



Determination 2010/102

The code compliance certificate of a deck to a house at 46 Hackett Street, St Mary's Bay, Auckland



1. The matters to be determined

- 1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004¹ (“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 applicants are the owners, W Hull and Y Treen (“the applicants”) and the other party is the Auckland City Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.
- 1.2 This determination arises from the decisions of the authority to refuse to issue a code compliance certificate and to issue a notice to fix for 4-year-old alterations to a house because it was not satisfied that elements of the building work complied with certain clauses² of the Building Code (First Schedule, Building Regulations 1992). The authority’s current concerns about the compliance of the alterations relate to the weathertightness of the tiled deck to the house (see paragraph 1.5).

¹ The Building Act, Building Code, compliance documents, past determinations and guidance documents issued by the Department are all available at www.dbh.govt.nz or by contacting the Department on 0800 242 243.

² In this determination, unless otherwise stated, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code.

1.3 The matter to be determined³ is therefore whether the authority was correct in its decisions to refuse to issue a code compliance certificate and to issue a notice to fix for the building work; in regard to the compliance of the tiled deck floor only.

1.4 In deciding this matter, I must consider whether the tiled deck as installed on the building (“the deck floor”) complies with Clause E2 External Moisture and Clause B2 Durability of the Building Code. The deck floor includes the components of the system (such as the membrane, the plywood substrate and the deck tiles) as well as the way the components have been installed and work together.

1.5 Matters outside this determination

1.5.1 Although the notice to fix dated 22 May 2009 identified a number of defects and other items, with the exception of the deck floor these have been, or are in the process of being, resolved between the parties.

1.5.2 I have received no evidence relating to a dispute about any other matters related to this building and the applicants have restricted their application to those items in the notice to fix that relate to the deck floor. This determination is therefore limited to the weathertightness of the upper deck floor.

1.6 In making my decision, I have considered the submissions of the parties and the other evidence in this matter. I have evaluated this information using a framework that I describe more fully in paragraph 5.

2. The building work

2.1 The building work consists of additions and alterations to a 1920’s two-storey detached house situated on a sloping site in a high wind zone for the purposes of NZS 3604⁴. Construction of the altered house is generally conventional light timber frame, with pile foundations, suspended floors, weatherboard claddings, aluminium windows and profiled metal roofing.

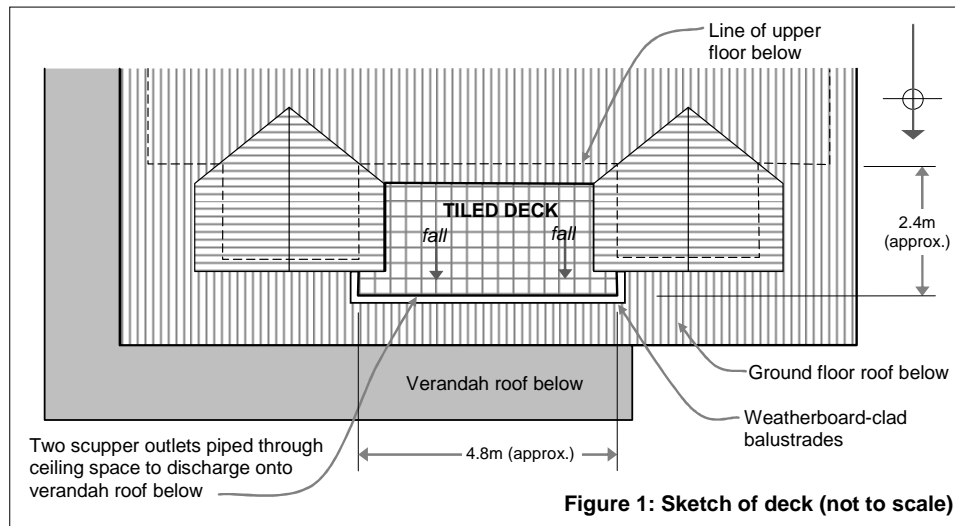
2.2 The deck

2.2.1 The enclosed deck is to the altered upper floor, as shown in Figure 1, and is located over entry and living spaces below.

2.2.2 The 11m² deck is set within the steeply-pitched roof slope on the north elevation, with a framed balustrade clad on both sides with horizontal timber weatherboards. The deck floor falls to the north, draining into two scupper outlets and an overflow, which are piped through the space beneath the deck, and under the eaves, to discharge onto the verandah. The deck has a tiled floor over a membrane on a plywood substrate.

³ Under sections 177(1)(b), 177(2)(d) and 177(2)(f) of the Act

⁴ New Zealand Standard NZS 3604:1999 Timber Framed Buildings



2.3 The deck membrane system

2.3.1 The deck membrane is a 1.5mm thick synthetic butyl rubber sheet adhered to 17.5mm H3.2 CCA treated 'construction' plywood. The drainage scuppers are proprietary moulded plastic products supplied by the membrane manufacturer.

2.3.2 The membrane system has been appraised by BRANZ⁵. The appraisal is still current and 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. These conditions include:

- buildings to be within the scope of E2/AS1, with timber framed decks
- decks to be a maximum area of 40m²
- deck falls to be a minimum of 1:60 (1°)
- plywood substrates to be treated to H3.2 (CCA treated)
- membrane to be installed by trained applicators approved by the manufacturer, in accordance with the manufacturer's technical literature.

I note the appraisal does not specifically provide for tiling the membrane.

2.3.3 The manufacturer's instructions include 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.

2.3.4 The membrane installer has provided a producer statement dated 10 October 2008, which confirms that records show the membrane to be '1.5mm black butynol' with installation completed on 19 May 2006. The installer has provided an 'applicator workmanship warranty' dated 10 November 2008, which guarantees materials and workmanship for a period of five years.

⁵ BRANZ Appraisal Certificate No. 436 (2005)

3. Background

- 3.1 The authority issued the original building consent for the alterations (No. B/1994/3605489) in 1994 under the Building Act 1991. I have not seen a copy of the building consent, but the approval stamp on consent drawings shows 3 August 1994.
- 3.2 Some work commenced in about 1996 and, according to a letter from the architect to the authority (refer below), that work:
- ...consisted of construction of the new garage, refurbishment of toilet, laundry and bathroom and living areas prior to work continuing in a sporadic manner as finances became available.
- 3.3 In 2003, the owner was advised that, due to the length of time elapsed, the original building consent had expired and a new consent application was necessary to continue the building work. Under cover of a letter to the authority dated 31 March 2003, the architect attached updated drawings and specification and applied for a new building consent to 'continue with the work to the new verandah and complete the upstairs work identified on the original consent'.
- 3.4 The authority issued the second building consent to complete the alterations (No. B/2003/3602348) in 2003 under the Building Act 1991. I have not seen a copy of the building consent, but the consent drawings are stamped as approved on 9 April 2003 and included the alterations to the upper floor of the original house and a new verandah to the lower level.
- 3.5 The alterations to the north slope of the original roof shown in the drawings include:
- the removal of an original central dormer window
 - the construction of two new dormer windows
 - the extension of the original upper level enclosed deck, with tiles shown.
- 3.6 According to the applicants, a tarpaulin protecting the opened roof during the alterations became loose during a storm; resulting in water entering the ground floor of the house over a short period.
- 3.7 The authority carried out various inspections of the alterations, which included a pre-line inspection of the upper floor on 15 June 2006. The inspections did not identify any problems relating to the deck and confirmed acceptance of 'Deck level stepdown', 'Deck overflow/s' and 'Membranes'.
- 3.8 Following consultation with the membrane manufacturer and installer, tiles were applied to the deck membrane in July 2006. According to the applicants, the manufacturer recommended adhesive was used and the tiles were laid by a 'qualified tiler'. In 2008, a 'Practice Note 142' was issued, which stated that the authority would not accept tiles directly adhered to membrane products.
- 3.9 On 7 April 2009, the authority carried out a 'final residential inspection' of the work carried out under both building consents; and the inspection record identified various defects. With regard to the deck, the inspection record stated 'tiles laid over waterproofing membrane'.

3.10 The notice to fix

- 3.10.1 The authority wrote to the applicants on 22 May 2009, stating that it was not satisfied that the building work complied with the Building Code in ‘a number of respects’.
- 3.10.2 The authority attached a ‘photo file’ of the deck and a notice to fix, which cited non-compliance with various Building Code clauses (including B2 and E2). Included in the details of contraventions were the following items relating to the deck:
- 2.1 h) Roofs/decks must shed precipitated moisture. Using acceptable solution E2/AS1 for guidance decks are to have a minimum fall of 1:60. The upper level deck does not achieve this requirement.
 - 2.2 c) Council was unable to confirm the condition of the waterproofing membrane as tiles have been laid on top of it. However, moisture has been detected in the ceiling of the dining room. This is a possible indication that the waterproofing membrane is under stress and is failing to perform as intended.
 - 3.0 a) The approved building consent documents stipulate [brand of membrane] laid in strict accordance with the manufacturer’s specification on 17.5 construction ply. Council confirms that tiles have been laid over the waterproofing membrane.
- 3.10.3 The remaining items in the notice to fix were subsequently agreed between the parties, and the majority of the remedial work is now apparently completed. However, the situation regarding the deck remained unresolved, and the Department received an application for a determination on 16 August 2010.

4. The submissions

- 4.1 The applicants made a submission in the form of a letter to the Department dated 12 August 2010, which set out the background to the dispute and described the deck tiling. The applicants explained that storm damage during construction that caused the water staining to the ceiling, noting that the authority had ‘incorrectly inferred this is evidence of the waterproofing membrane failing to perform’. The applicants also stated that the membrane installer reviewed the deck in May 2009 and had ‘found no indication of leaks in the deck or water damage in the vicinity’.
- 4.2 The applicants forwarded copies of:
- drawings of the alterations
 - the authority’s pre-line inspection record
 - the membrane installer’s producer statement and warranty
 - the authority’s letter and notice to fix dated 22 May 2009
 - various producer statements and other information.
- 4.3 The authority made no submission and forwarded a CD-Rom, entitled ‘Property File’, which contained documents pertinent to this determination including:
- the consent documentation
 - the letter from the architect accompanying the second building consent

- the drawing of the original 1925 house
- the inspection records.

4.4 A draft determination was issued to the parties for comment on 28 September 2010. The applicants accepted the draft but noted a reference error that has since been corrected.

4.5 The authority did not accept the draft. In a letter to the Department dated 14 October 2010, the authority submitted, in summary, that:

... the membrane is not readily accessible for inspection or maintenance once the tiles have been directly fixed to it. It is not until a failure of the membrane has occurred ... that anyone becomes aware there is a problem ...

Should there be a loose tile then it is foreseeable that loose grout will find its way under the tile ... ultimately causing damage to the membrane ...

... the [Department] must accept that the appraisal assumes the membrane is assessable, as there is no mention of adhering tiles to it. [The authority submits] that the appraisal can not be relied upon as a means of showing ... code compliance nor that the membrane is suitable for adhering tiles to it.

The authority noted the localised ponding on the deck saying:

The [Department] clearly accepts that ponding is acceptable. In other forums, the fact there is ponding is sufficient to establish that compliance with E2 has not been achieved. ... [The authority seeks] clarification from [the Department] as to how much ponding is acceptable for compliance still to be achieved.

4.6 I respond to the authority's submission as follows:

- By their very nature leaks to membrane roofs and decks are not readily detectable. It is questionable whether the presence of tiles on a deck will, of itself, make a defect to the deck membrane less easy to detect.
- I have placed reliance on the membrane being installed correctly to provide a system compliant with Clause E2. The likely maintenance as a result of the membrane being tiled can be offset by the reduced risk of the membrane being punctured and the reduced exposure to the elements.
- I also observe that the underside of the deck can be readily assessed and its moisture level measured, refer paragraph 5.4.
- The failure of the tiles will be readily observable. Any loose and broken grout at failed tile joints should be corrected as a matter of routine maintenance. This incidence of failed tile joints occurring will be reduced by the addition of the control joint sought in paragraph 6.1.5.
- Limited ponding will occur on membranes installed at the minimum pitch described in E2/AS1, or as specified by the membrane manufacturer, particularly at the membrane joints. This is consistent with the position taken in previous determinations.

4.7 I have amended the determination as appropriate to take account of the party's submissions and to correct typographical and reference errors.

5. The establishment of code compliance

5.1 In order for me to form a view as to code compliance of the membrane as installed, I need to establish what evidence is available. In the case of the deck membrane system and installation, the evidence consists of:

- the BRANZ Appraisal Certificate No. 436 (2005) for the membrane system
- the membrane manufacturer's technical literature, which included recommendations for adhering tiles to the membrane
- the authority's satisfactory inspections of the deck membrane
- the membrane applicator's producer statement and warranty
- the applicants' statements on the tiling and the tile adhesive.

5.2 I accept that the BRANZ appraisal and the other standards provide independent expert opinion on the qualities and expected performance of the membrane system, with the applicator's information confirming the particular membrane used and the installation by an approved applicator of the membrane. The manufacturer's technical literature confirms that tiles may be adhered to the membrane, providing the recommended adhesive is used, and the applicants' statements confirm that the recommended adhesive was used.

5.3 Taking into account this evidence, and in the absence of any evidence to the contrary, I am satisfied that the products used in the tiled deck are adequate for the purposes used in this building. The compliance of this particular deck will therefore be dependent on the installation of the products.

5.4 The expert's site visit

5.4.1 Seeking evidence on whether the installed deck floor system meets the performance requirements of the building code, I engaged an independent expert to view and photograph the deck, in order to identify any apparent problems.

5.4.2 The expert visited the site on September 14. He inspected the deck; providing annotated photographs of the tiles, the tile joints and junctions, the drainage outlets, and the adjacent interior areas. These were supplied in an emailed report on September 22, 2010 which was copied to the parties

5.4.3 The expert took non-invasive moisture readings in associated internal walls and found no elevated readings. He also removed downlights from the ground floor space below the deck to take invasive moisture readings into the deck framing and recorded two moisture levels both of 9%.

6. Discussion

6.1 General

6.1.1 On examination of the expert's annotated photographs, I note the following:

- The two 9% invasive moisture readings in the deck floor framing provide reasonable grounds to consider that the deck floor is currently weathertight.
- The wall to deck junctions, sheltered by the eaves above the surrounding walls, appear satisfactory and the scupper drainage outlets appear adequate.
- The deck is sheltered by walls on three sides and a solid balustrade on the other. The deck would be protected from the predominantly westerly weather.
- The deck falls vary from 0.5° to 0.9° which, while providing a positive fall, is below the minimum 1° fall specified in E2/AS1, and there is residue from light ponding in one area.
- The close-up photograph of the tile joints indicates some cracks to the grout, and the expert noted some 'very slight movement under foot'.
- The tiles are large at about 600mm square, and therefore incorporate fewer joints than would be the case with smaller tiles.

6.1.2 I also note that the length of the deck is about 4.8m, and the deck floor does not incorporate a movement joint within the tiled surface. I note that suppliers of tile adhesives commonly recommend the installation of movement joints at a minimum of 3 metre centres for larger tiles, in order to accommodate increased stress to the decreased number of joints.

6.1.3 I make the following observations:

BRANZ Appraisal Certificate No. 436 (2005) (Conditions as outlined in paragraph 2.3.2)	The deck in this house
Buildings to be within the scope of E2/AS1, with timber framed decks	The house is within the scope of E2/AS1, and the deck is timber framed.
Decks to be a maximum area of 40m ²	The deck is well under the limit at about 11m ² .
Deck falls to be a minimum of 1:60 (1°)	The actual deck fall varies from 0.5° to 0.9°. The photographs indicate minor signs of localised ponding after four years.
Membrane is to be protected from UV exposure and damage	The membrane is protected by the tiles.
Membrane to be over treated plywood substrates	The plywood substrate is specified as construction ply and was inspected during construction. The substrate was approved by the membrane applicator as suitable for the product.
Membrane to be installed by trained approved applicators	The applicator is approved by the membrane manufacturer. The membrane was inspected and passed at pre-line stage.

Membrane to be installed in accordance with the manufacturer's technical literature	The manufacturer specifies 1mm thick membrane when 'overlaid with tiles' and this deck membrane exceeds that at 1.5mm thick. The applicants consulted with the manufacturer and the tiles are adhered with the recommended adhesive.
When completed, the membrane will be impervious to water and give a weathertight deck	The deck construction was inspected and 'passed' during construction and three years later at the final inspection. Moisture levels below the deck are low at about 9%, indicating the deck is currently weathertight.
When completed, the membrane is expected to have a serviceable life of at least 20 years	The manufacturer warrants the membrane product for a period of 20 years.
The membrane will not require maintenance provided significant substrate movement does not occur.	There is no indication of substrate movement, but some of the tile joints are deteriorating and require remedial work.
The appraisal does not cover any requirements in relation to tiling over the membrane.	Movement of the tiles The expert reports 'very slight movement under foot'. The tiles are large, at 600mm x 600mm, with fewer joints to accommodate stress from movement. Tile adhesive suppliers commonly recommend movement joints 3m centres for large tiles. The deck at 4.8m does not include a movement joint, and expert's comment indicates that lack of provision for movement has resulted in an isolated loss of tile adhesion.

6.1.4 In addition to the above I note the deck membrane has performed adequately since its installation in about June 2006 and there is no reason to suggest that the deck membrane will not continue to perform.

6.1.5 Taking into account the above, I am satisfied that the deck membrane has generally been installed to the membrane manufacturer's instructions in accordance with good trade practice and with the conditions in the appraisal. However, taking account of the expert's annotated photographs, I conclude that the following remedial work is necessary to the tiled surface:

- The installation of a central movement joint to the tiled surface.
- Check any tile showing any signs of movement to ensure they are well adhered to the deck membrane.
- Repair or replacement of the tile grout showing signs of cracking.

6.1.6 Notwithstanding that the deck floor has limited fall, thus inhibiting drainage of rainwater from the deck surface, I note certain factors that assist the performance of the deck in this case:

- The deck has a regular shape and is relatively small in area (11m²).
- The deck and membrane is generally installed according to good trade practice and in accordance with the manufacturer's instructions, with adequate provision of drainage outlets from the deck.

- The deck membrane is thicker than required for a tiled surface, thus providing increased protection against potential damage.
- The condition of the deck is readily observable and accessible for regular monitoring and maintenance.
- The deck surface is sheltered by walls and eaves from the predominate weather. The tiles protect the membrane from wear and limit its exposure to the elements.
- The deck is an area of low and limited foot traffic.
- After four years use, there is no evidence of moisture penetration through the deck membrane.

These factors can assist the tiled deck floor to comply with the weathertightness and durability provisions of the Building Code.

6.2 Conclusion

- 6.2.1 I consider the expert's photographs and the other evidence have established that the current performance of the deck is adequate because it is preventing moisture penetration at present. Consequently, I am satisfied that the deck complies with Clause E2 of the Building Code.
- 6.2.2 However, the deck is 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 deck membrane to remain weathertight.
- 6.2.3 The membrane is protected by the tiles and should therefore need less maintenance; however, the tiles require regular inspection to ensure there are no signs of the deck settling and that the grout remains free of cracking. Because the tiling defects identified could result in ingress of moisture in the future, the deck does not comply with the durability requirements of Clause B2.
- 6.2.4 Because the faults identified with the tiles occur in discrete areas, I am able to conclude that satisfactory rectification of the items outlined in paragraph 6.1.5 will result in the deck being brought into compliance with Clauses B2 and E2 of the Building Code.
- 6.2.5 It is emphasised that each determination is conducted on a case-by-case basis. Accordingly, the fact that a particular tiled membrane system has been established as being code compliant in relation to a particular building does not necessarily mean that the same system will be code compliant in another situation.

6.3 Maintenance

- 6.3.1 Effective maintenance of the tiled surface to the deck will be particularly important to ensure ongoing compliance with Clauses B2 and E2 of the Building Code. Such maintenance is the responsibility of the building owners. Maintenance will include regular inspection of the tiled surfaces and grout joints, with prompt repair or replacement if any signs of deterioration are noted.

7. The decision

7.1 In accordance with section 188 of the Building Act 2004, I hereby determine that:

- the tiled deck complies with Clause E2 of the Building Code
- the tiled deck does not comply with Clause B2 of the Building Code, insofar as it applies to Clause E2, and accordingly I confirm the authority's decision to refuse to issue the code compliance certificate
- the authority is to modify the notice to fix, dated 22 May 2009, to take account of the findings of this determination.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 26 October 2010.

John Gardiner
Manager Determinations