



## Determination 2012/014

### The code compliance of a deck incorporating a floating in-situ concrete slab over a waterproofing membrane at 38 View Road, Waiheke Island

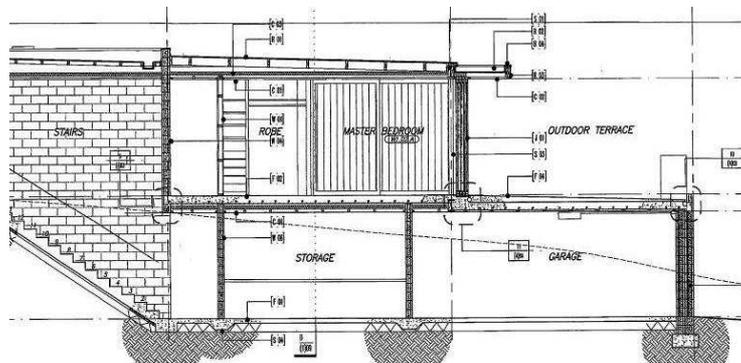


Figure 1: Section through deck as originally consented

#### 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 are:

- the owner of the house, Irini Trust (“the applicant”) acting through the designer
- the licensed building practitioner<sup>2</sup> who is the director of the architectural design firm for the project, M McLeay (“the designer”)
- Auckland Council (“the authority”), carrying out its duties as a building consent authority.

<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> LPB Licence Class ‘Design 2’

- 1.3 This determination arises from the decision of the authority to refuse to grant an amendment to a building consent for remedial work. The need to amend the building consent arose when water ingress was found in a deck area of a house while remediation work to the house was being undertaken. A solution was designed that incorporated a floating in-situ concrete topping slab over a waterproofing membrane (“the amended work”). The authority was not satisfied that the amended work will comply with the Building Code (Schedule One, Building Regulations 1992), and in particular is concerned about the inability to maintain the membrane.
- 1.4 The matter to be determined<sup>3</sup> is therefore whether the amended work, which is now largely completed, will comply with Clauses E2 External Moisture and B2 Durability of the Building Code.
- 1.5 By “the amended work” I mean the components of the deck (such as the original slab, the membrane, the pedestals, the plywood, and topping slab) as well as the way the components are designed and work together. The amended work is part of a larger body of alterations and remediation work being carried out on the house.
- 1.6 This determination considers only the amended work as described above. In particular I have not considered the requirements for surface water collection and discharge from the deck.

## 2. The building and the amended work

- 2.1 The house is a single story building approximately seven years old. The house comprises two levels (ground level and first floor) with residential spaces at first floor level, and a double garage and storage at ground level. The house is constructed predominantly of concrete block walls with concrete foundations and concrete floors to ground and first floor levels. The first floor has a ‘flat’ timber-framed roof.
- 2.2 The house has a large terrace deck at first floor along the west elevation, half of which is located over the ground floor garage; the remaining half of the deck is ‘slab on grade’. The deck is continuous across both halves and has a finished surface of exposed aggregate concrete.
- 2.3 The original deck (over the garage) consisted of concrete topping and a membrane, laid over a composite steel and concrete slab. The membrane and concrete topping have been removed; the existing slab has been retained. The original topping to the deck was 165mm to 185mm thick.
- 2.4 The amended work to the deck comprises the following:
- an in situ concrete slab, minimum 65mm thick, reinforced with galvanised steel mesh and perimeter bars, poured on two layers of polythene, over
  - permanent formwork consisting of either 4mm stainless steel sheet, or 15mm H3.2 CCA plywood to maintain the minimum slab thickness, over
  - pedestal support chairs at 300mm centres each way, over

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

- a two layer torch-on membrane (consisting of 2x3mm layers), with additional 150mm wide membrane strips located under each pedestal, over the existing floor slab.
- 2.5 The deck slopes away from the first floor walls to a perimeter edge drain. A stainless steel channel drain and grate is to be installed where the deck abuts the first floor walls. The membrane has a current BRANZ<sup>4</sup> appraisal certificate. The membrane manufacturer has offered a 20-year product warranty for the use of the membrane in this location.

### 3. Background

- 3.1 The authority issued a building consent (No. B/2009/6938/A) for alterations and remedial work to the house. During the course of the work, water ingress was found to be occurring in or around the deck, and an amendment to the consent was sought for remedial work to the deck itself (the amended work).
- 3.2 The amended work was the subject of discussions between the designer and the authority. The methodology for the amended work was set out in an email from the designer to a building surveyor acting for the designer, dated 15 March 2011. The email described the work and proposed that the ‘amended plans and specifications will be submitted to the council as “as- built” drawings’
- 3.3 In an email to the designer dated 8 April 2011, which was forwarded to the designer, the authority confirmed receipt of the revised detail for the topping slab and sought a PS4 from the engineer:
- Received your revised detail to construct an overlay slab as proposed by [the designer in] email of 15<sup>th</sup> March 2011 ....
- This seems like a good solution and the Engineer will provide his design and PS4 at the end of the project
- 3.4 In an email dated 19 October 2011 responding to the designers request for a site inspection, the authority said:
- We are unable to undertake the inspection as requested, as this is a deviation from the consented plans and requires an amendment to the current building consent. On this basis no further work on this area (including the pouring of the slab) should be undertaken until such time as the building consent amendment has been issued.
- 3.5 In response to the application to amend the consent, the authority asked for further information, including information relating to maintenance of the membrane. In a letter dated 28 October 2011 the authority requested the applicant:
- outline how the membrane below the proposed concrete slab can be inspected and maintained to meet the durability requirements of the building code.
- 3.6 The parties could not agree on the extent of maintenance required and the Department subsequently received an application for a determination on 21 November 2011.

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<sup>4</sup> BRANZ Appraisal Certificate No. 547 (2007)

## 4. The submissions

- 4.1 The designer made a submission (on behalf of the applicant) in a letter dated 16 November, describing the background to the dispute and the design of the amended work. The designer listed the features of the amended work which he considered reduced weathertightness risks and noted the dimensional constraints imposed by the existing house, concluding that the authority's approach:
- ...does not comply with the obligation of [an authority] under the BA2004 to consider an application on reasonable grounds including the merits of each proposed application.
- 4.2 The designer provided copies of the building consent, drawings and specifications relevant to the deck, the relevant BRANZ appraisal, and correspondence between the parties.
- 4.3 A draft determination was issued to the parties for comment on 21 December 2011. The designer accepted the draft noting minor errors that have subsequently been corrected.
- 4.4 The authority did not accept the draft determination, responding in a letter to the Department dated 24 January 2012. The authority challenged the premise that maintenance was not required in the normal course of events when this was required by the BRANZ Appraisal; that 'maintenance was a requirement' of Clause B2; and that the authority's position was in line with its practice note<sup>5</sup>. The authority advised that the amendment application was 'suspended' pending the outcome of the determination, but despite this the work carried on and is now complete.
- 4.5 In response to the authority's submission the designer advised, in an email dated 2 February 2012, that:
- the designer was 'given email approval from [the authority] that the deck proposal was ok and as-built drawings could be provided as part of the original consent.' (refer paragraph 3.3)
  - 'the membrane deck has been inspected by [the authority] prior to the slab pour'
  - the slab was poured on advice received and 'based on the required inspections as mentioned above being carried out'.
- 4.6 The responses were taken into account and a second draft determination was issued to the parties for comment on 10 February 2012.
- 4.7 The designer accepted the second draft determination but requested that the decision be altered to instruct the authority to grant the amendment to the consent.
- 4.8 The authority did not accept the second draft, and an undated letter received on 22 February the authority submitted (in summary):
- The determination should record that the work had proceeded onsite despite the designer being advised not to.

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<sup>5</sup> Practice Note AC2234, dated November 2011

- There were outstanding planning matters for which a notice had been issued under section 37<sup>6</sup> of the Act.
- ‘the amendment to the building consent will not be issued. ...a Notice to Fix will be issued for undertaking work otherwise in accordance with a current building consent’.

4.9 In response, the designer advised that the planning matters referred to by the authority were in relation ‘a proposed roof deck canopy ... located at the back of the house.’ The designer said the section 37 notice had been applied in error to the amendment for the deck, and that the authority had apologised for the error and removed the notice from the work.

4.10 Following this the Department asked the designer to confirm the inspections the authority had undertaken. In an email dated 23 February 2012 the designer said the membrane had been inspected and the designer ‘understood’ that the boxing had been observed before the topping slab was poured.

## 5. Discussion

### 5.1 General

5.1.1 The work is an alteration to an existing structure with the owner’s express requirement that the replacement deck match the section of deck that is to remain. The designer contends that the membrane is protected from UV light and wear and tear, and it is highly unlikely the topping slab will need to be removed to facilitate maintenance.

5.1.2 The authority has accepted the deck design but requires provision be made for maintenance of the membrane. Though this is stated in the authority’s practice note<sup>7</sup> entitled ‘External and internal membranes’ it refers to tiled membranes and not this specific situation. With respect to fixing tiles to membranes laid on concrete, the practice note says:

direct-fixing onto a concrete floor is acceptable subject to an assessment of the membrane via the alternative solution process

5.1.3 As noted in paragraph 2.1, the house is built predominantly of concrete and concrete block; the deck itself is made of reinforced structure. There is non habitable space to the ground level under the deck, comprising a double garage and storage space: the deck is located over the garage portion of the ground floor space.

5.1.4 While the garage is required to comply with Clause E2, its compliance must be determined against what is considered ‘undue moisture ingress’ in this case, taking account of the likely effects of damage cause by moisture ingress, and the level of amenity that will be provided. In my view Clause E2 must allow for such considerations given the limits on the application of Clause E2.2.

5.1.5 In this case the garage doors will allow the ingress of water and water laden air, whether open or closed, and water will be brought into the garage on wet vehicles. The garage is constructed of reinforced concrete and concrete block: the

<sup>6</sup> A notice described under section 37(2) stating that the work may not proceed until resource consent has been obtained.

<sup>7</sup> Auckland Council Practice Note AC2234, dated November 2011

consequential damage to the structure should the membrane fail is significantly less than if the structure was timber-framed.

- 5.1.6 The durability of the deck and garage will only be affected over time if significant quantities of moisture enter construction joints and cracks in both topping slab and the deck. Details supplied show the topping slab to be fully sealed at the perimeter with surface water being drained via falls to gutters on three sides. It is unlikely that significant quantities of water will run under the topping slab and come into contact with the membrane. Should water enter the area under the topping slab, and should the membrane also fail, water will be readily detected (refer paragraph 5.3.3).
- 5.1.7 In my opinion the amended work meets the requirements of Clauses E2.3.2 and E2.3.7.

## **5.2 The membrane**

- 5.2.1 The membrane has been installed by licensed applicators in accordance with the manufacturer's written specification. The manufacturer has offered a 20-year product warranty for the use of the membrane in this situation.
- 5.2.2 The appraisal certificate for the membrane states that it will comply with Clauses E2 and B2 as an alternative solution, providing the system is 'designed, used, installed and maintained' according to the conditions described in the certificate. The membrane has been installed by trained applicators approved by the manufacturer. The appraisal states the membrane will be impervious to water and will result in a weathertight deck, and will have a serviceable life of at least 15 years, subject to conditions in the certificate.

## **5.3 Maintenance of the membrane**

- 5.3.1 The authority is of the view that access must be provided to the membrane so that it can be maintained and that the access is required to maintain the membrane in order for it to comply with Clause B2.
- 5.3.2 I do not accept the authority's contention that building elements must be able to be accessible, and therefore exposed to view, to allow regular maintenance in order to achieve compliance with Clause B2. There are a significant number of building elements where no access is provided, nor can be reasonably expected, yet it is accepted that this is not necessary to achieve ongoing compliance: such examples include rigid air barriers to cavity systems, hidden parts of flashings, and underlay to metal roofing.
- 5.3.3 Clause B2.3.1 also qualifies the required durability periods for building elements by the ease with which the failure of the element will be detected during normal use: the inference being that lesser periods are acceptable if evidence of failure is easily detected. In this case any failure of the membrane will be readily detected through the normal use of the garage, even if it is not detected through 'regular' maintenance.
- 5.3.4 In my view what constitutes 'normal maintenance' must be taken in context and will vary depending on individual circumstances; as is articulated in the manufacturer's literature. A membrane that is exposed to the elements, or foot traffic, or both, will require a higher and more regular level of 'normal maintenance' than a membrane

that is fully protected. I note that a variant on the same membrane material is recommended for use as a tanking material where no maintenance can be expected to be carried out, and where a minimum 50 year life under Clause B2.3.1(c) is required.

- 5.3.5 In this instance the membrane is protected by the topping slab, which will prevent any UV degradation and mechanical or traffic damage. In this situation it is reasonable to take the view that the membrane will not, in the normal course of events, require regular maintenance.
- 5.3.6 I also note that the authority's practice note (refer paragraph 5.1.2) provides for the acceptance direct fixing of tiles to membranes where the membrane is applied to concrete. The ability to maintain membranes in those circumstances is similar to that discussed here.

## **5.4 The work as an amendment to the consent**

- 5.4.1 The authority had advised that the amended work should not proceed. This advice was given after the membrane had been installed, but before the topping slab had been poured.
- 5.4.2 I accept that the authority inspected the finished membrane, with the exception of the additional membrane strips under the chairs (refer 4<sup>th</sup> bullet point paragraph 2.4). I have no confirmed evidence that it completed a pre-pour inspection.
- 5.4.3 Although it is a significant building feature, I consider the topping slab is nonetheless a protective secondary element to the membrane; it can only be considered a significant feature by virtue of its size and the materials used. It is also noted that the topping slab replaced a similar building feature that was of a significantly greater thickness.
- 5.4.4 The authority had previously advised the designer that it accepted the proposal for the amended work and that this could be formalised through the provision of as-built drawings and a PS4 for the topping slab. It was not unreasonable for the work to have proceeded on that basis. However, it is clear that the work continued after the authority advised that it should cease.
- 5.4.5 The authority has subsequently advised the Department that it will not issue an amendment to the consent but instead issue a notice to fix for work undertaken other than in accordance with the consent.
- 5.4.6 Given the circumstances in this case and the degree to which the authority had accepted the amended work; it is my view the issue of a notice to fix would be an unnecessary regulatory action. I consider the provision of as-built drawings and the provision of a PS4 for the topping slab will be sufficient to formalise the amended work.

## **5.5 Conclusion**

- 5.5.1 I consider there are reasonable grounds to conclude that the amended work, as specified in the building consent application, will meet the performance requirements of Clause E2 and B2.

## **6. The decision**

- 6.1 In accordance with section 188 of the Building Act 2004, I hereby determine that the amended work to the deck, as described in paragraph 1.5 of this determination, complies with Clauses E2 External Moisture and B2 Durability of the Building Code.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 1 March 2012.

John Gardiner  
**Manager Determinations**

## Appendix A : The legislation and the Compliance Documents

A.1 The provisions of Building Code Clause B2 Durability e include:

**B2.3.1** Building elements must, with only normal maintenance, continue to satisfy the performance requirements of this code for the lesser of the specified intended life of the building, if stated, or:

- (a) ...
- (b) 15 years if:
  - (ii) Those building elements (including the building envelope, exposed plumbing in the subfloor space, and in-built chimneys and flues) are moderately difficult to access or replace, or
  - (iii) Failure of those building elements to comply with the building code would go undetected during normal use of the building, but would be easily detected during normal maintenance.
- (c) ...

A.2 The provisions of Building Code Clause E2 External Moisture include:

### Functional requirement

**E2.2** Buildings must be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.

### Limits on application

Requirement E2.2 does not apply to buildings (for example, certain bus shelters, and certain buildings used for horticulture or for equipment for washing motor vehicles automatically) if moisture from the outside penetrating them, or accumulating within them, or both, is unlikely to impair significantly all or any of their amenity, durability, and stability.

### Performance

**E2.3.2** Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both.

**E2.3.7** Building elements must be constructed in a way that makes due allowance for the following:

- (a) the consequences of failure:
- (b) the effects of uncertainties resulting from construction or from the sequence in which different aspects of construction occur:
- (c) variation in the properties of materials and in the characteristics of the site.