



## Determination 2010/83

### The compliance of proposed remedial work to window jambs on a house with monolithic cladding at 164 Quail Road, Kanohi, Rodney District



#### 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. The applicant is the owner B D Park (“the applicant”), acting via a consultant (“the consultant”), and the other party is the Rodney District Council (“the authority”), carrying out its duties as a territorial authority or building consent authority. The builder of the house, P & C Construction (“the builder”) is a party with an interest in this determination.

#### 1.2 The reason for the application

- 1.2.1 The determination arises from the following decisions by the authority to:
- refuse to issue a code compliance certificate and to issue a notice to fix for the house, because it was not satisfied that the building work complied with certain clauses<sup>2</sup> of the Building Code (1st Schedule, Building Regulations 1992)

<sup>1</sup> The Building Act 2004 is available from the Department’s website at [www.dbh.govt.nz](http://www.dbh.govt.nz).

<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.

- issue an amended building consent for remedial work to the house
- refuse to approve the proposed remedial work to the window jambs.

1.2.2 The application for this determination is because the authority is not satisfied that the proposed method of repairing the window jambs will comply with Clauses B2 Durability and E2 External Moisture of the Building Code.

1.3 The matter to be determined<sup>3</sup> is therefore whether the window jamb modifications proposed by the consultant will comply with Clause E2 External Moisture and Clause B2 Durability, insofar as it relates to the weathertightness of the window jambs.

1.4 I note that other requirements in the notice to fix are not in dispute, and the application for this determination was limited to the weathertightness and durability of the jambs to the conventional windows (see paragraph 4.1). The other specialised windows and other aspects of the exterior cladding not associated with the subject windows are therefore not considered in this determination.

1.5 In making my decision, I have considered the submissions of the parties, the reports of the applicant's building consultant, 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 large two-storey house on a level rural site facing west towards Kaipara harbour. According to the authority, the exposed site is in a high to very high wind zone for the purposes of NZS 3604<sup>4</sup>. Construction is generally conventional light timber frame, with a concrete floor slab, monolithic wall claddings, aluminium windows and low-pitched profiled metal roofing. The house is assessed as having a high weathertightness risk.

2.2 The house is complex in plan and form, with two circular 'turrets' linked with lower monopitched roofs at varying levels. The curved walls of the turrets extend to form parapets, while other roofs have eaves and verge projections of about 600mm overall. Two upper floor decks are situated over ground floor living areas.

2.3 The cladding is a monolithic cladding system described as stucco over a solid backing. In this instance it consists of 4.5mm fibre-cement backing sheets covered by a slip layer of building wrap, metal-reinforced 20mm thick solid plaster and a flexible paint coating. The backing sheets are fixed over a 20mm drained cavity and building wrap to the wall framing.

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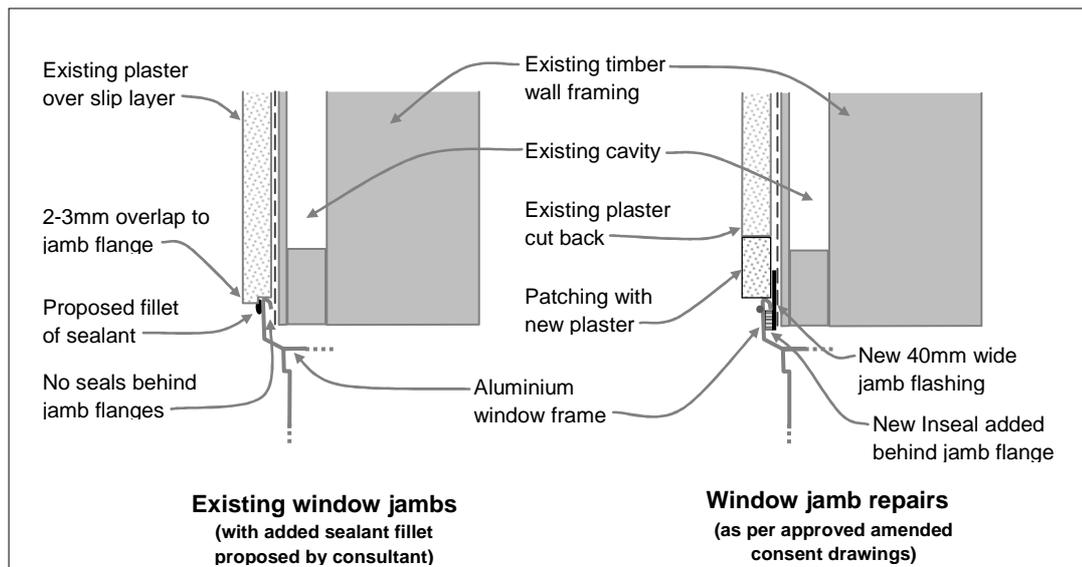
<sup>3</sup> Under section 177(a) of the Act

<sup>4</sup> New Zealand Standard NZS 3604:1999 Timber Framed Buildings

## 2.4 The window jambs

2.4.1 The aluminium windows are installed directly against the fibre-cement backing sheets, with the plaster applied up to and over the edge of the window jamb, overlapping the window flange by about 2 to 3mm.

2.4.2 The following simplified sketches compare the existing jamb detail (including the sealant bead proposed by the consultant) with the detail approved by the authority in the consent amendment drawings (see paragraph 3.6.1):



## 3. Background

3.1 The authority issued a building consent for the house (No. ABA 50085) on 8 May 2005 under the Building Act 2004. I have not seen a copy of the consent.

3.2 The authority carried out various inspections during construction in 2005, including a 'batten & wrap' on 16 September, pre-line on 27 October, 'post-line and mesh' on 8 November and pre-plaster on 14 November 2005. The first final inspection was carried out on 7 April 2006, and identified a number of outstanding items.

3.3 When the house was re-inspected on 2 August 2006, the authority noted 'cracking of the exterior plaster cladding system' and asked for a weathertightness report on repairing these. The authority met with the builder on 30 March 2007 but I am not aware of whether any repairs were made; and the authority carried out a specific cladding inspection on 12 September 2007, which identified many defects.

3.4 The authority issued a notice to fix on 5 October 2007, which included a long list of defects. Most of these were associated with the plaster cladding and included:

- install flashings as necessary to all windows and doors to comply with clause E2 and B2 of the Building Code
- ensure that jamb details to ranchsliders have been finished in accordance with manufacturer's details.

### **3.5 The consultant's report on the notice to fix**

- 3.5.1 The applicant engaged the consultant, who inspected the house and provided a report dated December 2008 which commented on the items identified in the notice to fix. The consultant carried out moisture testing and removed sections of cladding at various areas around the house to assess the underlying construction, including at the ends of the window head flashings.
- 3.5.2 In regard to windows and doors, the consultant considered that:
- despite the head flashings not projecting beyond the jambs and lacking end turn-ups, the detailing and cavity prevent any possibility of water ingress
  - there is insufficient slope and some gaps in the sill flashings, and new flashings are required in accordance with the manufacturer's recommendations
  - the ranchslider installation was inspected and passed by the authority during pre-line and pre-plaster inspections, so it is reasonable to assume that the jamb details are in accordance with the manufacturer's recommendations.
- 3.5.3 The authority commented on various parts of the consultant's report in a letter dated 3 April 2009 and it appears that repair requirements were subsequently resolved. The consultant submitted a set of 'weathertightness details' dated 16 July 2009 ("the amended consent drawings"); and the authority issued an amendment to the original building consent (No. 50085/A) dated 13 August 2009 for the repairs to the house.

### **3.6 The window repairs**

- 3.6.1 The amended consent drawings included window details identical to the manufacturer's 2005 recommended details. The jamb detail included a 40mm wide jamb flashing over the backing sheet and foam sealant tape min 19mm thick x 10mm wide between the flashing and the jamb flange (see paragraph 2.4.2).
- 3.6.2 The remedial work commenced and, when plaster was removed to install new sill flashings, it was discovered that the jambs lacked flashings or seals behind the window flanges. Due to the difficulty of retro-fitting flashings and seals, the consultant submitted for approval a detail showing a sealant bead applied at the junction of the plaster and the jamb flange.
- 3.6.3 In an email to the consultant dated 26 March 2010, the authority refused to accept the alternative jamb repair, noting the following reasons (in summary):
- the house is in a high wind zone
  - the actual overlap of plaster to the jamb flange shown in the detail appears to be substantially less than the 10mm shown in the proposed detail
  - where plaster was removed at the sill/jamb junction during installation of new sill flashings, flashing tape was used to overlap the sill flashing upstand and damage is apparent to the building wrap above the tape
  - any moisture penetrating the jambs will penetrate into the backing sheets.

#### 3.6.4 The authority concluded:

The jamb detail submitted by email 16/3/2010 is not acceptable and the amended detail approved 13/8/2009 remains on file as the consented detail.

Council require this 40mm wide jamb flashing to be installed between the head flashing and the sill flashing in accordance with the consented plans as a minimum requirement to meet the performance requirements of the Building Code.

#### 3.7 The Department received an application for a determination from the consultant on behalf of the applicant on 24 May 2010.

### 4. The submissions

4.1 The consultant made a submission which described the particular matter in dispute as being the 'external window jamb flashings' of the conventional windows. The consultant described the work that would be required to the 100 windows in the house; explaining that, in order to install jamb flashings, 100mm of plaster would need to be cut back at the sides of the windows. The consultant considered that the authority's requirements were unreasonable in the circumstances, as all inspections during construction had been passed with no mention of concerns about the windows and there was no evidence of moisture penetration except to the large complex bay window, which is a specialised window and not part of the matter to be determined.

4.2 The applicant provided copies of:

- the original consent drawings
- the amended consent drawings
- the authority's inspection summary
- the notice to fix dated 5 October 2005
- the consultant's report on the notice to fix
- the plasterer's producer statement for the repairs to the cladding cracks
- the correspondence with the authority.

4.3 The authority made a submission dated 1 June 2010, which briefly explained the background to the dispute. The authority noted that the original consent drawings referred to the manufacturer's details published in December 2003, which showed seals installed behind the window jamb flanges but did not include a jamb flashing. The subsequent window repair details approved for the amended consent were based on the manufacturer's updated details published in October 2005 and included jamb flashings and jamb seals. The authority explained its concerns about the consultant's proposal to merely apply a sealant bead to the jambs, concluding:

Council has not instructed [the consultant], the owner or builder on the method of achieving the installation of the flashing or [foam sealant] tape. Council is aware of the difficulties of installing these components retrospectively and has requested [the consultant] to propose the method of achieving satisfactory installation.

4.4 The draft determination was issued to the parties for comment on 12 August 2010. Both parties accepted the draft without comment.

## 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 Architects. The expert inspected the windows on 8 July 2010, providing a report that was completed on 13 July 2010. The expert noted that his inspection was restricted to the window jambs of the conventional windows in the house and did not include the specialised doors and corner windows.

5.2 The expert described the plaster cladding, noting the building wrap over the framing, the cavity, the fibre-cement backing sheets, the slip layer of building wrap over the backing sheets and the mesh-reinforced plaster.

### 5.3 Window installation

5.3.1 The expert noted that plaster removed at the sill to jamb junctions to install new sill flashings had not been reinstated. A cut-out made during the consultant's investigations also remained open and the ends of the head flashings were visible.

5.3.2 The expert compared the window installation with:

- the manufacturer's details referred to in the original consent drawings
- the manufacturer's updated details, used in the amended consent drawings
- the WANZ<sup>5</sup> details recommended at the time of construction.

5.3.3 The expert was able to view the head flashing detail via the consultant's cut-out, and noted that:

- the head flashing finishes in line with the jamb flange, with the 90mm end of the flashing sealed to the cladding in a similar way to the WANZ detail, which should prevent most water on the head flashing from draining back to the jamb
- an aluminium angle is used at the bottom of the plaster in lieu of the manufacturer's uPVC moulding, with the back of the angle tight against the head flashing and 5mm clearance above the flashing at the front of the angle

I also note that the cavity base moulding projects beyond the jamb and appears to be unperforated, so this should direct any moisture from the cavity above the window head into wall cavities and away from the jamb junctions.

5.3.4 The expert was able to view the sill flashing installation via the unrepaired plaster cut-outs, and noted that:

- the upstands of the new sill flashings were sealed with flashing tape to the slip layer of building wrap, with sealant applied to ground floor windows but not to first floor windows
- the ends of the sill flashings were not turned up, but the consultant advised that the builder has been instructed to do this.

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

- 5.3.5 The expert was able to view the top and bottom of the installed jamb detail via the cut-outs, and noted that:
- window jamb flanges were installed against the backing sheets, with the plaster extending 2 to 3mm over the edge of the flange
  - probing behind the jamb flanges confirmed that no seals had been installed between the window flanges and the backing sheets.

## 5.4 Moisture levels at the windows

- 5.4.1 The expert inspected the interior of the house and took non-invasive moisture readings, noting signs of moisture related to:
- the curved lintel of the helical staircase
  - beside the garage door
  - between the doors on the east elevation.

However, the only signs of moisture penetration associated with the conventional windows were elevated moisture readings below a north window, and these were confirmed by invasive moisture testing.

- 5.4.2 The expert noted that the holes left from retro-fitting sill flashings had remained open to moisture penetration for several months and he therefore considered invasive moisture to be of limited value in representing the original performance of the window installation prior to the recent repair work.
- 5.4.3 The expert therefore limited the extent of invasive moisture testing of the framing; taking six invasive moisture readings into wall framing using long probes from the inside at sample locations and noting the following elevated readings:
- 20% under the sill of a west window
  - 18% at the bottom of a stud under an east window
  - 19% at the bottom of a stud under a north window.

The expert noted that the north window reading was directly below a possibly defective deck to wall junction. Remaining readings were between 10% and 13%, indicating adequate performance at those three windows despite the plaster holes.

## 5.5 Other associated factors

- 5.5.1 The expert identified other factors that could be associated with the performance of the conventional windows, noting that:
- some windows are associated with other areas with possible defects, such as the deck to wall junction directly above the north window and this may have contributed to the high moisture reading noted in paragraph 5.4.3
  - the paint coating is acrylic rather than latex and has deteriorated in some areas
  - although the exposed metal mesh in many of the cut-outs is in good condition, corrosion is apparent in some areas which indicates that the mesh is likely to have been embedded in wet plaster for a substantially longer period

- there are several cracks in the plaster, although these are unlikely to be caused solely by jamb defects (I note that cracks in the plaster were first identified by the authority in August 2006, as outlined in paragraph 3.3).

## **5.6 The window jambs**

- 5.6.1 The expert considered it likely that the window jambs had complied with Clause E2, with no significant moisture penetration, prior to the remedial work on the sills. However, he also noted that minor leaks lead to cracking and increasing moisture penetration, and it is therefore likely the jambs would not comply with Clause E2 over time. The work therefore failed to comply with Clause B2.
- 5.6.2 With regard to the consultant's proposal to face seal the edge of the jamb flange, the expert noted that a sealant bead cannot be applied in accordance with the manufacturer's recommendations for minimum bonding depths and bond breaking tape. At best, any protection offered to the jamb plaster junction would only be a short term solution.
- 5.6.3 Taking into account the history of past cracking and the exposure from plaster cut-outs, the expert considered that more investigation is required to determine the condition of timber exposed to moisture either by past defects or by the unrepaired holes in the plaster.
- 5.7 A copy of the expert's report was provided to the parties on 16 July 2010.

## **6. The proposed remedial work**

### **6.1 Discussion**

- 6.1.1 The authority maintains that the consultant's proposal to repair the window jambs with a bead of sealant applied to the edge of the jamb flange is not sufficient to ensure durable weathertightness and the expert generally confirms that view.
- 6.1.2 The authority also maintains that window jambs should be repaired in accordance with the detail approved in the amended consent drawings (see paragraph 2.4.2); by retrofitting jamb flashings and seals under the jamb flanges. However, the authority also acknowledges that the original consent drawings did not include jamb flashings but did show seals installed behind the window jamb flanges.
- 6.1.3 The following summarises factors that I consider to be relevant to the window jambs:
- Cracks in the plaster cladding were first identified only 4 months after completion of the house in 2006, indicating a history of defects in the cladding (see paragraph 3.3) and likely moisture penetration since that time.
  - The original consent drawings called for jamb seals, but not jamb flashings.
  - The amended consent drawings called for jamb seals and jamb flashings.
  - The jambs as installed incorporate no jamb seals and no jamb flashings.
  - The plaster provides little protection to the jamb junction, overlapping the window jamb flanges by only 2 to 3mm, rather than the 10mm indicated in the consultant's proposed detail.

- There is little evidence that the lack of seals or flashings have directly resulted in significant moisture penetration past the cavity into the wall framing.
- There are unrepaired holes in the plaster and other defects, which are likely to have contributed to elevated moisture levels recorded in the framing by the expert.
- The sealant bead proposed by the consultant cannot be applied in accordance with the manufacturer's recommendations.
- While significant moisture penetration through jambs may not have occurred to date (some have performed and some have not), the junctions are unlikely to remain weathertight in the longer term.

## **6.2 Conclusion**

- 6.2.1 Taking account of the expert's report and the above observations, I am satisfied that the proposed sealant repairs to the window jambs will not provide adequate weathertightness and durability, as the edges of the plaster appear to be porous and those edges would still be exposed. However, while I consider that the consultant's proposal is inadequate, I am also of the opinion that the extent of additional work required is mitigated to some extent by the generally adequate past performance of most of the conventional windows.
- 6.2.2 I am also of the opinion that cutting back the plaster by 50mm and then reinstating the plaster over a 40mm flashing would result in a plaster joint that would be difficult to seal. This could result in long term leakage that could result in damage to the building, even with the presence of a cavity.
- 6.2.3 I therefore suggest that an adequate level of durable weathertightness of the window jamb junctions may be provided by the addition of appropriate mechanical protection. Should the windows not be removed, then a solution involving an engineered sealant joint protected from sun and rain by an external cover flashing system would be required.
- 6.2.4 I note that there are likely to be a number of methods that achieve an appropriate level of protection; and suitable methods should be carefully investigated before a selected proposal is submitted to the authority for its consideration.

## **7. The decision**

- 7.1 In accordance with section 188 of the Building Act 2004, I hereby determine that the proposed window jamb repairs will not result in the windows of this house complying with Clause B2 of the Building Code, insofar as it relates to Clause E2.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 7 September 2010.

John Gardiner  
**Manager Determinations**