



Determination 2016/061

Regarding aluminium window and door joinery installed to a house at 128 Fordyce Road, Helensville

Summary

This determination considers the compliance of an alternative solution using imported window and door joinery and the associated fixing and installation. The determination discusses the available technical and test information and the use of proposed testing to support the building consent amendment application.

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 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 are:
 - the owner and builder of the house, S Yazdi (“the applicant”)
 - Auckland Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.
- 1.3 This determination arises from a decision by the authority to refuse to grant an amendment to a building consent which included changes to window and door joinery profiles for a partially constructed house. The authority was not satisfied that the aluminium joinery as proposed will comply with certain clauses² of the Building Code (Schedule 1, Building Regulations 1992). The authority’s concerns relate to the strength, durability, and weathertightness of the joinery components and installation.
- 1.4 The matter to be determined³ is therefore whether the authority was correct to refuse to grant the amendment to the building consent. In deciding this, I must consider whether the aluminium joinery, as partially installed and proposed to be completed, will comply with the following clauses of the Building Code: B1 Structure, B2 Durability, E2 External Moisture, F2 Hazardous Building Materials, and H1 Energy Efficiency. The aluminium joinery includes the window and door frames and glass, the fixings and supports, the flashings and the junctions with adjacent walls and claddings, as well as the way components are installed or intended to be installed and work together.
- 1.5 In making my decision, I have considered the submissions of the parties, the report of the expert commissioned by the Ministry to advise on this dispute (“the expert”) and the other evidence in this matter.

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 In this determination, unless otherwise stated, references to sections are to sections of the Act and clauses are to Building Code clauses.

³ Under sections 177(1)(b) and 177(2)(a) of the Act

2. The building work

- 2.1 The building work consists of a large single-storey house, a two bedroom cottage and a changing shed situated on a level rural site in a high wind zone for the purposes of NZS 3604⁴. The primary house has a simple rectangular plan with three projecting areas; accommodating an open living/dining/kitchen area, various service rooms, six bedrooms, and five bathrooms. The house is fairly simple in plan and form, with a low weathertightness risk.
- 2.2 Construction is generally conventional light timber frame with pile foundations, profiled uPVC wall cladding and profiled metal roofing. The 20° pitched gable roof has roof overhangs of about 600mm or greater.

2.3 The uPVC wall cladding

- 2.3.1 The exterior wall cladding is a proprietary uPVC product with a profile that provides the appearance of horizontal weatherboards (“the weatherboards”). The profiled panels are fixed through battens and the building wrap into the framing, resulting in a 20mm cavity between cladding and building wrap.
- 2.3.2 The proprietary cladding system used for this house is a 6mm thick ‘double bevel-back weatherboard’ profile, with an inter-locking weather seal between panels. The cladding is pre-finished in standard colours and the cladding manufacturer provides installation instructions and purpose-made flashings to windows, edges and other junctions.
- 2.3.3 The cladding system has been appraised by BRANZ⁵ as an alternative solution that complies with Clauses B1, B2, E2 and F2 of the Building Code; providing the cladding is installed in accordance with the manufacturer’s instructions and to buildings within the appraisal’s scope. The appraisal is based on the use of conventional aluminium joinery and also ‘relies on the joinery meeting the requirements of NZS 4211⁶ for the relevant Wind Zone or wind pressure.’

2.4 The aluminium joinery

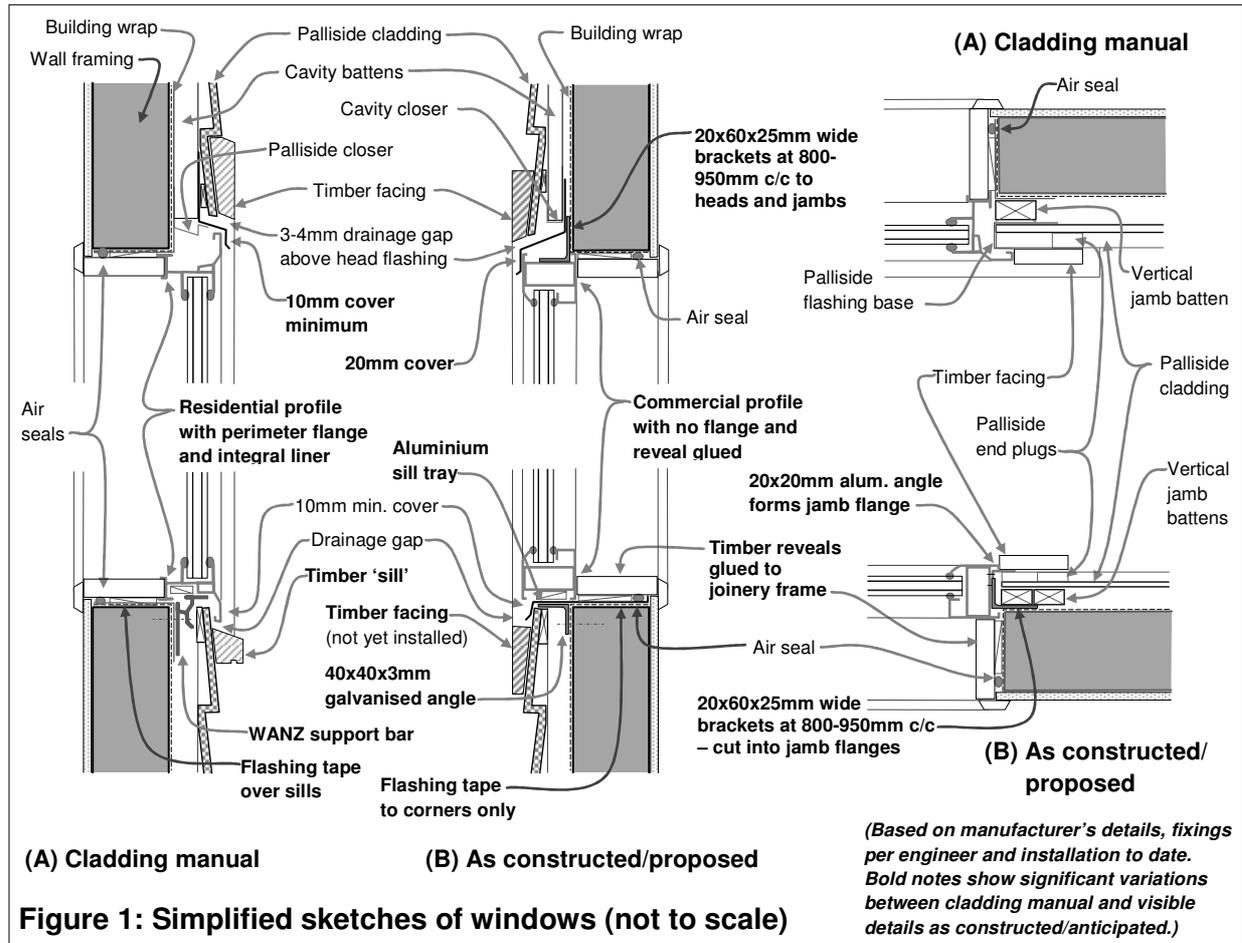
- 2.4.1 At the time of the expert’s inspection, the framing and roof were substantially complete, with building wrap and battens installed but no wall claddings installed. Most windows had been fixed but weatherboards, facings interior linings, reveals and air seals were yet to be completed pending resolution of the consent amendment.
- 2.4.2 The aluminium joinery to this house comprises fixed panes, top-hung and side-hung awning sashes, bifold windows, sliding doors and windows, and aluminium louvers. Several joinery units include combinations of different types, with different aluminium extrusions used to fabricate the units.
- 2.4.3 The drawings submitted for building consent showed standard residential aluminium joinery profiles but did not specify the joinery manufacturer or the specific profiles to be used. The applicant imported aluminium joinery of a commercial profile, which has resulted in changes to installation details as shown in the simplified sketch in Figure 1:

⁴ New Zealand Standard NZS 3604:2011 Timber Framed Buildings

⁵ BRANZ Appraisal No. 491 [2015]

⁶ NZS 4211:2008 Specification for performance of windows

Figure 1: Changes in window details



2.4.4 As shown in Figure 1, significant changes include the following:

Table 1: Significant changes in joinery

	(A) Cladding manufacturer's details	(B) The imported joinery	
		Amendment details	As constructed
Joinery profile	Conventional <u>residential</u> profiles (<u>integrated reveals</u>) Full perimeter flange	Light <u>commercial</u> profile, with primary box frame (<u>no integrated reveals</u>) <u>50x50mm</u> aluminium angle riveted to window frame to form jamb flange	<u>20x20mm</u> aluminium angle forms jamb flange
Support	WANZ ⁷ sill support bar shown	WANZ sill support bar not shown <u>50x50x6mm galvanised brackets</u> noted – but no spacing specified.	<u>Continuous 40x40x3mm</u> galvanised angle installed under sills
Framing	Flexible flashing tape noted as continuous over sill	Flexible flashing tape noted as <u>continuous over sill</u>	Flexible flashing tape applied over wrap at <u>corners</u> of openings
Flashing	No sill flashings shown	No sill flashings shown	<u>Coated aluminium sill trays</u> visible where reveals not yet installed.

⁷ WANZ – Window Association of New Zealand

	(A) Cladding manufacturer's details	(B) The imported joinery	
		Amendment details	As constructed
Fixing	Engineer's PS1 covered	<p>Bowmac brackets shown at jambs only, with no size, spacing or fixings.</p> <p>Engineer's site note states:</p> <ul style="list-style-type: none"> • 20x60x1 mm brackets <u>generally at 800mm c/c, fixed with 4 screws.</u> • Frame glued to reveal. Reveal screwed to timber framing. <p>Timber reveals cut to suit following window installation</p> <ul style="list-style-type: none"> • No note of reveal fixings • No sealant shown at junction 	<p>20x60x25mm wide galvanised steel brackets at <u>800mm to 950mm c/c</u>, fixed to framing with <u>2 screws</u> into framing.</p> <p>Aluminium angle flange cut to allow screw fixing of bracket to window frame.</p> <p>Timber reveals not yet installed</p>

2.5 The imported joinery

2.5.1 The double-glazed windows and doors are manufactured by a firm based in Shanghai ("the joinery manufacturer"). The applicant imported the joinery directly from the joinery manufacturer and there is no local supplier. The manufacturer's 'Producer Statement' dated 25 July 2016 identifies the profile type as 'non-thermal break' and the glass as '(5-9A-5) mm tempered glass', which is manufactured by another firm based in Shanghai ("the glass manufacturer").

2.5.2 A hinged sash window using profiles provided by the joinery manufacturer was tested by Intertek in China in 2013. However, the test report dated 13 November 2013 identifies the particular profiles used in the test sample as 'Thermal break Aluminium Profile'.

2.5.3 The applicant provided the test report and various certificates as evidence of the aluminium windows compliance with the Building Code. For clarity, this determination uses the following titles:

Table 2: Relevant certificates and test reports

Date	For:	By:	Covers:	Title given
April 13	The glass manufacturer	SAI Global ⁸	STANDARDMARK licence Safety glazing AS 2208-1996	"SMK40124 Licence"
Sept 13	The joinery manufacturer	Intertek ⁹	Quality management system for joinery manufacture ISO 9001:2008	"Intertek certificate"
Mar 14	The joinery manufacturer	SAI Global	STANDARDMARK licence Joinery product AS 2047-2014	"SMK40189 Licence"
Nov 13	The joinery manufacturer	Intertek	Casement window Thermal break Aluminium Profile	"Intertek report"
2016	The joinery manufacturer	WERS ¹⁰	Certificate of membership	"WERS certificate"

⁸ SAI: Standards Australia International, formerly Standards Australia - publicly listed standards compliance and information business

⁹ IAS accredited global testing company

¹⁰ Window Energy Rating Scheme (accredited by the Australian Fenestration Rating Council)

3. Background

3.1 The authority issued building consent no. ABA 1020746 on 16 September 2015 for ‘Second stage of re-sited single level dwelling from foundations; minor dwelling and three bay carport’.

3.2 The consent documentation

3.2.1 The consent drawings stamped 11 September 2015 were based on direct-fixed wall cladding and included extracts from the cladding manufacturer’s technical information – including standard window sill, head and jamb details which showed conventional residential joinery (see Figure 1).

3.2.2 No manufacturer or type of aluminium joinery was specified in the consent drawings and specification. However, the specification called for the provision of shop drawings and installation details together with other information ‘where required’. The specification also called for:

1.10 CERTIFICATION

Provide evidence of a certificate by a laboratory accredited by International Accreditation of New Zealand that the windows and doors will comply with the requirements of NZS 4211.

1.11 PERFORMANCE WINDOWS AND DOORS

To NZS 4211, including:

deflection, opening sashes, air infiltration, water penetration, ultimate strength, torsional strength of sashes, marking.

3.2.3 In regard to the glass, the specification called for the insulating glass units (“IGU”) to be in accordance with AS/NZS 4666¹¹ and the IGU Manufacturers Association (IGUMA) requirements. Safety glazing is to accord with NZS 4223.3¹², including the identification of safety glass panes.

3.2.4 Section B of the consent conditions included a list of ‘notifiable inspections’ and Section C listed ‘Producer Statements, Testing Certificates and Warrantees required to confirm compliance during construction.’ (I note that the latter did not include the requirement for a producer statement for the joinery.)

3.2.5 According to the applicant, he checked with the authority prior to importing the joinery and was advised that this would be satisfactory providing the joinery complied with the requirements of the Building Code. The joinery manufacturer provided a quotation dated 31 December 2015 and joinery schedules dated 27 January 2016, and importation proceeded without specific prior approval.

3.3 The changes during construction

3.3.1 During construction, it was decided to incorporate drained cavities behind the wall cladding and the authority carried out a cavity inspection on 20 June 2016. During the inspection the partially installed joinery units were observed and work was stopped pending approval of the window details. The inspection record noted:

1. SITE READY: NO, the inspection has failed and cannot continue as the site is not ready to proceed.
2. VAR.AMENDMENT – Is an Amendment required? Window details with flashings required.
3. Details of the windows and flashings required for a cavity system.

¹¹ Australian/New Zealand Standard AS/NZS 4666:2012 Insulating glass units

¹² New Zealand Standard NZS 4223.3:1999 Glazing in buildings, Part 3: Human impact safety requirements

4. The windows have no flanges on them. Detail will be required of how the windows will be made weathertight.
5. Fixings details will be required for the windows.

3.3.2 The applicant applied for an amendment to the building consent on 27 June 2016 for 'change of cladding from direct fix to cavity' and the authority responded on 11 July 2016. In regard to the imported windows, the authority required:

a) Windows

Please provide 3-D step by step details of construction/installation of flashings and weatherboard cladding around window head to jamb and window sill to jamb corners.

The window system will need to meet the requirements of NZS 4223 and NZS 4211.

Please confirm that the joinery manufacturer/installer will issue a Producer Statement – Design to confirm compliance.

Please provide product specifications and testing certificates for the windows.

Please provide Producer Statement – Design for face board around windows on cladding.

3.4 Documentation and responses

3.4.1 The applicant engaged the designer to prepare revised window details and collected information and documentation about the joinery. Details and statements for the consent amendment were provided under cover of a letter from the architect to the authority dated 18 July 2016. According to the applicant, these were discussed with a local official who agreed that the amended details were satisfactory but stated that the structural engineer needed to inspect the installation and provide a producer statement.

3.4.2 The local office of the authority forwarded the window documentation to its central office for review and guidance. An internal email dated 21 July 2016 responded with a list of concerns and the authority emailed the designer and the applicant on 22 July 2016 noting that the following matters had been raised (in summary):

- the Intertek ISO certificate relates only to the manufacturer's quality system
- there is no correlation to NZS 4211 or AS 2047¹³
- the joinery manufacturer has not shown technical qualifications and is not on the authority's register, so the producer statement is not acceptable
- the StandardMark licence for the joinery certifies compliance with a standard that is out-of-date
- a sample of the markings to safety glass is needed
- joinery should be submitted to WANZ for testing to NZ Standards
- manufacturer's installation details are required
- an engineer's producer statement for fixings is required
- the sealant manufacturer's specification and warranty is required
- submitted details need updating as they do not match on-site installation.

¹³ Australian Standard AS 2047-2014 Windows and external glazed doors in buildings

- 3.4.3 The engineer subsequently checked amended details and inspected the joinery installation; issuing a site note (No. B 559835) dated 19 July 2016 which noted:
- Fixing alum frames to timber framing achieved with 20x1x60mm L bracket with 4 screws generally @ 800c/c around window. Also frame glued to reveal. Reveal screwed to timber framing. Photos taken.
- Fixing appears adequate for intended loads. No movement detectable. OK to continue.
- 3.4.4 The engineer also provided a Producer Statement – PS1 – Design dated 8 August 2016, which confirmed that ‘structural details for windows and joinery’ as provided by the designer would comply with Clauses B1 and B2 of the Building Code. The applicant also obtained a test report and various certificates from the joinery manufacturer as outlined in paragraph 2.5.3 and Table 2.
- 3.4.5 The building work under the original amendment application (see paragraph 3.3.2) was subsequently expanded to include ‘install windows imported from China as an alternative solution.’

3.5 The refusal to approve the consent amendment

- 3.5.1 In a letter to the applicant dated 26 July 2016, the authority stated that:
- ...under Section 50 of the Building Act 2004 your amendment application has been refused because the plans and specifications accompanying the building consent application do not satisfy [the authority] on reasonable grounds that the completed building work would comply with the New Zealand Building Code.
- 3.5.2 The authority noted that a reassessment was needed in regard to compliance with the following code clauses:
- B1 – Structure > Joinery installation
 B2 – Durability > Joinery including associated fixings and sealants
 E2 – External Moisture > Joinery plus cladding system
 F2 – Hazardous Building Materials > Glazing
 H1 – Energy Efficiency.
- 3.5.3 The authority listed ‘specific reasons’ for its refusal, which included (in summary, with the authority’s reference numbers in brackets):
- The documentation provided:
 - Windows must comply with NZS 4211, but Intertek testing is against a British/European standard¹⁴ (item 1).
 - The SMK40189 Licence covers compliance with the Australian Standard AS 2047¹⁵, so a comparison with NZS 4211 is needed. AS 2047-1999 has been superseded by AS 2047-2014¹⁶ (item 2).
 - The producer statement does not comply with the authority’s policy for acceptance of producer statements as the joinery manufacturer is not an ‘approved author’ (item 3).
 - A condition of the BRANZ appraisal for the cladding system is that joinery will meet the requirements of NZS 4211 (item 4)

¹⁴ BS EN 14351-1:2006 Windows and doors - Product standard, performance characteristics. (+A1:2010)

¹⁵ AS 2047- 2014 Windows and external glazed doors in buildings

¹⁶ I note the licence states that it includes compliance with AS 2047-2014

- Evidence provided for the proposed alternative solution does not present ‘a strongly argued case’. Persuasive evidence may include (item 5):
 - calculation or test method
 - comparison with Acceptable Solutions or Verification Methods
 - comparison with previously accepted product on similar building
 - comparison with a determination about a similar matter
 - technical data within trade literature
 - current appraisal of the product
 - in-service history
 - actual on site conditions
 - independent expert evidence
 - product certification.
- The proposed details for window installation deviates from cladding manufacturer’s details, therefore ‘voids’ the BRANZ appraisal (item 6):
 - riveted angle to form jamb flanges
 - sill flashing added in lieu of sill flange
 - window fixings to framing specified by engineer
 - decorative timber facing to perimeter.

3.5.4 The authority included annotated photographs (for information and guidance purposes) and stated that the applicant could either apply for a determination on the matter or submit a new application ‘with robust supporting documents and a strongly argued alternative solution proposal.’

3.5.5 The applicant sought advice from BRANZ on the proposed installation and, in an email dated 11 August 2016 BRANZ noted that the junction detailing ‘appears to achieve the minimum requirements regarding flange and flashing covers’.

3.6 The meeting minutes

3.6.1 The applicant met with the authority on 16 August 2016 to discuss the situation and the authority’s ‘meeting minutes’ noted that the discussion

...revolved around the [applicant] being able to demonstrate to [the authority] the imported joinery meets compliance with the NZ building code, in particular, but not limited to, clauses B1, B2, E2 and F2.

3.6.2 The record noted that a ‘list of façade engineers’ was attached, but according to the applicant this was not provided. Based on the minutes of the meeting, the discussions included the following points (in summary):

- The applicant presented documentation as well as a complete joinery unit, and the proposal was agreed to be an alternative solution.
- The authority explained that it was not able to review the documentation, as some related to overseas tests that need to be related to New Zealand tests. The joinery also needed to be considered as a system, not just individual components.
- The authority agreed to accept the variation from direct-fixed cladding to a cavity system as a ‘minor variation’ providing ‘all required information submitted in full’, which would allow the cladding to proceed.

- Options for confirming compliance of the the joinery were to seek a ‘professional opinion from a suitably qualified person such as a façade engineer, determination or a Codemark certificate.’

3.7 The applicant again approached BRANZ for advice, forwarding a copy of the meeting minutes on 24 August 2016. In an email to the applicant dated 30 August 2016, the BRANZ advisor noted that the best option was to engage a façade consultant to evaluate the joinery as installed as an alternative solution, because the costs of testing to establish compliance with E2/AS1 were likely to be prohibitive. The email noted:

As previously discussed, the testing the manufacturer has had done for the joinery (as detailed in the test certificate), only partially covers the requirements of NZS 4211 for casement style windows in NZS 3604 Wind Zones up to Medium. NZS 4211 testing is specific to each window/door style, e.g. sliding, awing, fixed, louvre etc, therefore each style of window/door in your house would need to be verified before compliance with the NZBC could be determined using NZBC Acceptable Solution E2/AS1 as the compliance path.

3.8 The applicant attempted to find a façade engineer, apparently without success due to the residential nature of the building. Following some correspondence with one façade engineer, the applicant was given the name of a window testing company (“the testing company”). In a letter dated 6 September 2016, the testing company noted it could carry out water testing on each type of window, providing these were ‘installed with air seals and flashings in place’. The authority refused to accept the testing company’s proposal and advised the applicant to seek a determination on the matter.

3.9 The Ministry received an application for a determination on 13 September 2016 and sought further information from the parties. The authority’s local official subsequently visited the site on 29 September 2016 and a report on the window installation was received on 14 October 2016, which I have taken as the authority’s submission outlined in paragraph 4.2.1).

4. The submissions

4.1 The applicant’s submission

4.1.1 The applicant’s submission set out the background to the dispute, describing his unsuccessful attempts to demonstrate the windows’ compliance and noting that the same windows had been installed in another house within the past two years. The applicant stated that the authority has refused to accept the certificates and reports provided by the joinery manufacturer and is insisting on local testing.

4.1.2 The applicant provided copies of:

- some of the consent drawings
- the amended window details
- the engineer’s site note dated 19 July 2016 for the joinery fixing and producer statement for the joinery dated 8 August 2016,
- the joinery manufacturer’s window schedule
- the WERS certificate of membership for the joinery manufacturer
- the Intertek certificate for quality management issued 26 September 2013

- ‘StandardMark’ Licenses issued by SAI Global:
 - SMK40189 issued 12 February 2016 to the joinery manufacturer
 - SMK40124 issued 24 April 2013 to the glass manufacturer
- the Intertek test report on an aluminium window dated 13 November 2013
- the joinery manufacturer’s producer statement dated 25 July 2016
- correspondence with the authority
- various other email correspondence, photographs, statements and information.

4.2 The authority’s submission

4.2.1 The authority made a submission on 13 October 2016, in the form of an undated report from a local official who had inspected the window installation on 29 September 2016. The report included the following comments (in summary):

- In regard to stored windows, the joinery units include:
 - a lip of 4-5mm extends on the inner and outer edges
 - an L-shaped flange fixed to the frame, with sealant at the junction
 - no standards or manufacturer’s markings.
- In regard to partially installed windows, installation includes:
 - L-shaped brackets that fix the unit to the framing
 - the added L-shaped aluminium flange cut to accommodate the brackets, with sealant added to the cut section.

4.2.2 The authority forwarded a CD-Rom, entitled ‘Property File’, which contained documents pertinent to this determination including:

- the consent documentation
- the inspection records
- documentation submitted for the consent amendment
- correspondence with the designer and the applicant
- various calculations, statements and other information.

4.3 The draft and submissions received in response

4.3.1 A draft determination was issued to the parties for comment on 24 November 2016.

4.3.2 The applicant accepted the draft in a response received on 2 December 2016. On 6 December the applicant forwarded an email from the testing company with an attached document titled “Standards and test procedures for testing of windows”. The testing company noted that the document compares the relevant New Zealand and overseas standards and procedures and shows that the tests it carries out ‘are to NZS 4284’.

4.3.3 The authority made a submission on 9 December 2016, correcting some minor errors of fact and noting that:

- the authority assumed that the lack of definition in the building consent application meant that New Zealand sourced and compliant joinery would be used, and the list in Section C reflects this assumption

- the Producer Statement was requested in error
 - the third profile has only a very small flange (refer paragraph 5.2.2)
 - new test certificates from the joinery manufacturer would need to be for the joinery that does not have a thermal break
 - the detail drawings received only cover one of the three profiles used, and the alterations to fixings, fixing spacings, and reduced angles should be addressed by the engineer and designer
 - the expert's conclusions regarding compliance with Clause E2 should be confirmed by testing but the authority questioned 'how long these measures will be expected to last'.
- 4.3.4 The authority submitted that it considered the use of the proposed modified testing procedure was reasonable (refer paragraph 5.5.3), but that it would like the opportunity to witness the testing. The authority also sought further clarification of the discussion in this determination, noting also that there was a reliance on successful testing in establishing compliance.

5. The expert's report

5.1 General

- 5.1.1 As mentioned in paragraph 1.5, I engaged an independent expert to assist me. The expert is a member of the New Zealand Institute of Architects and inspected the partially installed aluminium joinery on 25 October 2016; providing a report dated 3 November 2016 which was forwarded to the parties on 4 November 2016.
- 5.1.2 The expert noted that his report reviewed the consent application, the evidence of performance of the proposed joinery and the installation to date to assess compliance of the joinery system with Building Code Clauses B1, B2, E2, F2 and H1.
- 5.1.3 When the expert visited the property, the house structure, roof and walls were substantially complete, with building wrap and battens installed but no wall cladding fixed. All windows had been partially installed to the primary house but head flashings and cladding were yet to be completed pending resolution of the consent amendment. Apart from joinery installation, the expert did not observe any significant changes to the layout of the primary house.

5.2 The joinery units

- 5.2.1 The expert noted that joinery units included fixed panes, top-hung and side-hung awning sashes, bifold windows, sliding doors and windows, and aluminium louvers. Several joinery units included combinations of different types, with different aluminium extrusions used to fabricate the units.
- 5.2.2 The expert observed that the two generic types of window frames lacked flanges. Frames to awning windows and doors were manufactured from extrusions similar to light commercial New Zealand joinery. Composite assemblies have a primary box frame with sub-frames that hold fixed panes and louvers fixed and sealed to the primary frame.

5.3 Testing of the joinery units

5.3.1 In regard to the test report provided to demonstrate the performance of the windows:

- the Intertek tests covered awning windows only
- there was no evidence of testing of other joinery types
- the Intertek tests used thermally broken profiles
- the joinery supplied are made from ‘non-thermal break’ profiles
- there is no testing carried out for doors
- NZS 4211 requires joinery units to be labelled as compliant.

5.3.2 The expert reviewed the proposal provided by the testing company, noting that:

- the company was set up by the building surveyor, which ‘indicates a professional background to their operations’
- the proposal was to test each of the window types while a partial vacuum is applied to the interior face
- the testing would be to ASTM¹⁷, E1105¹⁸ and AAMA 502¹⁹
- testing to the above American standards would not allow direct comparisons with the water penetration requirements of NZS 4211.

5.3.3 The expert noted that, although NZS 4211 refers only to positive pressure, the outcome of partial vacuum conditions from the inside would still create a positive pressure difference from the outside and achieve the intent of that standard. The expert therefore considered that the testing company’s test procedure could be modified so that it could ‘for all practical purposes’ be comparable to NZS 4211, including its references to AS 4420.5²⁰ by:

- creating pressure chambers to test joinery by sealing box to face of framing before lining is fixed – so that joinery and air seals are exposed to the full pressure difference between inside and outside
- spraying water over exterior faces of joinery in accordance with AS 4420.5
- applying water pressure at 291 Pascal for the high wind zone site²¹
- providing test reports as indicated in the standards.

5.4 The installed joinery

5.4.1 The expert noted the following changes in window installation between the details supplied for the proposed consent amendment and the consent details (see Figure 1):

- consent details are based on the proprietary cladding system window details (“the cladding manual”)
- consent drawings are not specific as to the window extrusion or manufacturer

¹⁷ American Society for Testing and Materials, ASTM International is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services

¹⁸ ASTM E1105: Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference

¹⁹ The American Architectural Manufacturers Association (AAMA) 502 test is the "Voluntary Specification for Field Testing of Newly Installed Fenestration Products" that was drafted and approved by the American Architectural Manufacturers Association.

²⁰ AS 4420.5-1996: Windows - Methods of test - Water penetration resistance test

²¹ According to bracing and risk matrix calculations included in the consent documentation the subject site is in a high wind zone

- the cladding is now to be fixed over a cavity
- weatherproofing of window installation details is based on the cladding manual
- fixings and sill supports have been assessed by the engineer
- the lack of precision in the consent documents results in ‘it being unclear whether the windows installed constitute an amendment or not.’

5.4.2 The expert compared the partial joinery installation with the consent application details and his observations are shown in Table 3:

Table 3: Observations of partially installed joinery

	Observation	Comments
Installation	Windows in place, but not fully fixed or weatherproofed	To be completed
Fixings	Fixings include: <ul style="list-style-type: none"> • Steel straps to jambs • Steel brackets • Continuous steel angles to some sills 	<ul style="list-style-type: none"> • Straps in lieu of CPS80 brackets • Some fixings 950mm c/c in lieu of 800mm per engineer • 40x40mm continuous angle in lieu of 50x50mm per amendment
Head flashings	No head flashings yet fixed	To be completed
Sill flashings	Sill trays to all doors and windows	Not shown in details, will mitigate effect of any failures of weather sealing
Added flanges	<ul style="list-style-type: none"> • 20x20mm alum. angles riveted and sealed to window jambs only • Provides similar cover to standard NZ manufactured residential windows. 	Amended drawings show 45x45mm angles shown at sills, and 50x50mm angles shown at jambs
Glass markings	<ul style="list-style-type: none"> • All glass permanently labelled: ‘Certified product: AS/NNZ 2208 Licence SMK 40124 SAI Global’ • Visible roller wave distortion shows that glass is toughened. 	Glass lacks any NZS 4223 reference for toughened or laminated glass
Frame openings	<ul style="list-style-type: none"> • Flexible flashing tape over wrap at corners of window openings • Tape not continuous over sills (sill flashings installed) 	Sill flashings used in lieu of continuous sill flashing tape
Performance to date	<ul style="list-style-type: none"> • Heavy rain since installation in June • No evidence of water penetration associated with installation. 	

5.5 Compliance of the imported joinery and installation

5.5.1 In regard to Clause B1, the expert noted that:

- the engineer’s site note confirmed adequacy of fixings observed and called for reveal to be glued to window frame and nailed to timber framing
- the engineer’s producer statement covered ‘the structural details for windows and joinery’, but did not include engineering drawings or details
- the engineer has verbally confirmed that his PS1 covered the issued site note
- there is no evidence of compliance of the joinery units themselves.

5.5.2 In regard to Clause E2, the expert noted that:

- as outlined in paragraph 5.3, although the window and door units as supplied to the site have insufficient evidence of weathertightness compliance, they can be tested onsite using a modification of the testing company's procedures
- for the partially installed/proposed joinery installation compared to E2/AS1 and the cladding manufacturer's details (see Figure 1):
 - riveted and sealed flanges added to jamb provide similar overlaps
 - head flashings provide at least the same minimum overlap
 - the installed aluminium sill tray flashings will allow any moisture penetrating the air seals to drain to the outside rather than down the cavity, so the proposal should improve expected performance
 - the proposed timber facing boards are decorative and unlikely to have any significant effect on weathertightness
 - the use of galvanised angles in lieu of WANZ sill support bars is covered by the engineer's producer statement.

(I note that the sealing of the reveals to the joinery units should be sufficiently achieved by the gluing of the reveals to the joinery frame as instructed by the engineer's site note (see paragraph 3.4.3).

5.5.3 In regard to Clause F2, the expert noted that:

- the permanent SAI StandardMark label is on inner and outer glass of double glazed units and a slight surface ripple indicates toughened glass
- the SIA SMK40124 Licence confirms compliance with AS/NZ 2208 (Table 2).

5.5.4 In regard to Clause H1, the expert noted that:

- windows and doors are all double glazed units with rubber gaskets
- double glazing complies with the consent window schedule so there is no variation in thermal performance or any reason to doubt compliance.

5.6 The expert's conclusions

5.6.1 The expert concluded that:

- differences between the partially installed joinery and the cladding manufacturer's details are unlikely to have any adverse effect on performance
- information provided is sufficient to demonstrate compliance with Clauses B1, B2, F2 and H1 of the Building Code
- the detailed drawings of the installation will need to be clarified and updated.

5.6.2 In regard to compliance with Clause E2, the expert noted that:

- the weathertightness of joinery installation (when completed as anticipated) is expected to be adequate
- test data from the testing company (using a modified test procedure) is needed to confirm the weathertightness of the joinery product itself
- a clarified testing procedure followed by an appropriate report of successful tests would provide evidence of adequate weathertightness of the joinery product.

6. Code-compliance of the aluminium joinery

6.1 In order for me to form a view as to compliance of the aluminium joinery system installed as proposed, it is important to look for evidence that establishes whether the imported joinery when correctly installed will meet the performance requirements of the Building Code.

6.2 In the case of this house, I consider that the evidence consists of:

- the expert's report on the partially installed joinery (refer Figure 1, Table 1 and paragraph 5)
- available test and technical information on the cladding and the joinery (see paragraph 2.3, Table 2, Table 3 and paragraph 5.3)
- the history of use of the aluminium joinery
- other information on aluminium joinery systems.

6.3 The history of use

6.3.1 I have seen no evidence of a history of local use of this particular manufacturer's aluminium joinery product.

6.4 The available technical and test information

6.4.1 In the case of the subject aluminium joinery, the technical information includes:

- the designer's original consent details and specification
- the designer's amended joinery details for the amendment application
- the cladding manufacturer's recommended joinery details, supported by the BRANZ appraisal for the uPVC cavity cladding system
- the joinery manufacturer's technical and test information for the joinery
- the anticipated window installation completed as sketched in Figure 1.

6.4.2 Taking account of the expert's report and the other evidence; I have reasonable grounds to be satisfied that in regards to the proposed fixings and installation details, the joinery when installed in accordance with these details will comply with Clauses B1, B2, F2 and H1 of the Building Code, and also that the joinery installation in principle will comply with Clause E2. However, those reasonable grounds do not yet extend to the imported joinery product itself, i.e. the joinery units.

6.4.3 The test information on the aluminium joinery system consists of the documents summarised in Table 2 (see paragraph 2.5.3). That documentation was reviewed by the expert in Table 3 (see paragraph 5.3) and certain deficiencies were identified. However, the expert has also reviewed the testing company's proposal and has concluded that modified testing procedures followed by an appropriate report of successful tests would provide evidence of adequate weathertightness of the joinery.

6.4.4 Without successful onsite testing, or the submission of test reports for the various joinery types to standards comparable to New Zealand's standards, I am therefore unable to be satisfied that the test reports, certification and other statements provided to date include sufficient reliable confirmation of weathertightness of the aluminium joinery product itself when installed in New Zealand's climatic conditions.

6.5 The consequences of future failure for this house

6.5.1 My conclusions in regard to this particular house also need to take into account other factors that apply to this specific situation, which may serve to balance the lack of reliable test evidence for the joinery.

6.5.2 Clause E2.3.2 of the Building Code requires that ‘exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both’. In addition to factors outlined above; I therefore need to assess risks applying to the particular circumstances of this building, which means considering the consequences of any possible future moisture penetration.

6.5.3 In regard to the risks and consequences of any future failure of the joinery system proposed for this particular house, I make the following observations:

- The single-storey house has a low weathertightness risk, with generous eaves to limit the impact of rain on most windows and doors.
- The uPVC cladding is installed over a 20mm drained cavity, with the window units installed above those cavities.
- The framed openings are wrapped and taped at all corners, aluminium flashings are installed to all window sills, details call for air seals, sill support angles are installed, aluminium angles are fixed and sealed to form jamb flanges, and reveals will be fixed to the framing and the joinery frame. The installation is therefore anticipated to perform adequately.
- Joinery units are fixed to framing with steel brackets at heads and jambs, and timber reveals are intended to be fixed to the framing and glued to the joinery frame – as instructed by the engineer and covered by the engineer’s producer statement.
- Although required weathertightness tests have not yet been completed, I concur with the expert’s opinion that a modification of the testing procedures proposed by the testing company followed by an appropriate report of successful tests would provide evidence of adequate weathertightness of the joinery.

6.5.4 Taking into account the above observations, providing the above weathertightness testing is satisfactory, I consider that the particular joinery to this particular house when completed will comply with Clause B1 and will also be likely to meet the performance requirements of Clause E2 for a minimum of 15 years as required by Clause B2.3.1 of the Building Code of the Building Code.

6.6 Conclusion

6.6.1 I acknowledge and support the authority with respect to the need to properly assess applications for consent amendments and to carefully review documentation submitted in support of proposed products.

6.6.2 I have considered the expert’s report and the other available evidence, together with the risks and consequences described in paragraph 6.5.3. Provided the modified weathertightness testing of the various joinery units is satisfactorily carried out (refer paragraph 5.3.3), I am of the opinion that there are sufficient grounds for me to conclude that the aluminium units partially installed and proposed to be installed in this particular instance will comply with Clauses B1, B2 and E2 of the Building Code. I am also satisfied that the joinery complies with Clauses F2 and H1 of the Building Code.

- 6.6.3 I emphasise that each determination is conducted on a case-by-case basis. Accordingly, the fact that particular joinery units have been established as being code-compliant in relation to a particular house on a particular site does not necessarily mean that the same system will be code-compliant in another situation.

7. The decision

- 7.1 In accordance with section 188 of the Building Act 2004, I hereby determine that there is currently insufficient evidence to establish on reasonable grounds that the imported joinery will comply with Clause E2 of the Building Code, and accordingly I confirm the authority's decision to refuse to amend the building consent, in respect of that matter only.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 22 December 2016.

John Gardiner
Manager Determinations and Assurance