



Determination 2010/025

The refusal to issue a building consent for a wood/plastic composite deck at 139 Pukehina Parade, Te Puke.

1. The matter 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 applicant is the owner of the house, Mrs V Moore (“the applicant”) acting through an agent who is also the builder (“the builder”). The other party is the Western Bay of Plenty District Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.
- 1.2 This determination arises from a decision by the authority to refuse to amend a building consent for a deck because it could not be satisfied that the proposed wood/plastic composite deck would comply with certain clauses of the Building Code² (Schedule 1, Building Regulations 1992).
- 1.3 Based on the information available to me, the authority’s concerns are about the composite decking in regard to its compliance with Clause B2 - Durability. I have received no evidence relating to a dispute about any other matters related to the proposed building work, and this determination is therefore limited to the deck.
- 1.4 The matter for determination³ is whether the authority was correct in its decision to refuse to amend the building consent. In order to determine this matter I have considered whether the wood/plastic composite deck would comply with Clauses B1 Structure, and B2 Durability of the Building Code.

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.

³ Under section 177(b)(i) of the Act.

- 1.5 In making my decision, I have considered the submissions of the parties, the relevant research literature, advice supplied within the department and other evidence in this matter.

2. The building work

- 2.1 The building work considered in this determination is a deck overlaid with a wood/plastic composite decking material for a new residential dwelling. The authority has declined to issue a building consent for the deck because it considers that compliance with Clause B2 Durability of the Building Code has not been established.
- 2.2 The original plan for the dwelling was for 100mm x 25mm Kwila timber to be used for the decking material, but this was subsequently changed by the applicant to the alternative 100mm x 25mm wood composite decking material, which has been installed onsite.
- 2.3 There has been some correspondence between the supplier of the wood plastic composite decking and the authority regarding whether the durability period for the product is 5 or 15 years. I discuss this in more detail in paragraph 5.

3. Background

The wood/plastic composite decking

- 3.1 The wood/plastic composite product in question has not been in use in New Zealand for enough time to have demonstrated sufficient in-service performance, although the supplier states that it has been supplied to the Australian market for some nine years. Similar wood/plastic composite products have been sold into the American market for approximately 15 years.
- 3.2 The decking is an extruded composite product made from a mixture of ground sawdust, or wood flour, recycled high-density polyethylene (rHDPE) plastic milk bottles, and additives, stabilisers, bonding agents, and pigments. Over 50% of the product is wood (the sawdust).
- 3.3 Although the manufacturer states that the composite has excellent water resistance, product information also makes it clear that it is not recommended for 'use in water', which will lead to absorption of moisture and swelling over time. The product carries a ten year manufacturer's guarantee against rotting, warping, splitting and cracking due to environmental factors, provided it is installed and used according to the manufacturer's recommendations.
- 3.4 The product literature from the manufacturer quotes CSIRO tests that show the product is resistant to termite attack. The product could therefore be considered borer resistant. The literature also states that '[the] decking products have a high degree of UV stability with a modern, multi-functional UV stabilisation system', and that the product is unaffected by salt air.

- 3.5 A separate building consent authority, in response to building consent application using the same material, stated in a letter dated December 2008 that based on documents provided to them by the product supplier the authority accepted that the composite decking 'complies with the New Zealand Building Code in particular clauses B1, B2 and D1 of the Building Code'. The authority also set conditions on joist spacings in that instance and noted in the letter that the approval 'may change / be withdrawn as industry knowledge, Building Codes and Acts change'.

4. The submissions

- 4.1 The applicant forwarded copies of:
- the consent drawings and specifications
 - the manufacturer's product information, including fixing instructions for the product
 - correspondence from the authority, the product supplier (New Zealand) and manufacturer (Australia), the Building Policy Manager for the separate building consent authority, and from the applicant in confirmation of the agent's authority to act on her behalf in this matter.
- 4.2 The authority made no submission in response to the application.
- 4.3 The draft determination was issued to the parties for comment on 10 February 2010. The authority accepted the draft without comment on 16 March 2010.
- 4.4 In a submission, dated 24 February 2010, the agent agreed with the draft determination and its decision. However, the agent noted that similar products were being used throughout the country, yet it seemed that compliance with B2 Durability had not been proven. The agent therefore questioned the basis on which the building consent authorities concerned had established compliance. The agent noted that the importer of the decking was seeking an appraisal for the product.

5. Discussion

Durability requirements

- 5.1 In a letter to the authority dated 5 December 2008, the manufacturer stated that 'it is our firm understanding that a product such as ours is actually subject to section 'AS1/B2 of the Building Code – non-critical applications', which calls for a durability of 5 years, rather than 15 years'. This relates to the view that the deck in question is not a main access way and that the installed decking material is easy to access and replace (refer to appendix for Clause B2.3.1 (c)(i)).
- 5.2 The parties have agreed that the deck in question is not a main route to the main entrance of the dwelling; however I note that this has no bearing on the durability requirements of the decking itself. I also note that the deck is relatively low at around 1 metre above the ground but that, although the consequences of failure may differ, this does not alter the durability requirements for the decking.

- 5.3 However the compliance document B2/AS1 Table 1 specifically refers to non-structural strip timber decking as having a durability requirement of not less than 15 years.

The available evidence to establish code compliance

- 5.4 The authority considered that it had insufficient information with the building consent application to be satisfied on reasonable grounds that the deck would comply with Clause B2 Durability. While this type of wood/plastic composite product has been used in America and Australia for a number of years, I am not aware of comparable products being used in New Zealand and consequently I am not able to compare the likely durability performance of the product in question with that of local products.
- 5.5 Therefore in order for me to form a view as to the code compliance of the composite wood product, I need to establish what evidence is available. I have carried out a literature review and consider the following evidence sufficient for me to form a view as to whether the product will meet the requirements of B1 Structure and B2 Durability of the Building Code.
- The technical information submitted by the applicant, which includes:
 - the detailed drawings and specifications for the deck
 - information and statements from the composite wood product supplier and manufacturer.
 - The history of use of comparable composite wood products, including a review of the literature.
 - Test results from a source independent of the product manufacturer.
 - Correspondence from a New Zealand building consent authority not party to this consent, which supports the product's code-compliance.
 - Specialist advice sought within the Department on the matter, including structural analysis.

History of use

- 5.6 In-service performance information was supplied on request by the product manufacturer, although only for non-New Zealand installations. This included a photograph of boards that have been installed for eight years in an outdoor situation in Australia. The installed boards appear to be entirely sound in terms of their durability. It is however noted that demonstrated in-service performance in a New Zealand context could be expected to differ from Australian and other overseas in-service experience, given the often significant differences in UV exposure, rainfall, temperatures and other environmental factors between countries.

Clause B1 Structure

- 5.7 A comparison of the mechanical properties of the product, carried out within the Building Quality section of the department, with that of a sample of re-graded NLB timber (MSG8 feedstock) showed that the composite wood product in question is

generally comparable in strength to wood, and that it would meet the requirements of B1 Structure of the Building Code.

Clause B2 Durability

- 5.8 A review of the literature regarding the use of composite wood products highlighted a lack of information about the durability of such products when exposed to ultraviolet weathering. Information from a paper⁴ published by the University of Canterbury in 2008 gave results of accelerated ultraviolet weathering tests of recycled high density polyethylene-sawdust composites. These showed a loss of strength and stiffness over the period of the test, 2000 hours of accelerated UV weathering. However it is unclear what that would represent in terms of product life. Durability is also dependent on rot resistance.
- 5.9 A research paper⁵ prepared for the Office of Naval Research and published in 2001 (“the second research paper), was supplied by the product manufacturer following a request by the Department for additional supporting information. The tests compared HDPE composite with timber. My interpretation of the results of the tests is that some of the results are positive while others either do not appear to be positive or they provide mixed results.
- 5.10 With regard to the UV resistance of the specimens tested in the second research paper, the samples were tested with exposures of up to “2016 hours rather than the full exposure of 7090 hours”. However, the authors do state that ‘it appears likely that the performance goal of ‘no more than a 10% loss of mechanical properties due to UV exposure over the design life of the component’ can be met with these materials’.
- 5.11 I also note that UV exposure in New Zealand can be significantly more severe than UV exposure in other parts of the world, and that tests as described above need to be treated with caution regarding their relevance to the use of the product under the New Zealand conditions.
- 5.12 With regard to the water resistance of the product (referred to in paragraph 3.3), it is my view that there is some doubt over the product’s ability to retain its durability over a period of exposure to water. I consider the use of the product in direct contact with water should be avoided which would normally be the case with deck planking used in these applications.
- 5.13 Following correspondence with the consultants it is apparent that the results of tests for products similar to the one in question are mixed and inconclusive. I have therefore formed the view that a more formal opinion on durability from a properly qualified source is necessary before I can be satisfied on reasonable grounds that the product used for the decking will meet the performance requirements for Clause B2 Durability.

⁴ Chapter 8 Accelerated Ultraviolet Weathering of Recycled High Density Polyethylene-Sawdust Composites

⁵ Engineered Wood Composites for Naval Waterfront Facilities polished by the Office of Naval Research, Waterfront Materials Division California published June 2001

6. Conclusion

- 6.1 In relation to Clause B1 Structure of the Building Code, I am of the opinion that the wood/plastic composite decking is generally comparable in strength to wood and that it meets the requirements of Clause B1 of the Code.
- 6.2 In relation to Clause B2 Durability of the Building Code, I am of the opinion that the information included in the consent application was not sufficient for the authority to be satisfied on reasonable grounds that the building work would comply. Neither the manufacturer nor the supplier has been able to supply the Department with sufficient information about the product's durability under ultraviolet weathering, or with evidence of product in-service performance relevant to the New Zealand environment for me to form a view that the decking would comply with Clause B2.
- 6.3 On 2nd February 2010, I received a letter from the agent outlining a proposed test methodology for assessing the product's durability (with respect to degradation from exposure to UV which includes a 7000 hour exposure). Following the letter there was an exchange of e-mails between the agent and a Department Staff member. Subject to clarification that the test standard quoted in the letter (ASTM G155 (2005)) is an appropriate method for the particular material, it would appear that the successful conclusion of these tests would provide sufficient grounds for the authority to form a view as to compliance with B2.
- 6.4 It is emphasised that each determination is conducted on a case-by-case basis. Accordingly, the fact that it has not been established that the decking would be code-compliant in this instance, does not of itself mean that the same system will or will not be code-compliant in other situations.

7. The decision

- 7.1 In accordance with section 188 of the Building Act 2004, I hereby confirm the authority's decision to refuse to amend the building consent.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 22 March 2010.

John Gardiner
Manager Determinations

Appendix A The legislation

A1 The relevant Clause of the Building Code is:

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) the life of the building, being not less than 50 years, if:
 - (i) those *building elements* (including floors, walls, and fixings) provide structural stability to the *building*, or
 - (ii) those building elements are difficult to access or replace, or
 - (iii) failure of those building elements to comply with the building code would go undetected during both normal use and maintenance of the building.
- (b) 15 years if:
 - (i) 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
 - (ii) 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) 5 years if:
 - (i) the *building elements* (including services, linings, renewable protective coatings, and *fixtures*) are easy to access and replace, and
 - (ii) failure of those *building elements* to comply with the *building code* would be easily detected during normal use of the *building*.

A2 The relevant table from B2/AS1 is:

Table 1:		Durability Requirements of Nominated Building Elements (cont'd)				
Building Element	Component	Situation/Function	Not less than 50 years	Not less than 15 years	Not less than 5 years	
Decking (timber)	Decking	Structural (e.g. bracing diaphragm)	✓			
		Non-structural strip decking		✓		
	Sub-floor structure	All	✓			