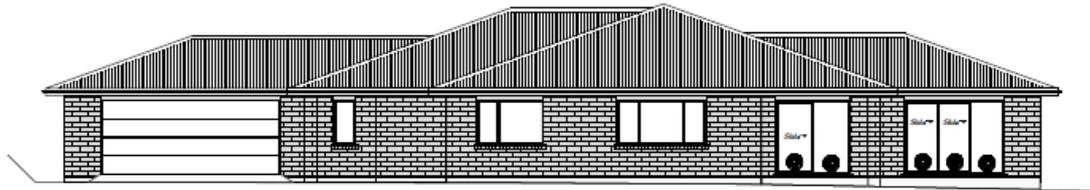




Determination 2019/039

Regarding the exposure zone for building work located near a tidal estuary at 45 John Burke Drive, Aotea, Porirua



Summary

This determination considers what is the appropriate exposure zone for a house located near a tidal estuary and the protection that is required to the brick ties used to secure the brick cladding. The authority considered that the house was located in exposure Zone D which required stainless steel ties to be used.

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, Katie Gordon, Manager Determinations, Ministry of Business, Innovation and Employment (“the Ministry”), for and on behalf of the Chief Executive of the Ministry.

1.2 The parties to the determination are:

- A Brew, the licensed building practitioner² (“LBP”) concerned with the relevant building work, who is also acting on behalf of the building franchise (“the applicant”)
- A & L Wills, the building owners
- Porirua City Council (“the authority”), carrying out its duties as a building consent authority.

1.3 This determination arises from conflicting classifications of the property’s exposure zone as C or D as defined in NZS 3604³. The applicant is of the view that the property falls within category C: Medium (“Zone C”) whereas the authority believes the property is in category D: High (“Zone D”).

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

² LBP Registration No BP120479: Carpentry and Site 1

³ Unless otherwise stated, references to exposure zones in this determination are as defined in New Zealand Standard NZS 3604:2011 Timber-framed buildings.

- 1.4 Therefore the matter to be determined⁴ is whether the proposed building work with brick ties manufactured for exposure Zone C will satisfy the minimum 50-year durability period required by the Building Code Clause B2.3.1(a) of Clause B2 Durability.⁵
- 1.5 In making my decision, I have considered the submissions of the parties, the report of the independent expert commissioned by the Ministry to advise on this dispute (“the expert”) and the other evidence in this matter.
- 1.6 The relevant clauses of the Building Code and the Acceptable Solution referred to in this determination are set out in Appendix A.

2. The building work and background

- 2.1 The building work considered in this determination is a new single storey house situated in Aotea Sub Division, Porirua. The site is approximately 375m away from the closest point of the Porirua tidal estuary. The site is in a very high wind zone with the prevailing wind running south-west to north-east. The nearest surf beach is Titahi Bay, which is about 2.7km north-west of the site. Figure 1 (taken from the expert’s report) shows the building site, the tidal estuary (Porirua Harbour) and the surf beach (Titahi Bay).

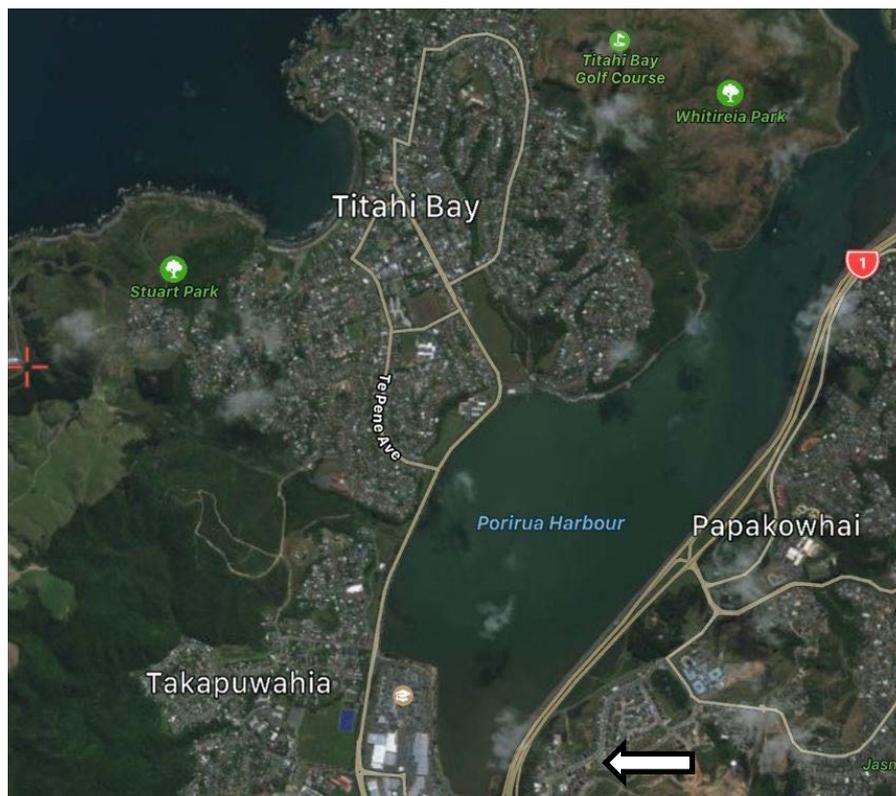


Figure 1: Aerial photograph⁶ showing the building site (arrow)

⁴ Under sections 177(1)(a) of the current Act

⁵ In this determination references to sections are to sections of the Act, and references to clauses are to clauses of the Building Code (Schedule 1, Building Regulations 1992)

⁶ Refer to https://satellites.pro/Porirua_map#-41.129264,174.849182,17.

- 2.2 The new 249m² four-bedroom house is timber-framed, brick veneer clad, with long run corrugated steel roofing. The authority issued a building consent for the property on 4 January 2019. The approved building consent plans (Drawing No. A501) specified the brick ties as being:
- Fix brickwork with medium duty screw ties... Durability requirement of 470g/m² galvanised coating or 316 stainless steel to all brick ties
- 2.3 A detail on Drawing No. A603 also specified the brick ties as:
- Hot-dipped galv. brick ties screw-fixed...
- 2.4 The applicant was concerned about the brick ties passing inspection as a bricklayer had informed him that galvanized brick ties at a nearby property were removed and replaced with stainless steel ties following an authority inspection.
- 2.5 The site is described as “Corrosion Zone: Zone D” in the BRANZ maps⁷.
- 2.6 On 11 February 2019 the applicant contacted the authority informing it that the building was soon to be clad. The authority responded on the same day identifying the site as Zone D explaining, “generally the requirement for brick ties in a corrosion zone is stainless steel...”
- 2.7 The applicant responded to the authority on 11 February 2019 explaining that it believed the property should be considered Zone C because the section is approximately 375m away from the Porirua sheltered inlet. The applicant referred to section 4.2.3.3 of NZS 3604 which states that if the property was within 100m of tidal estuaries or sheltered inlets then it would be in Zone D, but in this instance it was outside the 100m zone.
- 2.8 In several emails to the applicant, all dated 12 February 2019, the authority confirmed its view that the property was in Zone D, stating “the sea spray zone, including all offshore islands and the area within 500m of the coastline, is defined as Zone D in NZS 3604:2011”. The authority also referred to the BRANZ maps for the site (refer paragraph 2.5). The authority said that “all other buildings in this area have been designed and constructed based on these requirements”.
- 2.9 The building franchise manager contacted the Ministry on 12 February 2019 seeking advice about the matter in dispute; the Ministry provided general advice including past determinations related to coastal exposure zones. On the same day, the managing director of the building franchise contacted the authority asking for a response on whether they could proceed with the building work based on the information that the Ministry had provided.
- 2.10 On 15 February 2019 the authority responded to the franchise manager advising that for it to approve the use of the galvanized ties over stainless steel it would need supporting documentation from a suitably qualified person in order to establish compliance.
- 2.11 The Ministry received an application for a determination on 4 March 2019.

⁷ BRANZ Maps are an online mapping tool showing the earthquake and corrosion zones for a given address in New Zealand, <https://www.arcgis.com/apps/webappviewer/index.html?id=1bade5ce36a9459aa0de4bd5cecd6e36>.

3. The submissions and the draft determination

3.1 The applicant included a submission in support of the application for determination that stated (in summary):

- The authority has taken a generic approach to establish exposure zones and they seem to be disregarding site-specific factors. The applicants stated, “We believe that if the authority looked at our section and went through a standalone site assessment ... they would agree that Exposure Zone C is sufficient”.
- The section is over 50m above sea level with thick vegetation along the base of the hill where the highway separates this sub division from the ocean, which means the risk of wind-blown sea spray is heavily reduced. The sheltered inlet has no breaking waves so the risk of sea spray is minimal. The applicant submitted that while the BRANZ maps are a useful tool they are to be used as a guide only and each site should be assessed individually.
- The managing director of the building franchise, in correspondence with the LBP to the authority, said that “If [NZS] 3604 – [paragraph] 4.2.3.3 is followed this area is in Exposure Zone C, BRANZ maps are used as a guide only” confirming his opinion that the appropriate exposure zone was Zone C. The managing director also stated “The consent plans documentation approved specified the relevant exposure zone as zone C.”

3.2 The applicant provided:

- email correspondence between the parties
- building consent plans of the proposed dwelling
- photographs of the site
- documentation from the NIWA⁸ website explaining ‘Estuary types’
- the BRANZ map tool (“the BRANZ Maps”) from the BRANZ website
- a report prepared for the Ministry by the Managing Director of the building franchise.

3.3 The authority made a submission in response to the application for determination that stated (in summary):

- NZS 3604 clearly indicates that Zone D includes the area within 500m of the coastline as reflected in the maps. All other buildings in this area have been designed and constructed based on this requirement.

- The authority stated:

We have a harbour that is subject to wind speeds that can vary from Very High to Specific Design, it would be hard to consider in this instance the area sheltered or the wind zone modified by topography, this clearly supports the site being in Zone D less than 500m from the harbour and exposed to salt in the air.

3.4 With its submission the authority provided copies of email correspondence between the parties.

⁸ National Institute of Water and Atmospheric Research

3.5 The draft determination and responses received

3.5.1 A draft determination was issued to the parties for comment on 18 June 2019. The authority accepted the draft without comment on 3 July 2019. The applicant accepted the draft without further comment on 5 July 2019, and the owners accepted the draft without comment on 15 July 2019.

4. The expert's report

- 4.1 As mentioned in paragraph 1.5, I engaged an independent expert to assist me. The expert is a Chartered Professional Engineer with specialist expertise in corrosion and is a member of several national and international organisations for corrosion engineering. The engineer reviewed the documentation provided with the application and carried out a site visit on 20 April 2019. The expert's report was received on 16 May 2019, and was issued to the parties on 21 May 2019.
- 4.2 The expert provided a table⁹ identifying the different categories of site corrosivity and their characteristics as below.

| ISO 9223 ¹⁰ | AS/NZS 2312:2002 ¹¹ | NZS 3604: 2011 | | SNZ TS 3404:2018 | |
|------------------------|--------------------------------|----------------|--|------------------|---|
| C5-M | E-M: Very High | Zone D(E) | Surf beaches | C5-M | Within 100m of breaking surf on the west and south coasts of the North Island. |
| C4 | D: High | Zone D | < 500m of sea or harbours | C4 | Within 500m inland from breaking surf. Within 50m of calm salt water such as harbour foreshores. May be extended inland by prevailing winds and local conditions. |
| | | Zone D | <100m of tidal estuaries | | |
| C3 | C: Medium | Zone C | Inland coastal areas | C3 | Within 5km from salt water including harbours. |
| C2 | B: Low | Zone B | Inland areas with little risk of sea spray salt deposits | C2 | More than 5km to 50km from salt water including harbours. |

4.3 The expert considered the local topography, weather and site corrosivity. In respect of the site the expert noted the following:

- The closest distance between the high-water mark of the tidal estuary that forms the southern arm of Porirua Harbour and the site is approximately 375m from the north-west (and approximately 475m from the west). It is also about 3.5km south-east from the rocky coastline impacted by the Pacific Ocean just west of Titahi Bay as shown in Figure 1. The site location is elevated and is approximately 45m above sea level and has previously been categorised as NZS 3604 Zone C.

⁹ (Note that the table has been updated from that provided with the expert's report; the NZS 3404.1 extract has been replaced with the equivalent extract from SNZ TS 3404, Table 2 as SNZ TS 3404 was referenced in Acceptable Solution B2/AS1 at the time the consent was issued, refer paragraph 5.1.5)

¹⁰ International Standards Organisation ISO 9223:2012, Corrosion of metals and alloys – Corrosivity of atmospheres – Classification

¹¹ Joint Australia and New Zealand Standard AS/NZS 2312:2002, Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings. I note while this version has been cited in NZS 3604 and NZS 3404, the Standard has been superseded by Joint Australia and New Zealand Standard AS/NZS 2312.1:2014 – Part 1: Paint Coatings, and AS/NZS 2312.2:2014 – Part 2: Hot dip galvanizing. AS/NZS 2312 has adopted the equivalent ISO terminology (Categories C1 to C5)

- The prevailing local winds were interpolated from the weather records for Wellington and Paraparaumu Airports. The records show that north-westerlies are less dominant than the more frequent north-easterlies and southerlies.¹² The site is sheltered from south-westerly winds blowing off the Tasman Sea by the hills adjacent to Colonial Knob and is partially sheltered from north-easterlies by a small pine plant plantation below the site.
- The site is nearby and above a relatively sheltered harbour; it is at a sufficient distance from the source of large breaking waves (i.e. ocean and coastal surf beach) where most of the corrosive marine aerosols are generated.
- Atmospheric corrosivity categories (ACC) are classified in accordance with a scale in ISO 9223. These are based on the weight of metal lost per unit area due to corrosion in the first year when exposed to weather. ISO 9223 category C4 (equivalent to AS/NZS 2312:2002 D: High and exposure Zone D of NZS 3604) is defined by ISO 9223 as having a first year corrosion for mild steel of more than 50 microns/year.
- The expert provided that the site falls within ISO 9223 C3 or exposure Zone C as defined in NZS 3604. The first-year corrosion rate of carbon steel in C3 is between 25 and 50 microns/year or 200 to 400g/m²/year. BRANZ atmospheric tests¹³ and AS/NZS 2312 Parts 1 and 2 support this ACC classification. AS/NZS 2312 states that “Around sheltered seas category C3 extends beyond 50m from the shoreline to a distance of about 1km inland. Much of the metropolitan areas of ... Wellington are in this category.”
- The authority considered the site corrosivity at the site to be Zone D as defined in NZS 3604 because of its interpretation of BRANZ maps since the site is within 500m of a ‘coastline’. This has been taken as the edge of the Porirua Harbour but, given the BRANZ published corrosivity data for their test sites in the region¹², and allowing for the direction of prevailing winds and the distance from any significant wave action, this is an overly conservative classification.
- Based on the available data discussed above and in the absence of site-specific testing, it is the expert’s opinion that since the site is much more than 50m from the edge of a sheltered shoreline, the site’s atmospheric corrosivity category is well within ISO 9223 Category C3 (equivalent to C: Medium) and is defined as such in AS/NZS 2312 and SNZ TS 3404.
- In addition, based on the broad and approximate categories in the New Zealand Standards, the site should be zoned as exposure Zone C as described in NZS 3604 (or Zone 1 as described by NZS 3404.1:2009), since it is more than 100m from the edge of a sheltered harbour and considerably more than 500m downwind from breaking surf on the Pacific Ocean coastline.

4.4 The expert concluded that based on the local atmospheric corrosivity testing and current New Zealand and Australian standard descriptions of corrosivity categories the site would correctly classified as ISO category C3, which is equivalent to NZS 3604 exposure Zone C: Medium.

¹² PR Chappell, 2014. The climate and weather of the Wellington (2nd.ed.) NIWA Science and Technology Series No.65.

¹³ BRANZ Study Report SR288, Update of New Zealand’s Corrosivity map, 2013

5. Discussion

5.1 The durability required by Clause B2

- 5.1.1 The objective of Clause B2 Durability of the Building Code is that a building continues to satisfy all the objectives of the Building Code throughout its effective life. That includes the requirement under Clause B2.3.1 for the building elements to meet the performance requirements of the Building Code for the minimum periods of 5 to 50 years from the date the code compliance certificate is issued.
- 5.1.2 The minimum durability requirement for brick ties as a building element falls under performance provision B2.3.1(a) of the Building Code which provides:
- (a) the life of the building, being not less than 50 years, if
 - (i) ...
 - (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
- 5.1.3 Table 1 of B2/AS1 lists the durability of brick ties as being not less than 50 years (refer Appendix A.2). In addition, the commentary to Table 1 says:
- Note: Clause B2.3.2 requires that all hidden elements have at least the same durability as that of the element that covers it (i.e. must have the same expected life) which may be more than the requirement in clause B2.3.1. For example, the reason that a brick tie has a requirement of not less than 50 years in this table, instead of the 15 year requirement for cladding, is that the brick veneer that hides it has an expected durability of 50 years or more.
- 5.1.4 I note the drawings for the work described in the approved building consent specify that both galvanized steel and stainless steel brick ties may be used (refer paragraphs 2.2 and 2.3) and the building consent was granted and issued on that basis.
- 5.1.5 Compliance with Clause B2 can be demonstrated by meeting the requirements of SNZ TS 3404 or NZS 3604. I note SNZ TS 3404 was referenced in Acceptable Solution B2/AS1, effective from 20 November 2018, so was referenced in B2/AS1 at the time the building consent was granted in January 2019. I note the specification that formed part of the approved building consent references B2/AS1, but it does not reference either SNZ TS 3404 or NZS 3404.
- 5.1.6 Paragraph 3.6.1 of B2/AS1 says:
- SNZ TS 3404 is an Acceptable Solution for meeting the durability requirements of steel building elements within its scope.
- 5.1.7 SNZ TS 3404 sets out the technical requirements that are necessary to provide the required level of durability to steel structures and their component parts. This can include brick ties located in a “damp internal” environment; the microclimate category would be C3 for buildings located in both C3 and C4 macro environments.¹⁴

¹⁴ Joint Australia New Zealand Standard AS/NZS 2312.2:2014 – Part 2: Hot dip galvanizing at clause 5.2 provides that when selecting a hot dip galvanised coating system to take into account of multiple factors including “...the general environment (macro-climate) and the effects of any local variations in the environment (microclimate).”

5.2 The appropriate exposure zone

- 5.2.1 Exposure Zone D sites are defined in paragraph 4.2.3.3 of NZS 3604 as ‘Coastal areas with high risk of windblown sea-spray salt deposits’. This is defined as ‘within 500m of the sea including harbours, or 100m from tidal estuaries and sheltered inlets...’
- 5.2.2 The BRANZ maps classify all land within 500m of the coastline as exposure Zone D, and have not taken into consideration the location of tidal estuaries or sheltered inlets. Guidance¹⁵ provided with the BRANZ maps states the maps have “not attempted to define what precisely is or isn’t a tidal estuary or sheltered inlet” and as a result the maps are ‘technically conservative in those areas.’”
- 5.2.3 However, where there is a tidal estuary (or sheltered inlet) present, NZS 3604 states that Zone D is classified as the area within 100m from the tidal estuary. The expert’s report considers that the body of water adjacent the site is a tidal estuary and that the site is located over 100m from the sheltered estuary shoreline (375m according to the applicant). The expert states that the site is located considerably more than 500m downwind from breaking surf (some 2.7km away), which is the main source of corrosive marine aerosols. Therefore, the site should be classified as exposure zone C, as it is located over 100m away from a tidal estuary and has a low risk of windblown sea-spray deposits from the nearest surf beach.
- 5.2.4 I am of the view that the authority should have used the definitions in NZS 3604 in conjunction with the BRANZ maps, especially when tidal estuaries are specifically excluded from BRANZ maps classification of exposure zones as noted in paragraph 5.2.2. I note the BRANZ maps are not referenced in Clause B2 Durability.
- 5.2.5 I consider the BRANZ maps a useful tool for the authority to use in establishing exposure zones but I consider it was incorrect to maintain its position on what was the appropriate zone without consideration of the specifics of the site with regards to NZS 3604 and SNZ TS 3404.
- 5.2.6 The authority’s assessment in determining the zone as Zone D is based on a conservative interpretation of NZS 3604. However, clauses 4.2.2 and 4.2.4 of NZS 3604 require that after determination of an exposure zone that “evidence of local environmental effects ... shall be considered.” and “then in all cases apply any microclimate considerations”.
- 5.2.7 In summary, I accept the expert’s conclusions that the site is located in Zone C, and the authority was incorrect to classify the site as Zone D. This position is consistent with the decisions made in past determinations that have considered the effect of sheltered bodies of salt water on exposure zones; namely Determinations 2016/005¹⁶ and 2017/012¹⁷.

¹⁵ Map viewer zone available on the BRANZ website at www.branz.co.nz/map-viewer-zone-information

¹⁶ Determination 2016/005 The durability of a substitute metal roofing material on a house located close to a tidal estuary (15 February 2016)

¹⁷ Determination 2017/012 Regarding the corrosion zone of a proposed housing development (6 March 2017)

6. The decision

- 6.1 In accordance with section 188 of the Building Act 2004, I hereby determine that the appropriate exposure zone for this site is Zone C as defined in NZS 3604, and that brick ties manufactured to meet this exposure zone will satisfy the minimum 50-year durability period required by the Building Code Clause B2.3.1(a).

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 19 August 2019.

Katie Gordon
Manager Determinations

Appendix A: The relevant legislation

A.1 The relevant provisions of the Building Code referred to in the determination include:

B2 Durability

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.

A.2 Excerpt from Table 1 of the Acceptable Solution for Clause B2 Durability, B2/AS1, says:

| 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 |
| Fixings (Continued) | Bolts | Used to fix non-structural or moderately difficult to replace <i>building elements</i> | | ✓ |
| | Brick ties and fixings | All | ✓ | |