



## Determination 2012/007

# The compliance of tiled decks to three proposed buildings in a retirement village at 550 Albany Highway, Albany, Auckland

### 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 applicant, Settlers Albany Ltd, who is the owner of the retirement village, acting via the project architect (“the architect”)
- Auckland Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.

### 1.3 The reason for the application

1.3.1 This determination arises from the following:

- The retirement village (“the development”) includes six completed buildings (“Blocks A to F”), two buildings under construction (“Block H and Block I”), one building documented for consent application (“Block G”), and six further buildings planned for the future.
- The authority<sup>2</sup> issued building consents for Blocks A to F, with these buildings constructed with deck tiles directly adhered to membrane-covered substrates.
- In 2011, the authority issued building consents for Block H and Block I, based on documentation calling for a slip layer to be installed between the deck tiles and the underlying membrane, and construction is now underway.

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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> North Shore City Council has since transitioned into the Auckland Council. The term authority is used for both.

- The architect sought approval to revert to the direct-tiled system used for the existing Blocks A to F. In the meantime, drawings for Block G have been prepared which call for tiles directly adhered to deck membranes.
- The authority has refused to amend the existing building consents for Blocks H and I because it is not satisfied that the decks will comply with weathertightness and durability clauses<sup>3</sup> of the Building Code (Schedule 1, Building Regulations 1992).

1.4 The matters to be determined<sup>4</sup> are therefore

- whether the authority was correct in its decision to refuse to amend building consents for Block H and Block I to allow direct tiling of deck membranes
- whether the same tiled membrane system proposed for the decks to Block G will comply with the Building Code.

1.5 In deciding this matter, I must consider whether the tiled decks as proposed for Blocks G to I (“the decks”) will comply with Clause E2 External Moisture and Clause B2 Durability of the Building Code. The decks include the components of the systems (such as the concrete substrate, the deck membrane, the tile adhesive and the tiles) as well as the way the components have been installed and work together.

1.6 I have received no evidence relating to a dispute about other matters related to this development and the architect has restricted the application to the direct tiling of decks in Block G to I. This determination is therefore limited to the weathertightness and durability of the subject deck floors. I have not considered any other matters related to the proposed work.

1.7 In making my decision, I have considered the submissions of the parties, 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 considered in this determination consists of decks to three blocks proposed for a partly completed retirement village. All buildings in the development have similar materials and construction; with specifically engineered precast concrete walls and floors, and concrete and steel columns and beams. Concrete deck floors are set down from the interior by 130mm, providing a finished step of 100mm. The profiled metal hipped roofs are timber-framed, with eaves of about 600mm.

2.2 Block H is four-storeys-high and provides communal and administrative facilities for the development, with six two-bedroom apartments on the upper floor. The adjacent Block I is also four-storeys-high and provides carparking on the lowest level, with fifteen one and two-bedroom apartments on each of the upper three levels.

2.3 Block G is two-storeys-high and provides three two-bedroom apartments and five garages in the ground floor, with two three-bedroom apartments in the upper floor.

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<sup>3</sup> Unless otherwise stated, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code.

<sup>4</sup> Under sections 177(1)(a) and 177(2)(a) of the Act

## 2.4 The decks

2.4.1 All decks have concrete floors covered with synthetic butyl rubber membrane. The proposal is to directly adhere tiles to the underlying membrane. The majority of decks are partially sheltered by roofs or decks on upper levels.

2.4.2 Block G is two-storeys-high, with four decks as follows:

- All decks are situated over enclosed spaces below, with two above garages.
- Decks range from 13m<sup>2</sup> to 24m<sup>2</sup>.
- Deck floors have a fall of 1:40.

2.4.3 Block H is four-storeys-high, with twelve decks as follows:

- Six of the decks are situated partly or fully over enclosed spaces below.
- A 90m<sup>2</sup> deck along the north elevation of Level 2 is open below.
- The remaining decks range from 14m<sup>2</sup> to about 37m<sup>2</sup>.
- Deck floors have a fall of 1:40.

2.4.4 Block I is four-storeys-high, with thirty-one decks as follows:

- nine of the decks are situated partly or fully over enclosed spaces below, with eight of these above the unlined carparking space.
- Decks range from 6m<sup>2</sup> to about 16m<sup>2</sup>.
- Deck floors have a fall of 1:60.

## 2.5 The proposed deck floor system

2.5.1 The deck membrane is a 1mm thick synthetic butyl rubber sheet adhered to the concrete substrate. The proposal is to adhere deck tiles to the underlying membrane, using adhesive recommended by the membrane manufacturer.

2.5.2 The current BRANZ appraisal<sup>5</sup> for the specified deck membrane states that the membrane will comply with Clauses E2 and B2, providing the system is 'designed, used, installed and maintained' according to the conditions described in the certificate. The conditions for concrete substrates include:

- buildings up to 3 storeys high with a maximum height of 10m to eaves
- decks larger than 40m<sup>2</sup> to be specifically designed
- concrete substrates to be specifically engineered to code requirements
- decks falls to be a minimum of 1:60 (1°), with falls built into the substrate
- no steps or integral gardens within decks
- membrane to be installed by trained applicators approved by the manufacturer, in accordance with the manufacturer's instructions.

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<sup>5</sup> BRANZ Appraisal Certificate No. 436 (2011)

- 2.5.3 The manufacturer's instructions include:
- 1mm thick membrane is suitable for 'decks with protection'
  - recommendations for a 'direct-stick system' for adhering ceramic and clay tiles to the membrane, using a 'two component cementitious acrylic modified white adhesive' supplied by the manufacturer.
- 2.5.4 The membrane supplier has confirmed that its standard 20-year product warranty would apply to the proposed system, with a 5-year installation warranty from its certified applicators, based on the manufacturer's installation specifications.

### 3. Background

- 3.1 In early 2011, the authority issued building consents for Block H (No.BE/1240980/1) and Block I (No.BE/1241241/1) and construction commenced on the buildings. The consent drawings called for a separation layer between tiles and deck membranes.
- 3.2 In July 2011, the architect contacted the authority to ask whether floor tiles adhered directly to an underlying deck membrane would be acceptable and was verbally advised that the lack of provision for inspection and maintenance of the membrane precluded direct tiling. The authority's practice note<sup>6</sup> at that time stated that a deck membrane system 'must be maintainable', noting:

Direct fixing does not allow for inspection or maintenance of the membrane and this makes leak detection difficult and repairs costly. Direct fixing of tiles on membranes is outside the New Zealand building code compliance document clause E2/AS1 and is therefore considered an alternative solution.

- 3.3 The architect met with the authority on 6 October 2011 to discuss omitting the separation layer; and subsequently submitted revised drawings for direct tiling, with a covering letter explaining reasons for the requested amendments.
- 3.4 The authority responded in a letter to the architect dated 20 October 2011, stating that it could not accept the proposed changes due to the lack of access to the deck membranes. The authority noted that:

...once the membrane is tiled over there is no way of being able to either inspect or undertake maintenance on it. Unfortunately, through Councils experience with leaky building syndrome, we have found that it is only once the membrane has failed, and often damage has occurred, that owners become aware there is an issue. If owners had been able to access the membrane and inspect it, then they will have been aware there was a problem, and addressed it well before the cost of repairs became expensive.

- 3.5 The Department received an application for a determination on 21 November 2011.

### 4. The submissions

- 4.1 The architect set out the background to the situation; describing the construction of buildings in the development, the deck construction in existing blocks, and the low risk characteristics of the decks in the subject blocks. The architect concluded:

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<sup>6</sup> Practice note BLD-142-PN 1 July 2010 'External and internal membranes – alternative solutions'

Given the construction methodology, small area of the balconies (all less than 40m<sup>2</sup>) and acceptability of tiles on Butynol in other parts of the country we consider these areas low risk and propose to delete the ... separating layer from these balconies.

4.2 The architect provided copies of:

- the amended drawings for Block H and Block I
- some of the drawings for Block G
- correspondence with the authority
- correspondence with the membrane supplier.

4.3 The authority acknowledged the application, but made no submission.

4.4 Copies of the submissions and other evidence were provided to each of the parties.

4.5 A draft determination was issued to the parties for comment on 25 January 2012. Both parties accepted the draft without further comment.

## **5. Code compliance of the tiled membrane system**

### **5.1 The evidence**

5.1.1 In order for me to form a view as to code compliance of the proposed tiled deck areas, I need to establish what evidence is available and to assess that evidence in the context of these particular buildings.

5.1.2 In the case of these tiled deck areas, the evidence includes:

- the BRANZ Appraisal Certificate No. 485 (2011) for the membrane system
- the membrane manufacturer's technical literature
- the membrane manufacturer's standard 'materials warranty' and 'applicator workmanship warranty'
- the authority's practice notes
- the expert's report as outlined below.

### **5.2 The expert's report**

5.2.1 As mentioned in paragraph 1.7, I engaged an independent expert to assist me by assessing available evidence and providing an opinion on the code compliance of tiles directly adhered to butyl rubber membrane over a concrete substrate.

5.2.2 The expert is a member of the New Zealand Institute of Building Surveyors and provided a report dated 24 January 2012. The expert assessed the available information and discussed tiled membranes with relevant technical representatives.

5.2.3 Based on his assessment and discussions with BRANZ, the authority and the manufacturer, the expert noted the following:

### The BRANZ information

- The BRANZ Appraisal 436 (2011) applies to buildings within the scope of the current Acceptable Solution E2/AS1, which is limited to membranes installed over plywood substrates and does not cover ‘the application of directly applied wearing or decorative surfaces’.
- BRANZ would be prepared to appraise a directly tiled membrane system if it was demonstrated to comply with Clauses E2 and B2 and the supplier was prepared to provide a minimum 15 years warranty for the system.
- If properly installed to manufacturer’s instructions, it seems likely that such a tiled membrane system would be appraised as code compliant.
- There is no apparent need to change advice in a BUILD article<sup>7</sup> on direct adhesion of tiles to synthetic rubber membranes, which noted that:
  - an authority requires satisfactory evidence to approve tiled finishes as an alternative solution
  - decks need sufficient slope to effectively drain water over the life of the deck and a minimum slope of 1.5° is recommended
  - substrates must be sufficiently rigid to avoid deflection and tile damage
  - manufacturers’ instructions must be followed, including the use of adhesives compatible with the membrane.

### The authority’s practice notes

- The authority’s requirement for access to an underlying membrane reflects the provision for maintenance and inspection of membranes, with past references to wearing surfaces such as tiles removed from current versions of E2/AS1.
- Practice note 142 states this (see paragraph 3.2), but was withdrawn and replaced with an updated practice note (AC2234<sup>8</sup>) in November 2011.
- The updated statement states ‘direct-fixing onto a concrete floor is acceptable subject to an assessment of the membrane via the alternative solution process’.
- When asked about the wording in the practice note, the authority maintained its position with respect to declining the direct-fixed tiles, and advised that it would consider revising the updated practice note.

### The manufacturer’s information

- The recommended adhesive for bonding tiles directly to membrane is latex based and is fully waterproof in itself. Approved applicators generally aim to achieve fully coverage by the adhesive when laying tiles.
- Tile grouting uses a similar product so that when fully cured the tiled surface becomes the primary waterproofing and drainage surface with the membrane layer as the back-up.
- A 20-year warranty is provided for direct-fixed tile systems installed by approved applicators using recommended products.
- There is no minimum requirement for deck slopes, which can be at zero pitch.

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<sup>7</sup> BUILD December 2007/January 2008

<sup>8</sup> Practice Note AC2234 November 2011 ‘External and internal membranes’

- A loose-laid tile system has been developed and discussed with the authority, which includes tiles adhered to an additional loose layer of membrane.
- Most deck failures the manufacturer is aware of involved poor performance when installing liquid-applied membranes over timber substrates.
- The manufacturer was not aware of butyl rubber membrane failures related to direct-fixed tiles where its products and instructions had been properly used – especially not for concrete substrates.

5.2.4 The expert made the following additional comments:

- E2/AS1 requirements are not relevant as these buildings are outside its scope – particularly in regard to the specifically designed concrete structures.
- The membrane manufacturer's system and products are designed to avoid compromising the membrane's performance, with the recommended waterproof tile adhesive fully compatible and a 20-year warranty provided.
- Although deck slopes to Block I are only 1:60, these concrete decks are short in slope length and therefore unlikely to suffer ponding. The manufacturer does not require a minimum deck slope.
- Providing a wearing surface is a common practice that will protect a membrane and extend its useful life. Building components are often 'hidden'; and membranes to concrete retaining walls are an example of this.
- The authority's position appears to be based on an overall policy, rather than an assessment of the features and risks of this particular situation.
- There is no specific evidence of failures attributable to directly adhering tiles to properly installed butyl rubber membranes over concrete substrates.

5.2.5 The expert concluded that, in his opinion, code compliance

... can be achieved for the proposed decks with tiles direct-fixed to the Butynol membranes if all of the relevant details are in accordance with the [manufacturer's] specifications and other accepted industry practices.

### **5.3 Assessment of the tiled membrane system**

5.3.1 Direct tiling to a membrane is an alternative solution which must be assessed for compliance with the Building Code. I have considered the following criteria in this case:

- the history of use of tiled butyl membrane decks
- the in-service performance in other buildings in this development
- the quality and expected performance of the particular membrane.

5.3.2 With regard to the above criteria, I make the following observations:

- Tiles have been applied to synthetic butyl membrane decks in New Zealand for over 20 years and are generally accepted by other authorities. Known instances of failure appear to relate to installation and detailing problems.

- Similar decks to other buildings in the development were recently completed, which limits assessment of their in-service performance. However, the expert found no evidence of failures elsewhere associated with other similar systems.
- The BRANZ appraisal provides independent expert opinion on the qualities and expected performance of the membrane itself while the manufacturer's technical literature confirms that tiles may be adhered to the membrane, with warranties to be provided for properly completed decks.

5.3.3 Taking into account this evidence, and in the absence of any evidence to the contrary, I am satisfied that the deck membrane products will be adequate for the purposes used in these buildings. Code compliance will therefore dependent on the proper installation of the specified products onto these particular decks.

#### **Risks and consequences of future failure**

5.3.4 The weathertightness and durability of the proposed deck systems will be dependent on the weathertightness risk features of the buildings as a whole, the features that protect the decks from the weather, the application of the membrane and tiles, the weathertightness detailing, and the consequences and likelihood of failure on the building elements themselves.

5.3.5 Clause E2.3.2 of the Building Code requires that 'Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both'. I therefore take the view that, in addition to the factors outlined above, I need to assess the weathertightness risks of the subject decks and the likely consequences should moisture penetration occur in the future.

5.3.6 In regard to the risks and consequences of any possible future failure of the proposed deck treatment, I make the following observations:

- The concrete deck floors will provide a rigid substrate to the membrane and tiles, with little risk of movement or deflection over time.
- Tiles installed to decks will provide protection against the risk of damage to the membrane from foot traffic and the effects of UV radiation.
- The decks have simple plan shapes, and are designed with falls to shed water to the outer edge, so minimising the risk of water ponding on the deck surface.
- Most decks are small in area, with the only deck over 40m<sup>2</sup> open below and with a 1:40 fall over the limited width to drain under open balustrades. Decks with falls of only 1:60 are less than 16m<sup>2</sup> in area.
- Although deck positions range from one-storey to three-storeys above ground, the higher level decks are open below. Upper deck/wall junctions are partially sheltered by 600mm eaves, with lower decks generally below upper decks.
- The buildings have reinforced concrete walls and floors (including deck floors), which is not as susceptible to the effects of water ingress as timber.
- Most decks are open below or above unlined garage spaces, so any moisture ingress would not cause a significant loss of amenity in these circumstances.

5.3.7 Based on the above, I consider that the decks generally present a low risk of weathertightness failure and are unlikely to suffer significant consequences to the buildings' structure and amenity should moisture penetration occur in the future.

#### **The authority's practice notes**

5.3.8 The authority has published two versions of practice notes relevant to the subject decks, which contain contradictory advice in regard to direct fixing of tiles onto membranes. At the time of its refusal to amend the building consents, the earlier version<sup>9</sup> stated that any direct tiling was considered to be an alternative solution.

5.3.9 However the updated note<sup>10</sup> specifically states that the authority 'will not approve' applications for alternative solutions to direct tile membranes over timber framing, although it will consider direct tiling for concrete floors 'subject to an assessment of the membrane via the alternative solution process'.

5.3.10 I note the authority's concerns regarding the lack of access to the underlying membrane for the proposed tiled decks and I have taken these concerns into account in making my decision.

## **5.4 Conclusion**

5.4.1 The expert's report and the other evidence provide me with reasonable grounds to conclude that the tiled decks proposed for these buildings will be weathertight and durable when installed in accordance with the manufacturer's instructions.

5.4.2 It is emphasised that each determination is conducted on a case-by-case basis. Accordingly, the fact that the particular membrane system has been established as being code compliant in relation to these particular buildings does not necessarily mean that the same systems will be code compliant in another situation.

## **6. The decision**

6.1 In accordance with section 188 of the Act, I hereby determine that the tiled membrane systems proposed for the decks of Block G, Block H and Block I comply with Clauses E2 and B2 of the Building Code, and accordingly I reverse the authority's decision to refuse to issue amended building consents for Block H and Block I.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 8 February 2012.

John Gardiner  
**Manager Determinations**

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<sup>9</sup> Practice note BLD-142-PN 1 July 2010 'External and internal membranes – alternative solutions'

<sup>10</sup> Practice Note AC2234 November 2011 'External and internal membranes'