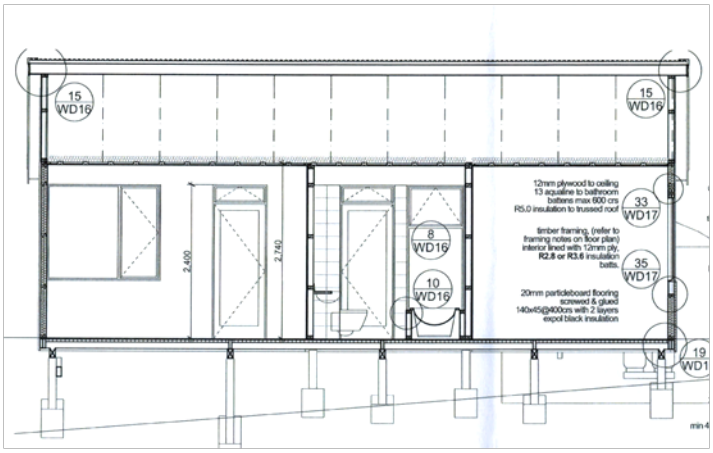
MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

Determination 2017/031

The code compliance of a proposed shower area in a new house at 24A Beechnest Drive, St Arnaud



Summary

This determination considered the detailing of the window and door regarding compliance with Clauses B2, E3.3.2, E3.4.5, and E3.3.6. The determination considers whether there was sufficient evidence to establish on reasonable grounds that the proposed shower area would comply with the Building Code.

1. The matter to be determined

1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004[1] ("the Act") made under due authorisation by me, John Gardiner, Manager Determinations and Assurance, 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 owners of the proposed house, R and F McGuigan ("the applicants"), acting through an agent ("the architect")
- the Tasman District Council ("the authority"), carrying out its duties as a territorial authority or building consent authority.

1.3 This determination arises from an application for a building consent for construction of a new dwelling. The authority is of the view that details proposed for the tiled bathroom do not comply with Clauses[2] B2 and E3 of the Building Code[3]. These concerns relate to the proposed shower area ("the shower"), taking into account the window and door located within the watersplash zone of the shower head[4].

[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] In this determination, unless otherwise stated, references to sections and clauses are to sections of the Act and clauses of the Building Code.
[3] Schedule 1, Building Regulations 1992
[4] The watersplash zone for the shower is defined as the area either within the shower enclosure, or a 1500mm horizontal radius from the shower rose where there is no shower enclosure, as based upon E3/AS1 Internal Moisture.

1.4 The matter to be determined[5] is whether the shower will comply with Clause B2 Durability and Clause E3 Internal moisture of the Building Code if constructed in accordance with the consent documentation. The shower includes the components (such as the tiling system, the waterproof membrane system, the wall and floor substrates, and the exterior joinery) as well as the way components are intended to be installed and to work together.

1.5 The determination is limited to the matter outlined above and does not consider other clauses or other areas within the proposed house.

1.6 In making my decisions, I have considered the submissions of the parties and the other evidence in this matter, using a framework outlined in paragraph 55.1. The relevant parts of clauses of the Building Code and the Acceptable Solutions discussed in this determination are set out in Appendix A.

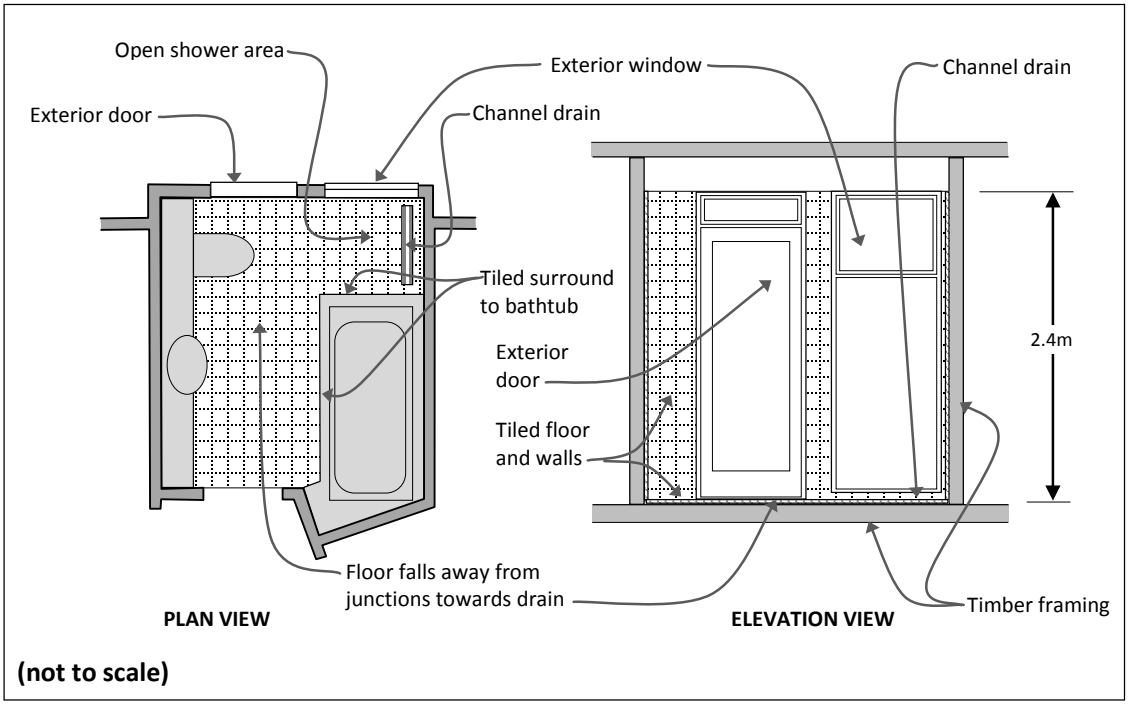
2. The building work

2.1 The proposed building work is a single-storey two-bedroom cottage ("the bach") situated on a sloping site. Construction is generally conventional light timber frame for the purposes of NZS 3604[6], with timber pile foundations, timber-framed floors, plywood and corrugated metal wall claddings, aluminium windows and profiled metal roofing. The wall framing is specified as H1.2 treated.

2.2 The bathroom

2.2.1 The bathroom is shown in Figure 1.

Figure 1: The bathroom

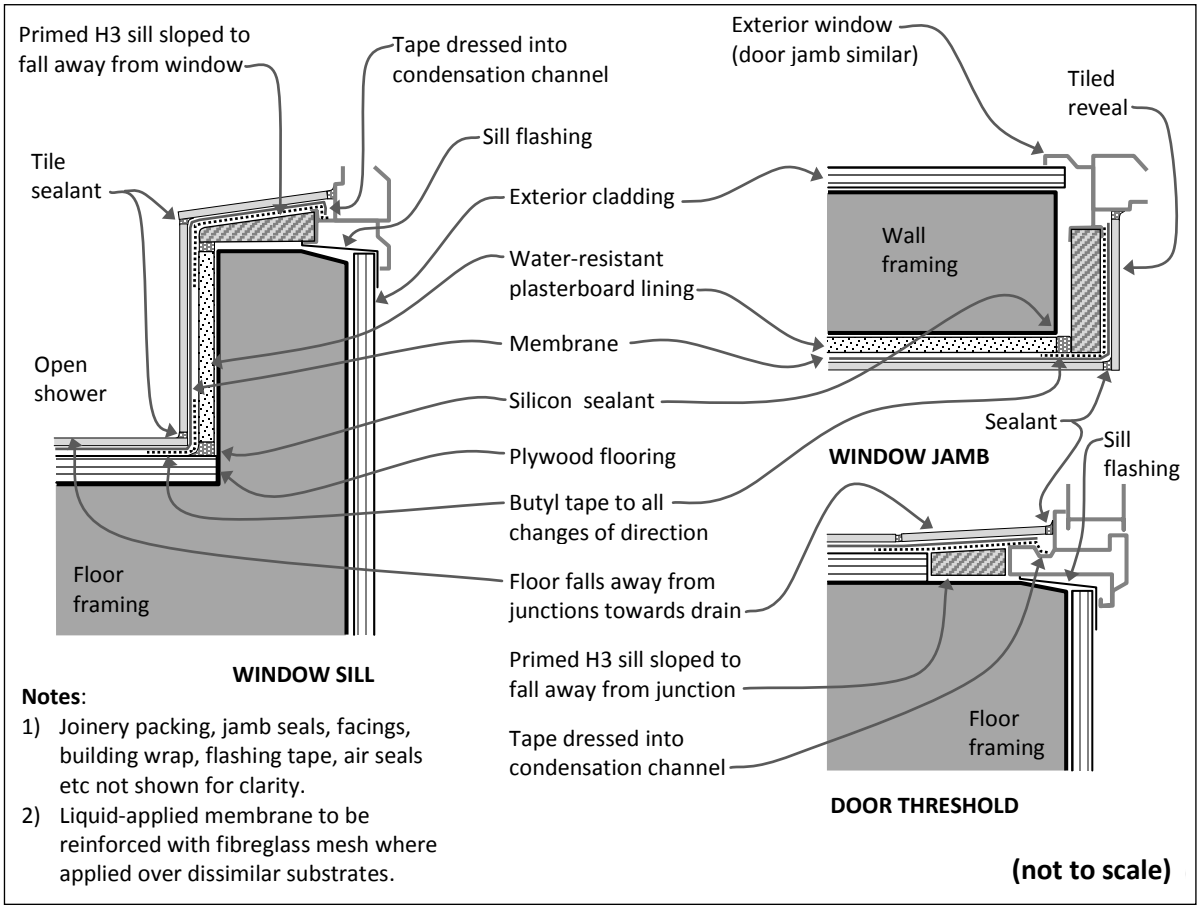


2.2.2 As shown in Figure 1, the shower is located in the corner of the bathroom adjacent to the external wall – which includes a full-height window and an external glazed door. The floor is tiled, with tiles extended up the walls to a height of 2.4m and up the bathtub surround. The shower floor incorporates a stainless steel channel drain.

[5] Under section 177(1)(a) of the Act
[6] New Zealand Standard NZS 3604:2011 Timber Framed Buildings

2.2.3 The architect notes that the detail drawing WD20 dated 22 February 2017 incorporates amendments made to the original documents following discussions with the membrane manufacturer. The following indicative details in Figure 2 are therefore based on WD20 representing the current proposed details.

Figure 2: Simplified sketches of tile junctions based upon the architect's details



2.3 The tiling system

2.3.1 Based on the latest details and specification notes in drawing WD20[7] and the other evidence, the tiling system is to be made up of the following primary layers installed over the timber framed walls and floor:

- The tile substrates:
  - 20mm H3 treated plywood laid to fall towards channel drain
  - 10mm water-resistant plasterboard underlay to all wall tiles
- substrates primed, with silicone sealant to junctions
- self-adhesive butyl tape applied to all corners and junctions
- liquid-applied waterproofing membrane under all tiled areas, reinforced with fibreglass mesh at inter-substrate junctions
- the wall and floor tiles, adhesives and mortar (not specified).

[7] There is some lack of clarity and inconsistency with the other submitted drawings WD03 (floor plan) and WD12 (sections). For example, references to the extent of tanking, changes in membrane product, flooring and tile backing sheets

2.3.2 The specification notes on drawing WD20 state:

> [proprietary membrane] Rapid membrane to be used to entire bathroom.
>
> [proprietary membrane] tape to be applied to all changes in direction, and to perimeter of aluminium joinery as detailed, (note tape 75mm wide) and membrane to be reinforced with deckweb bandage where crossing different substrates likely to move separately.
>
> All surfaces to be primed prior to application of tape and membrane.

2.4 The specified products

2.4.1 Based on the information provided, the bathroom tiling system is based on the following underlying products:

- Plasterboard that has a BRANZ Appraisal, which describes the product as a 'paper-bound, modified water-resistant gypsum plaster core sheet lining material'. The system includes fixings, adhesives sealant and other accessories and, if used in showers or areas subject to water-splash, 'must include a wet area water proofing membrane system under the tiles'. The appraisal concludes that, if installed in accordance with the conditions within the appraisal, the lining system will comply with Clauses B1, B2, C3, E3, F2 and G6.
- The liquid-applied membrane system is covered within a BRANZ Appraisal, which concludes that, if installed in accordance with the conditions within the appraisal, the membrane system will comply with Clauses B2, E3 and F2. The appraisal describes the specified products as follows:
  - [Proprietary membrane] is 'a one-part, water-based polyurethane-acrylic, ready-to-use, liquid-applied, rapid setting membrane.'
  - [Proprietary membrane] tape is 'an uncured butyl tape with a fleece layer that is used in the…under-tile waterproofing system' and is a self-adhesive tape applied over the tiling substrates prior to the application of the waterproofing membrane.
  - The primer is 'a water-based primer used to seal substrates and enhance the adhesion of the membranes'.
- A woven polyester reinforcement cloth embedded into the liquid-applied membrane during application to build up and reinforce critical areas such as, wall/floor and other junctions subject to differential movement of dissimilar substrates.

2.4.2 The architect also provided copies of shower technical details related to a proprietary under-tile heating system, although there is no other mention of such a heating system[8]. The purpose of these is not clear as the proprietary details have not been adapted to suit the subject bathroom and the details are not consistent with the architect's drawings in that:

- the level entry and channel details show a tiled preformed shower base with a 'glass channel waterstop' for a shower screen (whereas the subject shower has no screen and no pre-formed shower base is called for)
- the shower threshold detail shows a step up to a tiled pre-formed shower base (whereas the subject has a level entry)
- the centre drain detail does not apply (whereas the subject has a channel drain).

[8] This Determination is based on the assumption that there is no under-tile heating system.

3. Background

3.1 The architect lodged an application (No. BC 170008) on behalf of the applicants for a building consent for the bach on 21 December 2016. The documentation included the bathroom shown in Figure 1, with five tiling details and 'tiling notes' that included 'tanking is to be laid behind all wall and floor tiles in watersplash areas'.

3.2 The request for information

3.2.1 In a letter to the architect dated 13 February 2017, the authority required further information about various items, including the:

> ...alternative solution in respect of the full length window (reference WO7) being located in the external wall to the tiled (walk in) shower shown in the Bathroom.

3.2.2 The authority noted that the following was required (in summary):

- all material elements to be fully annotated on the bathroom details on WD14
- the manufacturer's data sheet for the 'continuous bandage' noted on details
- expanded details of junctions between the membrane and window
- the manufacturer's confirmation that the 'waterproof membrane can be applied to, and provide an appropriate seal to, the aluminium window sections.'

3.3 The architect's amended proposal

3.3.1 The architect consulted with the membrane manufacturer and prepared expanded details based on 'a more robust system using [membrane] and [membrane] butyl detail tape'. The manufacturer reviewed the revised proposal and emailed the architect on 16 February 2017, stating:

> I have viewed your drawings regarding the [proprietary membrane] undertile membrane including the [proprietary membrane] tape in the corners and bonding to the aluminium profile.
>
> If installed by an [proprietary membrane] approved applicator as per our specification and installation methods, this is suitable for this application.
>
> I would also recommend [proprietary membrane] tile adhesive and [grout] with [coloured silicon] in the corners within the tile installation.

3.3.2 In a letter to the authority dated 19 February 2017, the architect attached a copy of the above email, updated installation instructions and a new drawing (WD20) of expanded jamb and sill details (see Figure 2). The architect noted (in summary):

- the change to a more robust system suggested by the manufacturer
- the function of the 'continuous bandage' as a mesh embedded in the coating system in accordance with the manufacturer's instructions
- the use of a modified self-adhesive butyl tape to junctions
- the manufacturer's approval of the tape adhering directly to aluminium
- the same tape dressed into standard aluminium angle waterstops in system[9].

3.3.3 The authority reviewed the amended proposal and its internal checklist completed on 3 March 2017 rejected the alternative solution and recommended a determination be sought on the compliance for 'both the window in the shower [and] the adjacent external door'. The reasons for the decision were noted as:

[9] Sheet WD14, Detail 07

> Multiple junctions between dissimilar materials, plus timber substrate.
>
> Concerns compliance with NZBC Clauses E3.1(a), E3.2(a) and (c), E3.3.4, E3.3.5, E3.3.6, plus Acceptable Solution E3/AS1, Section 3 (3.1, 3.1.1, 3.1.2, 3 3.2, 3.3, 3.3.1 and 3.3.2) not achieved including to meet durability requirements NZBC B2 (B2.1, B2.2, B2.3.1(a) and (b),B3.3.2)
>
> Noted: Significant difference between BC17008 and Determination 2015-009[10]
> (1) Timber substrate construction (not concrete)
> (2) Multiple junctions
> (3) Greater dissimilar materials.

3.3.4 The authority informed the architect of its concerns and asked for a determination on the matter. The Ministry received an application for a determination from the architect on 3 March 2017.

4. The submissions

4.1 The applicant's submission

4.1.1 The architect made a submission on behalf of the applicants, which set out the background to the situation and explained the authority's concerns in regard to the number of junctions and the timber-framed floor. The architect described the proposal for the bathroom within a 'small bach' where:

> ...a full wet-room shower is proposed in the bathroom adjacent to the tiled bath, and to a full height window located in the external wall. It is intended that no curtain or protection be provided to this window and that the shower will impact directly on these surfaces.

4.1.2 The architect also provided a statement titled 'Assessment of Compliance", which set out the reasons that he considered the modified proposal submitted to the authority on 19 February 2017 complied with the relevant parts of the Building Code. He noted that the performance requirements of E3.3.5 for surfaces likely to be splashed to be 'impervious and easily cleaned' were met by the tiles and also the powder-coated aluminium and glass, which are commonly used as shower screens.

4.1.3 In regard to Clause B2 and to E3.3.6, all surfaces within the watersplash zone of the shower are detailed to protect against water penetrating into the underlying timber framing in the following ways (in summary):

- The first line of defence is provided by the impervious surface finishes; which are sealed with flexible sealant at intersections or changes of direction, with any deterioration of seals 'easily noted and fixed'.
- All horizontal surfaces are laid with positive falls away from the junctions in order to avoid ponding or excess water.
- The waterproof membrane is dressed into the channel drain and carries up and into joinery reveals as an impervious under-tile layer that drains any water penetrating the surface finishes.
- The membrane is also dressed into the condensation channels of the window and door to provide a secondary means of allowing water to escape to the outside should the seal fail.
- The use of the butyl tape provides 'another level of robustness to the system with its ability to take up movement across the timber frame junctions.'

[10] Determination 2015/009 Regarding the code-compliance of a window in a proposed shower enclosure of a new house at 591 Paerata Ridge Road, Opotiki (Ministry of Business, Innovation and Employment) 2 March 2015

4.1.4 The architect forwarded copies of:

- some of the original consent application drawings
- relevant correspondence with the authority
- the amended proposal for the tiled membrane system
- relevant appraisals and technical information on proposed products.

4.2 The authority made no formal submission but noted that the determination needed to include the external door, due to the affect of any direct or indirect water spray on the junctions. The authority attached a completed copy of its internal assessment of the proposed alternative solution, which outlined 'clauses which we believe relate to the item to be determined.'

4.3 A draft determination was issued to the parties for comment on 2 May 2017.

4.4 On 5 May 2017, the architect accepted the draft determination.

4.5 On the same day the authority responded that it accepted the determination and noted a reference error.

4.6 I have taken the parties' submissions into account and altered the determination as appropriate.

5. Code compliance of the tiled membrane system

5.1 In order to determine the adequacy of the shower as documented, I have considered whether the authority can be satisfied, on reasonable grounds, that the provisions of Clauses B2 and E3 would be met if the shower was properly constructed in accordance with the plans and specifications submitted.

5.2 There are various means by which an authority can be satisfied and my assessment of the documentation for the shower takes the following into account:

- the credentials of the designer and installer (if known)
- the completeness or certainty of information submitted
- the demonstration of compliance with relevant performance requirements
- any errors, conflicts and/or omissions apparent in the documentation.

5.3 Although the architect has submitted no evidence of experience with this particular type of tiled shower area, it appears that the underlying membrane system will be installed by an applicator approved by the manufacturers, with fewer details therefore necessary for areas that the installers are expected to be familiar with. I have taken this into account when considering the adequacy of the documentation.

6. Compliance with Clauses E3 and B2

6.1.1 The authority is concerned that the proposed bathroom does not meet the functional and performance requirements of Clause E3 Internal Moisture, which are provided in Appendix A.1 and Clause B2 (insofar as it applies to E3).

6.1.2 The question is whether the proposed surface finishes and details at the junctions between the tiled floor and walls with the exterior joinery, will comply with the performance requirements of Clause E3.

6.2 The surface finishes (Clause E3.3.4 and E3.3.5)

6.2.1 The authority considers that compliance with Clauses E3.3.4 and E3.3.5 will not be achieved for the surfaces likely to be splashed with water as a normal and expected occurrence. For this shower, the surfaces will be the floor tiles, the wall tiles, the window, the door and the sealants proposed for the junctions. These junctions will be sealed with a proprietary flexible tile sealant, which acts as the first barrier to water ingress. The sealant proposed by the membrane manufacturer is suitable for use in wet areas such as showers.

6.2.2 E3/AS1 (refer Appendix A.1A1.5) lists materials and surface finishes that are 'impervious and easily cleaned' and deemed to satisfy the requirements of Clause E3 – including those that may be used in showers. Some of the materials listed use mechanical and sealed joints at junctions with the base of a shower lining, which lack any means to drain away any water that may penetrate the joint. The proposed tile/joinery junctions are similar in nature, but with the added benefit of drainage.

6.3 Watertightness (Clause E3.3.6)

6.3.1 The performance requirement of Clause E3.3.6 is to avoid the likelihood of internal moisture penetrating behind linings and, in this case, into substrates and timber framing where it may damage the underlying construction. Clause E3.3.6 must therefore be considered as it applies to the subject floor/joinery system as a whole.

6.3.2 The shower includes an under-tile waterproofing membrane applied over butyl junction tape that falls away from vulnerable junctions as shown in Figure 2. This junction design directs any moisture away from the junctions or into the joinery condensation channels from the joinery surfaces. Such channels are typically designed to collect any condensation that runs down the inside of the glass and frame, with holes to direct the water to the outside. Any moisture breaching the tile sealants and underlying membrane system would also fall into these channels and be directed to the outside.

6.3.3 Should the first barrier to water ingress fail, the proposed system has the following mechanisms to direct any internal moisture to the exterior:

- the falls away from the vulnerable junctions, towards the channel drain
- the membrane system dressed into the condensation channels to the sills
- the sill tray under the window and door sills
- the wrapped and taped timber framing beneath the joinery openings.

Any other failure of the joinery's waterproofing performance (i.e. failure of glazing gaskets or aluminium mitre junctions) would lead to the same drainage mechanisms from the condensation channels being brought into play.

6.3.4 It will be important to ensure the manufacturer's instructions are carefully followed in relation to the correct installation of the membrane system and the seals and to ensure that no component of the system element restricts or reduces proper drainage from the condensation channel. The construction would need to be carefully monitored by the authority and could include the provision of construction statements from the installer.

6.4 Summary

6.4.1 Taking into account the submissions and the other evidence, the following table summarises my conclusions on the likely code compliance of the proposed shower:

Table 1:

Clause	The subject shower	Comment	Conclusions
E3.3.4	**Floor surfaces:** Tiles	• Membrane/tiling system and installer to be approved by membrane manufacturer	Impervious and easily cleaned – **Adequate**
E3.3.5	**Wall surfaces:** Aluminium window, door Tiled walls	• Joinery surfaces no different in principle from shower screens.	Impervious and easily cleaned – **Adequate**
E3.3.4 **E3.3.5** **E3.3.6**	**Showers:** Floor/wall surfaces as above Continuous underlying membrane under all tiles	• Membrane system to all tiled walls and floor • Membrane/tiling system approved by membrane manufacturer	Impervious – **Adequate**
E3.3.6(b)	**Showers:** Floor/wall surfaces as above Continuous underlying membrane under all tiles	• Membrane system under all tiled walls and floor, including shower • Applicator to be approved by membrane manufacturer	Impervious - **Adequate**
E3.2 **B2.3.1** **B2.3.2**	Avoidance of damage Durability periods required Durability of underlying system components	Protection via drainage should any joint leaks penetrate the three moisture barriers: • **Tiling system** - first barrier • **Membrane system** – second barrier • **Primed/sealed substrates** – third barrier • **Condensation channels** drain moisture to outside – in case of failure • **Sill tray flashings** under joinery • **Building wrap/sill tape** to framing	Protection via drainage should any joint leaks penetrate the three barriers to moisture barrier **Adequate**

6.5 The consent documentation

6.5.1 Section 45 of the Act requires an application for a building consent to be accompanied by plans and specifications which contain, or are accompanied by, any other information that the authority reasonably requires. The Act allows the authority to set reasonable requirements for documentation that accompanies applications for building consents. The authority is entitled to set minimum requirements to ensure that the proposed building work is clearly documented and to require the applicant to clearly demonstrate and document how compliance is to be achieved for those areas it considers to be unclear.

6.5.2 In regard to this shower, the authority considers that the documentation supplied in support of the proposal is not sufficient to allow it to be satisfied, on reasonable grounds, that the building would comply with the Building Code if built in accordance with the plans and specifications submitted.

6.5.3 However, I note that the authority must ensure that the level of its requirements for documentation are actually reasonable in the particular circumstances, which would be expected to include factors such as:

- the small scale of the house and bathroom
- the conventional construction of the house structure
- the low risks and consequences of failure, given:

- the ability to easily inspect and maintain the tile joints and sealants
- the underlying moisture barrier provided by the membrane system
- the drainage provided under the above two moisture barriers
- the treatment levels of the substrates and timber framing
- the ventilated accessible subfloor
- the expected expertise of the designer and the membrane manufacturer.

6.6 Conclusion

6.6.1 Taking account of the available evidence, I consider there is sufficient evidence to establish on reasonable grounds that the proposed shower area considered in this determination will comply with Clauses E3 and B2 of the Building Code.

6.6.2 Maintenance of the tile sealant will be an important factor in ensuring ongoing performance of the system as a whole and this is the responsibility of the owners. The surface finishes, joints and sealants are readily observable and repairable.

6.6.3 I have also noted that the documentation and some information provided to support the tiled membrane system as an alternative solution is inconsistent in a number of areas, which appear to be fairly minor. I leave these to be resolved as part of the normal consenting process.

7. The decision

7.1 In accordance with section 188 of the Building Act 2004, I hereby determine that the detailing to the proposed shower area will comply with Clause E3 and Clause B2 of the Building Code.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 17 May 2017.

John Gardiner
Manager Determinations and Assurance

Appendix A

A.1 The relevant legislation

A1.1 The Building Code provides the objectives, the functional requirements and performance requirements that building work must meet, while the Acceptable Solutions to code clauses provide one way, but not the only way, of meeting these code requirements.

A1.2 This determination addresses the functional and performance requirements of Clause E3 Internal Moisture and Clause B2 Durability, together with the Acceptable Solutions associated with those requirements. Those parts most relevant to the subject shower are provided in the following paragraphs.

The Building Code

A1.3 Parts of Clause E3 Internal Moisture most relevant to this shower are:

Functional requirement

E3.2 Buildings must be constructed to avoid the likelihood of –

(a) fungal growth or the accumulation of contaminants on linings and other building elements; and …

(c) damage to building elements caused by the presence of moisture.

Performance

E3.3.4 Wall surfaces adjacent to sanitary fixtures or sanitary appliances must be impervious and easily cleaned.

E3.3.5 Surfaces of building elements likely to be splashed or become contaminated in the course of the intended use of the building, must be impervious and easily cleaned

E3.3.6 Surfaces of building elements likely to be splashed must be constructed in a way that prevents water splash penetrating behind linings or into concealed spaces.

A1.4 Parts of Clause B2 Durability most relevant to this shower are:

Functional requirement

B2.2 Building materials, components and construction methods shall be sufficiently durable to ensure that the building, without reconstruction or major renovation, satisfies the other functional requirements of this code throughout the life of the building.

Performance

B2.3.2 Individual building elements which are components of a building system and are difficult to access or replace must either:

(a) all have the same durability, or

(b) be installed in a manner that permits the replacement of building elements of lesser durability without removing building elements that have greater durability and are not specifically designed for removal and replacement.

The Acceptable Solutions

A1.5 Parts of the Acceptable Solution E3/AS1 most relevant to this shower are:

3.0 Watersplash

3.1 Lining materials

3.1.1 Floors

The following linings and finishes to floors satisfy the performance for impervious and easily cleaned surfaces in areas exposed to watersplash:

b) Ceramic or stone tiles …

3.1.2 Walls

The following linings and finishes to walls satisfy the performance for impervious and easily cleaned surfaces in areas exposed to watersplash:

a) Integrally waterproof sheet material (e.g. polyvinylchloride) with sealed joints.

b) Ceramic or stone tiles …

3.3.1 Showers

All shower spaces shall have impervious floor and wall finishes. Lining materials and finishes listed in Paragraphs 3.1.1 and 3.1.2 satisfy this requirement …

b) Ceramic or stone tile finishes shall be laid on a continuous impervious substrate or membrane. …

A1.6 Parts of the Acceptable Solution B2/AS1 most relevant to this shower are:

1.2 Assessing required durability

1.2.1 Evaluation of building elements shall be based on the following concepts:

a) **Difficult to access or replace** – applies to building elements where access or replacement involves significant removal or alteration of other building elements. . . . . A 50 year durability is required.

b) **Moderately difficult to access or replace** – applies to building elements where access or replacement involves the removal or alteration of other building elements. . . . . A 15 year durability is required.

c) **Easy to access and replace –** applies to building elements where access or replacement involves little alteration or removal of other building elements. Examples are linings... ...A 5 year durability is required.

d) **Failure to comply with the NZBC would go undetected during both normal use and maintenance of the building** – applies where the building elements are hidden from view with no provision for inspection access, and failure would not be apparent until significant damage had occurred to other building elements... ...A 50 year durability is required.

e) **Failure to comply with the NZBC would go undetected during normal use of the building but would be easily detected during normal maintenance** – applies where normal maintenance will identify faults unlikely to be observed by building occupants until significant damage has occurred. Examples are degradation of exterior claddings on roofs and walls, sealant filled joints, flashings... ...A 15 year durability is required.

c) **Failure to comply with the NZBC would be easily detected during normal use of the building** – applies where the failure is obvious to the building occupants. Examples are exposed building elements which are damaged or inoperative such as protective finishes.... ...A 5 year durability is required.