

Determination 2023/037

The compliance of a waterproof membrane tanking system with Clause E2 of the Building Code

8 Rock Hill Drive, Kennedys Bush, Christchurch

Summary

This determination considers whether the tanking system, applied to a blockwork retaining wall on a residential house, complies with the weathertightness requirements of Building Code clause E2 External Moisture.

The legislation discussed in this determination is contained in Appendix A. In this determination, unless otherwise stated, references to “sections” are to sections of the Building Act 2004 (“the Act”) and references to “clauses” are to clauses in Schedule 1 (“the Building Code”) of the Building Regulations 1992.

The Act and the Building Code are available at www.legislation.govt.nz. Information about the legislation, as well as past determinations, compliance documents (eg, Acceptable Solutions) and guidance issued by the Ministry, is available at www.building.govt.nz.

1. The parties and the matter to be determined

- 1.1. This is a determination made under due authorisation by me, Charlotte Gair, Manager Advisory, Building Resolution, Ministry of Business, Innovation and Employment (“the Ministry”), for and on behalf of the Chief Executive of the Ministry.¹
- 1.2. The parties to the determination are:
 - 1.2.1. A Cooper, the owner of the house (“the owner”).
 - 1.2.2. Christchurch City Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.
- 1.3. This determination arises from the construction of a new dwelling on a sloping site, incorporating a concrete blockwork retaining wall (“the concrete blockwork wall”) with a waterproof membrane tanking system (“the tanking system”). Due to a leak in the garage at the foundation and concrete blockwork wall junction, the owner considers the work was not constructed correctly and does not comply with the Building Code (First Schedule, Building Regulations 1992).
- 1.4. The matter to be determined, under section 177(1)(a), is therefore whether the as-built tanking system complies with Building Code Clause E2.3.3.
- 1.5. In deciding this matter, I must consider the design and construction of the as-built tanking system.

2. The building work

- 2.1. The building is a 248m² single storey dwelling on a 983m² sloping site in a residential area.
- 2.2. The building is constructed on an excavated building platform and comprises a reinforced concrete slab foundation with primarily timber framed walls and roof. The building is clad with a combination of autoclaved concrete masonry panels and

¹ The Building Act 2004, section 185(1)(a) provides the Chief Executive of the Ministry with the power to make determinations.

fibre cement bevel back weatherboards over a plywood rigid air barrier for the walls, with metal roof cladding.

- 2.3. The building includes a blockwork retaining wall that roughly follows the southern boundary of the proper. The retaining wall also forms part of the southern wall of the garage, shown in figure 1 below.

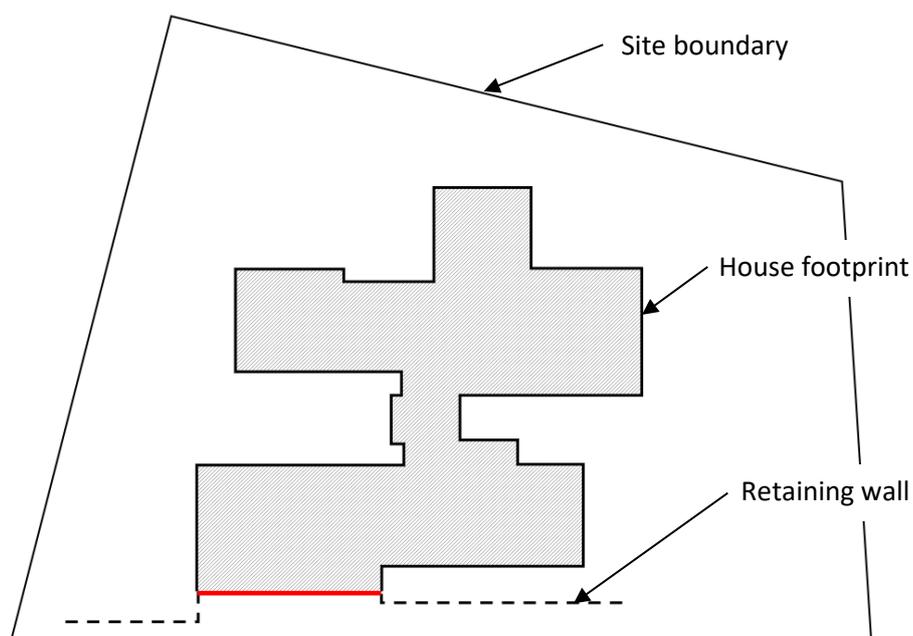


Figure 1. Diagram showing the site layout. The portion of the retaining wall in question is highlighted in red.

- 2.4. The design of the concrete blockwork wall incorporates external waterproofing by way of the tanking system. The tanking system is a two-coat bitumen liquid application membrane (“the membrane”), protected by two 100mm layers of polystyrene drainage board and compacted sand backfill. The approved consent showed this backfill capped with a sloped concrete surface to drain water away from the wall, however site photos show it topped with coarse pebbles.
- 2.5. As part of the tanking system, there is drainage behind the wall comprising a 100mm high density polyethylene subsoil drain in a filter sock. The approved consent showed the drain connected to a silt trap, which then connects to the stormwater drain, however a bubble up sump was installed instead.
- 2.6. After the initial building work was completed and code compliance certificate issued a second 65mm subsoil drain was installed alongside the 100mm subsoil drain.

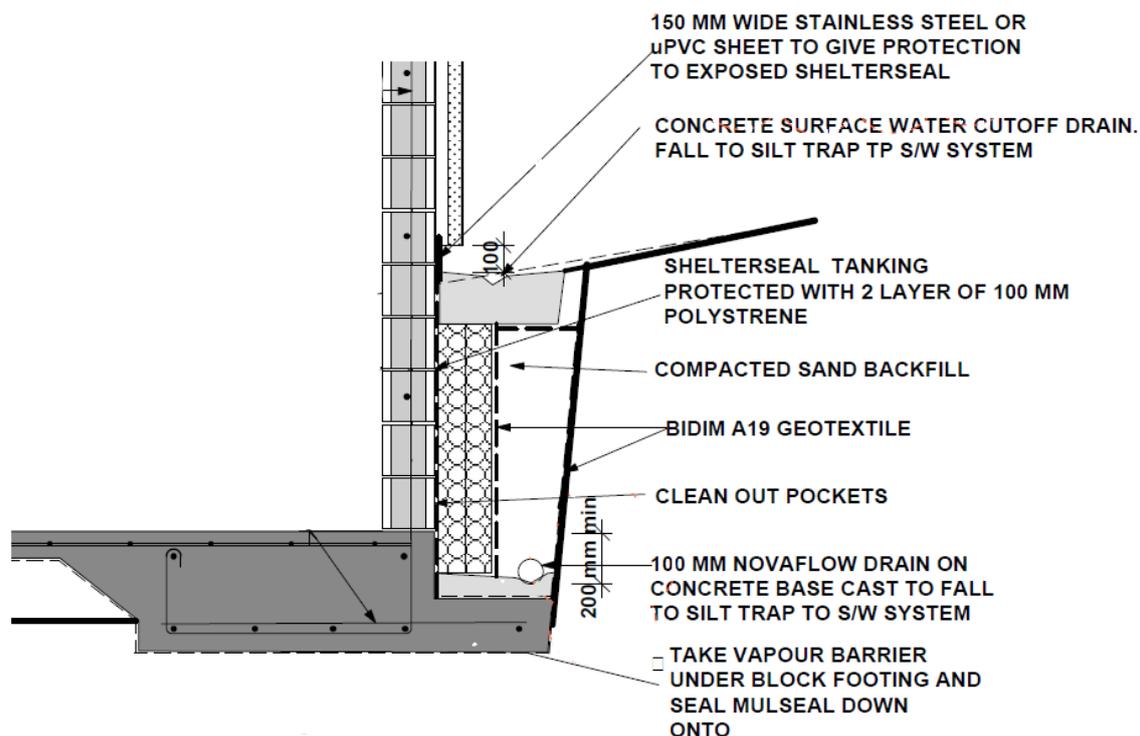


Figure 2. Excerpt from approved plans showing construction detail for the tanking system.

3. Background

- 3.1. On 31 August 2012, the authority granted building consent ABA10117659 (“the building consent”) for the construction of the new dwelling.
- 3.2. The building consent documentation included a geotechnical report dated 1 June 2012, which notes that “well-conceived subsoil drainage systems should be included in the design of any retaining system to ensure continued site stability.”
- 3.3. The building consent documentation included:
 - 3.3.1. Compliance information, specification, and installation requirements for the tanking system by way of an appraisal² (“the appraisal”).
 - 3.3.2. Construction details for the concrete blockwork wall and subsoil drains shown on the approved architectural plans.
- 3.4. Construction of the substructure was started in September 2012. The authority carried out a number of inspections for the drainage and foundation. During an

² BRANZ Appraisal No. 462 [2010]. Shelterseal 3000X and Shelterseal HD Damp-proof membranes. 31 January 2012.

inspection of the retaining wall drainage on 18 March 2013 they noted that drains were not laid as per the plans, however as built plans had been received and no specific concerns were highlighted.

- 3.5. On 10 May 2013, the authority carried out a final inspection for the consented work, which failed. The inspection notes stated work was required for a number of items including sealing and flashing the external cladding, and that drainage and plumbing was to be completed.
- 3.6. On 17 May 2013, the authority carried out a second final inspection for the consented work, which passed. The inspection notes stated, “all items from previous final have been rectified,” and “ground clearance correct at time of inspection, landscaping not completed, ensure correct clearances to claddings and gully are maintained after completion.”
- 3.7. On 2 September 2013, the authority issued a code compliance certificate in respect of the consented building work. The code compliance certificate application did not include an applicator’s certificate for the tanking membrane to the garage retaining wall³.
- 3.8. In 2013, subsequent to the code compliance certificate being issued, the owner discovered a leak in the garage during heavy rainfall. The leak left water on the garage floor and occurred at the grouted foundation and concrete blockwork wall junction.
- 3.9. The owner subsequently contacted the builder and drainlayer (“the drainlayer”) that completed the relevant building work. After visiting the site, the builder and drainlayer advised the owner that no further leaking would occur after the neighbouring building uphill was completed. A second 65mm subsoil drain was also installed alongside the existing 100mm subsoil drain at this time.
- 3.10. The leak in the garage became worse after completion of the neighbouring building in approximately early 2020.
- 3.11. On 26 February 2021, the owner engaged a drainlayer (“the second drainlayer”) to investigate the issues. The second drainlayer cleaned the subsoil drains and inspected the drains using CCTV. The report provided by the second drainlayer noted:
 - 3.11.1. The first entry point was a rodding point at the end of the driveway. The second entry point was through the sump at the back of the house.
 - 3.11.2. Both the 100mm subsoil drain and 65mm subsoil drain are holding water to various degrees indicating the gradient of both drains has been compromised.

³ It is not clear from the consent file whether this was required by council.

- 3.11.3. Both the 100mm subsoil drain and the 65mm subsoil drain do not appear to be laid below driveway and garage floor level.
- 3.11.4. The installed sump is a bubble up sump rather than a silt trap sump. This means that as the subsoil drain enters the sump at a low level, and as the outlet pipe is higher, the water level must rise up to flow out.
- 3.12. On 17 August 2021, the authority responded to the applicant about the leak and the findings of the second drainlayer. The authority advised the owner:
- 3.12.1. At the time the code compliance certificate was issued, the authority considered it had reasonable grounds to believe the work complied with the building consent.
- 3.12.2. For water to enter to the building at the location pictured, it is possible that the as-built tanking system is not performing as intended, rather than the subsoil drain failing. From the photographs provided, it appears that there is shingle over the top of the ground so it is difficult to see whether the as-built tanking system has been constructed as detailed on the plans or as described in the product documentation.
- 3.12.3. The inspection carried out on 26 February 2021 is part of the maintenance of the tanking system that should be carried out regularly. All maintenance should be carried out and if there are further issues, the persons who carried out the work should be contacted.
- 3.13. The Ministry received an application for a determination on 20 August 2021.

4. Submissions

The owner

- 4.1. The owner considers that the leak to the garage floor as caused by the drainage system and that it does not comply with the Building Code. Based on the second drainlayer's report, the owner is of the view that subsoil drain was not installed as consented and that the subsoil drain is too high, the diameter of the subsoil drain is too narrow, the incorrect sump was installed (as a bubble-up sump was used instead of a silt-trap) and there is no rodding point installed for the subsoil drain.
- 4.2. The owner accepted the draft determination.

The authority

- 4.3. The authority considers that:

- 4.3.1. For water to enter the building, it is possible that the membrane is not performing as intended, rather than just the subsoil drain failing.
- 4.3.2. Based on the photos of the work it is “difficult to see whether it has been constructed as detailed on the plans” or the BRANZ appraisal.
- 4.3.3. At the time the code compliance certificate was issued, it had reasonable grounds to conclude the building work complied with the Building Code.
- 4.3.4. The investigation by the second drainlayer is part of the maintenance that should be carried out regularly.
- 4.4. The authority accepted the draft determination and reiterated their view that the membrane may not be performing as intended.

5. Discussion

- 5.1. Section 17 of the Act states that all building work must comply with the Building Code to the extent required by the Act.
- 5.2. The functional requirement of Clause E2 External moisture is:

E2.2 Buildings must be constructed to provide adequate resistance to penetration by, and the accumulation of, moisture from the outside.
- 5.3. The performance requirements of Clause E2 External moisture includes:

E2.3.3 Walls, floors, and structural elements in contact with, or in close proximity to, the ground must not absorb or transmit moisture in quantities that could cause undue dampness, damage to building elements, or both.
- 5.4. The Building Code is performance based, and one way of showing compliance with the Building Code is by an alternative solution, using evidence specific to a given design or product.
- 5.5. At the time the building consent was issued, the tanking system had been issued the appraisal (refer to paragraph 3.3).
- 5.6. An appraisal is a technical opinion from an independent organisation that verifies the Building Code compliance of a building product or system. An appraisal involves testing and assessment of the product or system, with the resulting appraisal outlining the conditions and scope of its use.
- 5.7. Section 19 of the Act outlines the items that must be accepted by a building consent authority as establishing compliance with the Building Code. An appraisal does not have a status under section 19, however, appraisals are often used as part of an alternative solution, showing evidence that the relevant performance clauses of the Building Code will be met.

- 5.8. The tanking system incorporated the membrane itself, which was a two-coat bitumen liquid application membrane, with the appraisal also setting out a number of features required as part of the design, and therefore installation, of the tanking system, including:
- 5.8.1. A “protection material” placed between the membrane and backfill to protect the membrane from damage.
 - 5.8.2. The backfill must be a free draining material and the top of the backfill must be capped with an impervious capping that may be covered in topsoil. The slope of the capping and topsoil must be minimum 1:30 fall away from the wall.
 - 5.8.3. A minimum 100mm diameter subsoil drain must be installed at the “bottom of the wall”. The drain must have a minimum 1:200 gradient fall and discharge to a drainage outlet.
 - 5.8.4. The subsoil drain must incorporate provision for cleaning and inspection.
 - 5.8.5. Annual inspections must be carried out to the top edge seal of the membrane and protection, the backfill capping and the subsoil drain. If necessary, the subsoil drain must be cleared of any sediment or silt build-up.
- 5.9. These requirements for the tanking system are reflected on the consented plans (refer to figure 2).
- 5.10. It is not in dispute between the parties that the tanking system, as documented in the appraisal and the consented plans, would comply with the requirements of Clause E2.3.3 if installed in accordance with the requirements set out in this documentation.
- 5.11. Therefore, this determination considers whether the tanking system, as built, complies with Clause E2.3.3. It is not just the membrane that needs to be constructed correctly, but also the other components outlined above, such as the backfill, capping, and field drain.
- 5.12. I agree with the authority that it is difficult to see whether the membrane itself, the protection material, and backfill have been installed correctly as this building work is now hidden and I have not been provided with evidence regarding its installation.
- 5.13. However, the findings of the second drainlayer highlighted that the following requirements of the appraisal and consented plans were not met:
- 5.13.1. The two subsoil drains do not discharge correctly to a drainage outlet. This is due to a combination of insufficient gradients, disconnections, and the use of a bubble up sump, which all contributes to allowing water to pool behind the tanking system.

- 5.13.2. The two subsoil drains appear to not be installed at the bottom of the wall. This means a level of standing water is held behind the membrane and backfill level at or above the finished floor level before it can drain away.
- 5.13.3. The second subsoil drain is 65mm in diameter, smaller than the 100mm minimum diameter required as part of the tanking system.
- 5.14. Given these issues identified by the second drainlayer, I agree with the view of the authority that there may now also be issues with the condition of the membrane because of how the subsoil drains have been functioning.
- 5.15. I note that the issues identified are not exhaustive. For instance, the concrete capping as detailed on the approved plans is not shown in as-built photos. This may mean an undue amount of water is able to build up against the retaining wall at ground level, affecting the performance of the membrane or overloading the subsoil drains below.
- 5.16. There may also be other issues with the installation of the tanking system and the condition of the membrane that cannot be sighted without excavation and further testing.
- 5.17. Evidence has been provided by the owner that water is seeping through the concrete blockwork wall into the garage, and I consider this is due to failure of the tanking system, based on the issues identified with the installation of the system.
- 5.18. As the tanking system is allowing for the transmission of an amount of moisture that causes undue dampness or damage, I consider the tanking system does not comply with Building Code Clause E2.3.3.

6. Decision

- 6.1. In accordance with section 188 of the Building Act 2004, I determine that the as-built tanking system does not comply with Building Code Clause E2.3.3.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 22 November 2023.

Charlotte Gair

Manager Advisory