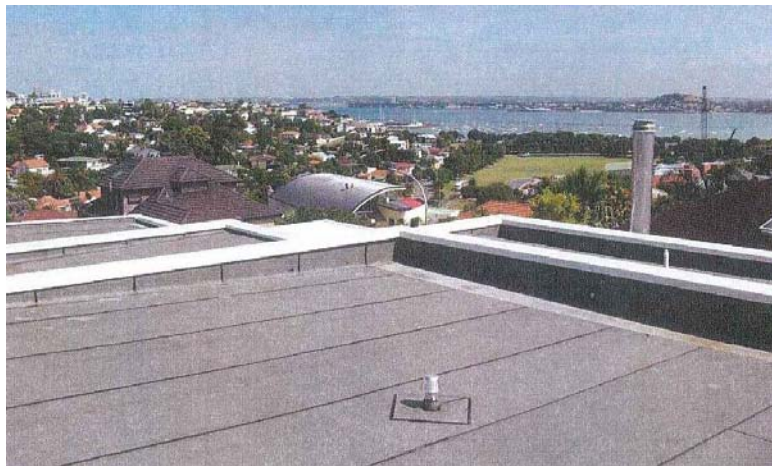




## Determination 2009/24

### Determination regarding the code compliance of the roof membrane to a new building at 2 Hawaiki Street, Orakei, 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. The applicants are the owners, D and J Hanson (“the applicants”) acting through the supplier of the deck membrane, Sealtec Ltd (“the membrane supplier/installer”), and the other party is the Auckland City Council (“the authority”), carrying out its duties as a territorial authority or building consent authority. The applicants have identified the builder, Watts and Hughes Construction Ltd (“the builder”) as a person with an interest in this determination.
- 1.2 This determination arises from the decision of the authority to refuse to issue an amendment to the building consent for the substitution of roof and deck membranes to a new building because it is not satisfied that the membrane systems comply with Clause E2 of the Building Code<sup>2</sup> (Schedule 1, Building Regulations 1992).

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

<sup>2</sup> The Building Code is available from the Department’s website at [www.dbh.govt.nz](http://www.dbh.govt.nz).

- 1.3 The matters for determination in terms of section 177(a) and 177(b)(vi) are:
- Whether the roof and deck membranes as installed on the building comply with Clause E2 External Moisture and Clause B2 Durability of the Building Code.
  - Whether the authority was correct in its decision to refuse amend the building consent
- 1.4 By “the membranes as installed” I mean the components of the membrane systems (such as the underlying substrate, the membrane layers, the joints, the flashings, the gutters and the deck tiles) as well as the way the components have been installed and work together.
- 1.5 I have received no evidence relating to a dispute about any other matters related to this building, and this determination is therefore limited to the membranes installed to the deck and the roofs.
- 1.6 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”), the builder’s report as outlined in paragraph 5.10, and the other evidence in this matter.

## **2. The building work**

### **2.1 General**

- 2.1.1 The building work consists of a 3-storey apartment building, which accommodates separate dwelling units on the second and third levels with a shared basement garage set into the sloping site. The construction is specifically engineered, with a concrete slab, foundations and retaining walls, suspended concrete floors to the upper levels, concrete masonry walls and timber-framed partitions and roofs.
- 2.1.2 The building is fairly complex in plan and form, with a multi-level roof. The membrane roofs have a slope of about 1:30 falling towards 1:100 internal gutters or sumps. Each of the eight roof levels are bounded by concrete block or timber-framed parapets.
- 2.1.3 The northwest corner of the upper floor slab is stepped down to provide a deck, with the deck slab falling at about 1:60 towards a corner sump. The concrete block walls extend up to form a small upstand at the deck edges, to which glass balustrades are fixed. The deck slab is covered with membrane, over which adjustable “jacks” support large pavers. A motorised aluminium louver roof extends over the deck.
- 2.1.4 Invoices for the roof substrate confirm that the plywood is H3 treated. The expert noted that the parapet framing appeared to be CCA treated and, given the date of construction in 2008, I accept that this framing is treated in accordance with NZS3602:2003.

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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.

## 2.2 The membrane systems

2.2.1 The membrane is a 2-layer ‘torch on’ system applied over a bitumen-based primer. Each layer is a polyester reinforced modified waterproofing bituminous membrane adhered using the application of heat and results in a total thickness of about 7mm.

2.2.2 The following products are supplied and installed to this building by Sealtec Ltd:

- “Bituplus” membranes of approximately 3mm and 4mm thick, which are manufactured by Henkel Polybit Industries Ltd and require protection from ultraviolet light (“UV”).
- “Polyplast” membrane manufactured by Pazkar Ltd, which incorporates a UV resistant embedded mineral chip coating.
- A liquid-applied UV resistant top coat manufactured by Pazkar Ltd.

2.2.3 The above products (“the Sealtec products”) are used as follows:

### **The roof membrane system**

The base layer of the roof membrane is Bituplus and the top layer is Polyplast.

### **The gutter membrane system**

Both layers are Bituplus, with a liquid-applied UV resistant finish applied over the top layer.

### **The deck membrane system**

Both layers are Bituplus, with a UV resistant finish applied over the top layer.

## 3. Background

3.1 The authority issued a building consent for the building (No. 2007/2125201) on 1 October 2007. The consent drawings called for a specific proprietary torch on membrane system. The builder substituted different torch on membrane products, although no amendment to the building consent had been issued by the authority. The substituted Sealtec products are the subject of this determination.

3.2 According to the builder, it had been agreed with the authority that consent amendments generally would be processed as a group, rather than individually. It appears that the builder was not aware that the authority had a pre-approved list of membrane products.

3.3 Concurrently the membrane supplier/installer commissioned appraisals of the Sealtec products from a local product assessment company (“the product assessor”). The appraisals, dated 30 August 2008, were forwarded to the authority on 6 September 2008 as part of an application for the membrane systems to be included as a pre-approved product. On 18 September 2008, further information was supplied in regard to warranties, producer statements, and installer training and installation quality control systems.

3.4 It appears that the first indication of a problem with the membrane’s use was when the authority issued a site instruction, dated 29 September 2008, which stated that the membrane laying must stop as the system “is not approved by this authority”.

- 3.5 At this stage, it appears that the roof was half finished and the builder was given the impression by the membrane supplier/installer that its application to be included on the authority's list of approved membrane manufacturers was being processed and that matters were "in order". The builder therefore allowed the membrane installation to continue.
- 3.6 A meeting about the membrane systems was held on 23 October 2008 to "chase progress on waterproofing issue" and the site meeting record notes that the membrane supplier/installer's representative had:
- ... told [the builder] that the product has now been approved, I recommend that [the builder] check with council that this is so, and do not proceed until satisfied that product is approved.
- 3.7 In separate letters to the applicants and the membrane supplier/installer dated 9 December 2008, the authority noted that it had reviewed the roof membrane systems installed on the building and was not satisfied that it "would meet the requirements of the Building Code – Clause E2 External Moisture". The authority advised the applicants that either the roofing membrane would need to be replaced with the consented system, or a determination on the matter should be sought.
- 3.8 It appears that the authority again wrote to the applicants in a letter dated 19 December 2008, which I have not seen. The authority apparently outlined that its concerns included the lack of technical information about the origin of the products, the lack of supporting information, and the lack of information about the in-service history and performance of the membrane systems.
- 3.9 The Department received an application for a determination on 22 December 2008.
- 3.10 In a letter to the membrane supplier/installer dated 16 January 2009, the product assessor supplied a report on tests carried out on the membrane lapped joints, the adhesion of the membranes to various substrates, the water resistance of the membranes and the ease of installation of the membrane systems.
- 3.11 In a letter to the authority dated 16 January 2009, the product assessor responded to the authority's concerns (refer paragraph 3.8) and provided further information about the Sealtec products.

## **4. The submissions**

- 4.1 The applicants forwarded copies of:
- the product assessor's appraisals of the Sealtec products
  - the correspondence from the authority
  - various other information.
- 4.2 The authority forwarded a CD-Rom that was entitled "Property File" that contained documents pertinent to this determination.
- 4.3 Copies of the submissions and other evidence were provided to the parties, which made no submission in response.

4.4 A draft determination was issued to the parties for comment on 11 March 2009.

4.5 Both parties accepted the draft without comment.

## 5. Establishing code compliance

5.1 In order for me to form a view as to code compliance of the membranes as installed, I need to establish what evidence is available.

5.2 In the case of the membrane materials, the evidence consists of:

- the membrane supplier/installer's information on the products, the detailed instructions for handling and fixing the membrane systems and construction details
- the appraisals and reports provided by the product assessor
- the information and test results dated 16 June 2008 from Pazkar Ltd for the Polyplast membrane and liquid-applied UV resistant top coat, along with:
  - a "Certificate of factory production control" dated 21 August 2007 issued by the Bureau Veritas Italia in compliance with the European Community's specified requirements for construction products for product compliance<sup>3</sup>, attesting that the Paskar factory production control meets the provisions of EN 13707<sup>4</sup>
  - a certificate dated 16 January 2007 issued by the standards institution of Israel stating that Pazkar Ltd complies with ISO 9001:2000.
- the information supplied by the Bituplus membrane manufacturer, Henkel Polybit Industries Ltd, along with:
  - a "Certificate of registration" dated 22 April 1999<sup>5</sup> provided by the British Standards Institution ("BSI Management Systems") attesting that Henkel Polybit Industries Ltd operates a quality management system that complies with the requirements of BS EN ISO 9001:2000
  - various test results dated 30 June 2008 by a Dubai testing laboratory<sup>6</sup>.

5.3 I accept that the above information includes independent confirmation on the manufacturers of the membrane products and on various qualities of the products.

5.4 The "Code of Practice for Torch on Membrane Systems for Roofs and Decks"<sup>7</sup>, together with the information from the product assessor, allow me to link the product data supplied by the membrane manufacturers to the performance requirements of the New Zealand code situation.

5.5 Taking into account the evidence outlined above, and in the absence of any evidence to the contrary, I am satisfied that the roof and deck membrane products are adequate for the purposes used in this building.

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<sup>3</sup> Directive 89/106/EEC

<sup>4</sup> European Standard EN 13707 Reinforced bitumen sheets for waterproofing

<sup>5</sup> Confirmed as current at 24 February 2009

<sup>6</sup> One of the Bodycote Testing Group, an international group of accredited test facilities with over 100 laboratories in 24 countries

<sup>7</sup> Published October 2008 by the Membrane Group New Zealand Inc.

5.6 I need also to consider the installation of the membrane system to this building. In the case of the membrane installation, the evidence consists of the expert's report as described below.

## **5.7 The expert's report**

5.7.1 As mentioned in paragraph 1.6, I engaged an independent expert to provide an assessment of the condition of those building elements subject to the determination. The expert is a member of the New Zealand Institute of Building Surveyors. The expert inspected the roof and deck membranes on 5 February 2009 and furnished a report that was completed on 13 February 2009.

5.7.2 The expert noted that the building was almost complete and the construction quality appeared high. The roof and deck areas appeared to be "well detailed and executed", with the membrane installation showing "considerable care" had been taken.

5.7.3 The expert noted that the roof was very complex, with 8 separate roof levels bounded by external and internal parapets and 14 roof slopes, mostly to membrane lined internal gutters. Apart from several minor changes in slope direction and the addition of 2 additional overflows, construction appeared to accord with the consent drawings.

### **The roof membrane system**

5.7.4 A skylight was removed to expose the underlying membrane. The expert cut out a small section of membrane, noting that the layers were well adhered to each other and to the plywood substrate and that the total membrane thickness is about 7mm.

5.7.5 The expert included the following comments on the roof membrane system:

- The membrane appears to be generally installed in accordance with the supplier's instructions, with staggered lapped joints and "carefully executed" overflashing of penetrations.
- The chip coating to the Polyplast layer is prone to damage from foot traffic, with scuff marks apparent in some areas.
- Photographs taken during construction show that a membrane layer extended over the top of the parapet framing, over which metal cappings were installed.
- The multiple roof levels with parapets result in many junctions of lower parapets against upper parapet walls. Construction photographs showed that the membrane layer over the parapets had been extended over the junction, followed by a metal saddle flashing then metal parapet cappings.

### **The gutter membrane system**

5.7.6 The expert noted that the gutter membrane is coated with an UV resistant coating.

5.7.7 The expert included the following comments on the gutter membrane system:

- Outlets through parapets incorporate factory-made metal scuppers comprised of a pipe welded to a folded plate.

- The sumps used for several roof areas are fully-welded aluminium with integrated overflows.
- The clear opening of outlets and overflows is reduced by the thickness of the membrane layers.
- The top roof area falls towards an internal gutter that includes an overflow and slopes towards an outlet at the centre, which drains through the internal parapet to the next lower roof.
- The main part of the next roof level is divided into 3 small catchment areas, with no overflows provided as each area can flow into those adjacent.

5.7.8 The expert noted that, if outlets were blocked, some areas of the roof could accumulate a considerable quantity of water before flowing over a high point into the neighbouring catchment area. While catchments may be small, the lack of overflows means that no early warning of blockage is provided. The expert recommended that additional overflows be considered, with strict monitoring for blockages.

### **The deck membrane**

5.7.9 The expert noted that the deck membrane system incorporated a UV resistant finish, despite the pavers shading the surface.

5.7.10 The expert included the following comments on the deck membrane system:

- The membrane forms an upstand at the walls and the concrete block upstand, where it is set into a chase and flashed.
- The deck falls towards a corner outlet, which incorporates a welded scupper comprised of a pipe welded to a folded plate. The pipe through the concrete block upstand leads to a rainwater head, which includes an overflow slot.
- The clear opening of the outlet is reduced to about 55mm by the membrane thickness. The overflow outlet is also reduced, to about 30mm clear opening.
- The tiles on the jacks are installed with very small gaps between them, which should guard against items entering the subfloor area and blocking the pipes.

5.8 A copy of the expert's report was provided to the parties on 16 February 2009.

5.9 The membrane supplier/installer responded to the expert's report in a letter to the Department dated 27 February 2009, noting that it generally found the report to be a "fair and accurate account". The letter attached additional information about the membrane manufacturers and testing procedures, along with a report from the builder ("the builder's report") about the situation.

### **5.10 The builder's report**

5.10.1 The builder's report outlined the background to the dispute, commented on the expert's report and attached photographs of work undertaken to the roof since the expert's inspection on 5 February 2009.

- 5.10.2 In regard to the background to the situation, the builder included (in summary) the following points:
- For expediency, the builder and the authority had agreed to “gather up consent amendments as they were encountered and lodge all the amendments at once”.
  - The builder was aware that the change in membrane would require an amendment approval, but did not know that the authority had a pre-approved list of torch on membrane products and was not aware of the status of “Sealtec’s application” to be included on that list.
  - The roofing was half completed when the “stop work notice” was issued, which was the first indication that the authority did not accept the membrane.
  - The builder allowed membrane laying to continue as he was unwilling to leave construction incomplete, and was under the impression that Sealtec’s application to the authority for general approval was proceeding satisfactorily.
- 5.10.3 In regard to the expert’s report, the builder included (in summary) the following points:
- All of the installed rain outlets can be confirmed as being in accordance with E1/AS1 Table 5, based on the catchment areas of each roof section.
  - However, the number and frequency of the overflow outlets is a more difficult compliance matter, given the complexity and possible drain paths.
  - Although specialist advice was followed for the original provision of five overflows, an additional two have been added since the expert’s visit.
  - Also since the expert’s visit, the overflow outlet to the deck has been replaced with a larger outlet in order to increase the clear opening area.
  - There are now ten overflows installed to cater for the seven downpipes.
  - Saddle flashings are installed to all necessary junctions, with the particular details varying according to the particular underlying construction.

## **6. Discussion**

- 6.1 In the case of the code compliance of the deck and roof membrane systems as installed to this building, I consider it important to look for evidence that establishes whether the systems are adequate to meet the performance requirements of the building code when installed in accordance with the supplier’s instructions.
- 6.2 In this particular case, the evidence has come from the construction photographs and the expert’s inspection of the accessible components, which can be used to verify whether installation was properly carried out.
- 6.3 Taking into account the expert’s report, I am satisfied that the roof and deck membranes have been installed to the membrane supplier/installer’s instructions and in accordance with good trade practice. The expert’s report and the other available evidence have allowed me to conclude that the membrane systems as installed in this building comply with Clauses E2 and B2 of the Building Code.



- 6.4 It is emphasised that each determination is conducted on a case-by-case basis. Accordingly, the fact that particular membrane systems have been established as being code compliant in relation to a particular building does not necessarily mean that the same systems will be code compliant in another situation.
- 6.5 As outlined in paragraph 5.7.8, the expert's report raised some concerns regarding overflow provisions for various roof areas. Since the expert's visit, the builder has increased overflow provisions as outlined in paragraph 5.10.3. However, as compliance with Clause E1 Surface water with respect to the roof outlets is not a matter considered within this determination, I leave this to the authority for resolution as it considers appropriate.

## **7. The decision**

- 7.1 In accordance with section 188 of the Building Act 2004, I hereby determine that the roof and deck membrane systems installed on the building comply with Clauses E2 and B2 of the Building Code, and accordingly, I reverse the authority's to refuse to amend the building consent.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 3 April 2009.

John Gardiner  
**Manager Determinations**