MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

Determination 2017/071

The code-compliance of a proposed house with steel framing and polyisocyanurate insulation board at 250 Wills Road, Upper Moutere, Tasman

Summary

This determination considers the code-compliance of a proposed steel-framed house that uses rigid foam insulation board to insulate the walls and roof: the house was the subject of an application for building consent. The determination considers whether the insulation board satisfies certain clauses of the Building Code, and also whether the documents submitted in support of the application for building consent were adequate.

1. The matter to be determined

1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004[1] ("the Act") made under due authorisation by me, John Gardiner, Manager Determinations and Assurance, Ministry of Business, Innovation and Employment ("the Ministry"), for and on behalf of the Chief Executive of the Ministry.

1.2 The parties to the determination

1.2.1 The parties to the determination are:

- the owners of the proposed house, S Padrott and P McKenzie ("the applicants") acting via the supplier of the proposed insulation ("the insulation supplier")
- Tasman District Council ("the authority"), carrying out its duties as a territorial authority or building consent authority.
- the licensed building practitioner[2] and designer of the proposed house ("the designer").

1.3 The application for this determination arises from the decision of the authority to refuse to accept the proposed insulation system. The authority was of the view that it had received insufficient information in the documentation accompanying the building consent application to be satisfied that the insulated walls and roof to the house would comply with certain clauses[3] of the Building Code (Schedule 1, Building Regulations 1992).

[1] The Building Act, Building Code, compliance documents, past determinations and guidance documents issued by the Ministry are all available at www.building.govt.nz or by contacting the Ministry on 0800 242 243.
[2] LBP number BP100490
[3] In this determination, unless otherwise stated, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code.

1.4 The matter to be determined[4] is therefore whether the insulation system proposed for the house will comply with Building Code Clauses B2 – Durability, C2 – Prevention of fire occurring, E3 – Internal moisture, F2 – Hazardous building materials, and H1 – Energy Efficiency if constructed in accordance with the consent documentation.

1.5 The insulation system includes the associated components of the external building envelope (such as the steel framing, the insulation board, the claddings and the interior linings) as well as the way the components are to be installed and work together.

1.6 In making my decisions, I have considered the submissions of the parties and the other evidence in this matter.

1.7 Matters outside this determination

1.7.1 The authority's concerns about the proposed wall and roof insulation appear to be restricted to the system's compliance with Clauses B2, C2, E3, F2, and H1 (refer paragraph 4.2.1). This determination is therefore limited to these clauses only.

1.7.2 The application for this determination is restricted to the wall and roof insulation system proposed for the house. Other matters raised by the authority during the processing of the building consent are left to the parties to resolve.

2. The building work

2.1 The proposed building work is a two bedroom detached cottage that is two storeys high in part and is situated on a level building site in a very high wind zone as defined in NZS 3604[5]. The cottage is based on a proprietary kitset barn construction, which is adapted to suit the requirements of the site and the owners. The resulting cottage is simple in plan and form and is assessed as having a low to moderate weathertightness risk.

2.2 The 108m^2 ground floor accommodates the garage, living/dining area, kitchen, bathroom and one bedroom. A spiral staircase provides access to the second bedroom at a mezzanine level that is open to the living area below.

2.3 The structure is specifically engineered of rolled-steel portal frames, with steel girts and purlins, a concrete slab and foundations, plywood and profiled metal wall claddings, profiled metal roof claddings, and aluminium windows. The internal walls are timber-framed. The interior linings are 10mm plasterboard to walls and 12mm plasterboard to ceilings.

2.4 The raised central section has a 22^o pitch gable roof, with the lower roofs forming 5^o pitch lean-tos against the north and south upper walls. The roofs have no eaves or verge overhangs. Separate lean-to roofs above the lower wall cladding form deep verandas along the east and west elevations.

2.5 The insulation system

2.5.1 The subject insulation is a 90mm thick rigid polyisocyanurate foam board with a composite foil-facing to both sides ("the PIR board"), which is intended to be installed within the external envelope of the building with a 30mm gap between the insulation board and the building wrap (refer Figures 1 and 2). The exterior envelope

[4] Under section 177(1)(a) of the Act
[5] New Zealand Standard NZS 3604:2011 Timber Framed Buildings

to the garage is not insulated, and there is "R2.6 batts" insulation installed to the timber-framed walls separating the garage from the rest of the building.

2.5.2 The drawings show 120mm deep 'top hat' steel sections fixed to the outer faces of the rolled steel portals. The portals are exposed on the interior, with interior linings installed over timber battens fixed to the inner side of the top hat sections. The top hat sections form purlins and girts to support wall and roof claddings, with the PIR board cut to fit between as shown in Figure 2.

Figure 1: Section though the proposed house (not to scale)

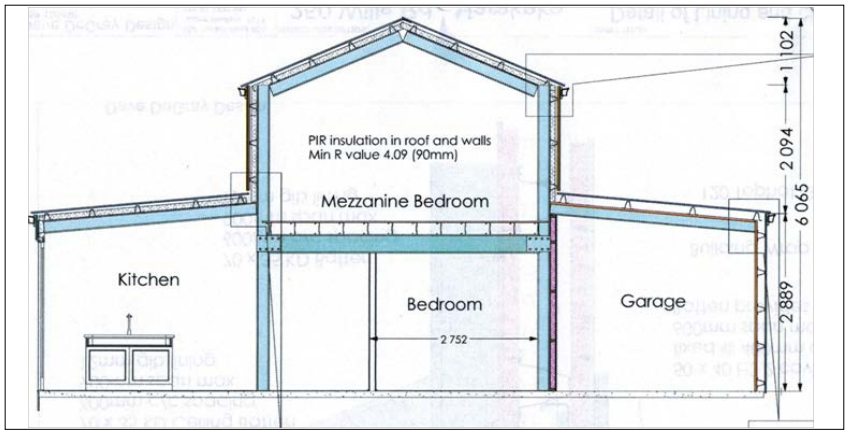
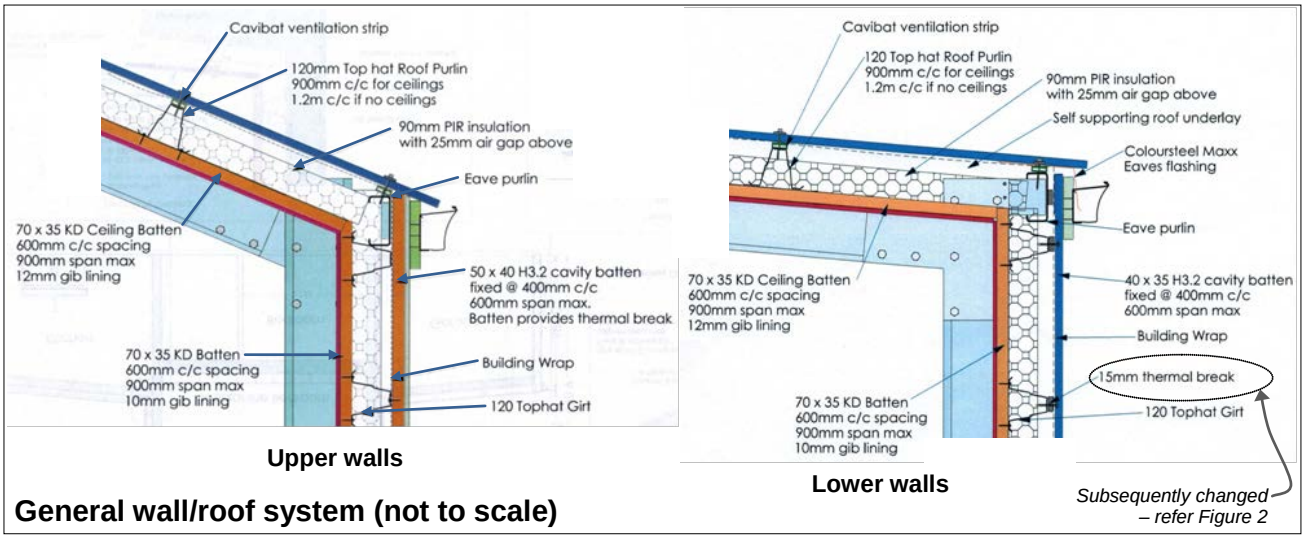


Figure 2: Typical construction in drawings dated 12 April 2017



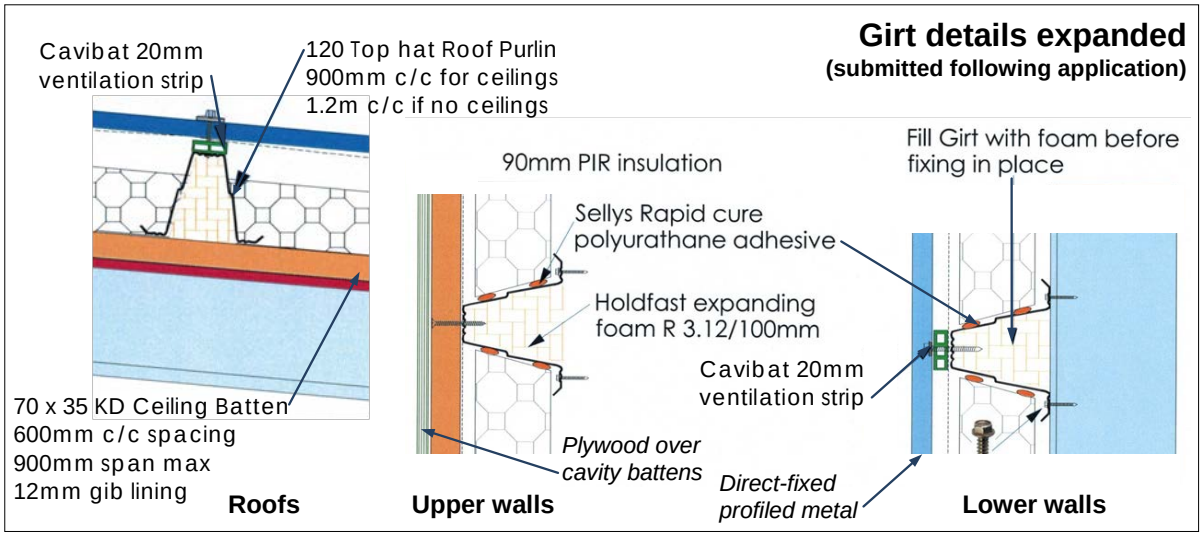
2.5.3 The cladding to ground floor walls is trapezoidal profile metal vertical installed vertically and fixed through perforated battens and the building wrap to the horizontal steel girts. On the upper walls, 50mm x 40mm H3.2 vertical battens at 600mm maximum centres are fixed over the building wrap to the girts then 12mm thick exterior plywood is fixed to the cavity battens.

2.5.4 Following the consent application, the designer provided expanded details to clarify methods of insulating around the steel girts and purlins[6]. As shown in Figure 3, top hat sections used for roof purlins and wall girts will be filled with expanding polyurethane foam and the cut edges of the PIR board are bevelled to fit against the top hat profile with adhesive holding the PIR board in place.

[6] Sheets 30 to 32

2.5.5 The details also showed that the vertical trapezoidal profiled cladding would be fixed through proprietary fluted cavity battens[7]. The battens are 45mm wide x 20mm thick and are supplied in 1200mm lengths. They are manufactured from 10mm thick extruded polypropylene with drainage flutes across the width (a thermally broken variation of the batten has a 10mm thick extruded polystyrene adhered to the back face). The BRANZ Appraisal for the cavity battens notes that they incorporate 'a thermal break for use with non-structural wall cladding systems on steel framed buildings'.

Figure 3: Insulation at steel girts and purlins per drawings dated 29 June 2017



2.6 The insulation product and BBA Certificate

2.6.1 The PIR board is manufactured overseas and the material is imported by the insulation supplier.

2.6.2 The manufacturer provides a variety of different products organised around four primary areas: building insulation, bedding, flexible foams, and automotive. The building insulation area provides thermal insulation boards using rigid closed cell foam for the construction sector. The subject PIR board is one of the products marketed by the manufacturer for residential, commercial, industrial, public and agricultural buildings.

2.6.3 The manufacturer's information about the PIR board provides details that include performance data on the product's thermal conductivity, compression strength, moisture vapour resistance, specific heat capacity and fire performance, and refers to certification of those qualities by the British Board of Agrément[8] ("BBA"). The relevant BBA certificate (02/3905 dated 17 October 2013, Product Sheet 1 for pitched roof insulation) includes pitched roof insulation and timber frame board (Product Sheet 3).

2.6.4 The BBA certificate is valid within the United Kingdom and states that the PIR board, 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) thermal performance, condensation, behaviour in relation to fire, and durability.

[7] Assumed to be 'Cavibat R' Cavity battens
[8] The British Board of Agrément (BBA) is a construction industry approvals body, originally set up in 1966 by the UK government and offering product and installer approval.

2.6.5 The BBA certificate says the PIR board will not contribute to the development stages of a fire or present a smoke or toxic hazard. The certificate said the PIR board could be 'easily cut' using a sharp knife or fine-tooth saw; and the certificate gave no precautions regarding the handling of the product.

2.6.6 The BBA certificate states that the PIR board will comply with the relevant Building Regulations and British Standards when installed in accordance with the conditions of the certificate, which include the use of the product:

- in roofs and walls designed to incorporate normal precautions to prevent the formation of condensation;
- above sloping rafters and below a vapour permeable roof underlay;
- in roofs detailed to incorporate cavity barriers at edges, around openings and at junctions with fire-resisting elements, with cavity dimensions not exceeding 10m in any direction;
- in conventional timber frame walls, including as insulated sheathing over studs with brick veneer and a 50mm air cavity.

(Another BBA certificate, No 02/3905, Product sheet 2, for underfloor insulation, is referred to in paragraph 5.5.1.)

3. Background

3.1 The authority received an application for a building consent (No. 170410) on 18 April 2017 for a new steel kitset building to be used as a detached residential dwelling. The consent application included:

- the kitset manufacturer's standard engineering drawings (9 sheets)
- the designer's specific drawings for the subject house (13 sheets)
- the designer's supporting information, which included:
  - specification for insulation
  - BRANZ annual loss factor (ALF) calculation for house
  - the BBA Certificates
  - quality control certification of the insulation manufacturer
  - 10-year product warranty from the manufacturer.

3.2 The request for further information ("the RFI")

3.2.1 The authority issued a request for further information on 8 May 2017, which listed 16 items. Some of the items related to the external building envelope and included the need for further details or information about (in summary):

- ventilating the cavity battens
- specific type, joint, and fixing details for the upper level plywood cladding
- clarification of the wording on two plans that say 'batten provides thermal break'
- method of fixing of plasterboard to girts
- threshold details for doors
- the PIR board.

3.2.2 In regard to the subject PIR board, item 16 of the RFI stated that:

> [The PIR board] is not accepted by [the authority]. Please provide a BRANZ Appraisal for this product or provide an alternative roof insulation...

3.2.3 In regard to the above requirement, the authority's submission to the determination accepted that the RFI did not 'clarify what were the perceived areas of non-compliance with the Building Code', and neither did it detail other options available to support the use of the proposed PIR board.

3.3 The insulation supplier applied for a determination on 16 May 2017, which was accepted following confirmation from the owners on 19 May 2017 that the insulation supplier was acting on their behalf. Further information was sought from the parties and the designer was added as a party to the dispute on 15 June 2017.

4. The submissions

4.1 The insulation supplier's submission

4.1.1 The application for determination was supported by a submission from the insulation supplier, dated 12 May 2017, which noted that the authority had accepted the R-values of the product but had stated that a BRANZ appraisal was required because, although 'good information was provided for the UK, it isn't known if the product is fit for purpose for NZ conditions'. The insulation supplier understood that the PIR boards needed to meet the performance requirements of Building Code Clauses B2, F2, and H1.

4.1.2 In regard to product fitness for local conditions, the insulation supplier noted that because the PIR boards are proposed to be used '...inside the building envelope (therefore presenting a lower risk of failure) the requirement to be suitable for NZ conditions becomes less relevant than if it were to be exposed to direct environmental conditions.'

4.1.3 The insulation supplier noted that(in summary):

- PIR products have an in-service history of extensive use in the UK and Europe for approximately 40 years.
- The BBA certificate shows that the PIR board has been tested to UK and European standards and regulations, which are comparable to local standards – and ISO certification supports the manufacture and quality assurance of the insulation.
- A recent determination[9] found the use of a BBA certificate outside of the UK did not prevent some reliance being placed on their results, and therefore it can provide reasonable grounds for code-compliance.
- The product is maintenance-free within the building envelope and durable, rot proof, and stable, does not present a health hazard, and the authority has accepted the stated R-values – so it will achieve the requirements of the Building Code.
- A similar insulation board[10] with foil facings has CodeMark certification and is 'almost identical' to the PIR board.

[9] *Determination 2016/046 The refusal to grant an amendment to a building consent for the use of imported composite slate roofing tiles on a house*, (Ministry of Business Innovation and Employment) 26 September 2016

4.1.4 The insulation supplier also maintained that the proposed steel construction is similar to timber framed construction, and since 2014 the authority has consented three timber framed buildings that include the PIR board.

4.1.5 The insulation supplier provided copies of:

- drawings of the proposed house dated 12 May 2017
- BBA certificate for the PIR board
- the certificates of approval for ISO compliance
- the PIR board product warranty
- reference to other building consents issued by the authority that used PIR board
- other technical information on the proposed or similar products.

4.2 The authority's submission

4.2.1 The authority made a submission dated 18 May 2017, noting it considered the matter for determination was whether it had reasonable grounds to be satisfied that the PIR board 'as specified and detailed in a Building Consent application, complies with Building Code clauses B2, C2.2, E3, F2, and H1'. The authority advised the building consent application was currently 'on hold' pending a response to the RFI. As such, the authority had not yet refused to issue the building consent.

4.2.2 The authority described the proposed construction and noted that it had focussed on the information contained within the BBA certificate, rather than the validity of the certificate for reliance outside of the UK.

4.2.3 The authority included the following concerns about the consent application documentation (in summary):

- For demonstrating code-compliance, the application relied solely on the BBA certificate which relates only to timber framed walls and roofs and not to the steel framing proposed for the subject building.
- The fire resistance tests referred to in the certificate was for construction systems not 'remotely equivalent or similar to' the proposed house.
- The application did not include 'a product technical statement (PTS), CodeMark, BRANZ or BEAL appraisal', or similar, to show compliance.
- The BBA certificate makes no reference to the relevant AS/NZS standards referenced in H1/AS1.
- The product warranty is limited to 10 years, but the durability requirement for insulation within the building envelope is a minimum of 50 years.
- The drawings and specifications do not specifically or adequately address:
  - risks of interstitial condensation
  - areas of thermal bridging
  - proximity of the solid fuel heater flue to the PIR board
  - methods of installing and fixing the PIR board between the girts
  - insulation within the girt profile and at other junctions

[10] Comprising a 'rigid thermoset phenolic insulation core with composite foil facings on both sides', with the core material categorised as a polyisocyanurate (PIR) insulation foam

- direct fixing of trapezoidal steel cladding despite the medium weathertightness risk
- installation of building wrap
- the BRANZ ALF calculations.

4.2.4 The authority concluded that it had some concerns about 'the demonstrable compliance' of both the PIR board and its proposed use, but added it supported the application for a determination.

4.2.5 The designer made no submission, but provided additional drawings dated 29 June 2017 (see Figure 2).

4.3 The draft determination and submissions received

4.3.1 A draft determination was issued to the parties for comment on 4 August 2017.

4.3.2 The authority responded to the draft determination on 7 August 2017. The authority accepted the draft but made the following comments (in summary):

- It was requested that the determination consider compliance with Clause F2 'and either supports, or not, the assumption [the authority] made' regarding this clause.
- The authority questioned how the BBA certificate could be accepted as a basis for compliance when the proposed roof construction was so different to that detailed in the certificate. The authority assumed 'it was considered reasonable to accept that the compliance was appropriate, but asked [the Ministry] to consider this in the determination'
- '[The authority] accepted that the insulation values quoted in the BBA Certificate were reasonable, and it did not question the same.' However, 'neither of the references made in the BBA certificates are cross-referenced anywhere in H1/AS1, or any other related AS or NZS standards that could be ascertained reasonably'. The draft determination does not represent this position.
- Tables in H1/AS1 (referenced in the draft determination) no longer form part of the Acceptable Solution. (This information is contained in NZS 4218[11] and not in the current version of H1/AS1.)

The authority pointed out typographical and reference errors in the draft determination.

4.3.3 The insulation supplier and designer accepted the draft without comment on 10 and 21 August 2017 respectively.

4.3.4 I have taken the parties comments in to account and amended the determination accordingly.

4.3.5 The authority has asked how the BBA certificate could be accepted as a basis for compliance when the proposed roof construction was so different to that detailed in the certificate (paragraph 4.3.2). The BBA certificate (No 02/3905) considers the use of the PIR board in a pitched timber-framed roof clad with roofing stales or tiles for use in the UK. The certificate is considered in relation to the attributes of the PIR board and its compliance with Clauses B2, C2, E3, F2, and H1. To a large extent the

[11] New Zealand Standard NZS 4218: 2009 Thermal Insulation – Housing and Small Buildings

attributes are the same, or similar, and are not affected by the differences in construction; where there are differences this is considered herein.

5. Discussion: the compliance of the PIR board itself

5.1 General

5.1.1 The authority is not satisfied that the PIR board as documented will satisfy the relevant provisions of Clauses B2, C2, E2, F2, and H1: I consider each of these clauses below. In order to form a view as to the compliance of the proposed PIR board system, I also need to consider the evidence that is available, which includes:

- available technical information on the PIR board
- the history of use of the PIR board and comparable insulation products
- the drawings and specification.

5.2 The available technical information

5.2.1 The British Board of Agrément (BBA) holds a combination of UKAS[12] accreditations within the construction industry. BBA approvals show compliance with Building Regulations and other requirements, including installation quality, and cover 200 different product sectors with the largest being insulation and roofing.

5.2.2 The consent application documentation included a BBA certificate for the proposed PIR board, which is valid only with the UK. I have considered this restriction in a previous determination[13], and I maintain the view that conditions in the BBA certificate does not prevent conclusions being drawn about compliance with the New Zealand Building Code.

5.2.3 Notwithstanding the above, I must also consider the scope and the other conditions described within the BBA certificate for the PIR board, and how these relate to the particular circumstances of this particular house and its construction. While some aspects of the construction described in the BBA certificate are clearly different from the construction proposed (timber-framed construction versus light steel) I consider this is immaterial as far as the properties of the PIR board itself is concerned.

5.3 History in use

5.3.1 The manufacturer's building insulation production concentrates solely on thermal insulation boards in rigid closed cell polyurethane and polyisocyanurate foam (PIR) for the construction sector. Although the development of PIR insulating boards is relatively recent, they have been used in various countries for some decades.

5.3.2 The insulation supplier provided photographs of three other buildings where the same PIR board had apparently been approved by the authority in late 2014 and early 2015. The supplier also noted that the PIR board is supplied throughout New Zealand and has been accepted by other authorities.

5.3.3 The authority noted that the three buildings in question were all timber-framed, and it had found nothing in respect of those buildings that changed its view regarding the compliance of the subject building.

[12] The United Kingdom Accreditation Service
[13] Determination 2016/046 (26 September 2016)

5.4 Comparable products

5.4.1 The insulation supplier submitted that a comparable insulation board had been approved for local use via the CodeMark process. I note that board is marketed as suitable for use as an insulating sheathing in steel frame wall construction; however, I consider that that product (and its attached CodeMark certification) cannot be considered as comparable with the PIR board because:

- the product information shows a maximum thickness of 50mm
- details show the board installed as a continuous layer
- although foil-faced, the board's core is 'rigid thermoset phenolic insulation'.

5.5 Clause B2 Durability

5.5.1 Another BBA certificate[14] provided by the insulation provider is for the use of PIR product as underfloor insulation. This certificate contains the statement that the insulation is 'rot-proof, dimensionally stable', and when installed under a concrete screed, concrete slab, particle board flooring, or a suspended timber floor, 'will remain effective as an insulation material for the life of the building…'.

5.5.2 I consider there is no significant difference between the service conditions for insulation in New Zealand when compared with the UK – if anything the conditions experienced in New Zealand will be more benign.

5.5.3 Provided the PIR board as installed continues to be protected from adverse effects including physical and chemical damage, and the effects of sunlight, it is reasonable to expect the PIR board will remain durable for the life of the building under New Zealand conditions.

5.6 Compliance with respect to fire safety

The use of the PIR board as a foamed plastic under C/AS1

5.6.1 The authority raised concerns about the applicability of fire test results provided in the BBA certificate to the steel framed construction of the proposed house, noting that the BBA certificate stated that the product is 'combustible'. However, I consider that while PIR board is technically combustible, it can be used in assemblies for applications where fire resistance is required.

5.6.2 The Acceptable Solution, C/AS1, Part 4, Paragraph 4.3, says:

> Where foamed plastics or combustible insulating materials form part of a wall or ceiling system, the completed system (see comment) shall achieve a Group Number of not more than 3.

The Comment to Part 4 says:

> The completed system may or may not include a surface lining product enclosing any insulation material from any adjacent occupied space. If a surface lining is not included, then the foamed plastics or combustible insulating materials when tested alone shall achieve a Group Number of 3, otherwise a surface lining is also required such that the completed system achieves a Group Number of 3 (see Appendix A of C/VM2).

Section A1.7 of C/VM2 says:

> Foamed plastics or combustible insulating materials that form part of an element requiring a group number can be assumed not to influence the group number

[14] BBA Certificate 02/3905, Product Sheet 2, for underfloor insulation.

> classification and need not be included in the test specimen in the following examples.
>
> a) The surface lining material is a rigid sheet product of gypsum plasterboard, plywood, solid wood, wood composite, fibre reinforced cement, concrete or masonry and is not less than 9 mm thick, and
>
> b) It is securely fastened with steel fasteners to a conventional lightweight timber or steel frame or a concrete/masonry wall, according to manufacturers' literature, and
>
> c) All sheet joins are supported and sealed and/or stopped with a non-flaming material.

5.6.3 Therefore, if there is no wall and ceiling lining the foamed plastic is required to achieve a Group Number of 3; if the walls and ceilings are lined, then the wall and ceiling systems are to achieve a Group Number of 3.

5.6.4 The walls and ceilings are lined with plasterboard 10 and 12mm thick; if the assessment under A1.7 of C/VM2 is satisfied, then C/AS1 allows the use of the PIR insulation irrespective of its Group Number.

The PIR board adjacent the flue to the solid fuel heater

5.6.5 The flue to the solid fuel heater comprises a triple-skin construction where it passes through the building envelope. This construction is intended for use when the outer skin of the flue assembly is in contact with a combustible material. There would appear to be no reason why it is unable to be installed adjacent the PIR board as proposed.

5.7 Clause E3 Internal moisture

5.7.1 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.

5.7.2 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.

5.7.3 The consent plans show no means of forced ventilation to spaces that will generate moisture (shower and kitchen); I suggest this aspect of the design be reconsidered.

Interstitial moisture

5.7.4 I consider the BBA certificate's reference to interstitial condensation is a reminder to designers to be aware of this potential effect, and is applicable to almost all insulation materials. It is also noted that the climatic conditions under which the PIR board will be likely used in the UK are more severe that will be experienced in New Zealand. The PIR material is a closed-cell foam and the board as supplied is faced both sides with aluminium foil – both with resist the uptake of moisture.

5.7.5 I consider it unlikely that the installation of insulation will lead to non-compliance with Clause E3.3.1. Provided the construction details align with the details in Acceptable Solution for E3/AS1 then the likelihood of interstitial moisture is avoided.

5.7.6 I note the BBA certificates require the installation of a vapour control barrier to the warm side of the PIR insulation in rooms expected to have high humidity. The use of a vapour control barrier in New Zealand is not normal practice in a residential situation, and is only considered necessary in exceptional circumstances, such as to the exterior envelope of an indoor pool.

5.8 Clause F2 Hazard building materials

5.8.1 The authority has requested the determination consider its assumption that the PIR board satisfies Clause F2 based on the statements made in the BBA certificate.

5.8.2 The BBA certificate says the PIR board can be cut and sawn during installation with no special precautions being required, and that the board does not present a smoke or toxic hazard. A literature search revealed no known hazards associated with the material. Dust during fabrication can be a mechanical irritant to skin, eyes, and the upper respiratory system, but is little different to other building materials cut on site.

5.8.3 The suppliers handling recommendations should be followed, however, the recommendations for cutting and installation are likely no worse than the precautions normally taken with other commonly-used insulation materials. PIR board is also used extensively in Europe and North America.

5.8.4 There would appear to be no reason why the statements in the BBA certificate are unable to be accepted as reasonable grounds that the PIR board will meet Clause F2.

5.9 Clause H1 Energy efficiency

5.9.1 The BBA certificate provides information about the thermal properties of the PIR board: the certificate says the PIR's thermal conductivity is $0.022 W.m^{-1}.^{o}K^{-1}$. For the proposed 90mm thick PIR board (excluding the additional effects of the foil insulation) this is equivalent to an R-value of $4.0\ m^{2}.^{o}C.W^{-1}$.

5.9.2 In my view the BBA certificate provides adequate evidence that the PIR board will be able to be used in a thermal envelope to achieve compliance with Clause H1. The R-value of the 90mm thick PIR board alone will exceed the highest minimum values listed in the tables in NZS 4218.

5.9.3 While the authority has accepted the R-values quoted in the BBA Certificate, it contends that the standard the Certificate cites is not referenced in H1/AS1.

5.9.4 The insulation values quoted (either U or R) in the standards referenced in H1/AS1 and the BBA certificates use exactly the same metrics to describe insulation values and are directly comparable, without interpretation, from one standard to another. The insulation standards cited in the BBA Certificate are published by the British Standards Institution: I consider that such standards are able to be relied despite not being referenced in either the Verification Method or Acceptable Solution for Clause H1.

5.9.5 I note the use of the proprietary cavity batten under the steel wall and roof cladding will lessen the effects of thermal bridging from the metal cladding to the steel girts.

6. The drawings submitted for building consent

6.1 Generally

6.1.1 Section 45 of the Act requires an application for a building consent to be accompanied by plans and specifications which contain, or are accompanied by, any other information that the authority reasonably requires.

6.1.2 In regard to the proposed PIR insulation system, the authority considers that the documentation supplied in support of the proposal was not sufficient to allow it to be satisfied on reasonable grounds that the building would comply with the Building Code if built in accordance with the plans and specifications submitted.

6.1.3 I consider the PIR board will, in principle, satisfy the relevant requirements of the Building Code providing its installation is adequately documented. The following comments are made in relation to the documentation presented with the application for building consent and provided subsequently.

6.2 Review of the consent drawings and documentation

6.2.1 The following is noted:

- The weathertightness risk scores show 7 for all elevations, but the score for eaves should be 5, which increases totals to 10. However, the risk level remains at medium so the choice of cladding types under E2/AS1 is unchanged.
- A medium risk allows the use of vertical corrugated metal only, with vertical trapezoidal metal only available as a cladding choice in low risk situations[15]. The designer's risk assessment was based on a simple elevation basis; if a more detailed wall face approach is taken, the risk level for the lower walls is reduced to low risk and trapezoidal metal may be used for those faces.
- Although the proprietary batten insulates the steel girt from the profiled metal cladding, parts of the girt are exposed to unheated cavity air – allowing some thermal bridging.
- The ALF calculations appear to ignore the contribution to heat losses from the walls and ceilings (these are stated as zero) and needs to be recalculated with a construction R-value for the wall and ceilings, the calculations do not appear to take account of the garage. However, irrespective of this, given the R-values proposed it is considered likely that the thermal envelope will satisfy Clause H1.
- Better consideration needs to be given to the framing (steel or timber) necessary to support the PIR board at some building junctions – how the PIR board is to be supported is not clear.

6.2.2 Drawings 11 to 13:

- On Sheet 11, expanded details of section junctions incorrectly show habitable spaces as unlined and the garage space as lined (and conflict with Sheet 15).
- There are no details for plywood cladding joints and junctions (drawings also require updating to accord with the subsequent expanded details).

[15] Refer E2/AS1 Table 3

6.2.3 Drawings 14 to 16:

- The additional expanded details show a ventilated batten installed along the face of the horizontal girt, which should allow any condensation to drain past the junctions (Figure 2).
- Although head and sill flashings accord with E2/AS1 Figure 95, the jamb flashing differs and a note should be added to ensure that the sill flashing is extended past the outer edges of the jamb flashings to allow moisture to escape.
- On Sheet 15, the apron flashing upstand lacks a dimension.
- On Sheet 16, the cladding/foundation overlap should be noted as 50mm.

6.2.4 The Act allows the authority to set reasonable requirements for documentation that accompanies applications for building consents. The authority is entitled to set minimum requirements to ensure that the proposed building work is clearly documented and to require the applicant to clearly demonstrate and document how compliance is to be achieved for those areas it considers are unclear.

6.2.5 Examination of the documentation has allowed me to conclude that the documentation provided for the application for this building consent did not adequately demonstrate compliance of the proposed cladding systems with the Building Code in a number of respects.

6.2.6 Until the shortcomings in the documentation are satisfactorily resolved, the authority is entitled to refuse to issue 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. I conclude that the documentation is not adequate in a number of areas, including but not limited to the examples outlined in paragraph 6.2.

7. What is to be done now?

7.1 I suggest that the authority modify its request for information (RFI), taking into account the additional revised drawings submitted following the consent application. In response to a modified RFI, the designer should then amend the drawings and specification, taking into account the findings of this determination.

7.2 I note that the detailed examination of construction details for weathertightness remains the responsibility of the authority and not the Ministry. If remaining details cannot be agreed with the authority, any items of disagreement can then be referred to the Chief Executive for a further binding determination.

8. The decision

8.1 In accordance with section 188 of the Act, I hereby determine that the PIR board installed in this house will, in principle, satisfy Clauses B2, C2, E3, F2, and H1 of the Building Code subject to the findings of this determination.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 31 August 2017.

John Gardiner
Manager Determinations and Assurance