Determination 2024/035

The purported refusal to grant a building consent for a skillion roof and whether it complies with E2.3.5 by way of E2/AS1

304 Jack Henry Road, Kinleith, South Waikato

Summary

This determination considers an authority's purported refusal to grant a building consent for a proposed skillion roof design on an extension to an existing dwelling. The roof design is intended to comply with E2.3.5 by way of acceptable solution E2/AS1 for ventilation to this roof space.

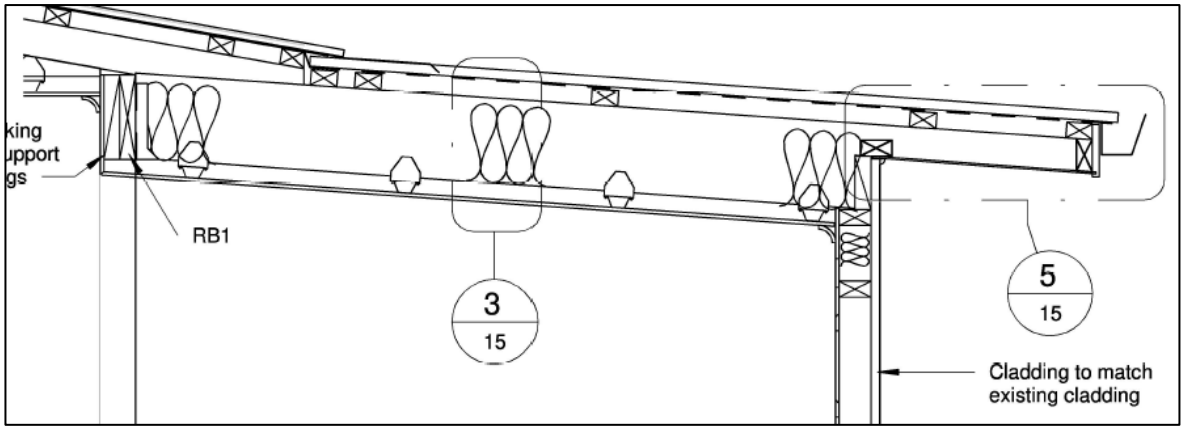

Figure 1: Section view of the skillion roof design (not to scale)

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 matter to be determined

1.1. This is a determination made under due authorisation by me, Andrew Eames, Principal Advisor Determinations, 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. S Fryer, the licensed building practitioner who carried out the design work and the applicant for this determination ("the designer")

1.2.2. R and C Bowers, the owners of the property ("the owners")

1.2.3. South Waikato District Council ("the authority"), carrying out its duties as a territorial or building consent authority.

1.3. This determination arises from the authority's purported refusal to grant a building consent for an addition and alterations to an existing house. The refusal arose because the authority was not satisfied that the proposed roof design complied with Building Code clause E2 *External Moisture*, particularly performance criteria E2.3.5, regarding ventilation of the roof cavity.

1.4. Therefore, the matter to be determined, under section 177(1)(b) and (2)(a), is the authority's purported refusal to grant a building consent.

1.5. The matter turns on whether the proposed skillion roof design demonstrates compliance with E2.3.5 by way of Acceptable Solution E2/AS1 *External Moisture*.

Matters outside this determination

1.6. In determining this matter, I have not considered:

1.6.1. the compliance of the proposed roof design with any other Building Code clauses

1.6.2. the compliance of any other aspect of the proposed building work with the Building Code

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

1.6.3. the authority's subsequent decision to grant the building consent following a change to the design.

2. The building work

2.1. The designer applied for the building consent (BC230183) for alterations and an addition to an existing single-level dwelling on the owners' rural property, which is described on the plans as being situated in a high wind zone[2].

2.2. The proposed building work consisted of alterations to the master bedroom, including an 11.65m^2 extension on the western elevation, and enlarging an ensuite within the dwelling's existing floor area.

2.3. The extension is a single-level timber-framed structure on timber piles and sub-floor, with a 17m^2 skillion profile roof with 3° pitch.

2.4. The roof design for the extension comprises (figure 1):

- Profiled metal cladding
- Metal strip bracing
- Timber structure, including rafters and purlins
- Roof underlay and insulation
- Plasterboard ceiling.

3. Background

3.1. The designer applied for a consent for the building work, and on 21 June 2023 the authority requested further information. Regarding 'E2 Roof Cladding', the authority requested information to demonstrate:

a) there is adequate ventilation provided to prevent the accumulation of moisture below the cladding, and

b) that there is adequate separation provided between the underside of the substrate and insulation to prevent transfer of moisture, and

c) that the roof cavity is sealed from penetrations from spaces below.

The plans are to show that there is an adequate number of air changes to ensure the enclosed roof cavity is well vented. Air flow should be shown flowing in and also venting out.

[2] As described in NZS 3604 Timber Framed Buildings.

3.2. On 3 July 2023, the designer responded to the authority but did not address the E2 request.

3.3. The designer and the authority continued to correspond, with each expressing differing views as to whether or not the skillion roof space required ventilation.On 28 July 2023, the authority stated in correspondence to the designer that the proposed skillion roof design needed to comply with clause E2.3.5.

3.4. Following further correspondence, on 16 August 2023, the designer confirmed they would modify the plans to include roof space ventilation to enable the consent to be issued. They also stated that they would be applying for a determination.

3.5. The Ministry accepted an application for a determination on 15 November 2023.

4. Submissions

The designer

4.1. The designer's view is that the skillion roof design complies with E2/AS1, and that it therefore complies with E2.3.5. The designer submitted that:

4.1.1. In their view, specific ventilation of the skillion roof cavity is not required by NZS 3604:2011 Timber-framed buildings, E2/AS1, or the Building Code.

4.1.2. "There is no requirement in E2/AS1 to supply a minimum amount of air flow, size of area at any construction to allow air admittance, or calculation to prove minimum with any such requirement for the roof cavity."

4.1.3. Timber-framed skillion roofs are a standard construction method and are covered by NZS 3604, and in their view are therefore within the scope of E2/AS1 based on the specified scope in the acceptable solution.

4.1.4. The roof design for the proposed extension meets the requirements of E2/AS1 and the consent should not have been purportedly refused by the authority.

4.1.5. A 25mm gap has been provided on the plans between the insulation and the underlay to allow for air flow.

The authority

4.2. The authority believes that E2/AS1 does not cover the compliance of skillion roofs with E2, and in its submission added that both E2 and E3 are relevant as "both deal with preventing the migration of moisture and preventing moisture degrading building components over time".

4.3. I have also taken the authority's correspondence with the designer during the request for further information process to represent its further views in this matter, namely where the authority:

4.3.1. Stated that all building work must satisfy compliance with the Building Code, including E2.3.5.

4.3.2. Referred the designer to the Roofing Code of Practice[3] for further information.

The owners

4.4. The owners did not make a submission in relation to this application.

5. Discussion

Establishing Building Code Compliance

5.1. Section 17 requires that all building work must comply with the Building Code, and the Code sets out the performance criteria for the assessment of building work. The performance criteria are the qualitative and quantitative requirements that are to be satisfied in performing the functional requirements of a Building Code clause. If the performance criteria are not satisfied, the building work will be non-compliant with that Building Code clause.

5.2. In this case, I consider whether the proposed skillion roof design demonstrates compliance with E2.3.5 by way of acceptable solution E2/AS1.

5.3. Section 19 of the Act sets out how compliance with the Building Code is established. It gives various methods that can be used for establishing compliance, such as acceptable solutions, verification methods and current registered product certificates. These means of compliance must be accepted by the building consent authority if they are being used as the compliance pathway.

5.4. The objective of Building Code clause E2 is to safeguard people from illness or injury that could result from external moisture entering a building.

5.5. In this instance, the matter to be determined relates to performance criteria E2.3.5:

> Concealed spaces and cavities in buildings must be constructed in a way that prevents external moisture being accumulated or transferred and causing condensation, fungal growth, or the degradation of building elements.

[3] New Zealand Metal Roofing Manufacturers Inc. *The NZ Metal Roof and Wall Cladding Code of Practice.*

Compliance with E2.3.5

5.6. The matter to be determined is in relation to the skillion roof design and the authority's request to see ventilation in the roof cavity.

5.7. E2.3.5 requires that buildings be constructed in a way that does not cause condensation, fungal growth or degradation to building elements from external moisture accumulating or transferring into concealed spaces and cavities, such as roof and wall cavities. The transference of moisture can include moisture vapour movement and interstitial vapour diffusion through building materials, and is a concern with skillion roofs in relation to E2 compliance.

5.8. Interstitial vapour diffusion is the movement of water molecules through porous materials into spaces such as roof cavities. It is caused by differences in temperature and humidity levels on either side of the material or construction assembly. While profiled sheet metal is a less porous material in comparison to insulation or building wrap, it is not 100% impervious.

5.9. This vapour diffusion can cause moisture to condense on the 'warm' side of the material and if this is on the internal side of the roof cladding and is not addressed, it may transfer into other building materials such as the insulation, causing fungal growth.

5.10. E2/AS1 is the acceptable solution for complying with E2, and there are no limitations on the performance criteria that this acceptable solution covers.[4] Therefore, it can be considered that by complying with E2/AS1, the building work will comply with all of the performance criteria set out in E2.

5.11. It has been disputed by the parties whether skillion roofs are within the scope of E2/AS1. Having reviewed paragraph 1.1 of the acceptable solution, I consider the design of the skillion roof is within the scope of the acceptable solution because:

5.11.1. the building and the skillion roof are within the scope of NZS 3604:2011

5.11.2. the building has fewer than three storeys, with the highest point of the roof being less than 10m from the ground

5.11.3. the roof pitch is less than 60 degrees.

5.12. The following sections of E2/AS1 are applicable to roof cladding in this particular case:

5.12.1. 8.0 for roof claddings

[4] It is noted that E2/VM1 paragraph 3.1, contained within the same document as the acceptable solution, states that "no specific method has been adopted for verifying compliance of skillion roofs … with NZBC E2.3.2". However, as this is contained within the verification method, I consider it to have no effect on the acceptable solution.

5.12.2. 8.4 being for profiled metal roof cladding.

5.13. I consider that following an assessment of the skillion roof against E2/AS1 sections 8 and 8.4, it is compliant on the following items:

5.13.1. Roof material.

5.13.2. Roof pitch for the type of profile.

5.13.3. Manufacturer specifications have been provided which confirm the fixing requirements, and this is also on the plans.

5.13.4. The cladding is stop-ended under flashings at the top of run.

5.13.5. The cladding is turned down and overhang to the gutter at the bottom of run.

5.13.6. Flashings to the barge and change in roof pitch, where the new skillion roof meets the existing roof.

5.14. I consider that the roof design complies with E2/AS1, so therefore compliance with E2.3.5 is achieved.

Additional Considerations

5.15. While compliance with E2/AS1 confirms compliance with E2, I note there is a lack of specific detail in the acceptable solution that demonstrates how roof constructions are deemed to comply with E2.3.5, particularly for skillion roof types with smaller concealed cavities.

5.16. As with wall construction, roof cladding/assembly construction incorporates the four basic principles of water management in building, known as the '4Ds'[5], with 'drying' being one of these. Allowing air flow below the roof cladding will assist in removing moisture by evaporation or diffusion and drying out the cavity.

5.17. An example of a similar principle in E2/AS1 is in section 8.5.2[6] for membrane roofs and decks, where adequate ventilation is required for these closed-in constructions 'to prevent the accumulation of moisture'.

5.18. The designer has noted that they have specified a 25mm gap on the plans between the roof underlay and insulation product to allow for air flow. As described in previous determination 2021/012, this gap prevents insulation from becoming

[5] From section 3 of the DBH weathertightness design principles document.

[6] 'Acceptable Solutions and Verification Methods for Clause E2 External Moisture' (effective 5 Nov 2020), 3rd edition, Amendment 10 (building.govt.nz)

damp by absorbing moisture that might be held by the underlay.[7] If the insulation were to become wet, there is an increased risk in further condensation, fungal growth and damage to building elements.

5.19. However, air flow in and through this space to dry any moisture will be limited in low pitch roofs, such as skillion roofs. If the roof cladding is constructed to E2/AS1, the requirements are to turn down the bottom edges of the roof cladding to the gutter, as per E2/AS1 cl. 8.4.14 and to have stop-ends to the top end of the cladding, as per E2/AS1 cl. 8.4.13, where in this case it is also flashed to the existing roof structure. These requirements will reduce the natural air flow accessing and moving through the entire roof cavity. Any addition of a purlin being installed at the end of the run against the fascia board – as is shown in the eaves detail on the plans in this instance – will also restrict air flow.

5.20. There are previous determinations on cases of failure in skillion roofs due to damage and dampness caused by moisture, whether from internal or external sources[8]. This plus additional industry advice from the likes of BRANZ and in the Metal Roofing Code of Practice, describes 'best practice' which includes a combination of separation of building elements through space/gaps as well as ventilation for skillion roofs.

Comment regarding E3

5.21. The design of assemblies such as roofs should include consideration of the risk of water or moisture coming from all sources. This can be internal or external moisture.

5.22. The cavity in the skillion roof needs to manage moisture from vapour diffusion from above as well as moisture vapour rising from below.

5.23. Therefore, skillion roof construction should not be assessed against Clause E2 in isolation. Clause E3, specifically E3.3.1, should also be considered and addressed appropriately to ensure that the performance of the construction meets all relevant clauses of the Building Code for moisture from various sources that may accumulate in the roof space.

6. Conclusion

6.1. The design of skillion roofs should take into consideration both internal and external moisture that may accumulate or be transferred into this space by vapour diffusion, and the reduced natural ventilation that occurs in skillion roofs, when assessing compliance with the Building Code.

[7] 2021/012 *Regarding alterations to install insulation in a skillion roof at 96 Lochiel Branxholme Rd, Lochiel, Winton*.
[8] 2013/038 *The compliance of remedial work proposed for the skillion roofs of a house*.

6.2. In this case, the skillion roof complies by way of E2/AS1 and therefore must be accepted as complying with E2.3.5.

7. Decision

7.1. In accordance with section 188 of the Building Act 2004, I determine that the design of the skillion roof complies with E2.3.5 by way of the acceptable solution E2/AS1, and I reverse the authority's purported decision to refuse to grant the building consent.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 18 July 2024.

Andrew Eames

Principal Advisor Determinations