



Determination 2012/026

The refusal to grant a building consent for the retrofitting of foam insulation to a house at 570 Tweed Street, Invercargill

1. The matter to be determined

1.1 This is a Determination under Part 3 Subpart 1 of the Building Act 2004¹ (“the Act”) made under due authorisation by me, John Gardiner, Manager Determinations, Department of Building and Housing (“the Department”), for and on behalf of the Chief Executive of that Department.

1.2 The parties

1.2.1 The parties to this determination are:

- the owners of the house, C & V Graham (“the applicants”) acting through their agent Airfoam Wall Insulators (Invercargill) Limited (“the insulation provider”). The insulation provider, also represented the applicant for the purposes of the building consent application
- Invercargill City Council, carrying out its duties and functions as a territorial authority and a building consent authority (“the authority”).

1.2.2 Airfoam Wall Insulation Limited and Airfoam Wall Insulators (Invercargill) Limited are considered persons with an interest in this determination on the grounds of being the proprietary system provider and installer respectively. As the determination is primarily about issues relating to the product, methodology, and documentation, I have referred to both companies (and the insulation provider in its role as the applicant’s agent) as “the insulation provider”.

1.2.3 I have also included the building consultancy firm (“the building consultant”) advising the insulation provider as persons with an interest in this determination on the grounds of the technical advice provided to the applicant in support of the building consent application (refer paragraph 3.2).

¹ The Building Act, Building Code, Compliance documents, past determinations and guidance documents issued by the Department are all available at www.dbh.govt.nz or by contacting the Department on 0800 242 243.

1.3 The matters

- 1.3.1 The determination arises from a decision made by the authority to refuse to grant a building consent for building work that consisted of retrofitting urea formaldehyde foam insulation (“the insulation”) because the authority was of the view that the installation would not comply with the Building Code (Schedule 1, Building Regulations 1992) and would adversely affect the house.
- 1.3.2 In this case I have considered compliance with the Building Code with respect to the product, methodology and process, and documentation, for both the building work itself, and the effect of the building work on the existing building.
- 1.3.3 Therefore, the matters to be determined² are:
- whether there was sufficient evidence for the authority to conclude on reasonable grounds that the building work and the existing building (as altered) would comply with the Building Code to the extent required by the Act
 - whether the authority correctly exercised its power in refusing to grant the building consent.
- 1.3.4 I note that another determination³ considered the proposed installation of the insulation in a different house. Although the houses have different features, similar issues arose concerning compliance with the Building Code with respect to the product, methodology, and process, and documentation, for both the building work itself and the effect of the building work on the existing building, and I took this into account where relevant. Refer to Appendix A for further information on the evaluation of the technical data and operational procedures against the requirements of the Building Code that have been considered in this determination.
- 1.3.5 In making my decision I have considered the submissions of the parties, and the other evidence in this matter. I emphasise that each determination is conducted on a case by case basis.

2. The building work

- 2.1 The existing house was built in 1976. Construction consisted of a proprietary product of structural panels utilising 12mm particle board to the exterior and interior on 70mm studs. In other respects construction is conventional, a single story house with 600mm eaves and concrete slab foundation.
- 2.2 The proposed building work consists making a series of 20mm holes in the external walls and pumping the insulation into the walls to improve the thermal performance of the house. The holes to the external walls are subsequently plugged, and a drying regime is followed while the foam cures.

² Under sections 177(1)(b) and 177(2)(a) of the Act

³ Determination 2012/027

3. The background

- 3.1 On 9 November 2001 the authority became aware that the applicant was retrofitting the exterior walls of the house with the insulation. Work was stopped and the applicant was directed to obtain a building consent.
- 3.2 The subsequent building consent application included drawings of the house with a specification of the work to be carried out and background of the insulation provider. The application was supported by a letter from the building consultant referring to the management of the drying process and general information on the insulation.
- 3.3 In an email on 3 October 2011 the authority requested more information in respect to documentation supplied with the consent application, how the holes in the cladding would be filled to comply with Clause E2, how the house was to be cross ventilated in order to cure the foam and the occupants protected from off-gassing during the curing process.
- 3.4 The insulation provider responded to the authority's request in a letter dated 18 October 2011, noting that as the cladding was already over 15 years old, '[under section 112 of the Act] any repairs [to the cladding] would have no durability requirement as the cladding has met its durability requirement'. The insulation provider was also of the view that the numerous holes in the cladding system were exempt under Schedule 1 as they were less than 300mm.
- 3.5 In an email of 19 October 2011 the authority responded; stating that the exemption for holes less than 300mm is for service penetrations and the like and not 'holes covering the entire surface of the dwelling' as proposed. The authority refused to grant the consent and maintained the view that the proposed building would work would not comply with the following clauses of the Building Code:
- B2 – Durability – Numerous penetrations in the cladding system possibly affecting the durability of the structure and cladding systems
 - E2 – External Moisture – Numerous penetrations in the building envelope allowing the ingress of water
 - F2 – Hazardous Building materials – formaldehyde levels in the building while the foam is curing.
- 3.6 The insulation provider made an application for a determination, which was received on 25 October 2011, and the authority provided a submission on the application to the Department (refer to paragraph 4.)
- 3.7 Following discussions between the parties and an officer of the Department, a trial panel in the garage of this building was injected with the insulation. After a month an area of particle board was removed. No damage was observed and the associated bottom plate and stud had dried to a moisture content level of 18% and 17%.

- 3.8 In a letter to the Department dated 7 December, the insulation provider noted that the applicants would be provided with stickers to put on their windows as a reminder to keep the windows open and this would provide sufficient airflow and ventilation throughout the house. In an email to the Department on 12 December 2011, the authority stated that it remained concerned that a ventilation plan had not been submitted and that the repairs' to the exterior cladding may be ineffective.

4. The submissions

- 4.1 The application for determination was accompanied by a submission from the insulation provider, dated 19 October 2011, which outlined the background to the application. This included the building consultant's report outlining how the drying process is managed and how code compliance is achieved. Technical data on the insulation was also included and extracts from the insulation provider's installation and training manual ("the manual"). In a letter dated 27 October 2011, the authority submitted an outline of its concerns, which included (in summary):
- an increased level of moisture is present in the framing members while the insulation is curing and the voids created by the insulation shrinking provide an ideal environment to support fungal growth and would contribute to the decay of the structural timbers
 - the hollow core structural panels used for cladding form horizontal bracing of the structure and the particle board is not resilient to wet conditions, and would be difficult to remediate for mould growth
 - the existing cladding will be compromised, when the insulation shrinks the builder's fill will no longer be supported, and if the fill was to shrink it would then inevitably fall away
 - the documentation provided is ambiguous on the subject of expected formaldehyde levels inside the dwelling during the curing process. It does not provide a required flow rate for ventilation or a means of monitoring formaldehyde levels after its installation
- 4.2 The authority later submitted a letter dated 30 November 2011 quoting the moisture content of the insulation in the trial panel (refer paragraph 3.6) and an email dated 12 December 2011 reiterating the reasons it could not grant building consent (refer paragraph 3.8).
- 4.3 A draft determination was issued to the parties and persons with an interest for comment on 17 February 2012. The insulation provider, on behalf of the applicant, and the authority both accepted the draft without comment.
- 4.4 Neither the insulation provider nor the building consultant made any further submission in response to the draft. However the building consultant had made a submission on Determination 2012/027 (refer paragraph 1.3.4), which included a copy of a recently amended version of the manual. I have taken that information into account in this determination and amended the evaluation of the technical data and operational procedures as appropriate (refer to Appendix A).

5. Discussion

5.1 Outline for assessing the matters to be determined

5.1.1 The matters I have set out for determination are:

- whether there was sufficient evidence available to the authority to conclude on reasonable grounds that the building work and the existing building (as altered) would comply with the Building Code to the extent required by the Act
- whether the authority correctly exercised its power in refusing to grant the building consent.

5.1.2 In order to consider these matters, I must consider the requirements for alterations to existing buildings under the Act. I have issued a number of determinations about the requirements of the Act, as they relate to alterations to existing buildings, including repairs and remedial work. These determinations include 2010/140, 2010/139 and 2010/080.

5.1.3 The Department has also issued guidance under section 175 of the Act that is relevant to this determination⁴, including:

- Guidance on Building Code compliance for retrofitting insulation in external walls
- Using the Product Assurance Framework to Support Building Code Compliance – A Guide for Manufacturers and Suppliers of Building Products.

5.2 Requirements for alterations to existing buildings

5.2.1 Section 17 of the Act requires that all building work must comply with the Building Code. It doesn't matter whether the building work is to construct a new building or carry out alterations or repairs to a building, all such building work must comply with Building Code.

5.2.2 The Building Code is made up of clauses that set out the performance requirements that buildings and building work must meet. Most clauses of the Building Code have a subject to which the Building Code obligations are expressed to apply. It is that subject that defines the scope of the Building Code obligation. Just because building work is being carried out doesn't mean the building work has to comply with every clause of the Building Code. Building work to alter or repair a building only has to comply with the Building Code obligations that are applicable to building work of that scope.

⁴ The guidance documents are available on the publications section of the Department's website <http://www.dbh.govt.nz/publications>

- 5.2.3 There are Building Code obligations that apply to:
- a building or household unit
 - particular building elements of a building
 - different building systems within a building
 - amenities for a building
 - building materials
 - other characteristics of a building or matters associated with a building or building work.
- 5.2.4 There are express limitations on the types of building to which particular Building Code provisions apply set out in the “limits on application” column of the Building Code. Further definition of a number of the features of buildings to which Building Code obligations apply are provided in the Building Code for the terms “building”, “household unit”, “building element”, and “amenity”.
- 5.2.5 Some Building Code obligations apply to more than one feature of a building. For example, the Building Code obligations relating to structure in B1.3.1, B1.3.2 and B1.3.3 apply to “buildings”, “building elements” and “siteworks” and are thus triggered when constructing a new building, carrying out repairs or alterations to building elements, or carrying out siteworks.
- 5.2.6 Section 17 of the Act also makes it clear that building work must comply with the Building Code regardless of whether a building consent is required. The circumstances when a building consent is not required are set out in section 41 of the Act, including work that is exempt from the requirement to obtain a building consent under Schedule 1 of the Act.
- 5.2.7 Where a building consent is required, section 49 of the Act gives effect to the requirements of section 17 by specifying that a building consent will not be granted unless the authority “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.”
- 5.2.8 These requirements in section 49 apply to any building consent regardless of whether the building work is to construct a new building or building work for alterations or repairs to a building.
- 5.2.9 Section 112 of the Act contains specific requirements for alterations. 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 or the provisions of sections 67 to 70 as to waivers or modifications of the Building Code. Under section 112(1):

- any new building work must comply fully with the Building Code (subject to any waiver or modification granted by the authority)
- after the alteration, the existing building, as a whole must:
 - comply as nearly as reasonably practicable with the provisions of the Building Code that relate to means of escape from fire and access and facilities for people with disabilities.
 - continue to comply with the other provisions of the Building Code to at least the same extent as before the alteration.

5.2.10 Therefore, section 112(1)(b) prevents an authority granting a building consent for an alteration if one of the effects of the proposed building work will be to detrimentally affect the compliance of the existing building with the Building Code.

5.2.11 Section 112(1)(b) states that before an authority can grant a building consent for alterations, the authority must be “satisfied that, after the alteration, the building will continue to comply with the other provisions of the building code to at least the same extent as before the alteration”.

5.2.12 It is important to distinguish between the need for building work (i.e. retrofitting insulation) to comply with the Building Code, as required by section 17 of the Act, and the need to ensure the building work does not reduce the extent to which the altered building complies with the Building Code as required by section 112(1)(b) of the Act. These two requirements relate to different parts of the building, the extent of code compliance is different, and they can relate to different Building Code performance criteria.

6. Whether there was sufficient evidence to conclude retrofitting insulation complies with the Building Code to the extent required by the Act

6.1 In order to form a view about whether there was sufficient evidence to conclude the proposed retrofitting of insulation to this house complies with the Building Code to the extent required by the Act, I have taken account of the regulatory requirements for alterations to buildings as I described in section 5.2, and how this applies to this situation and the items in dispute between the parties.

6.2 The Building Code obligations for the building work

6.2.1 The purpose of retrofitting insulation is to provide improved thermal resistance. The relevant Building Code obligation Clause H1.3.2E is to the building (‘Buildings must be constructed to ensure that their building performance index does not exceed 1.55’). Therefore Clause H1.3.2E is not applicable to the retrofitting of insulation as this building work is an alteration to the existing thermal envelope.

6.2.2 The Building Code obligations for the building work are:

- compliance with Clause B2, with respect to the other Code clauses
- compliance with Clause E2, with respect to the dissipation of the excess moisture present at the completion of construction (E2.3.6)
- compliance with Clause F2, with respect to the installation of the insulation and its ongoing effects (Clause F2.3.1).

6.3 The Building Code obligations for the existing building (as altered)

6.3.1 With respect to the impact of retrofitting insulation, the altered building needs to comply to at least the same extent as before the building work is done. Therefore, it is necessary to consider the impact of installing the insulation to the existing building elements and components of the building, and the way in which the components work (e.g. the affect on moisture transfer inside the walls, the change in drying rates). This is both in terms of the installation and drying process, and the dry insulation.

6.3.2 The relevant components of the building and Building Code obligations are:

Clause B1 (B1.3.1)

- the structural performance of the wall panels must not be reduced, with respect to the accumulated moisture causing damage to the particle board (relates to Clause E2)
- the structural performance of claddings and internal linings (for withstanding normal loads in use and providing bracing units where relevant) is not reduced

Clause B2 (B2.3.1)

- the durability of the building elements, with respect to the extent that other performance requirements apply

Clause C1 (C1.3.2)

- compliance of appliances that generate heat must not be reduced, so the insulation must not cover the appliances or affect their physical or mechanical properties or function

Clause C3 (C3.3.5)

- compliance of any fire rated walls must not be detrimentally affected

Clause E2 (E2.3.2, E2.3.5)

- the ability of the external wall to prevent the penetration of water that could cause undue dampness or damage must not be reduced
- the ability of the cavity to prevent external moisture being accumulated or transferred must not be reduced

Clause G9 (G9.3.1, G9.3.2)

- compliance and continued safety of the electrical wiring must not be detrimentally affected

Clause H1 (Clause H1.3.1, H1.3.2E, H1.3.3)

- the thermal performance of the building envelope must not be reduced

6.4 The application of the Building Code obligations to various Code Clauses.

- 6.4.1 Building consent applications for retrofitting insulation need to cover the proposed building work, demonstrate compliance with the Building Code, and show that the existing building, as altered, will comply to at least the same extent as before the building work was carried out.
- 6.4.2 The evidence provided as a part of the building consent application included:
- information about Building Code compliance
 - test data and analysis about the application of the results
 - extracts from reports and studies
 - extracts from the manual.
- 6.4.3 In conjunction with another determination on this product (refer paragraph 1.3.4), I evaluated the technical data and operational procedures against the requirements of the Building Code (refer Appendix A); and taking account of those findings and the building consent application for this case, I conclude that:
- there was insufficient information in the building consent application to provide reasonable grounds the building work will comply with the Building Code
 - there was insufficient information to provide reasonable grounds the existing building (as altered) will comply with the Building Code to the extent required by the Act.
- 6.4.4 With respect to the quality assurance procedures in place, I note the building consent application did not include information about the pre-installation inspection and decision making process. A drying plan was submitted, but did not fully explain the implications of the items and what actions might be taken to ensure the Building Code clauses would be complied with and the relevant requirements met.
- 6.4.5 The manual explains the importance of judging the suitability of a building for the insulation, and it is my view that there was not sufficient information about this particular building. The evidence supplied, as referred to in paragraph 6.4.2, does not address aspects of the insulation specific to this house. A detailed pre-installation report should be provided, with more information showing the factors affecting the house, analysis, and the decision making process.
- 6.4.6 I note that in respect of the operational procedures, it is my view that the manual and the procedures to ensure it is adhered to are a critical part of the system that ensures that this particular methodology, when applied in appropriate circumstances, meets the appropriate tests under the Act for compliance with the Building Code. This is a key aspect of this particular methodology that should be considered as a part of the building consent application.

- 6.4.7 It is my view that the quality assurance procedures, including the pre-installation inspection and documentation, must be sufficient to ensure robust decision making with respect to the application of this particular methodology, and that all the requirements of the manual are considered.
- 6.4.8 It is also strongly recommended that the insulation provider look at a more formal assessment of the methodology using some of the concepts in the Departments guidance on the product assurance framework⁵.

6.5 The authority's specific concerns

- 6.5.1 In response to the authority's specific concerns as outlined in paragraph 4.1:
- In respect of the increased level of moisture is present in the framing members while the insulation is curing and the potential for fungal growth that would contribute to the decay of the structural timbers; I consider that the documentation provided with the building consent application did not provide sufficient evidence for the authority to be satisfied that the existing building would continue to comply to the extent required by the Act (refer to the table in A2 Appendix A).
 - In respect of the resilience of the particle board to wet conditions, the panels forming horizontal bracing of the structure, and the difficulties of remediation in the case of mould growth; I consider that at the time of application for building consent there was insufficient evidence for the authority to be satisfied that the existing building would continue to comply to the extent required by the Act (refer also paragraph 7.2.10 and the table in A2 of Appendix A). I also note that the manual states that insulation cannot be used with particle board.
 - In respect of the use of builder's fill in the holes made in the existing cladding and whether when the insulation shrinks the fill will no longer be supported and prone to falling away if the fill was to shrink; I consider that the methodology for sealing the temporary holes is adequate and I accept the technical information provided with respect to the reinstatement of the claddings after the installation process. I note that in this instance, particular attention would need to be paid to the sealing the edges of the particle board before the holes are filled. I note the particle board holes are readily observable and therefore can be maintained. The particle board walls were installed in 1971 and appear to have performed adequately to date. The painting of the holes, once filled, should be to the same standard as the remainder of the exterior cladding.
 - In respect of the documentation provided in regard to expected formaldehyde levels inside the dwelling during the curing process and the required flow rate for ventilation or a means of monitoring formaldehyde levels after its installation; I note that the authority refers to the documentation frequently stating safe levels of ambient formaldehyde as exceeding 1ppm and as high as 12ppm and that the 'safe level of ambient formaldehyde inside a dwelling in New Zealand is 0.1ppm'⁶. As I have described in the table in A1 of Appendix

⁵ <http://www.dbh.govt.nz/UserFiles/File/Publications/Building/Compliance-documents/Product-Assurance-Framework-guidance.pdf>

⁶ The Department of Labour Workplace Exposure Standards refers to a 0.33ppm of formaldehyde over a 12-hour work day as 'permissible without experiencing poor health effects'.

A, there is test data showing results of formaldehyde present after installation below 0.1ppm. This is widely used as a guideline for non occupational exposure level for formaldehyde and levels decrease rapidly after installation and typically return to ambient house levels within several days, although clear procedures are required to ensure the house is continually cross ventilated for the whole curing period.

7. Whether the authority was correct to refuse to grant the building consent

7.1 The building consent application process

- 7.1.1 The authority considers that documentation supplied with the consent application is not sufficient to provide reasonable grounds that the building work would comply with the Building Code to the extent required by the Act if carried out in accordance with the plans and specifications.
- 7.1.2 In order to consider the authority's decision to refuse to grant the building consent, I need to take into account the requirements for building consent applications in terms of section 45 and section 49 of the Act.
- 7.1.3 Section 49 of the Act requires an 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.'
- 7.1.4 In terms of the basic information required to support an application for a building consent, section 45(1) of the Act states:
- 45 How to apply for a building consent
 (1) An application for a building consent must—
 (a) be in the prescribed form; and
 (b) be accompanied by plans and specification that are –
 (i) required by regulations made under section 402; or
 (ii) if the regulations do not so require, required by a building consent authority; and
 (c) contain or be accompanied by any other information that the building consent authority reasonably requires; and
 ...
- 7.1.5 The Act provides for an authority to set reasonable requirements for the documentation that accompanies applications for building consents. An authority is entitled to set minimum requirements to ensure that the proposed building work is clearly documented and to require designers to clearly demonstrate and document how Building Code compliance is to be achieved. The authority has a 'Guide to completing applications for building consents' that sets out the documentation that is required, the documentation that is sometimes required (depending on the type of application) and the types of plans and drawings that are required to support an application.

7.1.6 The Department has also issued guidance under section 175 of the Act that describes the minimum documentation that should be supplied with an application to demonstrate compliance with relevant clauses of the Building Code – ‘Guide to applying for a building consent (residential buildings)’ (second edition October 2010).

7.2 The authority’s decision to refuse to grant a building consent

7.2.1 In section 6.4, I considered the evidence that was provided and required in support of the proposed building work to demonstrate compliance with the Building Code and that the building work will not adversely affect the performance of the altered building.

7.2.2 In its letter refusing the grant the building consent dated 27 October 2011, the authority was of the view that :

- the evidence provided was not sufficient to demonstrate compliance
- issues with respect to Building Code Clauses B1, B2, E2 and F2 have not been answered satisfactorily.

7.2.3 As I have found that there is not sufficient evidence to demonstrate compliance with respect to the relevant Building Code obligations it follows that there was not sufficient evidence provided as a part of the building consent application and therefore the authority was correct to refuse to grant the building consent.

7.2.4 The Act makes specific requirements of both an applicant and an authority when a building consent is being sought; the applicant is required to provide sufficient relevant information to clearly describe the proposed work, and the authority must clearly articulate the reasons for an application being refused (if the application is not adequate).

7.2.5 The application for consent included a significant amount of information, some of it specialist in nature. I accept that if an authority receives material that is outside its area of expertise it is entitled to have the material peer reviewed at the applicant’s expense. I also note that if information is provided from another country or standards cited from another jurisdiction as part of demonstrating compliance with the Building Code, it is necessary to justify how the standards and information are relevant to the New Zealand situation.

7.2.6 As described in paragraph 6.4.5, I also consider that the building consent application did not include sufficient information about the particular building. A more detailed pre-installation report should be provided specifically addressing concerns of weathertightness.

7.2.7 The insulation provider considered that the holes in the cladding system were exempt under paragraph jh of Schedule 1, as they were less than 300mm in diameter (refer paragraph 3.4). In its response the authority noted that the exemption for holes less than 300mm is for service penetrations and the like and noted that the proposed work included a significant number of holes in the cladding (refer paragraph 3.5).

- 7.2.8 Paragraph jh of Schedule 1 states that a building consent is not required for the making of a penetration no greater than 30 centimetres in diameter to enable the passage of pipes, cables, ducts, wires, hoses, and the like through any existing building and any associated building work, such as weatherproofing, fireproofing, or sealing the penetration:
- 7.2.9 I concur with the authority's view that the holes required in the cladding to inject the insulation are outside that considered in paragraph jh of Schedule 1. It is my view that the making of the holes is not for one of the purposes stated in paragraph jh. I note there are a significant number of holes and this must be considered in light of the ability of the exterior envelope to remain weathertight. I am therefore of the view that the holes made to the cladding can not be considered exempt building work under Schedule 1.
- 7.2.10 I note that subsequent to the application for building consent the applicant injected a trial panel in the garage of this building with the insulation and recorded the moisture content level after one month (refer paragraph 3.7). I note that this may assist the authority in forming a view as to compliance, in conjunction with any other evidence provided in an application for building consent.

8. What is to be done now

- 8.1.1 I suggest that the building consent application should be modified and resubmitted, taking into account the findings of this determination. The modified building consent application should provide evidence to demonstrate compliance for this work. Sections 6.2, 6.3, and 6.4 provide my view of the appropriate methodology to be used to shape the building consent application for this building work.
- 8.1.2 As a response to this determination, I expect that the insulation provider will modify the manual accordingly to update it with new information that this determination has identified as being required.
- 8.1.3 Until the shortcomings in the documentation are satisfactorily resolved, the authority is entitled to refuse to grant a building consent on the basis that, without adequate documentation, it cannot be satisfied on reasonable grounds that the provisions of the Building Code will be met if the proposed building work is completed in accordance with the plans and specifications that accompanied the application for the consent (see section 49 of the Act).

9. Decision

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

- there was not sufficient evidence to provide reasonable grounds to conclude that retrofitting the insulation to this house would comply with the Building Code
- there was not sufficient evidence to provide reasonable grounds to conclude that the existing building (as altered) would comply with the Building Code to the extent required by the Act

and accordingly I confirm the authority's decision to refuse to grant a building consent for retrofitting the insulation to the house.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 10 April 2012.

John Gardiner
Manager Determinations

APPENDIX A

A1 The following table compares this evidence with respect to the Building Code obligations for the building work (refer to paragraph 6.2). The building work in question must comply with the Building Code.

Building Code obligations	Information provided	My view
Clause F2	<p>There is test data showing results of formaldehyde present after installation below the current Department of Labour exposure limit (although that limit relates to occupational exposure) and below 0.1ppm (0.1ppm is widely used as a guideline for non occupational exposure level for formaldehyde). Formaldehyde levels decrease rapidly after installation and typically return to ambient house levels within several days. The building must be continually cross ventilated for the whole curing period of about one month, which is covered in the manual.</p> <p>The manual requires the indoor area be continually cross ventilated for the whole curing period.</p> <p>The manual (revised during the determination process) addresses the need for cross ventilation and the use of reminder stickers by requiring the installer to select the windows to be kept ajar and to put a reminder sticker on it. There are follow-ups at one week and then one month. Persistent presence of unpleasant odour would require a sample test and possibly the installation of blower fans.</p>	<p>This relies upon owners' behaviour and therefore adequate information and instruction being provided to owners, and possible follow up visits or inspections being integrated into the system. Clear procedures are required to ensure the ventilation requirement is adhered to.</p> <p>I accept that the process described in the manual (revised during the determination process) is sufficiently robust.</p>
Clause E2 Clause B2	<p>The foam is open cell, with 'average' water vapour permeability⁷ and as such will not create an unwanted vapour barrier in the wall that could restrict dissipation of water.</p> <p>The catalyst formula contains three different antifungal additives to hinder the growth of fungi. Independent testing supports the fact that the foam is not a source of food for mould or fungi, rather, as moisture vapour migrates out of the foam, the fungicide is carried with it and penetrates the interior of the wall cavity, thereby helping inhibit the growth of fungi on interior wall components.</p> <p>There is a variability of cavity drying rates, however, the use of fungicides provides protection whilst high moisture levels decrease to appropriate levels.</p>	<p>Factors that will affect the drying potential of the insulation include the vapour permeability of the wall linings and claddings, the rain and wind environment, the ground conditions and foundation connections to a wall, the condition of the existing cladding, the ventilation rate within the cavity, and the relative temperature of the external and internal wall surfaces.</p> <p>Whilst the presence of fungicides provides a compensating feature, the evidence based on customer feedback records is empirical at best. I note that the records of installation are not relevant to the test being applied (with respect to Clauses E2 and B2).</p> <p>The compliance relies upon monitoring possible negative effects. Robust decision making, and clear procedures</p>

⁷ of 4.4ng/m².s.Pa

	The installation track record indicates moisture in walls as a result of the product installation has not been an issue based on customer feedback records and the records of installation (15,000 houses in New Zealand over the last 31 years and has been used in the USA for about 35 years).	and guidance is required on what to look for and what to do in the case that certain thresholds or timeframes are exceeded.
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A2 The following table compares this evidence with respect to the Building Code obligations for the existing building (refer to paragraph 6.3). The existing building must comply to at least the same extent as before the building work in question was carried out.

Building element	Building Code obligations	Information provided	My view
External wall framing, external cladding and internal linings (bracing and normal loads)	Clause B1 Clause B2	<p>There is a variability of cavity drying rates, however, the use of fungicides provides protection whilst high moisture levels decrease to appropriate levels. The installation track record indicates moisture in walls as a result of the product installation has not been an issue based on customer feedback records.</p> <p>The structural performance of claddings and linings are not altered as part of the installation process, other than the small holes for installing the product, which are subsequently reinstated.</p>	Although I acknowledge fungicides provide a compensating feature, the structural performance may also be affected by excessive or prolonged moisture being present in the cavity. Maintaining the structural performance for bracing and normal loads of the framing, claddings, and internal linings relies upon monitoring possible negative effects. Robust decision making, and clear procedures and guidance is required on what to look for and what to do in the case that certain thresholds of moisture levels or timeframes are exceeded.
Appliances	Clause C1	<p>The insulation is fire resistant.</p> <p>The insulation must meet the code requirements for clearances to things like flues and heat generating devices in walls like lighting dimmers. This requirement is addressed in the manual.</p> <p>The manual requires the position of the chimney or flue to be identified, however, allows for a complete fill of the void around the chimney or flue.</p> <p>The manual (revised during the determination process) states that all combustion appliances with flues against, through or adjacent to a cavity wall that is to be filled should be operated prior to filling to observe performance and refers to specific testing procedures.</p>	It is unclear how the requirement that the appliances be operated prior to the insulation being installed matches the information provided that clearances are considered.
Fire rated walls	Clause C3	<p>The insulation is fire resistant.</p> <p>The integrity of any fire rated</p>	The integrity of any reinstatement relies upon this step being integrated into the quality

		<p>wall would be maintained by reinstatement if penetration of the rated wall occurs for the installation process.</p> <p>The predominant installations are to single houses and therefore there are no fire rated walls present. In respect of unit requests, the insulation provider's policy is to have a fire engineer review and comment.</p>	<p>assurance process. Clear procedures and guidance is required on identification of this case, and what to do.</p> <p>Although I note the comment made about units, this requirement is not incorporated in the checksheet.</p>
External wall and cladding system	<p>Clause B1</p> <p>Clause B2</p> <p>Clause E2</p>	<p>The effect of the insulation on the compliance of an existing wall depends largely on the condition of the wall. The manual requires this be assessed with respect to whether the walls are structurally sound and weathertight.</p> <p>The retrofitting of the insulation increases the airtightness of the wall to reduce pressure differences across the cladding and the fact the insulation does not readily absorb moisture contributes to compliance.</p> <p>The installation track record indicates moisture in walls as a result of the product installation has not been an issue based on customer feedback records.</p> <p>The small holes made to the external cladding are filled with filler and finished.</p>	<p>This requirement relies heavily on the structural integrity of the existing building, and its current weathertightness performance.</p> <p>The manual and checksheet references most of the significant items, but does not provide a means of considering the implications of these items, and what actions might be taken to ensure the Building Code clauses would be complied with.</p> <p>The judgement of the suitability of a building is a key aspect and there is not sufficient information about this. A more detailed pre-installation report is required, with more information showing the factors affecting the house, analysis of the house, and the decision making process.</p> <p>I accept the technical information provided with respect to the reinstatement of the claddings after the installation process.</p>
Electrical wiring	Clause G9	<p>Existing wiring is typically completely encased with insulation, thus the issue of compatibility and the heat dissipation of wiring needs to be considered.</p> <p>The confirmation of compatibility with plasticised PVC wiring sheathing with the insulation is supported by a technical investigation⁸.</p> <p>The issues of electrical safety are addressed in the manual, which requires that a home is re-wired if aged electrical wiring with perished sheathing exists or 'sealed circuit breakers' are installed.</p> <p>It is the insulation provider's policy not to foam unsafe or old wiring. The pre-installation check list requires identification</p>	<p>The manual and checksheet references (revised during the determination process) most of the significant items, but does not provide a means of considering the implications of these items, and what actions might be taken to ensure the Building Code clauses would be complied with.</p> <p>The judgement of the suitability of a building is a key aspect and there is not sufficient information about this. A more detailed pre-installation report is required, with more information showing the factors affecting the house, analysis of the house, and the decision making process.</p>

⁸ BRANZ Investigation into the Performance of Urea Formaldehyde Foam Insulation DR0303/3 30 April 2010

		of wiring and confirmation from the client, and the manual states that foaming old wiring is a fire hazard.	
Thermal performance	Clause H1	<p>The compliance of retrofitted insulation with H1.3.1 is not a requirement for retrofit situations where the thermal envelope of the building is not being replaced.</p> <p>There are many references identifying the thermal conductivity of the insulation, tests conducted by BRANZ identify the average thermal conductivity to have a translated R value of R2.25 for a 90mm thickness.</p> <p>I note thermal performance is a matter between the insulation provider and a homeowner.</p>	<p>I note that there is sufficient evidence to conclude the energy performance of the house will be improved, although the extent to which this is achieved will depend on the effectiveness and durability of the installation and possible shrinkage of the insulation in the wall.</p> <p>In respect of the test required to be applied under the Act, I consider the information provided is adequate to provide reasonable grounds with respect to the technical information and operational procedures.</p>