and located on a flat urban site. Limited information has been provided about the building.
- 2.1.2 The house is timber framed on a concrete perimeter foundation with a suspended timber floor. The hipped roof is clad with profiled metal roofing – there are modest eaves to all elevations. The windows and doors are of timber joinery.
- 2.1.3 The exterior cladding is brick veneer, with a roughcast plaster finish to the walls except for 6-brick course ‘dado’ sitting on the foundation with a band above the dado in a single course of decorative brick. There are some other decorative brick elements.
- 2.1.4 It appears the framing is 100mm deep with a 40mm cavity to the brick veneer. The building consent application presumes no building wrap to the external framing, so the cavity from the internal lining to the inside face of the brickwork is 140mm.
- 2.1.5 The external wall framing to the original house is likely to be Rimu, which is durable timber considered likely to resist fungal decay if subject to moisture ingress.

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<sup>4</sup> Mineral fibre is a general name for fibre materials that are formed by spinning or drawing molten minerals (or "synthetic minerals" such as slag and ceramics).

<sup>5</sup> Under sections 177(1)(a), 177(1)(b) and 177(2)(a) of the Act.

<sup>6</sup> In this determination, unless otherwise stated, references are to sections of the current Act and references to clauses are references to the Building Code

<sup>7</sup> This information taken from the Quotable Value website <https://www.qv.co.nz>. The application information says the original construction was undertaken in the 1950s.

## 2.2 The proposed work

- 2.2.1 The proposed building work is the injection of blown mineral fibre insulation into the un-insulated external walls. The work consists of making a series of 16mm holes in the cladding from the exterior and blowing the insulation into the cavity between the lining and the cladding, with the resulting insulation being approximately 140mm thick.
- 2.2.2 The holes to the external walls are made in the masonry “T” joint where possible, or through the roughcast. A nozzle is inserted into the holes and the insulation is blown into the wall cavity until it is ‘full’. The installation holes are then filled using a sand/cement mortar mix to match existing joint mortar.
- 2.2.3 The proposal includes using a water-based water repellent coating that is vapour permeable to the exposed brick surface after the mortar to the installation holes has cured.

## 2.3 The CodeMark certificate

- 2.3.1 The insulation provider sought and obtained a CodeMark certificate for the insulation method<sup>8</sup>. In support of the application for CodeMark certification, the insulation provider supplied a British Board of Agrément certificate<sup>9</sup>.

- 2.3.2 The scope of the CodeMark certificate says:

This certificate is for the retrofitting of [the trademark named] wall insulation in all existing buildings subject to the completion of the [the trademark named] Existing Building Assessment

- 2.3.3 The insulation itself is described as:

...a soft white blown insulation material<sup>10</sup> that achieves an R value of 2.5 – 2.8/100mm.

- 2.3.4 The certificate sets out the Building Code clauses that the insulation and building work will comply with if installed in accordance with the conditions of the certificate as follows:

B1 Structure – B1.3.1, B1.3.2, B1.3.3(a)<sup>11</sup>

B2 Durability – B2.3.1(a)

F2 Hazardous Building Materials – F2.3.1

The building work will comply with:

E2 External Moisture – E2.3.2

And the insulation will contribute to compliance with:

C3 Fire affecting areas beyond the fire source – C3.7(a)

H1 Energy efficiency – H1.3.1(a, b), H1.3.2E

<sup>8</sup> CodeMark certificate no. AQ-060516-CMNZ

<sup>9</sup> British Board of Agrément certificate no. 14/5086, issued 15 January 2014 for ‘Superwhite 40 cavity wall insulation’

<sup>10</sup> A BBA Certificate was provided toASUREQuality to support the application for a CodeMark certificate. Refer Appendix C for more detail on the BBA Certificate.

<sup>11</sup> It is not clear how these Clause B1 Performance Requirements can be applied to the insulation and the building work.

- 2.3.5 The certificate states that:
- The controlled design method includes a prescribed method for evaluating, reporting and specifying maintenance work to be undertaken, on the existing building in respect of Building Act 2004: s112. For clarity certification covers the controlled design method and the [trademark named] insulation building material.
- 2.3.6 On 31 October 2016 I requested from AsureQuality further clarification of the certificate in regards to compliance to the extent required by section 112 for specific clauses of the Building Code, and the scope or any limitations in respect of types of cladding systems or construction features.
- 2.3.7 AsureQuality responded on 22 November 2016, advising the statement on the certificate regarding compliance under section 112 is in relation to the following clauses of the Building Code:
- B1.3.1
  - C2.2
  - E2.3.2, E2.3.5
  - G9.3.1
  - H1.3.1
- 2.3.8 In regards to the scope or limitations, AsureQuality stated that it had considered ‘a wide range of cladding systems and construction features and is satisfied that no limitation applied to the scope of the certificate’. AsureQuality noted historical concerns about different retrofitted insulation products, but considered it was ‘not appropriate for the [proprietary insulation] certificate to be explicit about a “non-concern” to allay concerns grounded on a different product.’

### 3. The background

- 3.1 The insulation provider, on behalf of the applicants, applied for a building consent on 1 June 2016 to retrofit the insulation. The building work is described in the application as consisting of installation of the insulation into exterior walls. The application listed the CodeMark certificate as being the means of establishing compliance with clauses B1, B2, C1-6, E2, F2 and H1. The application also says Clause F7 will be met using F7/AS1.
- 3.2 On 23 June 2016 the authority requested further information to demonstrate the proposed building work’s compliance, including further details in the assessment of the existing building, details of the person who is suitably qualified to do the pre-installation assessment, and installation details for the insulation. The authority also noted

The report doesn’t state or remark that building paper or underlay is present on the framing, therefore any insulation injected into the walls will fill the cavity. By filling the cavity you restrict ventilation for the building envelope and will allow moisture to transfer to the frame and internal linings which [does] not meet the requirements of [the Building Code clauses] E2.2.2, E2.3.4 and NZS 4246:2006<sup>12</sup> 3.11.

<sup>12</sup> NZS 4246:2006 has been superseded by New Zealand Standard NZS 4246:2016 *Energy efficiency – Installing bulk thermal insulation in residential buildings*. The 2006 version covered loose-fill insulation in walls; the 2016 version specifically excludes installation of loose-fill insulation in ventilation cavities and in wall cavities without underlay.

3.3 The application for determination included copies of the following documents. Given the correspondence noted above, it is unclear which of these were provided when the consent was lodged:

- an assessment form titled “Wall Structure & Install Information”, which noted the cladding type, some of the building’s features and its condition, and noted the building as being suitable for the installation to proceed; this information included 4 photos of the elevations to be insulated.
- an assessment titled “Property Information – Continuation of [the insulation] Existing Building Report”, which included 12 photographs and gave a general description of the building, noted the cladding type, showed the cavity to be approximately 140mm, and commented generally on the relevant features (this document was provided to the authority with a letter dated 5 July 2016)
- Small photographs (approx. 60x80mm) showing:
  - 5 photos of the exterior elevations
  - 1 photo of a timber jamb / roughcast junction
  - 1 photo of the roughcast plaster showing a previously repaired crack
  - 4 photos through a hole to the interior lining after the removal of a power outlet, showing the depth of the cavity, no building paper, and the TPS<sup>13</sup> electrical cabling, and a ceiling-mounted smoke detector

(Larger colour photos were provided by the agent on 29 September 2016 – these photos included four photographs not provided to the authority as part of the building consent application.)

- an outline floor plan showing the walls to be insulated (one small section of wall adjacent a second blocked-off chimney is noted not requiring insulation)
- trade literature for a water-based water repellent (the name of the product is similar but different to that stated in the “Building Work Installation Manual”)
- an agreement between the owner and insulation provider which indicates ‘no work required’ prior to installation
- the CodeMark certificate
- a “Declaration of Conformity to CodeMark Certification”, which stated the installation would be carried out or supervised by a certified person and meet the conditions of the CodeMark certificate.

3.4 On 5 July 2016 the insulation provider responded to the authority’s request for information, providing a revised “Existing building report”, noting the declaration had been provided, and that there is no requirement to meet the New Zealand Standard referred to by the authority, and stating that the consent application is made on the assumption that no building paper will be present in the existing building. In regards to compliance of the building as a whole after the alteration, the insulation provider stated:

In order to meet section 112, BA 2004 the building must perform to at least the same extent as before the alteration. This [insulation] method has been assessed by CodeMark and found to be adequate.

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<sup>13</sup> Tough plastic sheath, typically plasticised PVC.

- 3.5 On 7 July 2016 the agent wrote the authority, noting that the CodeMark certificate is a ‘deemed to comply’ solution and the conditions listed on the certificate had been met.
- 3.6 On 8 July 2016 the authority wrote to the insulation provider with a further request for information – restating that the construction ‘relies on the cavity for ventilation and the removal of moisture which transpires from the ground and through the walls’. The authority considered the building consent application had failed to establish compliance with Clauses E2.3.3, E2.3.4 and E2.3.5. (I note here that the extent of compliance for those clauses are in regards to section 112 and apply to the building as a whole after the alteration.)
- 3.7 On 22 July 2016 the agent responded to the authority, stating that the compliance with E2.3.5 to the extent required by section 112 is addressed by (in summary):
- the current performance of the external envelope – part of the process, ‘which was reviewed as part of the CodeMark certification process, involves a robust assessment of the current performance of the existing exterior envelope
  - the product, known by another name overseas, has been ‘evaluated and certified’ under a BBA certificate. (I have included some of the details from the BBA certificate in Appendix C as it provides useful information on the characteristics and expected performance of the product).
- 3.8 In a further email to the authority on 28 July 2016, the agent accepted that ‘this building consent application is more complicated’, and responded to the authority’s requests for information as follows (in summary):
- the installation manual will not be provided due to commercial sensitivity, and it is unclear why this is required
  - the CodeMark certificate provides the compliance pathway with regard to Clause E2.3.2. Clauses E2.3.3 and E2.3.4 do not apply. Clause E2.3.5 applies to the extent required by section 112 and compliance has been proposed by way of the pre-installation report and other information provided.
- 3.9 It appears that the insulation provider then forwarded to the authority three pages of supporting documentation<sup>14</sup> which set out key features of the assessment of the building prior to the work being carried out, and the performance characteristics of the insulation. The document refers to the BBA certificate (refer Appendix C) as well as testing for water absorption to EN1609<sup>15</sup>.
- 3.10 On 27 July 2016, the agent sought confirmation from the Ministry in regards to the reliance on a product certificate under section 19(d) of the Act in respect of:
- relevant clauses of the Building Code that apply to the installation of the insulation and for which compliance is to the extent required by section 17 of the Act, and
  - clauses of the Building Code that apply in respect of section 112 that concerns the building as a whole after the alteration.

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<sup>14</sup> It is unclear whether the pages are from the insulation provider’s installation manual or produced for the purpose of supporting the building consent application, but they are marked with “E2.3.5/s112 Version 1.0”

<sup>15</sup> BS EN 1609: Thermal insulation products for building applications. Determination of short term water absorption by partial immersion. (Method A – drainage)

- 3.11 On 30 July 2016 a Ministry officer confirmed the agent’s analysis of the two compliance tests under sections 17 and 112 as they apply to the Building Code clauses relevant to retro-fitting of insulation in the walls of existing buildings.
- 3.12 On 29 August 2016 the authority advised the applicant that it had reviewed the information provided along with other information available overseas and the BRANZ guideline (refer paragraph 4.1.2). The authority still had concerns regarding compliance, and considered it required further evidence to be satisfied the building work would comply. The authority noted that the CodeMark certificate ‘covers the design method only, not the installation’ and that the installation information was required for the authority to be able to assess the method of installation against the Building Code.
- 3.13 The authority queried whether there would be a producer statement provided by someone from its authorised list, and confirmation of the product being used as being the same as that for which the certificates were for. The authority sought information on:
- the effect of the product on electrical cabling, particularly how it is controlled around flush boxes in a wall cavity (G9.3.1(e) and (f))
  - how the installation is controlled to avoid spill over to the soffit where it is lower than the stud height and to prevent the insulation being too close to the roofing material
  - how condensation would be managed if the wall was not being filled to the top
  - how the insulation would be restricted from fall through the cavity to the subfloor area and into the ground
  - how the insulation will comply with Clause E2.3.5
  - how the insulation will comply with Clause E.2.3.7 allowing for the failure of the cladding.
- 3.14 The agent responded on 30 August 2016, providing two pages titled “Building Work Installation Manual” describing the drilling of holes to interior and exterior walls, and the filling of exterior walls. In regards to electrical cabling, the agent noted that the insulation is non-combustible and chemically stable.
- 3.15 The authority wrote to the insulation provider on 31 August 2016, clarifying the request for information in its letter of 29 August 2016 and including a list of 11 items (refer Appendix B.1). The authority followed this with a letter dated 1 September 2016 to the insulation provider, noting that as the agent did not intend to provide any further information in response to the authority’s questions the authority was refusing to grant the building consent.
- 3.16 On 21 September 2016, the agent applied for a determination. Payment of the application fee was received on 18 October 2016.

## 4. The initial submissions, the first determination, and the submissions in response

### 4.1 The initial submissions

4.1.1 The agent wrote a letter to accompany the application for a determination, setting out some of the background and submitting that all relevant information had been provided to the authority.

4.1.2 With the application, the agent provided copies of the following documents.

- The original building consent application and its supporting documentation (refer paragraph 3.1).
- The CodeMark certificate.
- The BBA Certificate.
- Relevant correspondence.
- A guideline published by BRANZ dated August 2016. The guideline included a ‘research update’ to a previously published article<sup>16</sup>. The research update stated:

... testing of loose-fill insulation by BRANZ and UK laboratories have found (so called) water-repellent fibres can transfer moisture without needing to absorb (and then wick) water from the back of the cladding.

If the drill-and-fill installation method is proposed, it should [be] carried out from the inside and should only be done where a wall underlay is present and the wall cavities are free of any moisture issues. This ensures that the moisture management performance of the underlay and the wall cladding is maintained.

(The update referred to two BRANZ Study Reports<sup>17</sup>; I note that both of these reports concern the injection of urea formaldehyde foam insulation (“UFFI”))

4.1.3 On 27 September 2016 the authority acknowledged the application for determination; it made no submission in response to the application.

4.1.4 On 29 September 2016 the agent provided copies of photographs taken of the cladding.

4.1.5 On 13 October 2016 BRANZ advised that it would be providing clarification to the ‘Retrofitting external wall insulation’ article in its November Guideline<sup>18</sup>. I have not seen any update or clarification of that article.

4.1.6 On 31 October 2016 I requested clarification fromASUREQuality in regards to the statements in the CodeMark Certificate (refer paragraph 2.3.5).

4.1.7 On 10 November 2016 I requested confirmation from the agent, or the insulation provider, what documentation had been to the authority with the application for building consent. The agent responded on 10 November, advising that with one exception, being the BRANZ guidance, the information provided in the application for determination was a complete set of the information provided in the building consent application.

<sup>16</sup> Build 136 (June/July 2013), *Retrofitting blown-in wall insulation*, Pringle. T

<sup>17</sup> BRANZ Study report SR233 (2010), *Investigation in the performance of Urea Formaldehyde Foam Insulation*, and SR234 (2010) *Investigation into the performance of Brick Veneer Walls installed with Urea Formaldehyde Foam Insulation*

<sup>18</sup> An update in regards to retrofitting insulation where internal linings are removed and there is no building paper appeared in Build 156 (1 October 2016): *Wall insulation retrofit update*.



## 4.2 The first draft determination and submissions in response

4.2.1 A first draft determination was issued to the parties and persons with an interest for comment on 9 December 2016. The draft concluded that:

- the proposed building work would, in principle, comply with Clauses E2.3.5 and G9.3.1 to the extent required by section 112 of the Act, and
- the authority's decision to refuse to grant the building consent was confirmed on the basis that the information provided did not provide reasonable grounds to be satisfied that the building work would comply with the Building Code to the extent required by section 112 of the Act.

4.2.2 On 9 December 2016 the agent noted factual errors in the draft and requested a hearing be held on the matter.

4.2.3 AsureQuality responded to the draft on 16 December 2016, noting some minor errors, and submitting (in summary):

- AsureQuality was satisfied regarding the traceability of the product, and although the tradename is different from that in the BBA Certificate it is the same product. Integrity of the manufacturing/supply of the product is an integral part of Product Certification.
- The CodeMark certificate includes a prescribed method for assessing existing buildings and identifying any work that must be done prior to the installation of the insulation, in order for the requirements under section 112 of the Act to be met. The completed existing building assessment report is provided as part of the building consent application.
- The building consent application listed the CodeMark certificate as being the means of establishing compliance with a number of clauses of the Building Code (refer paragraph 3.1), though some of those claims are not supported by the certificate (refer paragraph 2.3.4).
- AsureQuality is satisfied that the existing building assessment incorporated in the methodology addresses all of the factors that are relevant to establishing compliance to the extent required by the Act, however, AsureQuality acknowledges that the nuances regarding a decision on section 112 of the Act by building consent authorities are complex and these can often be assisted by providing more comprehensive background.

4.2.4 The authority responded to the first draft of the determination on 13 January 2017. The authority did not accept the draft and submitted (in summary):

- The matter to be determined should be amended to better reflect that an authority's decision to issue a consent was based on the information supplied with the consent application.
- Some aspects of the existing building's structure and materials are assumptions, and the insulation provider or agent could have confirmed these.
- Clause E2.3.3 needs to be considered because reliance on the BBA Certificate requires all the conditions of the certificate being complied with.
- It is unclear on what basis the determination has concluded that the water-repellent additive will remain durable 'for the life of the product'.

- The authority does not accept that any moisture that enters the cladding will fall by gravity and not be transferred into the insulation (refer paragraph 6.4.16). If the product is compressed against the brickwork, the question remains: where will the water go? The 40mm cavity in this case is less than the cavity size cited in the BBA Certificate (50mm).
  - When the internal temperature rises, the water carrying properties of the air will increase, and thermal bridges or holes in the insulation will potentially cause the accumulation of more condensation.
  - It is agreed that properly installed and protected electrical cabling should not be overloaded but this has not been established. There is no evidence from an electrician to indicate the cabling in this house is able to be covered by the insulation.
- 4.2.5 The agent provided a further submission on 16 January 2016 which she spoke to at the hearing.
- 4.2.6 No response to the first draft of this determination was received from BRANZ.

## **5. The hearing, the site visit, and the second draft determination**

### **5.1 The hearing**

- 5.1.1 On 14 February 2017 I held a hearing in Invercargill. I was accompanied by a Referee engaged by the Chief Executive under section 187(2) of the Act, together with a legal advisor and an officer of the Ministry.
- 5.1.2 The hearing was attended by:
- two officers of the authority and the authority's solicitor
  - the applicant, a legal advisor for the applicant, two representatives of the consultant acting on behalf of the applicant, and the insulation provider
  - two representatives of the CodeMark certification body.
- An officer from a different building consent authority also attended for part of the hearing.
- 5.1.3 All the attendees spoke at the hearing and were of assistance to me in preparing this determination. The discussions held at the hearing are summarised in Appendix B. The applicant's agent presented a submission, and the insulation provider performed a demonstration with the insulation product.
- 5.1.4 The question was raised at the hearing as to whether the installation of the insulation by itself is "building work" and if so what were the relevant clauses of the Building Code, or whether it was only the drilling and making good the holes to the cladding that is the building work. I have included this issue in the discussion section of this determination at paragraph 6.1.
- 5.1.5 The submissions and discussions at the hearing were wide-ranging, covering issues such as:
- the regulatory framework as it applies to the installation of the insulation in existing houses

- the grounds on which the authority refused to grant the consent, and the reasonable grounds test for the purpose of granting building consents
- the assessment of the existing building and the building report; the effect of installing insulation to cavities with regard to effects on draining and ventilation
- the likelihood of water being conducted from the roof underlay
- the likelihood and effect of insulation entering the subfloor space; the provision of a producer statement or other certification from the installer
- and the content and framework of the determination itself.

The 11 items identified in the authority's letter of 31 August 2016 were also discussed individually. I have appended a summary of the discussions held at the hearing as Appendix B.1, including discussion on each of the 11 items.

5.1.6 The agent and insulation provider maintain the view that:

- Sufficient information had been provided to establish on reasonable grounds that the building work would comply and the building after the installation would meet the requirements of section 112.
- The 11 items were not valid reasons for refusing to grant consent.
- The regulatory framework was not correctly applied by the authority when it made its decision; and the authority was seeking a level of assurance that was beyond the reasonable grounds required in making its decision.

5.1.7 The authority continued to hold the view that it did not have sufficient information with which to be satisfied that the building after the alteration would comply to the extent required by section 112.

## **5.2 The site visit**

5.2.1 A site visit to the property was undertaken at the conclusion of the hearing. The invitation to visit the site was extended to all attendees at the hearing; the authority elected not to attend.

5.2.2 The site visit included a visual assessment of the exterior, the subfloor area under the suspended timber floor, and the roof space above the ceiling; and discussions with the owner and the installer.

5.2.3 The following was observed:

### ***The house exterior***

- The house appeared to be well-maintained with a good paint coating to the roughcast plaster to the brickwork and timberwork.
- There were no perpendes to the brick cladding. The cladding was also sealed against the tongue-and-groove soffit and at all joinery penetrations.
- The exterior timberwork appeared to be sound.
- All joinery penetrations (timber windows and doors) appear to be well-sealed to the roughcast plaster with minor cracking evident at one sill/jamb junction. The concrete windows sills were steeply slopping, there was no gap between

the timber sills and the concrete sill. There was a crack evident in one concrete sill.

- The past cracking to the roughcast plaster was evident and was located high on one exterior wall only. The cracking was fully sealed.
- There was limited ventilation provided to the concrete foundation.

#### ***The subfloor space***

- The ground to the subfloor space was covered entirely by polythene sheet kept in place with metal pins. The subfloor space was dry: there was little or no evidence of a 'musty' smell.
- The top of the concrete strip foundation was at about the level of the ground floor. Insulation board approximately 50mm thick had been installed between the floor joists with a small gap (~40mm) between the insulation and the strip foundation.
- The cavity to the brick veneer opened into the subfloor space; it did not drain to the exterior. The horizontal gap between the wall framing and concrete foundation was about 40mm. The distance between the bottom of the brick cavity and the ground was in the order of 500mm.

#### ***The roof space***

- Blown-wool insulation had been installed in the ceiling space which covered all the ceiling joists, etc. The insulation was deep in places (~200mm) and was in close proximity to the roof cladding at the eaves.

#### ***Comments made by the insulation provider***

- The second chimney had been blocked off and insulation installed to the wall adjacent to the chimney.
- All joinery was well sealed, as noted in the assessment report, but any cracks observed would be sealed with a BRANZ-appraised sealant.
- The report only highlighted possible defects to the cladding; the past cracking (noted above) was pointed out by the installer. The greatest risk arose from the gutter overflowing onto the soffit and into the brick cavity. The soffit had been assessed for such leaks.
- Thermal imaging would be used to identify the location of the wall framing and the insulation would be installed near the underside of dwangs or the top plate between each stud as for a direct-fixed cladding.

### **5.3 The second draft determination and submissions in response**

5.3.1 A second draft of this determination was issued to the parties and persons with an interest for comment on 17 March 2017. The draft concluded:

- the authority correctly exercised its powers of decision in refusing to grant the building consent, albeit that some of the reasons provided were not grounds for refusing to grant a building consent.

- the proposed retro-fitting of the insulation and the existing building (as altered) would comply with Clauses E2.3.3, E2.3.5, E3.3.1 and G9.3.1 to the extent required by section 112, and accordingly the authority's decision was reversed.
- 5.3.2 The insulation provider responded by email on 24 March 2017, accepting the determination subject to a minor correction.
- 5.3.3 The agent for the applicants responded by email on 24 March 2017, accepting the determination subject to minor corrections of fact.
- 5.3.4 AsureQuality provided comment by email on 27 March 2017, noting some typographic errors that have subsequently been corrected. AsureQuality also noted that although Clause E3.3.1 was discussed by the parties, it is not a relevant clause when considering compliance of the altered building to the extent required by section 112 because the installation of insulation would never reduce compliance with that code clause in any building.
- 5.3.5 The authority responded on 30 March 2017. The authority accepted the determination's conclusion that it had correctly exercised its powers when it refused to grant the building consent, and also accepted that I am now satisfied that the altered building will comply with the Building Code. However, the authority did not accept the reversal of its refusal to grant the building consent, on the basis that the information before me 'does not reside on the building consent file' and to grant the consent this information would be required. The authority noted that should the applicants reapply for a building consent with the additional information, the authority would approve it based on the guidance offered through the determination, or it may consider an exemption under Schedule 1 from the requirement to obtain consent.
- 5.3.6 The agent for the applicant provided further comment by email on 31 March 2017, suggesting the decision should not include that the authority's decision be reversed, but that the determination provide guidance on what steps the parties can take after the determination is issued i.e. that the applicants reapply for building consent, submitting the product certification and the determination.

## 6. Discussion

### 6.1 Is the installation of insulation building work?

- 6.1.1 During the hearing the question was raised as to whether the installation of the insulation itself was "building work" for the purpose of the regulations, or whether the "building work" was restricted to the drilling and making good the holes in the cladding.
- 6.1.2 This issue has been addressed in previous determinations<sup>19</sup> involving the retro-fitting of insulation. Section 7 of the Act says, "building work"
- (a) means work
- (i) for, or in connection with, the construction, alteration, demolition, or removal of a building; ...

<sup>19</sup> See for example *Determination 2008/35: Regarding the code compliance of a house in which injected foam wall insulation has been installed* (19 May 2008) Department of Building and Housing

- 6.1.3 The purpose for installing the insulation into the walls of the house is to improve the thermal resistance of the walls. I maintain the view that the installation of the insulation is building work that alters the house and is building work as defined in section 7 of the Act. There are Building Code requirements that relate to the insulation material itself<sup>20</sup>, the building work carried out to install the insulation (the drilling, filling and making good the installation holes), as well the extent to which the existing building complies after the alteration.

## 6.2 The legislative requirements

- 6.2.1 I have issued several determinations about the requirements of the Act as they relate to alterations to existing buildings, including the retrofitting of insulation. The Ministry has also issued guidance<sup>21</sup> under section 175 of the Act on Building Code compliance for retrofitting insulation in external walls that is relevant to this determination.
- 6.2.2 The requirements under the Act for compliance of the building work are that the new building elements and the “building work” (i.e. the retrofitting) must comply with the Building Code as required by section 17 of the Act, and the retrofitting of the insulation must not reduce the extent to which the existing building complies with the Building Code as required by section 112(1)(b) of the Act. These requirements relate to different parts of the building (i.e. new part versus existing parts); the extent of code compliance is different; and they can relate to different Building Code performance criteria.

### ***Section 17 as it applies to the building work.***

- 6.2.3 The Building Code obligations under section 17 of the Act for the installation of the insulation in this case are:
- B2.3.1 in regards the durability of the building elements installed in the alteration, namely the insulation product itself, the filling of the holes, and the water-repellent coating used on the brickwork
  - E2.3.2 in regards to the weathertightness of the walls, in this case the injection holes which must be adequately sealed
  - F2.3.1 in regards to any hazard arising from insulation material itself during and after its installation.

### ***Section 112 as it applies to the altered house***

- 6.2.4 The retrofitting of insulation is an alteration to an existing building and section 112 of the Act contains specific requirements for buildings that are altered. Section 112 relates to the compliance of the existing building (which is the whole building as altered, not merely the alteration); it does not detract from the section 17 requirement that all building work must comply with the Building Code (subject to any waivers or modifications).

<sup>20</sup> In this case the insulation is being installed to an existing building and while it will improve the thermal performance of the building envelope, there is no obligation to comply with Clause H1 Energy efficiency.

<sup>21</sup> *Guidance on Building Code compliance for retrofitting insulation in external walls* (August 2011)

- 6.2.5 The relevant Building Code obligations that relate to compliance of the existing building after the alteration to the extent required by section 112 in this case are:
- B1.3.1 for example in regards to any alterations to structural claddings or the effect of structural performance if moisture were to accumulate. Compliance with B1.3.1 is not in dispute.
  - B2.3.1 and B2.3.2 which are considered in relation to other Building Code requirements. Compliance with B2.3.1 and B2.3.2 is not in dispute.
  - C2.2 in relation to ongoing compliance of fixed appliances. Compliance with C2.2 is not disputed.
  - E2.3.3 and E2.3.5 (discussed in detail in paragraphs 6.4.3 to 6.4.19)
  - G9.3.1 in regards to the continued electrical safety if either the insulation reduces the heat dissipation from the wires, or if the insulation causes electrical circuits to short.
  - H1.3.1 - it is almost certain that retrofitted insulation will improve both the thermal resistance and airtightness of the existing wall, so will not adversely affect the compliance of an existing house in relation to this clause.
- 6.2.6 This determination considers the extent of compliance of the existing building after the alteration (refer paragraph 6.4).

### **6.3 The authority's reasons for refusing to grant the building consent**

- 6.3.1 The agent has submitted that the authority incorrectly exercised its powers of decision when it refused to grant the consent because the authority failed to provide reasons why it did not accept information that had been provided, based its refusal on 'non consent related issues', and incorrectly applied the regulatory framework.
- 6.3.2 The authority's refusal followed a series of requests for further information, and the reason for the refusal was in effect described in the authority's letter of 1 September 2016 as being the lack of or inadequacy of information relating to the various RFIs that culminated in the 11 items identified in the authority's letter of 31 August 2016.
- 6.3.3 In regards to the authority's reasons for refusal, the requirement under the Act is that the information provided in the application will satisfy the authority on reasonable grounds that the building work, if constructed in accordance with the plans and specifications, will comply with the Building Code to the extent required. In the following paragraphs, I discuss each of the reasons for refusal in turn.
- 6.3.4 The requirement in the authority's letter of 31 August 2016 that the insulation be kept 25mm below the underside of the roof underlay is not a requirement of the Building Code and not grounds for refusing to grant the building consent. Clause E2.3.2.5 requires that concealed spaces 'in buildings must be constructed in a way that prevents external moisture [to be] transferred and causing condensation, fungal growth, or the degradation of building elements'. From the discussion at the hearing I understand the reference to a 25mm gap was intended as provision of guidance, however, I am of the view that any guidance is offered in such a way that it is not interpreted as a mandatory action as the only option that must be taken to achieve compliance.

- 6.3.5 In regards to the requests for a complete copy of the installation manual, I note that while it is usual for technical information such as data sheets, installation instructions, or product technical statements to accompany specifications in support of a building consent application, the authority cannot require as it did in this case the insulation provider to provide the installation manual – what is required is adequate information for the authority to make its decision. It is for the applicant to provide adequate information to the authority for it to be satisfied the building work will comply. In this case, as I understand it, the authority intended to use the installation manual to ensure the insulation provider’s adherence to the design methodology that formed part of the CodeMark certification.
- 6.3.6 I am of the view that some of the 11 items listed are not grounds on which the authority can refuse to grant building consent under section 50(b) of the Act and others are not clearly articulated in terms of the performance requirements of the Building Code.
- 6.3.7 However, it is clear from the correspondence generally and the 11 items in particular that the authority was of the view that it did not have sufficient information to be satisfied on reasonable grounds that the building work would comply with the Building Code in respect of section 112 of the Act. I summarise the authority’s concerns with regards to compliance as follows:
- Clause E2.3.3 – the insulation absorbing or transmitting moisture from subfloor space.
  - Clause E2.3.5 – the insulation transferring moisture or accumulating moisture from the roof space or where moisture has migrated through the external cladding.
  - Clause E3.3.1<sup>22</sup> – the effect of the improvement in thermal performance with regards to internal moisture, particularly in respect of the potential for voids to create cold spots.
  - Clause G9.3.1 – the effect of the product on electrical cabling<sup>23</sup>.
- 6.3.8 In order to consider whether the authority’s decision to refuse to grant the building consent was correct, I have reviewed the information provided in support of the application for building consent. In my opinion there was a lack of detail in regards to the existing building, particularly in respect of the existing building report which recorded a limited assessment of the condition of the existing cladding.
- 6.3.9 In my view the consent application did not adequately verify the condition of the existing building. For example, there was almost no information provided about the detailing and condition of window and door penetrations apart from one photo of a window jamb, or any investigation or assessment of the subfloor space. The initial first assessment report was supplemented by a later report (refer paragraph 3.3): my comment here applies to both reports.

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<sup>22</sup> The authority referenced the Functional Requirement in Clause E3.2(a) and (c)

<sup>23</sup> The agent had referenced NZS 4246:2006. The authority did not accept that reference as the building work was outside the scope of the current version of the Standard (NZS4246:2016). While limited in scope, the Standard does provide useful guidance on building assessments and in regards to information to provide in support of building consent applications.



- 6.3.10 The assessment of the building does not appear to have considered moisture levels to the subfloor space and the ventilation of this space through existing foundation vents, or up into the building via the wall cavity as can occur. An excessively damp subfloor can lead to moisture being drawn up a brick cavity and into a building. The assessment should have considered the present performance of the subfloor and the building in this respect. (In making my decision as to compliance I have taken into account my own observations of the subfloor during the site visit).
- 6.3.11 The authority also had concerns about the inspection process and how it would establish that the insulation had been installed correctly in order to confirm the building work would comply with the consent and the Building Code. Section 49(1) of the Act provides
- A building consent authority must grant a building consent if it is satisfied on reasonable grounds that the provisions of the building code would be met if the building work were properly completed in accordance with the plans and specifications that accompanied the application. [my emphasis]
- The authority must be able to identify how it will establish compliance with the building consent when it is considering granting the building consent.
- 6.3.12 There was little information provided about the methodology for the installation of the insulation. The authority had requested further detail regarding the likelihood and potential effects of insulation entering the subfloor space at the base of the brick cavity or touching the underside of the roof at the top of the cavity. I note here that additional information on these issues and the characteristics of the product was submitted by the insulation provider at the hearing and during the site visit (refer Appendix B) where it was apparent that the installer was familiar with the building and its present condition. Some installation advice was not included in the “Building work installation manual” (refer paragraph 3.14) but could quite easily have been provided to confirm how the insulation was to be installed on site. The installation manual is very brief and contains errors. I encourage the insulation provider to make that corrected information available for future building consent applications.
- 6.3.13 The CodeMark certificate covered the proprietary method ‘for creating plans and specifications for a building consent’ and described the ‘controlled design method includes a prescribed method for evaluating, reporting and specifying maintenance work to be undertaken, on the existing building’.
- 6.3.14 Although the information provided to the authority in support of the building consent application may follow the methodology that was assessed for the purpose of the CodeMark certificate, this can only be presumed as the methodology has not been provided to the authority.
- 6.3.15 The outcome of the methodology (in particular the detailed assessment of the existing building and performance of the cladding) may not meet the test of information an authority can reasonably require in order to be satisfied that the work described in the building consent application will comply with the Building Code.
- 6.3.16 Taking the above into account I conclude that the authority did not have sufficient information on which to be satisfied that the building after the alteration would comply with the Building Code to the extent required under section 112 of the Act.

6.3.17 In regards to the reasons for refusal set out in the authority's letter of 31 August 2016, I conclude that the authority correctly exercised its powers of decision when it refused to grant the building consent, albeit that *some* of the reasons provided were not grounds on which to refuse to grant building consent and the refusal could have been better articulated in terms of the performance requirements of the Building Code.

## 6.4 Compliance

6.4.1 With respect to the impact of retrofitting insulation, under section 112 of the Act the altered building needs to comply to at least the same extent as before the building work is done. It is therefore necessary to consider the effect of the installation on existing building elements and components of the building, and the way in which the components work.

6.4.2 Given the 11 items in the authority's letter of 31 August 2016, I have confined my discussion in the following paragraphs to the compliance of the proposed building work with section 112(1)(b) of the Act in relation to the Building Code clauses where the authority considered compliance had not been established – refer paragraph 6.3.7. In making my decision I have taken into account the information provided to the authority in support of the building consent application and to this determination, the submissions of the parties and including those made at the hearing, and my own assessment of the existing building during the site visit.

### **Clause E2.3.3**

6.4.3 At the hearing the insulation provider advised that during installation the insulation will begin to “clump” on the horizontal surfaces and then fill the cavity. The product is “self-supporting”, meaning that other than a small amount of material that may initially be lost<sup>24</sup> into the subfloor space, the insulation will not continue to drop or fall out. In addition, in some instances the installer may install plastic gauze into the cavity from the subfloor space to reduce the loss of material. I encourage the insulation provider to make the additional information about the product characteristics and installation available in future building consent applications.

6.4.4 I accept AsureQuality's view, supported by the BBA certificate, that the insulation material is hydrophobic and will not wick water into the wall space from contact with the ground. I am also of the view that it is highly unlikely that the insulation would bridge the approximately 500mm vertical distance between the bottom of the cavity and the ground. I also note that the ground to the subfloor is fully covered with black polythene sheet which is itself a barrier to moisture.

6.4.5 Taking into account my observations during the site visit (refer paragraph 5.2.3) and the discussion above, I conclude that the altered building will comply with Clause E2.3.3 to the extent required by section 112 of the Act. This opinion is specific to this particular house and the likely performance for houses should be assessed on a case by case basis.

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<sup>24</sup> The insulation provider advised that total losses in a typical house installation would be in the order of 10-15kg of material

***Clause E2.3.5 (with respect to transfer or accumulation of moisture from the roof space)***

- 6.4.6 The authority's concerns centre on the insulation being close to or in contact with the roofing underlay causing condensation on the underlay to be transferred into the wall space or to accumulate in the insulation material, and that the restriction of air movement in the roof space will reduce the evaporation of condensation.
- 6.4.7 The 25mm air gap quoted by the authority is recommended, and is a requirement of NZS 4246, to enable some degree of air movement above the insulation, and to prevent wicking from the building paper into the insulation. I note that there is already insulation in the ceiling space which is uneven in its thickness. In places, at the eaves, the ceiling insulation is in close proximity to the roof cladding
- 6.4.8 During the hearing the insulation provider advised that the insulation material typically creates a mound at the top plate and that the position of the top hole through which the insulation is installed will dictate how far the insulation mounds at roof level. I encourage the insulation provider to make the additional information about the product characteristics and installation available in future building consent applications.
- 6.4.9 I am of the opinion that provided the position of the top hole through which the filling is located is appropriate, the quantity of insulation spilling out of the top of the wall and dropping down into the soffit is unlikely to build up to such an extent that it would touch the underside of the roof cladding. I consider the presence of the existing ceiling insulation will also assist 'damming' the insulation above the soffit line.
- 6.4.10 I conclude that the altered building will comply with Clause E2.3.5 to the extent required by section 112 of the Act. I note that the conclusion reached on this matter is specific to the features of this particular house.

***Clause E2.3.5 (with respect to transfer from or accumulation of moisture ingress from the cladding)***

- 6.4.11 Common to considering the compliance of retrofitted insulation is the question of moisture ingress and whether the effect on moisture transfer inside the walls and the change in drying rates will lead to a damaging level of moisture content, particularly in framing timber.
- 6.4.12 In this case the existing cavity is not a drained and ventilated cavity as it is described in the Acceptable Solution E2/AS1. The cavity 'drains' to the subfloor and not to the exterior, and it has no ventilation to the exterior at the top of the brick, meaning it can only 'ventilate' into the roof space. The installation of the insulation into the cavity will reduce air movement within the cavity.
- 6.4.13 The brickwork is mostly covered with a painted roughcast plaster finish so it will not absorb moisture to the same extent as bare brick. Any bare brick is to be coated, after installation, with a water-repellent coating which will assist in preventing the transmission of liquid water but allow the movement of water vapour.

- 6.4.14 Previous determinations<sup>25</sup> have discussed the effect of insulation on ventilation in cladding systems with cavities, though I note in those cases the insulation shrank as it cured and capacity remained for water that did penetrate the cladding or linings to dissipate, to a greater or lesser extent depending on the cladding type. In this instance, while there is no shrinkage, the insulation is vapour permeable.
- 6.4.15 In regards to holding or accumulating moisture, the mineral fibre insulation is treated with a water-repellent additive making it hydrophobic, which, based on the BBA certificate, I accept will not absorb water and will remain durable for the life of the product.
- 6.4.16 The BBA certificate also states the insulation can be used in situations that bridge the damp proof course (“DPC”) in brick construction and not transfer dampness from the ground into adjacent brickwork, i.e., it will not transmit moisture from an area that is damp into the fabric of the building. The wall insulation may experience instances of occasional water ingress through the cladding; this is not as severe a test as prolonged exposure to damp ground.
- 6.4.17 It is also accepted that any moisture that may enter the cladding will fall by gravity and not be absorbed into the insulation and transferred across its depth to the internal linings. It is also noted that the internal surfaces of brick will likely absorb any liquid water that may reach the interior of the cavity, where it will dissipate as water vapour.
- 6.4.18 I conclude therefore that the mineral fibre insulation will not “accumulate or transfer” moisture such that the cladding system would not comply with Clause E2.3.5 to the extent required by section 112 of the Act. This conclusion is contingent on the satisfactory ongoing performance of the plaster and brick cladding.
- 6.4.19 Whether the cladding system as a whole with the insulation installed continues to comply to the same extent over time will depend on maintenance of the plaster and brick cladding, the maintenance of the junctions to the cladding, and its continued performance with respect to Clause E2.3.2. This, in itself, is not unusual, as there are many cladding systems that rely on regular maintenance to maintain their performance. It is an owner’s responsibility to maintain the external cladding. I strongly suggest the insulation provider’s procedures include alerting home owners to the importance of ongoing maintenance.

## **6.5 Clause E3.3.1**

- 6.5.1 Clause E3.3.1 requires a combination of thermal resistance, ventilation, and temperature to prevent the accumulation of internal moisture as follows:

An adequate combination of thermal resistance, ventilation, and space temperature must be provided to all habitable spaces, bathrooms, laundries, and other spaces where moisture may be generated or may accumulate.

- 6.5.2 The performance of any internal space with respect to Clause E3.3.1 requires management of ventilation and temperature, taking into account the thermal resistance of the building envelope. Any space regardless of its thermal performance may have a problem with internal moisture if the ventilation and temperature is not managed appropriately.

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<sup>25</sup> See, for example, Determinations 2015/048 and 2013/050.

- 6.5.3 The installation of insulation into a wall will improve the thermal efficiency of the building envelope which will assist with the buildings compliance with Clause E3.3.1. This is likely to reduce the occurrence of condensation forming on internal surfaces by raising the temperature of interior wall surfaces.
- 6.5.4 ‘Cold spots’ on walls that have been retrofitted with insulation may lead to localised areas of condensation but will not increase the total amount of condensation. Poor management of a space is more likely to lead to problems with condensation rather than solely the performance of the thermal envelope. Clause E3.3.1 itself says a combination of insulation, ventilation and space heating is required to prevent the accumulation of internal moisture.
- 6.5.5 I consider it unlikely that the installation of insulation will lead to non-compliance with Clause E3.3.1, and that the authority was incorrect to include this clause as a reason for refusing the consent.
- 6.5.6 I also accept that the insulation was more likely to provide a uniform thermal envelope with fewer gaps than batt-type products. The insulation installer also advised that thermal imaging was undertaken after installation to determine the presence of any gaps in the insulation.

### **Clause G9.3.1**

- 6.5.7 The insulation is made from fibres that are non-conductive materials electrically and are very unlikely to have any adverse effect on contact with electrical cabling or cause a ‘short’ between bare electrical terminals.
- 6.5.8 TPS<sup>26</sup> cabling, as it is used in this house, is typically rated for a normal and maximum permissible operating temperature of 75°C; it is limited to this value to allow for clipping and mechanical restraint. I consider it very unlikely that temperatures of this magnitude would be caused or reached before safety devices contained in the house’s electrical distribution system would take effect.
- 6.5.9 The heat dissipation from electrical cabling enveloped in the insulation is considered no worse than might be expected from any other form of blanket insulation – for example, the cables located under thick blanket insulation in a roof space which are also likely to be in bundles. In this case, the cables in the roof space are located under blown-wool insulation that is up to 200mm deep.

## **6.6 The building consent**

- 6.6.1 The authority raised concerns regarding this determination reversing the decision to refuse to grant the building consent, and that the authority would then be in the position of granting a building consent but without the additional information being recorded on the property file as part of the building consent application.
- 6.6.2 Section 19(1)(c) of the Act provides for compliance with the Building Code to be established by way of a determination. Accordingly, I see no impediment to the authority granting the building consent, or an exemption under Schedule 1 as suggested by the authority, after this determination is made. The determination provides the authority with the grounds to be satisfied as to compliance. I suggest that this determination be retained on the property file and referenced in the granting of the building consent or granting of an exemption.

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<sup>26</sup> Tough plastic sheath

6.6.3 Section 188 of the Act provides the determination must ‘confirm, reverse, or modify the decision or exercise of a power to which it relates’. In this case, I have concluded that the authority correctly exercised its powers of decision based on the information it had before it at the time. However, as I have also determined that the building after the proposed alteration would comply, it would not be reasonable to confirm the authority’s decision not to issue the building consent. Accordingly, the determination reverses the authority’s decision.

## **7. Decision**

7.1 In accordance with section 188 of the Act, I hereby determine that

- the authority correctly exercised its powers of decision in refusing to grant building consent, albeit that some of the reasons provided were not grounds for refusing to grant a building consent
- the proposed retro-fitting of the insulation and the existing building (as altered) will comply with Clauses E2.3.3, E2.3.5, and G9.3.1 to the extent required by section 112 of the Act, and accordingly I reverse the authority’s decision to refuse to issue the building consent.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 26 April 2017.

Tony Marshall  
**Manager Determinations and Assurance (Acting)**

## Appendix A

A.1 The relevant sections of the Building Act 2004 discussed in this determination

### **17 All building work must comply with building code**

All building work must comply with the building code to the extent required by this Act, whether or not a building consent is required in respect of that building work.

### **112 Alterations to existing buildings**

(1) A building consent authority must not grant a building consent for the alteration of an existing building, or part of an existing building, unless the building consent authority is satisfied that, after the alteration,—

(a) ...

(b) the building will,—

(i) if it complied with the other provisions of the building code immediately before the building work began, continue to comply with those provisions; or

(ii) if it did not comply with the other provisions of the building code immediately before the building work began, continue to comply at least to the same extent as it did then comply.

A.2 The relevant clauses of the Building Code discussed in this determination

**B1.3.1** Buildings, building elements and sitework shall have a low probability of rupturing, becoming unstable, losing equilibrium, or collapsing during construction or alteration and throughout their lives

**C3.7** External walls of *buildings* that are located closer than 1 m to the *relevant boundary* of the property on which the *building* stands must either

(a) be constructed from materials which are not *combustible building materials*, or...

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

**E2.3.3** Walls, floors, and structural elements in contact with, or in close proximity to, the ground must not absorb or transmit moisture in quantities that could cause undue dampness, damage to *building elements*, or both.

**E2.3.4** *Building elements* susceptible to damage must be protected from the adverse effects of moisture entering the space below suspended floors

**E2.3.5** Concealed spaces and cavities in *buildings* must be constructed in a way that prevents external moisture being accumulated or transferred and causing condensation, fungal growth, or the degradation of *building elements*.

**E3.3.1** An *adequate* combination of *thermal resistance*, ventilation, and space temperature must be provided to all *habitable spaces*, bathrooms, laundries, and other spaces where moisture may be generated or may accumulate.

**F2.3.1** The quantities of gas, liquid, radiation or solid particles emitted by materials used in the *construction of buildings*, shall not give rise to harmful concentrations at the surface of the material where the material is exposed, or in the atmosphere of any space.

**G9.3.1** The electrical installation shall incorporate systems to:

...

(e) protect building elements from risk of ignition, impairment of their physical or mechanical properties, or function, due to temperature increases resulting from heat transfer or electric arc,

(f) operate safely in its intended environment, ...

## Appendix B: Summary of submissions and discussion at the hearing

<b>Background/context</b>	
Insulation provider	There is an issue regarding consistency between BCAs in their decision making. A number of consents have been granted for the use of this product approved consents from 21 Councils, and those councils have not required the insulation manual, have not raised concerns about wiring or the other points that this authority has raised.
	The company has been running for 3 or 4 years, there are licensees in various areas around the country; the only consent applications challenged have been Invercargill City Council for this masonry veneer house, Southland District Council for a weatherboard house, and Clutha District Council are approving consents for weatherboard houses but not masonry veneer.
	Some BCAs are exempting the building work under Schedule 1(2) from the requirement to obtain consent. Those BCAs that are carrying out inspections do a visual inspection of the cladding and checking for smoke detectors.
Authority	The authority is not applying concerns relating to previous products – it is quite clear that this is a different product.
<b>Product characteristics</b>	
Insulation provider	The product is an inert mineral fibre formed from silica, with two forms of water repellent mineral oil. It is ideal for insulating in cavities because it does not take on/absorb water.
	The product is fully breathable – if water gets in it will pass out as vapour through the product.
	The product is “self-supporting” and will “clump”
<b>Reliance on the CodeMark certificate</b>	
Agent	Under section 19(1)(d), BCAs must accept the CodeMark certificate as a means of establishing compliance. If the Ministry did not accept the CodeMark certificate it would undermine the scheme.
	The compliance matters covered in the CodeMark certificate can be split into clauses that a) apply to the material itself, b) apply to the building work (the drilling and filling of holes), and c) apply in respect of the compliance of the existing building.
	This CodeMark certificate is unusual in that it is in respect of a building material but also has an element of “building design”.
	The certificate provides part of the ‘reasonable grounds’ on which the authority can make its decision on compliance with section 112. The CodeMark certification process considered the existing building assessment methodology and the actual performance of the product as it relates to the relevant clauses considered under section 112. The building report provides the site-specific information.
Authority	While there are specific code clauses that were tested, other affected clauses weren’t tested, so the authority was seeking confirmation in regards to those clauses not covered by the certificate.
AsureQuality	The unique element in this particular CodeMark certificate is that the procedures incorporate an assessment of the existing building to provide information to BCAs for them to make their own decision under s112.
	The building consent question is not about the compliance of the building work covered by the certificate, but rather the s112 question in regards to the existing building.



	<p>AsureQuality assessed all the code clauses that could be considered to be affected by the building work, largely guided by the MBIE guidance, and evaluated all of those clauses. The assessment included review of technical information in regards to the performance of the product itself, as well as the procedures the installation provider goes through with regard to the existing building inspection process. However, any lessons from experience should be taken on board, and it would be expected of a product certificate holder to have that in their procedures.</p>
	<p>The certificate covers the methodology, not the work that occurs after the building consent is issued.</p>
<b>Validity of the reasons for refusal</b>	
Agent	<p>While some of the reasons given were related to performance clauses of the Building Code, others weren't – meaning the authority did not correctly exercise its powers of decision.</p>
	<p>The information from the installation manual that was not provided was not relevant to compliance and this cannot be grounds for refusing the consent.</p>
	<p>It is part of the authority's duty to explain the particular code clauses that it needs to know more about.</p>
	<p>Confirmation of the product's used onsite is not a consenting issue – rather it is an issue for inspection. What assurances do BCAs generally require about the use of products onsite for assurances that the specified products are being used as part of the consenting process?</p>
	<p>The 25mm clearance between insulation and roofing underlay is not a requirement of the Building Code.</p>
	<p>Whether the insulation enters the subfloor area is not a compliance issue – there is no H1 requirement for installing insulation into existing buildings. It is a s112 test only.</p>
	<p>The authority has given no reason why it considers the information provided is not adequate to establish compliance with E2.3.5.</p>
<b>Is the blowing of insulation material into the walls building work?</b>	
Agent	<p>It is the view of the agent and the insulation provider that the building work is not the blowing of insulation material into the walls but rather it is only the drilling, filling, and making good the holes used for installation.</p>
	<p>There are no code clauses that would apply to the act of blowing in insulation (s17) – the only obligations that arise are in respect of the existing house (s112)</p>
Authority	<p>It is not just the drilling and filling of holes that is building work – the installation of insulation is in itself building work.</p>
<b>The building report</b>	
Agent	<p>While the initial building report may not have been adequate, the second report addressed the outstanding issues<sup>27</sup>. Photographs show the current maintenance status of the cladding and are representative, though it is acknowledged that it would be useful to identify the direction of wind driven rain to identify the elevation most likely to have moisture ingress, and some information on the site location.</p>
Insulation provider	<p>The report is evolving as experience is gained and includes assessment of the cladding, whether underfloor ventilation is present, window joinery to masonry seal, walls being free to air, indications of whether soffits are leaking etc.</p>

<sup>27</sup> I take these reports to be, respectively, the "Wall Structure & Install Information" and the "Property Information – Continuation of [the insulation] Existing Building Report", refer paragraph 3.3.

## B.1 Discussion on the 11 items in the Authority's letter dated 31 August 2016

Item 1	The need to see the installation manual & discussion regarding inspections
Agent / Insulation provider	<p>Concern that the manual covers commercially sensitive information; the system of installation is unique to New Zealand, in particular the ability to use a 16mm hole, which is then very easy to make good.</p> <p>Those parts of the manual that related to the compliance of the building work – the drilling and filling of holes, was provided. The rest is about the use of the machine, filling the sample box and making adjustments.</p> <p>The agent is of the view there are no relevant performance clauses that would be addressed by the provision of the full installation manual, and that creation of voids is not a code-compliance issue.</p> <p>Though some of the information regarding the way the product behaves at the top and bottom of the cavity are not in the installation manual, they could have been provided as part of the 'consent conversation process'.</p>
Authority	<p>The request for the installation manual would be matter of course for a product/system that the BCA doesn't have an existing knowledge/experience of – it is the industry norm to provide that sort of documentation.</p> <p>Further information was required than just that offered relating to the drilling and filling of holes, particularly as the insulation was going into an open ventilation cavity (not an enclosed box). It is hard for the authority to identify relevant information that it may not know that may be available in the manual – for example is there a certain pressure that needs to be maintained for the correct density to ensure that moisture does run down through the product and to reduce the creation of voids.</p> <p>The building consent process requires the authority to consider how it is going to inspect the building work and on what grounds it would sign off the building work – without a better understanding of the process from start to finish it is difficult to know how the inspection process would need to be carried out, for example whether a progress inspection would be required.</p> <p>It would be logical to make use of the Producer Statement approach, as there are only going to be limited aspects of the building work that the authority would be able to see in an inspection.</p> <p>The authority handles confidential documents on a regular basis, such as plans relating to banks and prisons, and the manual could have been stored as a confidential document.</p> <p>The information provided at the hearing about the position of the top hole drilled and the inserting of plastic gauze at the bottom of the cavity is the sort of detail required in the consent documentation.</p>
Items 2 & 3	Establishing compliance with the building consent (and producer statement discussion)
Agent	<p>Other building consent authorities have established compliance of the building work by establishing that all the holes are sealed (E2.3.2) and it is unclear why this is not sufficient for the authority in this case. Given that all the authority needs to look for is that the holes are adequately sealed, the authority should be able to do this</p>

	<p>The authority has indicated it would not accept a workmanship certificate from the installer. For the insulation provider to be a Producer Statement author on the authority's register may be a high threshold in terms of proof of compliance, but the alternative is the authority carrying out a final inspection of the cladding, checking there is no damage to internal linings, along with a certificate from the licence holder that says the work was done in accordance with the building consent. Alternatively, for aspects of the work such as sealing of the bricks and proof of product used, the licence holder could provide photographic evidence.</p> <p>This should be sufficient for the reasonable grounds test.</p>
Insulation provider	To check the sealant has been applied to the brick would be a simple matter of hosing it with water because the performance is visible.
Authority	<p>The BBA Certificate covers double leaf brick construction only.</p> <p>The authority has not refused to accept producer statements; the authority's quality manual requires the author of the producer statement is a person on the Southern Building Control Groups register. It would be logical for the insulation provider to be on the Producer Statement Authors register.</p> <p>There were assumptions made about the structure that were not verified – the building consent process should allow for confirmation of materials, gaps, how things will perform etc. How the product behaves if the bottom plate is not there – this is the sort of information that was required.</p>
<b>Item 4</b>	<b>Confirmation of the product used</b>
Agent	<p>The authority could have requested a photograph of the product delivered on site as part of the evidence that the building work complied with the building consent.</p> <p>A declaration has been signed that the building consent application is in accordance with the conditions of the current product certificate.</p> <p>The insulation provider is the sole importer of the product.</p>
Insulation provider	The authority would like to be able to look at the product onsite to confirm that it is the one for which the consent was issued. This is no different to checking the markings or identifying other products used in building work.
Authority	Although the proposed installation is outside the scope of NZS4246. Polystyrene in contact with TPC cable can be a concern, so elements of the standard can be used to establish compliance on reasonable grounds – similar to corrosion zones and wind speeds are elements of NZS 3604 that are used in consideration of buildings outside the scope of NZS 3604.
<b>Item 5 &amp; 6</b>	<b>Compliance with G9.3.1(e) and (f) (s112) – effect of insulation on electrical cabling &amp; how it is controlled around flush boxes in a wall cavity</b>
Agent	<p>The proposed installation is outside the scope of NZS4246. Polystyrene in contact with TPC cable can be a concern, so elements of the standard can be used to establish compliance on reasonable grounds – similar to corrosion zones and wind speeds are elements of NZS 3604 that are used in consideration of buildings outside the scope of NZS 3604.</p> <p>Putting insulation in the ceiling, which does not require building consent to do, is subject to the same overloading risk that the authority referred to during the hearing.</p> <p>The shrouding of flush boxes was done for wet insulation product to avoid conductivity issues.</p>
Insulation provider	<p>There are no thermal effects in the back of the plug.</p> <p>Part of the building assessment is to ensure that the cabling has been upgraded to a TPS cable.</p> <p>The attributes of the insulation in the wall are no different to houses that have had insulation of up to 200-300mm thick placed in the roof space over wiring and to no detriment.</p>

	If the cabling is subject to load, and that it may not be appropriate to further insulate it by having insulation material around it. A statement from an electrician would be sufficient to address the issue.
Authority	There are open flush boxes, and the insulation will get inside these flush boxes. Is this a concern, do they need to be pulled out and covered.
	When a Standard is referenced, the first step is to check whether the building work falls within the scope of that Standard.
<b>Item 7</b>	<b>Preventing the insulation from contacting the underside of the roof</b>
Agent	There may already be less than 25mm gap in places because the ceiling has already been insulated.
	In regards to the s112 test, if the roof is currently leaking or the condensation is currently running down and out, given that there is already insulation in the ceiling, the authority needs only to know that the moisture won't accumulate and cause damage or decay to other building elements (E2.3.5) to any greater extent than it currently does. The s112 test is that whatever happens to that moisture can't be any more damaging than what currently happens.
	As part of the certification process AsureQuality was satisfied as to the management of water.
	Agreed there is a continuous cavity from the subfloor to the roof space.
Insulation provider	The existing pathway for moisture in the roof space would be along the underlay until it hits a purlin when droplets would form and fall. If the underlay is wet and is touched by the hydrophobic insulation it will not absorb moisture.
	The underside of roof cladding is at least 150mm higher than the top plate; the theoretical situation of the insulation producing a 150mm mound above the top plate is highly unlikely.
	The location of the top hole through which the insulation is installed will dictate how far the insulation gets pushed up into the roof space.
	From previous experience, the insulation wells up when it hits the top plate (rarely goes higher than the top plate) and forms a mound – a small amount of insulation ends up in the soffit.
	The house is already insulated in the roof by loose-fill wool, which the insulation provider believes is likely to already be in contact with the roof underlay.
	To get into the eaves of a house that already has insulation, has a high chance of someone falling through the roof or disturbing the current insulation; it would be very difficult to check and clear insulation in that area.
	The authority incorrectly quoted the 25mm, which is referred to in Acceptable Solutions and other technical documents, as a requirement; but when there is a departure from standard industry practice the authority will look for more information to justify that departure.
Authority	The current pathway for moisture is along the underlay. The concern is that putting insulation in contact with the roof underlay could lead to conduction of water that has condensed on the underside of the underlay down into the wall system.
	The 25mm gap referred to allows air movement past the underlay, allowing water to disperse. If the air is still because it is blocked, the evaporation will be affected.
	Disagree that it would be difficult to go into the roof space to check and clear insulation and provide for a 25mm gap.
<b>Item 8</b>	<b>Preventing voids, cold spots above the insulation line, and condensation forming at those points</b>
Agent	The performance requirement is E3.3.1 to the extent required by s112 – E3.2(a) & (c) are functional requirements.

	<p>Non-compliance with E3.3.1 to the extent required by s112 would require creation of internal dew points at a rate greater than before the insulation was installed. Given all the other probable areas of thermal bridging in an older existing dwelling, this is unlikely to occur.</p>
	<p>The Ministry's guidance does not consider this code clause as needing to be addressed.</p>
	<p>The requirement is not that there aren't cold spots, only that it is no worse than before the insulation is installed.</p>
	<p>Existing houses of this era are likely to have single glazing, so the condensation would form on the windows (and there is no requirement to upgrade these to double glazing).</p>
Insulation provider	<p>There is a system to ensure that the machine is calibrated correctly and that the voids will be completely filled. Thermal imaging is used before and after the installation.</p>
	<p>If the installation misses an area of the wall above the soffit, there is no detriment to the house.</p>
	<p>A warmer room has the ability to hold more water vapour, so there is a far lower tendency for water to condense. Installation of insulation does not increase condensation on interior surfaces.</p>
	<p>If there was condensation occurring before the insulation was installed, there would be less after the insulation is installed.</p>
	<p>In a uniformly cold room mould growth will appear all over the wall rather than in one area. The amount of mould growing is not going to be worse, rather it would be less.</p>
Authority	<p>The concern is surface moisture on the inside of the building, not interstitial moisture. In a uniformly cold room there is less moisture in the air. If the space is insulated the warm air will hold more moisture – and if there are cold spots (particularly at the top of the wall) condensation may form.</p>
	<p>If there is a ribbon plate installed, there is likely to be a cold spot above that as the ceiling is higher than the ribbon plate – if no ribbon plate is installed there is likely to be no cold spot.</p>
	<p>The authority's experience in circumstances where insulation has not been installed all the way up is that you can see mould forming in the cold spot at the top.</p>
AsureQuality	<p>Intuitively it seems sound that when you heat the air up it contains moisture that will condense on a cold spot, but you have to have a common starting point before and after insulation, and if the common starting point before and after insulation is say 18deg inside temperature, the whole purpose is that you don't need as much energy to maintain that 18deg – you've got no more or less moisture containing capacity before or after the insulation. So the presence of the cold spot becomes irrelevant in that you have a smaller area. The problem of heating to a slightly different temperature is a slightly different issue, and when you do provide good insulation people tend to take a 1-2 degree increase in thermal comfort, but this is unlikely to be material in terms of creating an increase in condensation on internal linings.</p>

<b>Item 9</b>	<b>Preventing the accumulation of insulation in the subfloor (E2.3.3 to extent required by s112)</b>
Agent / Insulation provider	Typically there is a horizontal nog that would prevent the insulation from falling into the subfloor area. If the installer is able to, they would place a plastic gauze into the cavity from the subfloor space – this is done only to prevent waste of material.
	The insulation will self-support in the cavity – it settles on the bottom plate and then compacts within the cavity.
	If it does blow out of the cavity, it will not stick in a clump and it doesn't transmit moisture.
	Product loss over an entire installation would be in the order of 10-15kg of product.
Authority	Top and bottom plates generally do not protrude into the cavity in buildings around Invercargill of this era.
	Initially the authority's concerns were with regard to capillary action.
	The authority would also be concerned if the product could fall/drop out.
	The information regarding the product holding its own weight and the potential to install plastic gauze would have been useful to have.
<b>Item 10</b>	<b>Compliance with Clause E2.3.5 to the extent required by s112 when the cavity is filled</b>
Agent	The Building Code doesn't require a drained and ventilated cavity - the external envelope must meet the performance requirements of the Building Code.
	For s112 requirements to be met for both porous and non-porous claddings, once the insulation is installed the concealed spaces would have to accumulate moisture at a greater rate and cause "condensation, fungal growth, or the degradation of building elements" more than or to a greater extent than was occurring before the insulation was fitted.
	Assurance is based on the existing building report along with the characteristics of the insulation material.
	Compliance with E2.3.5 is based on the performance of the existing building, as identified in the building report, along with the product's characteristics.
	The means of achieving compliance in this case is by firstly ensuring that as little water as possible gets in through the cladding and second is that the product allows any water to drain.
	Failures referred to in overseas research into retro-fitted insulation appear to be the result of poor quality of workmanship, mistakes in the initial assessment, unsuitable nature or location of the building, poor maintenance, or an issue relating to the type of product used.
Insulation provider	This particular house has painted rendered plaster and 5 courses of brick work which will be sealed – the volumes of water required to cause decay or damage are not going to occur. The quantity of water able to pass through brick cladding is minimal to negligible or zero.
Authority	The authority's view was not reached in isolation.
	It is the long-term E2 issues relating to the ventilation cavity that are of greatest concern. The cavity cannot perform its function of allowing moisture to drain or disperse – those functions are being removed from the system. It is a design element that is there to protect the building, and the system is one that requires the biggest cavity of all systems. Non-porous solutions in E2/AS1 still require a cavity, and the technical literature available all require drained and ventilated cavities; what is being proposed goes against all that information and it is for the insulation provider to provide the evidence of performance.

	<p>Based on historical evidence, water can enter buildings slowly and stay for long periods of time; the authority has to be satisfied that the installation of the insulation will not make the building worse in respect of management of that water.</p> <p>The product may be hydrophobic, but it doesn't control the way in which water travels through it. The demonstration video shows that the liquid runs (with gravity) but not in a straight line – it finds a path to ground. The concern is where that water would run to and the potential effect on the structure, and the authority is asking for some evidence that this has been tested.</p> <p>In the demonstration video there was also water remaining after the liquid stopped running.</p>
AsureQuality	<p>AsureQuality looked at the BBA Certificate and did some analysis of that, drawing on the use of the product and in particular around it being accepted going past the DPC which indicated a high degree of comfort in its performance.</p> <p>AsureQuality reached the view that the product does not transmit water through; any water that does get through the exterior cladding doesn't bridge the insulation, and it is likely that it will fall with gravity down the face.</p> <p>Part of the assessment process is ensuring that the exterior cladding is water tight – looking for evidence of leaking, and if there are defects, those have to be rectified before the insulation is installed.</p> <p>In regards to altering the nature of the ventilation cavity – the installation of the insulation will reduce or eliminate ventilation through the cavity, but there is a vapour permeability of the material which will help with diffusion. The material is also hydrophobic, so will tend to resist moisture from the inside of the cladding moving through to the lining or structure.</p> <p>Many of the issues raised about the affect on a ventilation cavity have been canvassed in previous determinations.</p>
<b>Item 11</b>	<b>Compliance with Clause E2.3.7 to the extent required by s112 should the water repellent coating fail</b>
Agent	Compliance is met through compliance with E2.3.5 along with ongoing maintenance
Authority	<p>The brick "sealant" is only water repellent and not water proof – though the authority accepts it will greatly reduce the levels of moisture able to enter the system.</p> <p>The surface coating cannot bridge any existing gaps, for example between the brick and mortar.</p>

## Appendix C: The BBA Certificate

- D.1 The BBA certificate is for a proprietary insulation described as ‘a lightweight granulated glass mineral wool fibre material, treated with a water-repellent additive’.
- D.2 The certificate states the target mean density of the product when installed is  $18\text{kg.m}^{-3}$  over the entire installation, and that individual areas within the wall must not have an absolute density variation of more than  $\pm 5\text{kg.m}^{-3}$  from the target mean density when measured over an area of  $0.5\text{m}^2$ .
- D.3 The BBA certificate says the insulation’s thermal conductivity is  $0.040\text{W.m}^{-1}.\text{K}^{-1}$ . For 100mm thick insulation this is equivalent to an R value of  $2.5\text{m}^2.\text{C.W}^{-1}$ .
- D.4 The BBA certificate describes the installation procedure and set-out of installation holes, which it states are to be 22-26mm in diameter. (I note the installation holes for the insulation as described in the building consent application are 16mm diameter, with locations of holes described as “strategically placed”.)
- D.5 The BBA certificate is valid within the United Kingdom and states that the insulation, if used in accordance with the provisions of the certificate, will meet or contribute to meeting the UK building regulations listed in the certificate in respect of requirements related to (in summary): resistance to moisture, condensation, insulation, and durability.
- D.6 The provisions of the BBA certificate include use in external masonry walls up to and including 12m in height with nominal cavity widths not less than 50mm. The certificate covers the use of the propriety insulation in any exposure zone, subject to conditions, and may be installed in existing buildings ‘only where there are no signs of dampness on the inner face of the cavity wall, other than those caused solely by condensation...’ The design considerations listed in the certificate include (in summary) a survey of the existing building, walls in a good state of repair, and that all of the cavity space should be filled where possible.
- D.7 The BBA certificate states that the proprietary insulation:
- will resist the transfer of water across the cavity to the inner leaf<sup>28</sup>
  - will contribute to limiting the risk of condensation
  - is durable, rot-proof, water resistant and sufficiently stable to remain effective as an insulation of the life of the building.
- D.8 In regards to water resistance, the certificate notes:
- 7.1 The product can be used in situations where it bridges the damp-proof course (dpc) in walls; dampness from the ground will not pass through to the inner leaf provided the wall is detailed in accordance with the requirements and provisions of the [United Kingdom] Building Regulations
- 7.2 Where the product is properly installed in accordance with this Certificate, it will resist any water transfer across the cavity to the inner leaf.
- D.9 The certificate states that the walls will adequately limit the risk of surface condensation when the maximum thermal transmittance values described in the

<sup>28</sup> In the latter part of the 19th century a number of houses were built with cavity walls and this became an accepted form of construction in the 1920s. Most walls comprise two half-brick leaves with a 50mm cavity. In some early forms of construction, the DPC ran right across the cavity.



certificate are not exceeded at any point and the junctions with other elements are designed in accordance with guidance referred to in the certificate. It also states that walls will adequately limit the risk of interstitial condensation when designed and constructed in accordance with specified British Standards and relevant guidance.