



Determination 2018/019

The code-compliance of the base of a wall to a large shed containing a dwelling at 122E Forestry Road, Waitoki, Auckland

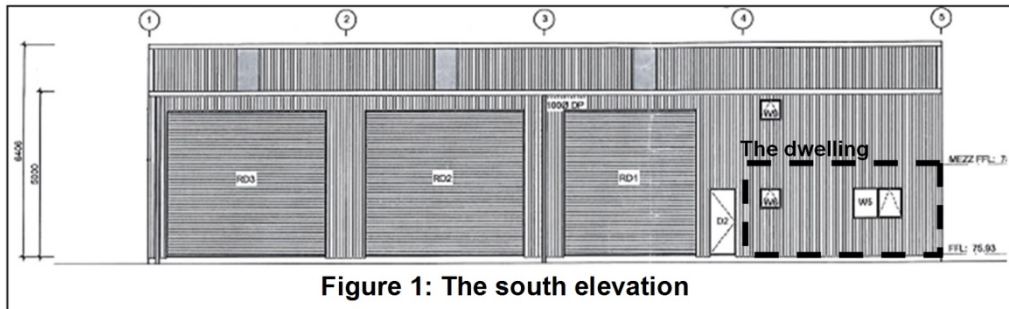


Figure 1: The south elevation

Summary

This determination considers the compliance of a base flashing detail installed to a portion of a shed containing a dwelling to resolve moisture ingress. The determination discusses the extent of the remedial work required in relation to the uses of the shed and their relative Building Code obligations.

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:

- the owner, the Maloney Family Trust (“the applicant”) acting through a consultant (“the consultant”) who is also a licenced building practitioner
- K Body, the designer/builder and licenced building practitioner² for the work concerned (“the contractor”)
- Auckland Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.

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. BP125428, “Site 2”.

- 1.3 The application for this determination is the result of a decision of the authority to grant a consent amendment for remedial work arising from the following:
- When the building (also referred to herein as “the shed”) was substantially completed it was discovered that water had entered at the bottom of the external walls.
 - A minor amendment to the building consent was approved to retro-fit an additional flashing to the bottom of external lined walls (“the remedial work”) and the work was subsequently carried out. The extent of the remedial work was limited to external walls surrounding and extending 1 metre past the part of the shed containing the dwelling.
 - The applicant was concerned about the weathertightness of the remedial work and also with the limits of its installation to only the part of the shed containing the dwelling.
 - The applicant is not satisfied that the proposal will ensure the remainder of the shed will comply with Clause³ E2 External moisture of the Building Code⁴.
- 1.4 The matter to be determined⁵ is therefore whether the remedial work as detailed and installed has resulted in the substantially completed shed complying with Clause E2 External moisture.
- 1.5 By “the remedial work” I mean the components of the remedial base detail (such as the existing slab, the steel framing, the cladding, the flashings, the insulation, and the lining) as well as the way components are designed and work together. I have also considered the extent of that work in relation to compliance of the shed.

1.6 Matters outside this determination

- 1.6.1 This determination considers only the compliance of the remedial work as described above and does not consider compliance with other clauses of the Building Code or other elements of the building work.
- 1.6.2 The applicant has raised matters of a contractual nature between the applicant and the contractor. These are matters outside that which I can determine under section 177 of the Act.

2. The building work and background

2.1 The building and the building consent

- 2.1.1 On 14 November 2016, the contractor applied for a building consent for ‘construction of a shed and minor household unit’ on behalf of the applicant. I have not seen a copy of the building consent for the shed (No. BCO10089928), but the consent documents are stamped as approved on 3 February 2017.
- 2.1.2 The building is a 24m long x 10.5m wide detached building on a large, level rural site in a very high wind zone⁶ for the purposes of NZS 3604⁷. The building has the form of a simple corrugated steel shed with a gable roof that is 5m high at the eaves and 6.4m at the ridge line.

³ In this determination, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code.

⁴ First Schedule, Building Regulations 1992

⁵ Under section 177(1)(a) of the Act

⁶ According to the structural engineer’s Producer Statement - Design

⁷ New Zealand Standard NZS 3604:2011 Timber Framed Buildings

2.1.3 As shown in Figure 2 and Figure 3, the shed accommodates:

- a 189m² store at the western end from Grid 1 to 4, with three 4.4m high industrial roller doors in the south wall (“the store”)
- a 63m² one-bedroom flat at the east lower level from Grid 4 to 5 (“the dwelling”)
- enclosed storage and a second bathroom on a mezzanine level above (“the mezzanine store”).

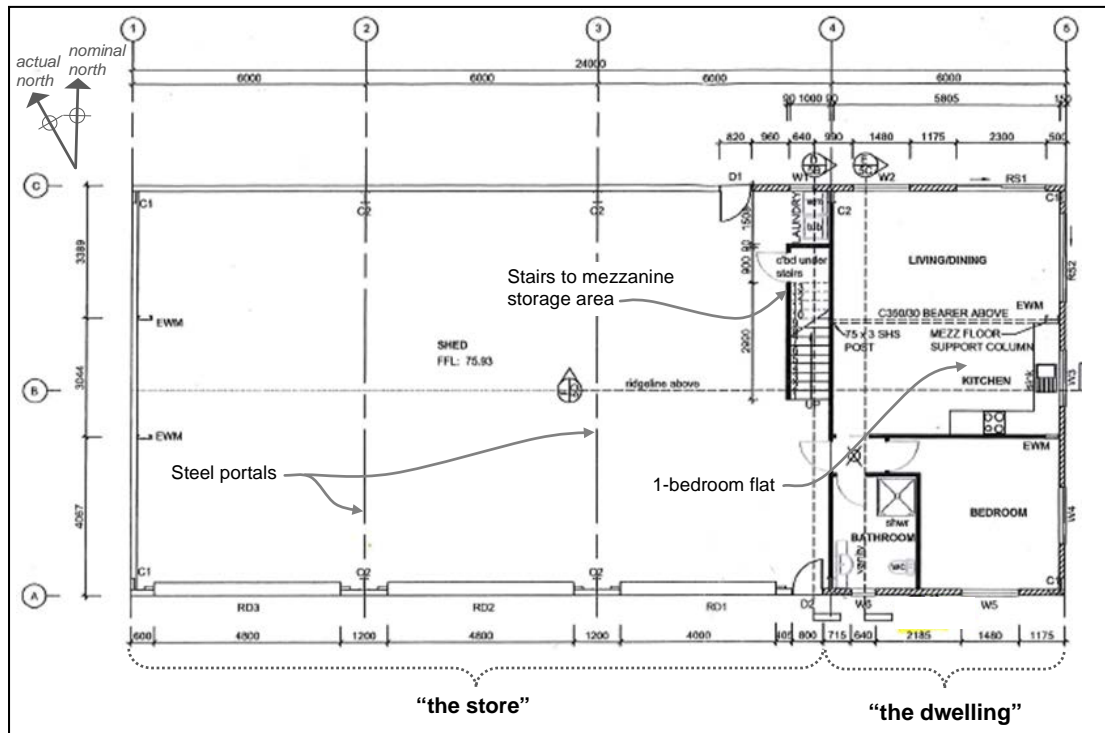
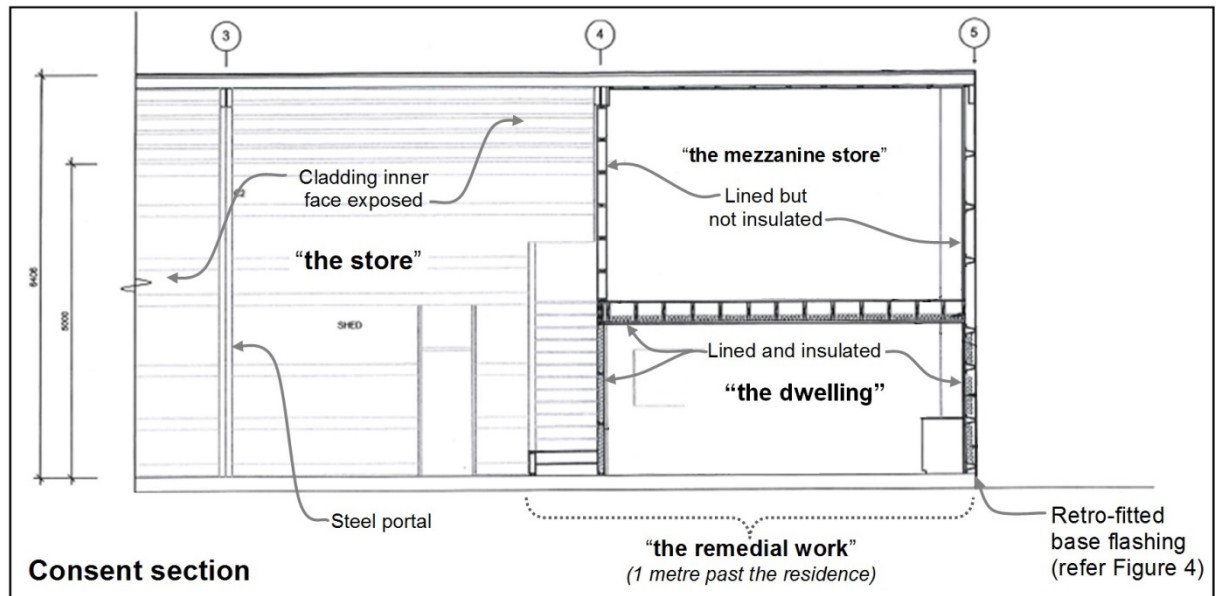


Figure 2: Floor plan of the shed as consented (not to scale)

- 2.1.4 The structure has specifically engineered steel portal frames, with a perimeter steel channel at the eaves, and horizontal steel girts to the external walls and steel purlins to the roof. The shed has a concrete slab and foundations, corrugated steel wall and roof cladding, aluminium windows, and steel roller doors. A proprietary polystyrene thermal break is located under the roof and wall cladding throughout the building.
- 2.1.5 All internal walls are timber-framed, and timber strapping is fixed to the external walls to the dwelling and mezzanine store to receive internal linings. All walls to the dwelling are lined and insulated, including the ceiling; the mezzanine store is lined but not insulated (refer Figure 3). Short sections of wall in the store between the dwelling and the two adjacent personnel doors on the North and South elevations are lined. The remainder of the building is unlined.

Figure 3: East/west section of the eastern end of the shed (not to scale)

2.1.6 The base of the corrugated steel cladding, as consented and constructed, is terminated at a horizontal closure flashing.

2.2 The weathertightness issue

2.2.1 When work covered by the consent documentation was substantially completed, a storm event resulted in water penetrating the base of the external walls via gaps between the concrete slab and bottom of the metal cladding. The applicant subsequently engaged the consultant to resolve completion of outstanding work (including the base detail) and the consultant prepared a list of defects, which was apparently discussed with the contractor at a site meeting on 10 August 2017.

2.2.2 In an email to the authority dated 1 September 2017, the consultant referred to the 'issue with water egress (*sic*) to the base cladding detail' and noted (in summary):

- the existing detail is not consistent with E2/AS1 Figure 93 or the cladding manufacturer's detail
- the shed is intended as a habitable space 'with a domestic lined storage area for furniture etc from the owner's farm house upon sale'
- Clause E2 requires buildings provide adequate resistance to moisture penetration and requires that a lack of weathertightness should not significantly impair a building's amenity, which should cover the whole shed
- because domestic goods are to be stored, 'the contractor should ensure the shed's amenity is maintained by ensuring no water can get in'.

2.2.3 The authority responded on 15 September 2017, referring to wall section X-X on drawing 19, noting this consent drawing:

...clearly shows what is required on the base cladding to the entire perimeter of the building.

This should be constructed as per Fig 93 of [E2/AS1]. If the capillary gap is more than 6mm and still letting water enter under extreme weather events a solution will be required.

2.2.4 The contractor responded on 20 September 2017, attaching two remedial options and asking for confirmation and clarification from the authority that:

1. You are happy with the consented detail [X-X on drawing] 19 (which is as we have constructed, as per passed inspections).
2. You refer to Figure 93 of [Acceptable Solution E2/AS1], in regards to its "Non Perforated Closure Flashing" (which is as we have constructed, as per passed inspections).
3. With the one-off weather event that let moisture in via the 6mm capillary gap, you (and I) seek a solution to satisfy E2. I propose one of the attached two options.

Can you please...

- Confirm the above three points, or advise otherwise.
- Confirm which of my attached two options are suitable, or advise otherwise.
- Advise whether you require any Variation (or Amendment) to the Consented Details, in order to update and satisfy all parties.

2.2.5 On 20 September 2017, the consultant responded to the above, including the following comments (in summary):

- Detail X-X in drawing 19 was incorrectly approved because 'whoever granted the consent did not recognise the requirements for a dwelling'.
- The contractor 'falsely thinks she has complied by building to an incorrect detail', but has an obligation to provide a weathertight dwelling.

2.2.6 On 20 October 2017 the authority set out its stance on the situation, including the following comments on the base detail (in summary):

- 'the entire building design is an alternative solution', so the base cladding detail is also an alternative solution that was accepted as meeting the 'Functional requirement'.
- Water did penetrate under the cladding so 'this will need to be looked at in the habitable section of the building'.
- A 'practical demarcation' would be '1 [metre] past the internal walls that make up the habitable portion'.
- The suggested solution would be 'to incorporate a flashing at the bottom to prevent any likelihood of water getting into the building but still keep the required 6mm capillary gap'.

2.2.7 On 26 October, the applicant's legal advisor responded to the contractor noting that (in summary):

- The contractor's 'remit was to construct a structure that could be used for a habitable dwelling'.
- The flashing suggested by the authority, or a similar alternative, must be installed to the bottom of the exterior walls 'as per the requirements of E2 - 9.6 (*sic*) of the Building Code'.

2.3 The remedial detail

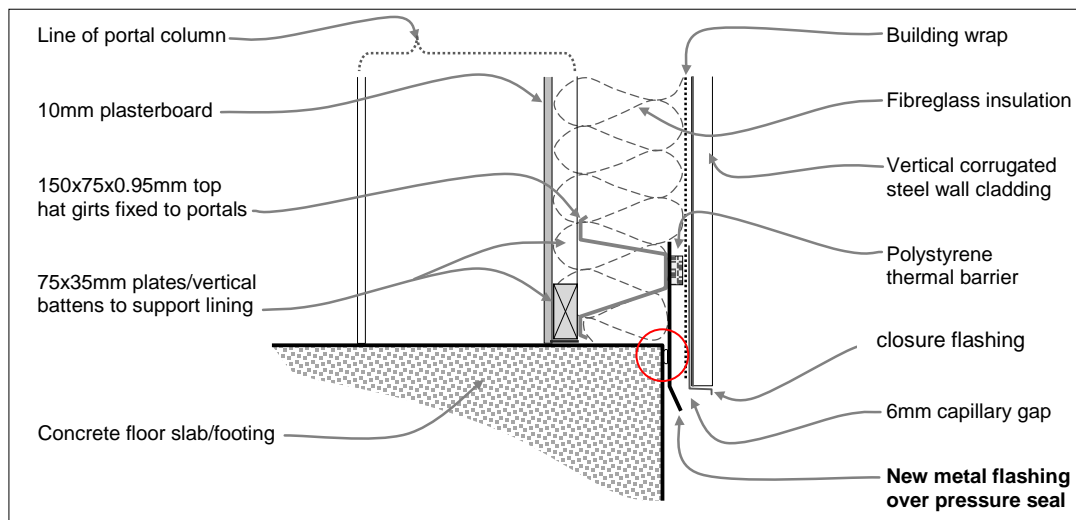
2.3.1 In late October 2017, the contractor submitted an 'on-site application for minor variations to approved plans'. This included the base flashing detail shown in Figure 4, which was stamped as approved on 6 November 2017. The authority noted that it would inspect the remedial work when completed. The contractor completed the remedial work by early December 2017, but no inspection was completed.

- 2.3.2 The hand-drawn detail of the additional flashing on drawing 19/9 (shown in Figure 4 as “new metal flashing over pressure seal”) is stamped as approved by the authority on 6 November 2017 and has the title (emphasis added):

“Expanded detail” of additional base flashing to habitable^[8] area only (plus 1 [metre] past internal dividing wall)

- 2.3.3 The new metal flashing (“the base flashing”) was designed to provide a 6mm capillary gap between the base flashing and the existing closure flashing.

Figure 4: The approved remedial base flashing detail (not to scale)



- 2.3.4 The pressure seal is a 3mm thick closed-cell PVC foam with pressure sensitive adhesive on one side. The seal is fixed with the adhesive to the additional flashing and the location of the flashing holds the seal against the concrete slab. According to the manufacturer, the foam is sold for use in automotive, marine, industrial, and construction applications.
- 2.3.5 In addition to the above, the remedial work included provision of a sill flashing to the two personnel doors with a spring-loaded proprietary weather seal to the base of the doors which closes against the sill flashing.

3. The submissions

3.1 The application and initial submissions

- 3.1.1 The applicant remained concerned about the limited nature of the remedial work and the Ministry received an application for a determination from the consultant on 15 December 2017 which was accepted on 22 December 2017. The Ministry sought copies of the building consent documentation for the shed, which the applicant supplied on 8 February 2018.

⁸ In various correspondence and documentation the parties to this determination refer to the “habitable space”, “habitable area”, and “habitable zone”. The term “habitable space” has a specific meaning for the purpose of the Building Code and is defined in Clause A2 (refer appendix A.2). Unless context otherwise requires, I have taken the parties references to mean “the dwelling” for the purpose of this determination.

- 3.1.2 The consultant described the background to the dispute and made the following comments (in summary):
- The consent was to construct a ‘Combined Accommodation and Storage Building’.
 - The applicant intended to complete the interior once the building was closed in and ‘signed off’ by the authority.
 - The applicant discovered water had entered onto the slab via a 6mm gap between the base of the cladding and the slab.
 - The consultant was engaged to deal with the contractor and prepared a list of defects, which included ‘issues with the weathertightness of the building’.
 - The remedial detail approved by the authority conflicts with details in E2/AS1 and also with the cladding manufacturer’s detail.
 - The authority has also approved limiting the extent of the remedial work, despite the Clause E2 requirement for the entire building to provide ‘adequate resistance’ to moisture penetration which ‘could cause undue dampness, damage to building elements or both.’
- 3.1.3 The consultant therefore requested a determination on the following:
1. Does the amended detail in the minor [amendment] meet the requirements of E2.2 and E2.3.2.
 2. Should the full exterior envelope of a building submitted under the Restricted Building Works be fully weather tight. As we believe there is no limit in the [Act] and Auckland Council has wrongly applied an arbitrary limit to the weather tightness of a Habitable dwelling.
- 3.1.4 Within and following the application, the consultant provided copies of the original consent documentation for the shed, the remedial detail and various other details.
- 3.1.5 On 23 January 2018 the authority forwarded copies of email correspondence between the parties, and advised its position remained as stated in its email dated 20 October 2017 (refer paragraph 2.2.6).
- 3.1.6 In response to a request from the Ministry, the consultant confirmed that the building was to be used for storage of household items, some business records and collections, and a few collectable vehicles.

3.2 The draft determination and submissions received

- 3.2.1 A draft determination was issued to the parties for comment on 20 March 2018. The authority accepted the draft without comment on 4 April 2018.
- 3.2.2 The contractor accepted the draft on 20 March 2018 noting typographical errors and stating the water penetration only occurred during a storm event and not at other times.
- 3.2.3 The consultant responded to the draft determination on 6 April 2018. The consultant did not accept the draft, noting the following:
- The methodology used to determine the arbitrary 1 metre “demarcation” between the dwelling and the remaining spaces in the building was questioned.
 - The sill to the personnel door is within 1 metre of the dwelling. “Why has it been determined that the personal (*sic*) door doesn’t require meeting the same standards as the other door [in] the habitable zone?”

- What methodology was to be applied when assessing the installation of the remedial detail?

3.2.4 I have taken the parties' comments into account and amended the determination as appropriate.

4. Discussion

4.1 General

4.1.1 The shed is a specifically-designed steel portal structure; it is therefore outside the scope of the Acceptable Solution for Clause E2, E2/AS1, which is limited to "materials, products and processes contained herein, for buildings within the scope of NZS 3604".

4.1.2 The shed is substantially complete in terms of the building work covered by its original building consent, and the remedial work has altered the floor-to-wall junction to the eastern end along with the addition of the weather seal and sill flashing to the two adjacent personnel doors.

4.1.3 As noted in paragraph 1.6.1, the remedial work must be assessed in the context of the documents approved under the building consent, which include construction as shown in Figures 1 to 4 and described herein. In regard to the shed as consented, I note the following:

- The building consent application is for 'a shed and minor household unit' and the drawings label the large storage area as 'shed'. (I discuss the use of the spaces and the relationship between those uses and the Building Code requirements in paragraph 4.3.)
- Sections through the shed in the consent documents show the inner face of the cladding exposed within the store area, with linings limited to the dwelling and mezzanine, however, small sections of the store between the personnel doors and the dwelling are also lined. Insulation is limited to walls and ceiling of the dwelling only.
- There is no indication in the consent documents that any other walls are to be lined.
- The store includes three 4.4m high industrial roller doors that provide openings of approximately 60m² within the 90m² south wall (some two-thirds of the wall area) and provide access for very large vehicles, machinery, and similar.

4.2 The remedial detail

4.2.1 The consultant contends the remedial work does not accord with the detail provided in the Acceptable Solution for Clause E2, being E2/AS1. As noted above, the shed falls outside the scope of E2/AS1, and in any event the requirements the Acceptable Solution are non-mandatory and provide one way, but not the only way, of complying with the Building Code.

4.2.2 The authority contends the entire shed was approved as an alternative solution and the original base detail was also assessed on that basis (although I note the original detail, along with several other details, generally accord with E2/AS1). However,

the original detail allowed water ingress during a weather event⁹, and the authority approved the installation of additional flashing to reduce the likelihood of water ingress under similar weather conditions.

4.2.3 I consider the detail referred to by the parties contained in E2/AS1 (Figure 93) has a limited application to this situation (refer Appendix A.4). Figure 93 only addresses the likelihood of capillary action drawing water up between the concrete slab and the rear of the cladding to the bottom plate. The bottom plate and closure flashing in Figure 93 is, in effect, providing a sealed air path above the top of the slab.

4.2.4 In the subject building, moisture-laden air is able to be drawn up under the base of the cladding and onto the concrete slab. There is no form of pressure equalisation to help prevent moisture-laden air being drawn into the building. While there has been an emphasis on avoiding the effects of capillary action, I do not consider this is the principle means by which water will enter the cladding at this point.

4.2.5 The following is noted:

- The gap between the base flashing and the closure flashing is reduced at the base of these two flashings: the thermal barrier will in effect form an air seal between both flashings. The gap between the two flashings itself would not have given any rise to capillary action.
- The base flashing extends some 80mm below the concrete slab. The bottom kickout to the base flashing minimizes capillary rise behind the flashing.
- The closed-cell foam seal behind the base flashing will reduce air and moisture movement into the wall space. The closed-cell foam itself will not allow the passage of water, i.e., water will not be drawn through the foam.
- However, the foam is only 3mm thick. This may not be thick enough to allow for construction tolerances in the relative location of the bottom girt and the edge of the concrete slab, and for variations in the slab edge itself. The proximity of the base flashing to floor slab along the length of the slab needs to be verified on site.

4.2.6 In principle, the remedial base detail will provide a solution that will meet the performance requirements of Clause E2. However, the location of the base flashing relative to the edge of the concrete slab should be verified onsite to confirm the effectiveness of the foam seal. The assessment might be done by carefully probing this junction at sample points to test for any gap.

4.3 The extent of the remedial work

4.3.1 The minor amendment to the building consent was limited to the external walls surrounding the dwelling and 1 metre 'past [the] internal dividing wall' separating the store from the dwelling.

4.3.2 The consultant contends that the remedial detail is to be applied to the shed as a whole and the applicant's lawyer asserts that the large storage area was always intended to be lined and the entire shed is therefore 'a habitable dwelling'. The applicant says the store is to be used for the storage of household items, business records and collections, and vehicles.

⁹ This point is disputed. The contractor says the ingress only occurred during a storm event, the applicant says this occurred at other times.

- 4.3.3 Although the store is associated with a household unit, that of itself does not make the store a habitable space as defined in Clause A2. The Building Code defines “habitable space” as:
- a space used for activities normally associated with domestic living, but excludes any bathroom, laundry, water-closet, pantry, walk-in wardrobe, corridor, hallway, lobby, clothes-drying room, or other space of a specialised nature occupied neither frequently nor for extended periods
- 4.3.4 There are specific requirements under the Building Code for habitable spaces. For example, the functional requirement Clause G7.2 for the provision of adequate natural light and visual awareness of the outside environment, and the performance requirement Clause G5.3.1 concerning maintenance of internal temperature.
- 4.3.5 The application for building consent describes the building as “a shed and minor household unit” as does the approved consent. Given those descriptions and the applicant’s description of the use of the space as one for storage, I conclude that the store is not a “habitable space”. I note also that a building may have more than one use (refer Clause A1.0.2.) and that the use of this building includes both a dwelling, which has particular requirements it must meet under the Building Code, and a store with different requirements to be met.
- 4.3.6 The relevant clause of the Building Code in dispute is Clause E2.3.2, which requires:
- Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both
- 4.3.7 While the store is required to comply with Clause E2.3.2, its level of compliance must be determined against its use and what is considered “undue dampness” in this case. In considering this matter it is relevant to take into account the limits on application of the functional requirement Clause E2.2 (refer Appendix A.3), the required level of amenity and the likely effect and damage cause by moisture ingress.
- 4.3.8 The store has three large roller doors that take up some two-thirds of the south wall and provide access for large vehicles and/or farm machinery. The doors are likely to allow some water ingress and water-laden air (whether open or closed) and water is likely to be brought into the store on wet vehicles and similar.
- 4.3.9 The store is almost completely unlined and has a fully exposed steel frame; any consequential damage to the structure arising from incidental water ingress is significantly less than if the structure was timber-framed and lined. I note also that the Comment on paragraph 1.2.1 in E2/AS1 makes allowance for unlined structures as follows:
- Details contained in this Acceptable Solution can be used for outbuildings and unlined structures, but the requirements may be in excess of the minimum required by the Building Code.
- 4.3.10 The unlined store and the use of the store as a something other than a habitable space is also reflected in the detailing of the external envelope: there is a difference between the level of weathertightness detailing of the cladding penetrations to the dwelling when compared with the rest of the structure. The window and ranchslider details to the dwelling generally accord with E2/AS1; in general terms the penetration details to the store area do not.
- 4.3.11 The nominal 1 metre distance that the remedial detail is to continue past the portion of the shed containing the dwelling is a practical measure adopted by the authority. Any water entering under the cladding will have a limited effect on adjacent building

elements, and because of this limited effect a demarcation point 1 metre past the dwelling appears reasonable.

- 4.3.12 However, the lined walls encroach into the store and in my view the 1 metre distance applies equally to the lined area of the walls in the store because the lining is a building element that would be damaged by water entering under the cladding. Therefore, the remedial detail should be applied to the areas of the store where the walls have been lined. I note the lined walls terminate at the personnel doors and the width of the doors, in effect, provide the 1 metre separation at that point.
- 4.3.13 The door sills to the two personnel doors are fitted with a spring-action weather seal and a sill flashing as part of the remedial work (refer paragraph 2.3.5). As one side of the personnel doors (between the doors and the dwelling) is lined, the junction of the lined wall and the personnel door should either be detailed as for the joinery penetrations to the remaining lined walls, or materials used that are sufficiently durable to allow for intermittent water ingress at this point.
- 4.3.14 In my opinion, the shed with the remedial work limited to the part of the building containing the dwelling and to those areas of the store where the external walls are lined, with the addition of a satisfactory detail at the junction of the lined wall and personnel doors, means the building as a whole will satisfy the minimum requirements of Clause E2 External moisture.
- 4.3.15 For completeness, while I have come to the conclusion that the remedial work will in principle comply, I note that an owner can elect to exceed the minimum requirements of the Building Code if that is their wish.

5. The decision

- 5.1 In accordance with section 188 of the Building Act 2004, I hereby determine the remedial base detail as described in paragraph 2.3 of this determination, pending verification as set out in paragraph 4.2.6, means the building as a whole will comply with Building Code Clause E2 External moisture.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 9 May 2018.

Katie Gordon
Manager Determinations

Appendix A: The legislation

A.1 The provisions of Building Code Clause A1 Classified uses include:

1.0.2 A building with a given classified use may have one or more intended uses as defined in the Act.

A.2 The provisions of Building Code Clause A2 Interpretation include:

amenity means an attribute of a building which contributes to the health, physical independence, and well being of the building's users but which is not associated with disease or a specific illness

habitable space a space used for activities normally associated with domestic living, but excludes any bathroom, laundry, water-closet, pantry, walk-in wardrobe, corridor, hallway, lobby, clothes-drying room, or other space of a specialised nature occupied neither frequently nor for extended periods

household unit means any building or group of buildings, or part of any building or group of buildings, used or intended to be used solely or principally for residential purposes and occupied or intended to be occupied exclusively as the home or residence of not more than one household...

A.3 The provisions of Building Code Clause E2 External Moisture include:

Functional requirement

E2.2 Buildings must be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.

Limits on application

Requirement E2.2 does not apply to buildings (for example, certain bus shelters, and certain buildings used for horticulture or for equipment for washing motor vehicles automatically) if moisture from the outside penetrating them, or accumulating within them, or both, is unlikely to impair significantly all or any of their amenity, durability, and stability.

Performance

E2.3.2 Roofs and exterior walls must prevent the penetration of water that could cause undue dampness, damage to building elements, or both.

E2.3.7 Building elements must be constructed in a way that makes due allowance for the following:

- (a) the consequences of failure:
- (b) the effects of uncertainties resulting from construction or from the sequence in which different aspects of construction occur:
- (c) variation in the properties of materials and in the characteristics of the site.

A.4 Figure 93 from the Acceptable Solution for Clause E2, E2/AS1:

