



Determination 2013/046

The code-compliance of top vented cavities proposed for the wall cavities to two Gisborne school buildings

1. The matters 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, 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 applicant is the Ministry of Education as the owner of the schools (“MOE”). The other party to the determination is the Gisborne District Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.

1.3 The reasons for this determination

1.3.1 The application for this determination arises from the following:

- Building consents were apparently issued by the authority for building work at two schools, based on wall cavity details that accorded with the Acceptable Solution for Clause E2 of the Building Code (“E2/AS1”).
- Following a review by MOE against its own weathertightness requirements for school buildings, amendments to the consents were sought to incorporate top vents in addition to the bottom vents shown in E2/AS1.
- The authority has refused to accept the top vented details as an alternative solution because it is not satisfied that the proposed top venting of wall cavities will comply with certain clauses² of the Building Code (Schedule 1, Building Regulations 1992).

1.4 The matter to be determined³ is therefore whether the authority was correct to refuse to accept the proposed amendments to the building consents. In deciding this, I must consider whether the proposed top venting of wall cavities will comply with Clause E2 External Moisture and Clause B2 Durability of the Building Code.

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

² In this determination, unless otherwise stated, “sections” are sections of the Act and “clauses” are clauses of the Building Code.

³ Under sections 177(1)(b) and 177(2)(a)

1.5 Matters outside this determination

- 1.5.1 I have received no information in regard to the building work to be carried out under the two building consents. The question of top and bottom vented wall cavities is therefore considered in principle, rather than on their application to a particular building with specific wall claddings.
- 1.5.2 This determination is also limited to the general consideration of common wall to roof junctions as indicated by MOE in its submissions. The determination does not consider more specialised junctions such as the tops of parapets, where the individual circumstances of a specific situation need to be assessed.
- 1.6 In making my decision, I have considered the submissions by the parties and the other evidence in this matter. MOE's submission includes a report by BRANZ on the top venting of cavities ("the BRANZ report") prepared by a principal scientist ("the scientist") who I consider to be an expert in this matter.

2. The building work

- 2.1 The building work considered in this determination consists of the top of drained cavities installed behind wall claddings installed to timber-framed exterior walls in school buildings that generally fall within the scope of E2/AS1 and NZS 3604⁴.

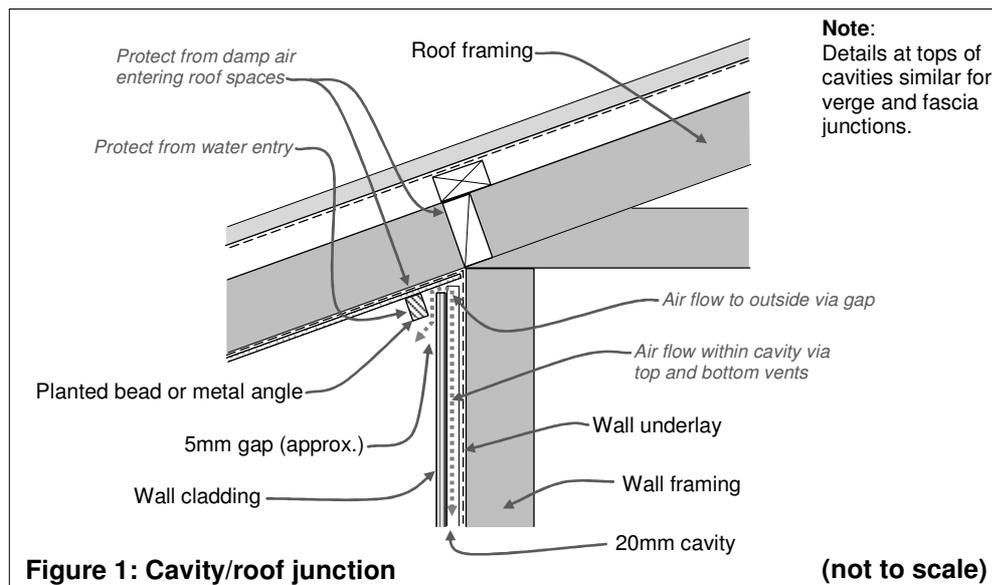
2.2 MOE weathertightness requirements for schools

- 2.2.1 In April 2011, MOE published an updated report titled 'Weathertightness requirements for schools', intended for 'boards of trustees, project managers, design consultants and building contractors', stating that the report mandated 'requirements additional to the requirements of the Building Code' and the approved documents.
- 2.2.2 The report noted that it aimed to reduce 'the risk and cost of weathertightness failure' by adding to Building Code requirements, with 'stricter standards in areas where there is a high risk of weathertightness failure.' The background of failures in school buildings was outlined, with the report focussing on the most common areas of failure. The regulatory framework of the Building Code was also explained.
- 2.2.3 Concepts and risks associated with moisture penetration were discussed and the report considered various elements of the building envelope. Within the section on walls, requirements for wall cavities included the statement 'top ventilation of the wall cavity is required'.
- 2.2.4 MOE sought an opinion from BRANZ on the use of top venting; and building projects incorporating top vented cavities were subsequently issued with building consents elsewhere in the country. The BRANZ report is outlined in paragraph 5.

2.3 The proposed top venting to wall cavities

- 2.3.1 The indicative sketch in Figure 1 shows the general concept required by MOE and proposed for the top of wall cavities:

⁴ New Zealand Standard NZS 3604:1999 Timber Framed Buildings



- 2.3.2 The junction provides ventilation within the cavity by way of a gap of about 5mm at the top to allow air flow to the outside, while protecting the junction from water penetration with the use of planted beads or metal angles. The roof and eave framing is intended to be sealed from damp air with blocking and wall underlay.

3. Background

- 3.1 The authority recently issued two building consents for school projects, based on details for drained cavities which accorded with E2/AS1. I have not seen the building consents or consent documentation for the projects.
- 3.2 At the same time as the consents were applied for, the architect submitted drawings to MOE for a weathertightness review. This resulted in the MOE's instruction to provide top venting of cavities to meet its weathertightness requirements for schools (see paragraph 2.2).
- 3.3 In an email to the authority dated 17 December 2012, the architect noted MOE's requirement for top venting and attached 'some very provisional details'. The authority apparently refused to accept the proposed change. MOE provided additional supporting information and forwarded the BRANZ report to the authority on 14 February 2013.
- 3.4 In an email to the architect dated 12 March 2013, the authority advised that it had reviewed the BRANZ report and 'considered the implications.' The authority noted that the report indicated that, although top venting could give more air movement, there is no proof that 'bottom only vented cavities are failing' and concluded:
- Therefore [the authority] can see no reason why we should accept a top vented cavity which is an alternative solution without more evidence of the effectiveness and compliance with E2.
- 3.5 The Ministry received an application for a determination from MOE on 8 May 2013 and sought further information from the parties, which was received by 2 July 2013.

4. The submissions

4.1 The MOE submission

4.1.1 In its submission and in response to queries, MOE briefly outlined the background to the dispute. MOE explained that it was currently remediating many leaky buildings and top vented wall cavities were wanted to ensure that any moisture in the cavity is dissipated as quickly as possible and also to allow a means of venting and drying should the bottom of the cavity be blocked in the future. The authority also noted that no other building consent authority had declined projects with top venting of wall cavities.

4.1.2 Within the application and in response to queries, MOE forwarded copies of

- typical details for use in various constructions
- the MOE report dated April 2011
- the BRANZ report dated 7 June 2011
- email correspondence with the architect and authority
- various marked-up details from E2/AS1 and other details.

4.2 The authority's submission

4.2.1 In response to queries, the authority wrote an email to the Ministry dated 20 May 2013 outlining reasons for refusing to accept the proposed top venting to wall cavities (in summary):

- the BRANZ report is ambivalent on the efficacy of adding ventilation via top venting as, although there may be some advantage, there is the added caveat of vermin and weatherproofing
- the BRANZ report also states that bottom only vents are working better than expected due to additional and unforeseen air infiltration paths
- experience shows that many schools have contracted and programmed painting/washing cycles, involving routine washing that is likely to be done by the quickest and easiest method
- routine washing will generally use high pressure water blasting, which will inevitably lead to water ingress at the soffit to wall junction
- given the admission that the bottom vents could get blocked, water penetration through top vents is likely to turn the cavity into a 'tank'
- as there is no problem with E2/AS1 cavity design, the addition of top vents is 'a problematic alternative solution that will provide no added advantages, and may actually detract from the building weathertightness'.

4.3 The draft determination

4.3.1 The draft determination was issued to the parties for comment on 11 July 2013.

4.3.2 In an email dated 19 July 2013, the applicant accepted the draft in principle and asked that the Ministry consider top venting cavities be included in the future as an Acceptable Solution.

- 4.3.3 In response, I note that while the Acceptable Solution for Clause E2 is not currently under review, I consider that building consent authorities are required to assess any building consent application incorporating top vented cavities against the requirements of Clause E2 taking account of a circumstances of the particular proposal: such an assessment may take account of the findings of this determination.
- 4.3.4 The authority responded to the draft determination by email on 1 August 2013, noting that it accepted the decision ‘with the rider that [the authority] require clarity if this applies to upward raking soffits as well.’
- 4.3.5 In response, I consider that the same principles apply in respect of upward raking soffits as to the situation here; careful detailing at such a junction will ensure water run-off from the soffit does not enter the wall cavity.

5. The BRANZ report

- 5.1 In 2011, MOE sought an opinion from BRANZ on the use of top venting to wall cavities and the scientist provided a report dated 7 June 2011⁵, which noted that the question asked was whether:

...walls with top-and-bottom vented wall cavities are more able to manage water leaks than walls with bottom-only vented cavities.

- 5.2 The report outlined the background of the use of drained cavities and noted that when cavity requirements for E2/AS1 were developed in 2004, these had been based on existing systems with little understanding at that time of how variables could influence wall performance. Since that time, the understanding of ventilation drying had increased and now allowed some broad conclusions on cavity venting.

5.3 Bottom only vents

- 5.3.1 Commenting on bottom only vents to wall cavities behind sheet and weatherboard claddings, the scientist noted that these are common internationally. Research since 2004 had shown that

- ventilation rates are substantially higher than expected due to accidental air infiltration paths throughout the length of the cavity, which significantly adds to the drying potential
- although much of the drying potential of cavity walls depends on construction quality, finish and cladding type, there is no evidence of any systematic lack of ventilation drying.

5.4 Top and bottom vents

- 5.4.1 Commenting on top and bottom vents to wall cavities, the scientist noted that
- specific top vents provide engineered air flow to wall cavities that does not depend on construction quality, finish and cladding type
 - studies of various cavity types show that top and bottom vented cavities have ‘a clear advantage’ over bottom only vents in ventilation rates and potential for drying

⁵ DC2095 Top vented water managed cavities

- the use of top vented cavities is conditional on
 - adequate screening against rain and vermin entry
 - prevention of damp cavity air transferring into other areas such as the roof cavity (in common with all cavity types).

5.5 The report concluded that top venting typically provides more airflow and is one way of ‘more securely engineering’ a ventilation path for the cavity; therefore providing a greater potential for ventilation drying. However the scientist also noted that there is ‘no field evidence that ventilation drying in walls without top vents is insufficient.’

6. Compliance of the proposed top vents

6.1 General

6.1.1 An Acceptable Solution is a prescriptive design solution that provides only one way of complying with the Building Code. As the proposed top vented cavities do not comply with E2/AS1 they must be considered as an alternative solution, entailing an assessment of a typical junction’s performance

6.1.2 In this instance the weathertightness of the top of the wall cavities is dependent on features that protect the junction from ingress of water and rodents, features that protect the surrounding construction from damp air, the workmanship of the installed junction and the likelihood of failure on the underlying construction. These features can be considered on their merits according to specific details provided for particular building work.

6.2 The Building Code

6.2.1 The relevant provisions of the Building Code are:

E2 External moisture

Performance

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

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.

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

- (a) the consequences of failure
- (c) variation in the properties of materials and in the characteristics of the site.

6.2.2 The relevant section of the Acceptable Solution E2/AS1 is:

9.1.8 Drained cavities

9.1.8.1 Limitations

This Acceptable Solution is limited to systems where:

- c) The drained cavity behind claddings, except in masonry veneer, is not vented at the top.

6.3 The proposed top vents to cavities

- 6.3.1 MOE considers that adding top vents to wall cavities will improve weathertightness by dissipating moisture as quickly as possible. However, the authority maintains top vents will provide no advantage over bottom vents only and may detract from weathertightness by allowing moisture through the junction into the cavity.
- 6.3.2 Taking account of the BRANZ report, I make the following observations:

The Compliance Documents	The proposed top venting <i>(In principle - refer Figure 1)</i>
<p>Clause E2</p> <p>E2.3.2 The proposed junction must prevent the penetration of water.</p> <p>E2.3.5 The proposed junction must prevent the transfer of moisture into concealed spaces such as the roof framing.</p> <p>E2.3.7(a) The proposed junction must make allowance for the consequences of failure.</p> <p>E2.3.7(c) The proposed junction must make allowance for variation in the properties of materials</p>	<p>The junction incorporates screening in the form of planted beads, metal angles or similar to prevent rain entering the cavity.</p> <p>Wall underlay seals off eaves framing, with blocking/purlins sealing off roof framing.</p> <p>Should moisture penetrate into the wall cavity, the additional top vents will provide higher ventilation rates and drying potential than bottom-only vents.</p> <p>Specific top vents provide engineered air flow that does not depend on construction quality, finish and cladding type.</p> <p>The proposed system is adaptable to common types of junctions and wall claddings.</p>
<p>E2/AS1 The drained cavity is not vented at the top.</p> <p>The drained cavity shall use vermin-proofing.</p>	<p>The junction incorporates a gap of about 5mm to allow air flow at the top of the cavity</p> <p>The cavity base closer has holes or slots between 3mm and 5mm to provide vermin proofing.</p>

- 6.3.3 Taking the above into account, I consider it likely that the addition of carefully detailed top vents is likely to improve air flow within wall cavities without any apparent disadvantages. Notwithstanding the adequacy of wall cavities with vents only at the bottom, the proposed top venting of wall cavities will therefore in principle provide weathertightness beyond the minimum required.

6.4 Conclusion

- 6.4.1 In the case of wall cavity to roof junctions proposed for school buildings, the BRANZ report and the other evidence have provided grounds for me to be satisfied that the proposed top vents to wall cavities, appropriately detailed to provide protection against moisture penetration and transfer, will comply with Clauses E2 and B2 of the Building Code.

- 6.4.2 In response to the authority's comments about the likelihood of water entry during cleaning with water blasting, I add the following comments:
- High-pressure water blasting is an inappropriate cleaning method that can damage the building envelope by breaking down surface finishes and materials and force water through any junction in the cladding.
 - Other junctions in the cladding, such as at exterior joinery, incorporate drainage gaps or anti-capillary gaps that can also be breached by directing high-pressure water to those vulnerable junctions.
 - Regular cleaning should be restricted to low-pressure water and light brushing.
- 6.5 I acknowledge that the authority is concerned that top venting is not warranted. However, providing the junctions are carefully designed to incorporate protective measures as discussed in this determination, I am satisfied that such alternative solutions will comply with the requirements of Clause E2. In this instance the authority could have sought information from the architect about the specific details intended for the particular buildings and made its decision as to compliance based on the information received.

7. What is to be done now?

- 7.1 I suggest the architect now modify the applications, taking into account the findings of this determination and clearly detailing the protective measures indicated in Figure 1 adapted to suit the specific circumstances of each project.
- 7.2 I note that the detailed examination of construction details for weathertightness remains the responsibility of the authority and not the Ministry. If remaining details cannot be agreed with the authority, any items of disagreement can then be referred to the Chief Executive for a further binding determination.

8. The decision

- 8.1 In accordance with section 188 of the Building Act 2004, I hereby determine that the provision of top vents to wall cavities will, in principle, comply with Clauses E2 and B2 of the Building Code, and accordingly I reverse the authority's decision to refuse to accept the proposed amendments to the building consents incorporating top vents to wall cavities.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 12 August 2013.



John Gardiner
Manager Determinations and Assurance