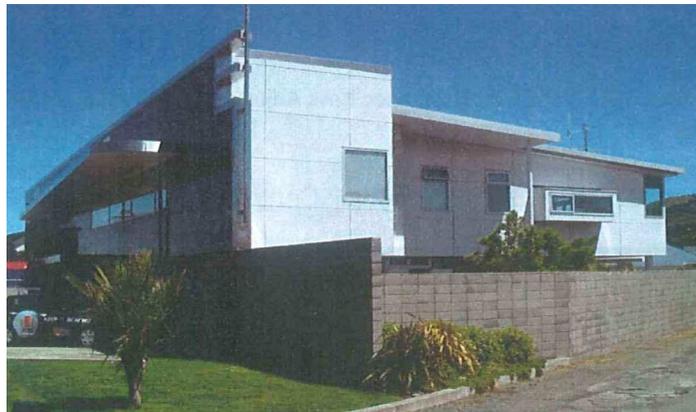




## Determination 2011/018

### Determination regarding the compliance of window heads to a building at 955-957 High Street, Avalon, Hutt City



#### 1. The matters to be determined

1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004<sup>1</sup> (“the Act”) made under due authorisation by me, 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 to the determination are:

- The building owner, the New Zealand Fire Service (“the owner”) acting through an architect as its agent (“the architect”).
- The Hutt City Council (“the authority”), being the building consent authority that issued the code compliance certificate for the building in 2007.

Mainzeal Building and Construction Ltd (“the contractor”) made the application on behalf of the parties and is treated herein as a person with an interest in the matter.

1.3 This determination arises from the mutual agreement of the owner, the contractor, and the architect, to seek a determination on the compliance of the window heads to the completed building with certain clauses<sup>2</sup> of the Building Code (Schedule 1, Building Regulations 1992).

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

<sup>2</sup> 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<sup>3</sup> therefore is whether the window heads as installed to the building comply with Clause E2 External Moisture and Clause B2 Durability insofar as it relates to the weathertightness of the window heads.
- 1.5 In making my decision, I have considered the submissions received, the report of the expert commissioned by the Department to advise on this dispute (“the expert”), and the other evidence in this matter.

## **2. The building work**

- 2.1 The building work consists of a two-storey detached fire station on a level site, which the expert describes as ‘subject to very strong prevailing winds from the northern direction’. The construction is specifically engineered concrete block and structural steel with timber framed infills; with a concrete ground floor slab, fibre-cement panel wall claddings to most walls, aluminium windows and profiled metal roofing.
- 2.2 The building is fairly simple in plan and form, with the monopitched roof sloping to the northwest from a parapet wall along the southeast elevation, which returns along part of the northeast elevation. Eaves projections to the northwest are more than 1 metre overall, with verge projections of about 1 metre to the southwest. At the north corner, the eaves are reduced adjacent to the side boundary of the property, with verges similarly reduced to part of the northeast elevation.
- 2.3 The specification calls for timber framing to ‘all exterior walls, balustrades to exterior decks and parapets’ to be H3.1 treated. The contractor has stated that all timber framing was H3.2, in accordance with the contractor’s policy at the time of construction of using H3.2 treated timber for all exterior and wet area walls.

## **2.4 The claddings**

- 2.4.1 Some ground floor walls are concrete block and these areas are not considered in this determination. The panelised claddings accommodating the subject windows is installed to the remaining timber framed ground floor walls and all upper floor walls. The claddings are a mix of two similar proprietary panelised cladding systems described as ‘facade panel rainscreens’.
- 2.4.2 The claddings consist of pre-sealed and pre-painted fibre-cement panels with 50mm sealant strips behind 10mm wide expressed vertical joints. The 1190mm wide x 9mm thick sheets (“the panels”) are fixed over 18mm vertical cavity battens and a rigid air barrier (“RAB”) to the wall framing. The RAB is a 5.5mm pre-sealed fibre-cement board that acts as a building wrap by creating a drainage plane and a wind barrier; equalising the pressure within the drained cavity to that of the exterior.
- 2.4.3 The panelised cladding systems have been appraised by BRANZ<sup>4</sup> as complying with Clause E2, providing the system (including the joinery) is subject to specific engineering and weathertightness design in accordance with the manufacturer’s instructions. The cladding manufacturer provides purpose-made flashings and accessories to joints, cavities and other junctions.

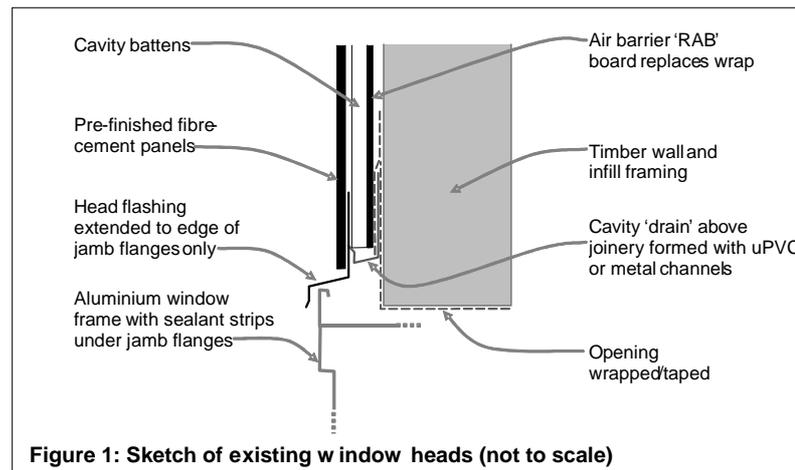
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<sup>3</sup> Under section 177(1)(a) of the Act

<sup>4</sup> BRANZ Appraisal Certificate No. 467 (2005)

## 2.5 The subject window heads

- 2.5.1 The commercial aluminium joinery comprises 158mm frame double-glazed units supported on WANZ<sup>5</sup> metal support bars. Joinery units are face-fixed against panels, with metal head flashings and compressible foam seals beneath the jamb flanges.
- 2.5.2 The cavity above joinery heads is drained via metal and uPVC channels, which extend beyond the window frames. However, the ends of the head flashings finish in line with the edges of jamb flanges, with no projections beyond the joinery frames. A typical window head is shown in the following simplified sketch:



## 3. Background

- 3.1 During construction of the building in 2006, the contractor changed the specified window flashing system to a WANZ flashing system with the agreement of the architect. The cladding manufacturer's recommendations included the WANZ system as an alternative solution to details show in E2/AS1.
- 3.2 However, although the WANZ recommended details call for the head flashings to extend 30mm past the joinery frames, the windows were installed with the ends of the head flashings finished in line with the edge of the jamb flanges.
- 3.3 The building was subsequently completed and the authority issued a code compliance certificate dated 24 January 2007. The building is subject to a 'warranty agreement' dated 11 February 2009, in which the contractor warrants the 'overall building envelope weathertightness' for a period of four years 'from the date of practical completion'.
- 3.4 Some time after completion of the building, the head flashing detail was queried as the architect considered that it did not comply with the Building Code. Under the terms of the warranty, the contractor was requested to 'replace the existing components with complying flashings associated cladding panels'. The contractor believed that the work was unnecessary as there was no evidence of leaking; and referred the matter to the architect.

<sup>5</sup> Window Association of New Zealand

- 3.5 Unable to reach a ‘mutually satisfactory resolution’, the architect and the contractor agreed to seek a determination ‘as a means of agreeing acceptance of the as-built detail and any rectification if required’.
- 3.6 The Department received an application for a determination from the contractor on 30 September 2010.

#### **4. The submissions**

- 4.1 The contractor made a submission dated 28 September 2010, describing the background to the situation and the subject window flashing installation. The contractor noted that the owner had agreed to have cladding removed adjacent to an exposed window to an upper level northeast wall.
- 4.2 The contractor provided copies of:
- floor plans and elevations of the building (showing the window numbers)
  - relevant extracts from the specification
  - correspondence with the project architect about the changed window details
  - construction photographs of window installation
  - a marked-up sketch of the head flashing detail
  - the code compliance certificate dated 24 January 2007
  - the contractor’s ‘warranty agreement’ dated 11 February 2009.
- 4.3 A draft determination was issued to the parties, and the person with an interest, for comment on 11 January 2011. The parties accepted the draft without comment.
- 4.4 The contractor did not accept the draft and responded in a submission dated 18 January 2011. In summary the contractor submitted that:
- ‘The building is clad with a rainscreen system. One of the key features of rainscreen technology is that water is expected to enter the cavity on occasions.’
  - the system is operating as designed; any water entering the cavity was able to drain as required
  - there is no evidence of water regularly entering the cavity
  - if flashings were installed to the WANZ details dated 2005 they would not materially change the likelihood of water entering the cavity.

I have taken account of the submission and amended the determination as appropriate.

- 4.5 The authority responded in an email on 21 February 2011 and had no comment to make on the draft.

## **5. The expert's report**

5.1 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 Building Surveyors. The expert visited the building on 5 November and 10 November 2010, providing a report that was completed on 15 November 2010.

5.2 The expert noted that his inspection was restricted to joinery installed in the exterior timber framed walls of the building. He described the panelised cladding system, noting that the window areas most exposed to the weather were in the limited number of walls not sheltered by roof overhangs or canopies.

### **5.3 Window installation**

5.3.1 The expert noted that the windows were face-fixed, with metal head flashings and compressed foam seals behind the jamb flanges. The expert also inspected the bottom of the cavity from below the cladding under the window to an upper north bedroom (Bedroom 1 in the floor plans).

5.3.2 Commenting generally on the windows, the expert observed that:

- junctions at jambs and sills appear weathertight
- head flashings finish in line with the jamb flanges, with no turn-ups at ends
- gaps were apparent at the ends of the head flashings
- sealant had been applied to the ends of some head flashings, although most head flashings were unsealed
- the most exposed window was on the first floor northeast wall of Bedroom 1, below the parapet (I note this was the same window that the contractor proposed to expose)
- other windows which were more sheltered under overhangs are unlikely to be regularly exposed to wind blown rain at vulnerable head to jamb junctions
- the perforated cavity closure at the bottom of the cladding allows satisfactory drainage and drying of the cavity.

5.4 The expert inspected the interior of the building and took non-invasive moisture readings; noting no signs of moisture or elevated moisture readings. As cladding removal was intended for the most exposed and therefore most vulnerable window, the expert did not consider it necessary to carry out invasive moisture testing.

### **5.5 Destructive testing**

5.5.1 On instruction from the expert, the contractor removed an L-shaped cladding panel cut around the jamb and sill, leaving the upper panel at the head to jamb junction intact. I accept that the exposed underlying construction is typical of similar areas elsewhere in the building.

5.5.2 Commenting on the exposed window, the expert observed that:

- sealant had been applied to the ends of the head flashing, with a bead of sealant extended down the jamb junction
- water staining was visible on the back of the removed panel, with the stain running in a straight line below the end of the head flashing
- the cavity battens and the RAB board were unmarked and dry, with no other signs of moisture and no impediment to drainage within the cavity
- evidence of moisture was restricted to the sealed inner face of the cladding, with no sign of deterioration to the fibre-cement sheet
- the full length of the cavity was able to be seen from the base of the cladding.

5.5.3 The expert dye-tested the head to jamb junction by creating a small 'dam' at the end of the head flashing and applying dyed water. He was able to observe that the water:

- dripped from the back face of the intact panel above the removed panel
- took the same path as the older water stains on the back of the removed panel
- drained to the bottom of the cladding below, where it could be seen marking the back of the cladding at the drip edge
- the cavity was operating satisfactorily to control moisture entering the cavity.

5.6 A copy of the expert's report was provided to the parties on 17 November 2010.

5.7 The contractor responded to the expert's report in a letter to the Department dated 22 November 2010. The contractor made a number of comments which I have taken into account in the preparation of this determination, including that (in summary):

- all timber framing in the building is treated to H3.2
- it is important to note that water ran only down the back of the panels, with no moisture elsewhere in the cavity
- the role of the cavity system is to act as a secondary water management system should the primary defence occasionally fail, as is expected at times over the life of the building.

The latter point is notable as it is the manner in which the cavity is utilised that is the basis for the determination.

## 6. Discussion

6.1 The architect considers that the window heads as installed do not comply with the Building Code and that therefore replacement of 'the existing components with complying flashings and associated cladding panels' is necessary.

6.2 The contractor maintains that, as there is no evidence of failure of the cladding system, the 'requirements of the Building Act have been satisfied' and also that any moisture penetrating the head to jamb junctions is effectively managed by the drained cavity, without causing any damage to the associated elements.

6.3 Taking account of the expert's report and the other evidence, the following summarises factors that I consider to be relevant to the subject windows:

**The weather exposure**

- Most window heads are sheltered beneath deep roof overhangs or canopies.
- Windows with exposed heads appear to be limited to the lower southwest elevation and some of the upper northeast elevation.
- The northeast elevation is exposed to wind blown rain from 'very strong prevailing winds from the northern direction'; while I consider that the southwest elevation will be subject to rain during southerly storms.

**The subject windows in general**

- Cavity base channels installed above windows satisfactorily drain the cavities above the joinery units, directing any moisture away from the jambs.
- However, head flashings finish in line with the jamb flanges, is not in accordance with the manufacturer's instructions and WANZ recommendations.
- Window jambs appear to be satisfactorily sealed, but head to jamb junctions are unsealed or poorly sealed, with gaps apparent at the ends of the flashings; allowing wind-blown rain to penetrate those junctions.
- The cavities appear to be satisfactorily constructed to provide drainage and drying of the cavities.

**The tested window**

- Destructive investigation and dye testing of the most exposed window confirms that the head to jamb junction has been allowing water to penetrate in the past and is still able to leak at the end of the head flashing.
- Sealant repairs to the ends of the head flashing are not effective in preventing moisture from entering the cavity in the medium to long term.
- There is no evidence of moisture penetration past the cavity into the cavity battens, RAB and wall framing.
- The cavity is currently managing any moisture that penetrates at the head to jamb junctions.

6.4 It is my view that drained cavities are intended to manage any occasional moisture ingress resulting from the failure of the primary defence mechanism. A cavity is not intended to allow for regular, or expected, water ingress. In the case of the window investigated by the expert, it is apparent that the ends of the head flashing will allow moisture to penetrate on a regular basis.

6.5 Taking the above factors into account, I consider that the exposed windows in this building manage external moisture by allowing water into the cavity detail at the ends of the head flashings to dry within the cavity. By "the exposed windows", I refer to the joinery units where the heads are not sheltered from wind blown rain. Those exposed windows appear to be (with the relevant window numbers shown in brackets):

- the first floor window at the north corner of the Kitchen/Dining area (WF07)
- the first floor window to Bedroom 7 (WF09)
- the first floor windows at the north corner of Bedroom 1 (WF13/WF14)
- the ground floor windows to the BA Workstation (W07)
- the ground floor windows to the Gym (W08).

6.6 However, I am also of the opinion that the heads of the remaining subject windows and doors (“the sheltered windows”) are sufficiently protected by deep roof overhangs or canopies to remain weathertight despite the lack of projections to the ends of the head flashings. I therefore accept that the sheltered windows are adequate in these particular circumstances.

6.7 I observe that the use of the WANZ head flashing detail with the cavity closer is intended to direct any water that has entered the cavity onto the rear of the fibre-cement panels. Any defects in properly joining the cavity closer and the head flashing may allow water running down the rear face of the fibre-cement panels to be directed back into the window head. I do not consider the detail adequate for very exposed situations.

6.8 I also observe that the window jambs, as noted by the expert, have been sealed to the fibre-cement with compressible foam strips. E2/AS1 provides for sealant also to be applied in addition to the foam strip to protect it from the elements. It is recommended that the sealant be installed.

## **7. Conclusion**

7.1 Taking account of the expert’s report and the above observations, I am satisfied that the window heads to the sheltered windows provide adequate weathertightness and durability. However, I have reasonable grounds to conclude that the window heads to the exposed windows do not provide an adequate level of durable weathertightness.

## **8. The decision**

8.1 In accordance with section 188 of the Building Act 2004, I hereby determine that the window heads as installed to the exposed windows to this building (see paragraph 6.5) do not comply with Clause E2 and Clause B2 of the Building Code.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 9 March 2011.

John Gardiner  
**Manager Determinations**