



## Determination 2012/041

### Regarding the issue of a notice to fix for a 9-year-old house with monolithic cladding at 244 Baxter Road, Otautau



#### 1. The matter 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

1.2.1 The parties to the determination are:

- the owner of the house, M Lindsay (“the applicant”), represented by an agent who has installed moisture detection probes in the house (“the agent”)
- Southland District Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.

1.2.2 I have also included Versatile Buildings Limited, the building company which constructed the house, as a person with an interest in this matter (“the builder”).

1.3 This determination arises from the decision of the authority to issue a notice to fix for the 9-year-old house because the authority is not satisfied that the house complies with certain clauses<sup>2</sup> of the Building Code (First Schedule, Building Regulations 1992). In the application for determination, the agent sought a determination on Item 5 of the notice to fix, which relates to concerns about the weathertightness of the external wall cladding system (see paragraph 3.4).

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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, 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> is therefore whether the authority was correct in its decision to issue a notice to fix with respect to Item 5 on that notice.
- 1.5 In deciding this matter, I must consider whether the external claddings to the house (“the claddings”) comply with Clause B2 Durability and Clause E2 External Moisture of the Building Code. The claddings include the components of the system (such as the backing sheets, the plaster and coatings, the windows, the roof cladding and the flashings), as well as the way components have been installed and work together.
- 1.6 Other Building Code clauses and items identified by the authority in the notice to fix are not disputed, and I leave those to the parties to resolve in due course.
- 1.7 In making my decision, I have considered the information provided by the parties, which includes:
- the results of moisture probe testing carried out by the agent
  - the submission from the builder
  - the report from the cladding manufacturer provided to the builder

## **2. The building work**

- 2.1 The building work consists of an L-shaped house with a basement under the eastern leg which extends to the north beyond upper level walls. The house is on an exposed rural site assumed to be in a high wind zone for the purposes of NZS 3604<sup>4</sup>; and is assessed as having a low to moderate weathertightness risk (see paragraph 6.2).
- 2.2 The basement has a concrete slab and foundations, with concrete block walls. The upper level is timber framed, with pile foundations to the western leg, monolithic wall claddings, and aluminium windows and profiled metal roofing. The specification calls for the wall framing to be ‘N Z Oregon’, which the agent accepts is untreated.
- 2.3 The house is simple in plan and form, with a 20° pitch profiled metal gable roof that is offset on the northern side and reduces about 10° pitch above north-facing verandahs. The living room verandah extends as a conservatory at the northwest corner, with a deck above the basement. Based on the applicant’s photographs, the remaining eaves and verge projections are about 500mm.

## **2.4 The wall cladding**

- 2.4.1 The wall cladding is a proprietary EIFS<sup>5</sup> system consisting of 40mm polystyrene backing sheets fixed directly to the framing over the building wrap. The sheets are finished with a proprietary coating system, which consists of three coats of fibreglass mesh-reinforced modified plaster finished with an acrylic coating.

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<sup>3</sup> Under sections 177(2)(b) and 177(2)(f) of the Act.

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

<sup>5</sup> Exterior Insulation and Finish System

- 2.4.2 The cladding includes purpose-made flashings to windows, edges and other junctions and the specification calls for the cladding to be installed in accordance with the manufacturer's 'Technical and installation manual' dated May 2000. I have not seen a producer statement or warranty for the installed cladding.

### **3. Background**

- 3.1 The authority issued a building consent (No. 22771/1) on 5 December 2001 under the Building Act 1991, with construction completed during the following year. The 'consent endorsements' included the requirement for 'foundation, pre-line, drainage and completion inspections'.
- 3.2 The authority carried out various inspections, which did not include a pre-cladding inspection. Due to minor unfinished items to be completed by the owner, a final inspection was not sought when the builder completed construction. According to the agent, the builder and owner have carried out various repairs since 2002, mainly relating to water penetration into the basement.
- 3.3 In 2010, the owner's family approached the builder for help in obtaining a code compliance certificate and the builder advised the authority of completion of the house on 18 October 2010.

#### **3.4 The notice to fix**

- 3.4.1 The authority carried out a final inspection of the house on 5 November 2010 and issued a notice to fix on 10 November 2010. The notice stated that the building work did not comply with Clauses B1 Structure, B2 Durability, D1 Access Routes, E1 Surface Water, E2 Weathertightness, G12 Water Supplies and G13 Foul Water.
- 3.4.2 As noted in paragraph 1.3, the agent has restricted the application to the weathertightness of the wall cladding. This was identified in Item 5 of the notice as:
5. Council's records do not indicate that a pre cladding inspection was carried out. It would appear that the flashings to the openings do not comply with the installation details for this type of cladding system. Having reviewed the installation details, it would appear that the penetrations are not sealed correctly. It is Council's belief that the cladding system is not complying with the requirements of the Building Code. This may have had an effect on the bracing elements within the house.

#### **3.5 The moisture detection probes**

- 3.5.1 In December 2010, the agent installed more than 80 permanent moisture probes in the house. In the upper level, probes were inserted into bottom plates, under window jamb to sill junctions, beside door sills and at various other areas. In the concrete block basement walls, holes were drilled into mortar joints and timber dowels inserted into the holes, with the probes then installed within the dowels.
- 3.5.2 The probes record moisture content at about 4mm from the outer face of timber framed walls and are intended to be periodically monitored. The suppliers of the system generally recommend that probes are read at least every six months to monitor moisture levels against natural seasonal equilibrium levels in order to be

warned of maintenance requirements and leaks. Guidance by a suitably qualified building professional is usually recommended for interpretation of probe data.

- 3.5.3 Probe readings were taken at installation on 23 December 2010 and again on 27 December 2010. The lowest readings at installation ranged from about 10% to 14%, indicating the likely equilibrium moisture levels in timber framed walls. I note that moisture levels above 18% or which vary significantly generally indicate that external moisture is entering the structure and further investigation is required.
- 3.5.4 Table 1 shows elevated readings recorded following the initial probe installation, along with the results recorded for the same probes some nine months later (with elevated readings shaded):

**Table 1**

Probe readings		27 Dec 2010 (note 1)	Sept 2011	Possible cause(s) of elevated moisture (according to agent) (note 2)
Probes	Location			
<b>Bottom plates of framed exterior walls on the north elevation</b>				
43	Northeast corner of bedroom 1	21%	16%	Corner very exposed Insufficient cladding clearance to decking
44	Sill/jamb junction of a bedroom 1 window	21%	14%	Exposed to prevailing winds so verandah does not protect cladding/decking junction
49	Sill/jamb junction of the ensuite window	18%	11%	Insufficient cladding clearance to decking
3,4	Northwest corner of the living room	18%,18%	12%,13%	Insufficient cladding clearance to decking End of gutter/apron flashing above
7,8,10	Living room sliding doors above garage	19%,20%,19%	14%,14%,13%	Bottom of cladding below deck surface Lack of flashing at roof pitch change above
11	Northeast corner of the living room	21%	16%	Unsealed handrail fixings Top of handrail sloping toward cladding
<b>Bottom plates of framed exterior walls on the east elevation</b>				
14	Sill/jamb junction of a living room window	18%	13%	Window very exposed – gaps at sill corners Unsealed heatpump fixings above
17	Southwest corner of the dining area	20%	15%	Cladding crack at corner Downpipe fixings Possible gutter overflow
<b>Bottom plates of framed exterior walls on the south elevation</b> (note 3)				
23, 24	Stairwell wall and back door	20%,22%	12%,15%	Sagging and blocked gutter above Cladding hard against timber decking Handrail fixed against cladding
<b>Bottom plates of framed exterior walls on the west elevation</b>				
37, 73	Sill/jamb junction of a bedroom 3 window	24%,18%	21%,22%	Windows very exposed to prevailing weather – serious cracks and gaps at sills
41	Sill/jamb junction of a bedroom 1 window	20%	24%	
42	Northeast corner of bedroom 1	22%	16%	Corner very exposed Insufficient cladding clearance to decking
<b>In timber dowels inserted into basement wall mortar joints</b>				
62,63,64	South wall	69%,31%,26%	83%,88%,67%	
65, 66	East retaining wall	24%,96%	99%,99%	
67, 68	North wall	22%,25%	34%,71%	
<b>NOTES:</b>				
(1) Due to the potential unreliability of readings taken during installation, table excludes initial readings of 23 December 2010.				
(2) The agent's comments on probable causes of elevated moisture levels – submitted in response to the draft determination (see paragraph 4.6.2).				
(3) Table excludes elevated readings due to a plumbing leak under the laundry tub (since repaired).				

3.5.5 As shown in Table 1, the September 2011 results show moisture readings in the framed walls decreasing, despite an expectation that moisture levels will rise during wetter seasons. The decrease may be due to surface repairs carried out on the cladding since the initial installation of probes, as I have seen no evidence of comprehensive repair work carried out since that time (see paragraph 6.3.1).

3.6 The Department received the application for a determination on 26 October 2011.

## **4. The submissions**

4.1 The agent's submission briefly outlined the background to the situation, noting that the notice to fix had identified 'numerous problems'. The agent noted that further readings of moisture probes were taken in September 2011 (see paragraph 0) and, based on those readings, his 'personal analysis' was:

- house built with oregon framing as specified
- some moisture in cladding from details that can be easily repaired/modified
- major internal leak at laundry
- very high moisture ingress at 2 west elevation windows (where exposed to prevailing weather)
- framing in excellent condition, except some minor decay at Probe 28 (internal, in laundry) and possible minor decay at Probe 72 (stud), by sill at Bed3 window.

4.2 The agent forwarded copies of:

- the consent drawings and specifications
- the building consent
- the cladding manufacturer's manual dated May 2000
- the builder's advise of completion of building work dated 18 October 2010
- the notice to fix dated 10 November 2010, including photographs
- probe readings at 23 and 27 December 2010 and 25 September 2011
- various other items of information.

4.3 The authority acknowledged the application and forwarded copies of the notice to fix dated 10 November 2010.

4.4 A determination was issued to the parties for comment on 1 December 2011. The authority accepted the draft without comment on 6 December 2011.

4.5 The Department wrote to the agent and the builder on 27 February 2012, noting that no response to the draft determination had been received.

## **4.6 The builder's response to the draft determination**

4.6.1 On 1 March 2012, the builder advised the Department of its intention to respond to the draft determination. The builder's submission of 3 April 2012 commented on the background to the situation and noted that a pre-cladding inspection was not required by the consent conditions, although the authority visited the site when 'the

cladding was on, complete with flashings when the pre-lining inspection was carried out’.

4.6.2 The builder also commented on the moisture detection probe readings, noting:

- The agent is an experienced installer who maintains that ‘initial probe readings are always high due to pressure on pins on wood around them when hammered in’; and the second readings should therefore be considered as more relevant. [Refer to Note 1 in the Table 1.]
- The only maintenance carried out on the cladding between the two reading dates were cosmetic repairs to several corners.
- Of the 76 probes in timber framing, 11 of these recorded moisture levels over 18% - and this reduced to only 4 in September 2011, despite a significantly higher rainfall for the two months prior to the latter readings.
- The drillings from the probe installation found the framing in ‘excellent condition’, apart from framing associated with the laundry leak and ‘possible minor decay’ beside the west window to bedroom 3.
- There is no evidence of significant moisture penetration and decay as claimed in the draft determination and the only area requiring further investigation is the isolated window areas on the west wall.

4.6.3 The builder also forwarded a statement from the cladding manufacturer, which noted that the draft determination and the probe results had been reviewed and stated that further investigation of the cladding would be undertaken. A report dated 14 May 2012 was subsequently provided, which is summarised in paragraph 5.

#### **4.7 The agent’s response to the draft determination**

4.7.1 The agent responded to the draft determination on 15 May 2012. The agent did not accept the draft and included the following comments:

- Moisture readings taken during probe installation are not reliable and only the second readings should be considered.
- Drillings from probe installation have been retained, and these samples can be sent to an independent testing facility for assessment of the timber condition.
- The house is generally performing very well, with the only moisture issues resulting from damage and ‘deck/groundline problems’, and the framing is in ‘excellent condition’ except adjacent to the laundry plumbing leak.

4.7.2 The agent also outlined probable causes of higher moisture probe readings, which I have summarised as part of Table 1 in paragraph 3.5.4, and proposed a list of repairs, maintenance and monitoring work.

4.8 I have considered the builder’s and the agent’s responses to the draft determination and have amended the draft as I consider appropriate; also taking into account the cladding manufacturer’s report as outlined below.

## 5. The cladding manufacturer's report

5.1 The cladding manufacturer's representative inspected the cladding on 27 March 2012 and provided the builder with a report dated 14 May 2012. The representative noted that the inspection was visual, with no invasive or destructive testing carried out.

5.2 The representative explained that details and construction practices used at the time of construction of the house 'may not comply with today's building code', while noting that the probe readings indicated that past moisture levels 'have reduced dramatically to acceptable levels'.

5.3 Commenting specifically on the building envelope, the representative noted that:

- some cladding clearances above ground or paving are insufficient
- there are no diverters (kick-outs) at the bottom of apron flashings
- some ends of gutters are penetrating the cladding, with the danger that water may have penetrated the cladding and damaged the underlying framing

### *General maintenance*

- cracking along the soffit/fascia is likely to be cosmetic only, and can be easily remedied during general maintenance by scoring a small chase at the junction then applying a sealant bead
- a fine crack at the southwest corner can be patched and repainted
- there is cracking around window flashings, which can be addressed and resealed when repainting is carried out.

5.4 The representative also suggested that the integrity of critical cladding junctions should be ensured by engaging 'an independent contractor to carry out invasive testing on these junctions prior to remedial works being carried out.'

## 6. Weathertightness

6.1 As noted in paragraph 1.7, I have considered the available evidence, and assessed the weathertightness of the house, as the basis for my decision. The evaluation of building work for compliance with the Building Code and the risk factors considered in regards to weathertightness have been described in numerous previous determinations (for example, Determination 2004/1).

### 6.2 Weathertightness risk

6.2.1 This house has the following environmental and design features which influence its weathertightness risk profile:

#### **Increasing risk**

- the house is two-storeys high in part
- the house is in a high wind zone
- the walls have monolithic cladding fixed directly to the framing

- there is an enclosed deck above part of the basement area
- the external wall framing is not treated to a level that provides resistance to decay if it absorbs and retains moisture.

#### **Decreasing risk**

- the house is fairly simple in plan and form, with some complex junctions
- there are eaves projections to shelter most of the cladding.

6.2.2 When evaluated using the E2/AS1 risk matrix, these features show that one elevation of the house demonstrates a moderate weathertightness risk rating and the remaining a low risk rating. I note that, if the details shown in the current E2/AS1 were adopted to show code compliance, the EIFS cladding would require a drained cavity for all risk levels. However, I also note that a drained cavity was not a requirement at the time of construction in 2002.

### **6.3 Weathertightness performance**

6.3.1 I have studied the consent drawings, the photographs, the moisture probe readings and the cladding manufacturer's report and I make the following observations:

- There are several complex roof or deck to wall junctions that provide particular risks of moisture penetration into associated framing.
- Clearances from decks and ground are inadequate in some areas, with timber decking and the garage roof deck butting against the bottom of the cladding.
- Although window sills have not been installed in accordance with the manufacturer's instructions at the time of construction, the cladding manufacturer has identified movement as the cause for cracks at junctions, which can be attended to as part of routine maintenance.
- Some pipe penetrations and other fixings through the cladding are unsealed.
- There are cladding cracks at soffit to wall junctions and to some corners.
- The bottom of the apron flashing is not weathertight, with no kick-out and the end of the gutter buried within the cladding.
- There is no flashing at the change in roof pitch at the north verandah.
- Probe readings taken at 27 December 2010 showed a number of elevated readings in upper level framing, which require further investigation to establish the cause(s). These areas include elevated moisture levels:
  - under sill to jamb junctions of some windows,
  - at bottom plates beneath the north verandah, despite the roof shelter
  - at external corners of the house
  - at the northeast corner of the living room under the bottom of the apron flashing to the wall to roof junction
  - in various other bottom plates adjacent to ground or deck surfaces.
- The house may have been subject to the above moisture problems for much of the nine years since completion, with an unknown effect on the underlying

untreated timber framing. Although the agent has stated that probe drillings were sound this has not been verified by testing and the agent has acknowledged 'possible minor decay' beside the sill of a west window.

- Surface sealant repairs are unlikely to remain durable in terms of weathertightness if defects and underlying causes of past and present moisture penetration are not satisfactorily remedied.
- All readings have shown significant leaks into concrete block basement walls.

6.3.2 Taking the above into account, it is clear that some areas of the external envelope are unsatisfactory in terms of their weathertightness performance, which has resulted in moisture penetration and possible decay to some areas of the untreated framing.

6.3.3 The agent and the builder maintain that the faults identified in the external building envelope occur only in discrete areas, and rectification of areas identified in Table 1 will result in the house being brought into compliance with Clauses B2 and E2 of the Building Code. I accept that further investigation may confirm that view.

6.3.4 However, I also consider that further specialised investigation is necessary, including the systematic survey of all risk locations, to determine all of the causes and the full extent of moisture penetration, timber damage and the repairs required.

## **6.4 Weathertightness conclusion**

6.4.1 I consider the moisture probe readings and the other evidence establishes that the current performance of the building envelope is not adequate because there is evidence of moisture penetration to some areas of the timber framing. Consequently, I am satisfied that the house does not comply with Clause E2 of the Building Code.

6.4.2 In addition, the building envelope is also required to comply with the durability requirements of Clause B2. Clause B2 requires that a building continues to satisfy all the objectives of the Building Code throughout its effective life, and that includes the requirement for the house to remain weathertight. Because the cladding faults on the house will continue to allow the ingress of moisture in the future, the building work does not comply with the durability requirements of Clause B2.

6.4.3 I therefore consider that the authority was correct to issue the notice to fix with respect to Item 5 referring to the weathertightness of the cladding. However, I note that a lack of a pre-cladding inspection, as specified in Item 5 of the notice to fix, is not in itself grounds to conclude that the cladding does not comply with the Building Code.

6.4.4 Final decisions on how code compliance can be achieved can only be made after a more thorough investigation of the external envelope and of the condition of the underlying timber framing. The agent has noted that the probe drillings are available for decay testing and I accept that such independent testing should verify the condition of the framing in those locations. However, there are other critical junctions, such as below the roof junctions, which require a careful analysis by an appropriately qualified expert. A full investigation of the causes, extent, level and significance of defects, moisture penetration and damage to the framing, with the chosen remedial option submitted to the authority for its consideration and approval.

## **7. What is to be done now?**

- 7.1 I suggest that the parties adopt the following process. The authority has already identified its general concerns about the cladding in Item 5 of the notice to fix and I concur with those concerns. The agent should produce a response to Item 5 in the form of a detailed proposal, produced in conjunction with a competent and suitably qualified weathertightness specialist, as to the further investigation and rectification of the cladding and underlying framing if necessary.
- 7.2 Any outstanding 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 Building Act 2004, I hereby determine that the external envelope of the house does not comply with Clauses E2 and B2 of the Building Code and accordingly, I confirm the authority's decision to issue a notice to fix in respect of Item 5 relating to the breach of the Building Code in respect of the wall cladding.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 28 May 2012.

John Gardiner  
**Manager Determinations**