Determination 2008/61

Dispute about the code compliance of two proprietary flashings installed on the roof of a house at 37 Meadowcroft Grove, Johnsonville, Wellington

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, Department of Building and Housing ("the Department"), for and on behalf of the Chief Executive of that Department. The owner is Mr W Vrede, acting through the local supplier of the proprietary roof flashings, Hometech Healthy Home Solutions ("the applicant"). The other party is the Wellington City Council ("the territorial authority").

1.2 The dispute arises from the territorial authority's decision to decline to accept that two proprietary Solartube roof flashings ("the flashings") comply with Building Code[2] Clauses E2.3.2 and E2.3.7. In a submission to the Department, received on 2 July 2008, the territorial authority also said that the flashing did not comply with Clause B2 (refer paragraph 6).

1.3 The matter for determination is whether the flashings as installed comply with Building Code Clause E2 "External moisture". For the purposes of this determination:

- The roof penetration is treated as a pipe penetration with a diameter of 250mm.
- The flashings exclude any associated equipment installed though the penetration such as fans, light tubes and their weatherproof cowlings.

1.4 In this determination, unless otherwise stated, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code.

[1] The Building Act 2004 is available from the Department's website at www.dbh.govt.nz.
[2] The Building Code is available from the Department's website at www.dbh.govt.nz.

2. The building work

The house

2.1 The house is a 1½ storey timber structure on a concrete floor slab. It is situated on a sloping site in a high wind zone for the purposes of NZS 3604[3]. The house is relatively simple in plan and form; it is clad in timber weatherboards, and has a 10° pitched gable end roof clad with asymmetrical trapezoidal profiled steel.

The fittings and their method of installation

2.2 Two flashings have been installed to the first floor toilet of the house: one flashing provides the opening for a skylight, the other flashing provides the opening for an extract fan. Both fittings are the same size and configuration (refer Figure 1).

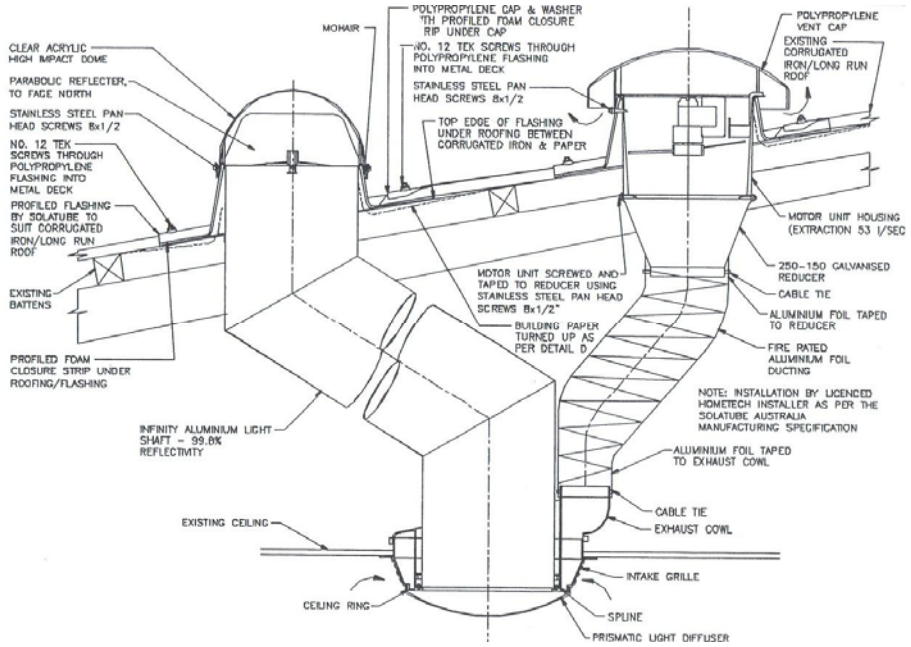


Figure 1: Section showing typical installation details

2.3 The flashings are purpose-made of moulded black polypropylene. The body of the flashings are 3-4mm thick. The thickness increases to approximately 8mm at the fixing points and to stiffen the underside of the flashings where they are fixed under the pan of the profiled roofing.

2.4 The flashings are moulded to the same profile as the roofing for both the overlap and under-lap. The top lap is 60 to 65 mm, the bottom lap ranges from a minimum of 110mm to a maximum of approximately 190mm. The minimum side lap is one ridge wide.

[3] New Zealand Standard NZS 3604:1999 Timber Framed Buildings

2.5 The top and bottom laps are sealed with a double line of black vinyl closed-cell compressible foam – one on either side of the fixing points. The side laps are sealed with one line of the same foam.

2.6 All the fixings are No 12 galvanised Tek screws with neoprene washers. The flashings are fixed at every ridge, in the centre of every trough, and fixed at 180mm maximum centres along the ridge at the side laps.

The installers

2.7 The flashings are installed by licensed installers who achieve that status after successfully completing a specific training programme.

2.8 Each flashing is made specifically to match the roofing profile to which it is being fixed, and comes as a complete kit including all fixings, templates and foam seals. Every item in an installation kit must be used and the installer is not permitted to substitute other materials or fixings.

3. Background

3.1 The territorial authority issued a building consent on 27 March 2007 for the construction of one of two houses on the property. The consent drawings show the installation of one fitting to an internal toilet on the upper level of the house. I understand the house has been completed.

3.2 There appear to have been some discussions about the adequacy of the flashings to the fittings between the owner and the territorial authority. On 11 April 2008 the territorial authority wrote to the owner saying:

> At the centre of [the territorial authority's] concerns is a flashing detail on [both flashings]. This flashing itself is an alternative solution and subject to the [territorial authority's] approval.
>
> The [territorial authority] has met with a [representative] from [the fitting's supplier] and [has] considered the flashing detail and do not believe that they satisfy the requirements of E2.3.2 or E2.3.7.
>
> . . . should you disagree . . . you can . . . apply . . . for a determination.

3.3 The application for determination was received on 19 May 2008.

4. The legislation

4.1 The relevant Clause from the Building Code Clause E2 "External moisture" says:

> **E2.3.1** Roofs must shed precipitated moisture. In locations subject to snowfalls, roofs must also shed melted show.
>
> **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

4.2 The relevant sections from the Acceptable Solution for Clause E2, E2/AS1 includes the following:

8.4.17 Roof penetrations

The maximum length of profiled roof cladding above penetrations shall be as shown in Table 17. The edge of roofing penetrations over 200 mm wide shall be supported in either direction with additional framing as shown in Figure 21. Roof penetrations shall be flashed as follows:

a) Pipe penetrations up to 60 mm shall be flashed using an EPDM boot flashing as shown in Figure 53,

b) Pipe penetrations up to 500 mm shall be flashed using a soaker flashing and EPDM boot flashing as shown in Figure 54,

c) . . . .

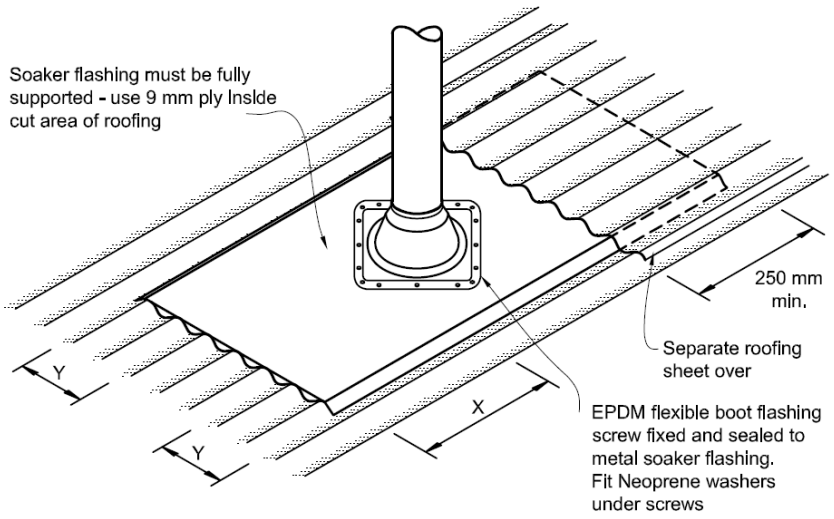
Table 17: Catchment areas for profiled metal
Paragraphs 8.1.7 b), 8.4.17 and 9.1.3.4, Table 9, Figure 22

Penetration width	Maximum roof length above penetration in metres		
	Corrugated	Trapezoidal	Trough profile
800 to 1200 mm	4 m	8 m	16 m
600 to 800 mm	6 m	12 m	18 m (refer Note)
400 to 600 mm	8 m	16 m	18 m (refer Note)
0 to 400 mm	12 m	18 m (refer Note)	18 m (refer Note)

NOTE: Limited to 18 m as per the limitations of this Acceptable Solution.

Figure 54: Soaker flashing for pipe penetrations
Paragraphs 8.3.10 and 8.4.17 b)

NOTE: (1) X = variable according to *wind zone* – refer Table 7.
(2) Y = to cover minimum of two crests – refer Table 7.
(3) Suitable for pipes from 60 mm to 500 mm diameter.
(4) Suitable only for roof pitches of 10° or higher.



(As it applies to this house, Table 17 prescribes the bottom lap(X) as 130mm and the side laps (Y) enough to cover two crests, which in this instance is a minimum distance of approximately 230mm.

5. The submissions

5.1 The applicant supplied:

- a full-size sample of the flashing installed into the same roofing as used on the house (I accept that the sample is representative of the flashings as installed)
- the building consent and some plans for the house
- photographs of the flashings as installed on the house
- installation details
- a consultant's report, dated August 2007, on the condition and performance of the flashings used on 4 houses in Wellington region.

5.2 The applicant submitted that:

> [HomeTech] has had a network of licensed Installer's throughout New Zealand since 1992 and over 110,000.00 flashing systems have been installed in New Zealand to date.

5.3 In an email to the Department dated 9 June 2008, the applicant expanded on the information about the houses contained in the consultant's report saying the four installations range in date from 7 to nearly 16 years. No leaks had occurred. The consultant reported that the flashings were in good condition but that some fixings were starting to corrode. It is noted that the fixings now used by the flashing supplier are galvanised steel.

5.4 In the same email the applicant provided further information on the performance of the flashings generally, noting:

- the flashings have been installed successfully over nearly 16 years.
- the applicant was "just completing a contract in Christchurch . . . where there are 1600 flashings in one contract with no leaks".
- completed flashings underwent a random audit, particularly on large contracts.
- the "odd leak" had occurred but this "often happened where the roof had been leaking previously"
- there is the "odd quality issue with our installers over 16 years, but we monitor this very closely. One [licensee] was . . . sacked last year for quality issues
- there was a national call centre to enable performance matters to be monitored.

In addition the applicant provided a detailed drawing of the flashing details sought by the territorial authority that the territorial authority accepted as complying with the Building Code (refer paragraph 6.10).

5.5 The draft determination was issued to the parties for comment on 13 June 2008. The applicant accepted the draft without comment.

5.6 In a letter to the department received on 2 July 2008 the territorial authority said that it did not accept the draft and submitted that:

> It is the [territorial authority's] view that [the flashing] do not comply with the requirements of clauses E2 External Moisture and B2 Durability.
>
> . . . the applicant has [not] supplied . . . independent verification that establishes reasonable grounds for the acceptance of the flashing system.
>
> . . . the [territorial authority] is concerned that the applicant . . . is seeking to bypass the intention of the Act by applying for a determination to establish generic compliance . . . for their product . . .

The territorial authority quoted from section 6.3 of the 'Metal Roof and Wall Cladding: Code of Practice for guidance' saying, with respect to EPDM flashings:

> They are lapped over the roof cladding, creating a dam that holds moisture or dirt.
>
> They rely on sealant alone for their weathertightness.
>
> This type of flashing is unacceptable on asymmetrical trapezoidal profiles if the size of the pipe and flashing restrict or obstruct the passage of water to less than half of the normal draining area.

6. Discussion

Compliance with the Building Code as an alternative solution

6.1 The Building Code is a performance based document. A proven history of performance in use is a valid test that any product or system complies with the Building Code. The applicant has advised that 110,000 flashings have been installed successfully since 1992. What problems that have occurred have arisen from existing leaks or poor installation: the latter matter is monitored and any problems remedied.

The solution described in the Acceptable Solution E2/AS1

6.2 For pipe penetrations of 250mm diameter to the roof to this house, E2/AS1 prescribes the use of a soaker flashing which is lapped with the metal roofing as described in Figure 54. This prescribes a minimum top lap of 250mm, a bottom lap of 130mm and side laps of 230mm.

6.3 Except for the down-turn to its edges, the soaker flashing is flat and not moulded to the profile of the metal roofing. There is no requirement for specific fixings, foam seals, closure pieces or similar, to close the gaps between the flat soaker and the metal roofing. The laps to the soaker flashing must therefore be sufficiently big to compensate for wind-blown rain being driven up or along the laps.

6.4 The soaker flashing is fitted with an EPDM boot that forms the seal to the pipe. . The EPDM boot is surface-fixed and sealed to the soaker flashing: a typical EPDM boot has a sealed lap width of approximately 20mm. In addition, the EPDM boot is also required to be sealed to the pipe itself.

The alternative solution provided by the flashings

6.5 The flashings are moulded to the profile of the metal roof, they are sealed at all laps with closed-cell foam (two lines of foam seal are provided to the top and bottom laps) and they are fixed to the roof at close centres around the entire perimeter of the flashing. Installers are required to ensure the installed flashing is fixed in close contact with the metal roofing at all laps.

6.6 Although the laps are generally significantly less that that described in E2/AS2, the moulded profile does not rely on the width of its laps as must a soaker flashing.

6.7 The flashings are moulded ready to accept the 250mm diameter fittings so there is no need for the EPDM boot described in table 54. In this instance both flashings are well within the limit for the catchment area described in Table 17.

The territorial authority's position

6.8 The territorial authority has said that the flashings do not comply with Building Code Clauses E2.3.2 and E2.3.7, however, it has not said in what specific respects the flashings do not comply.

6.9 The territorial authority's submission, received on 2 July 2008, says that its does not believe the flashing complies with Clause B2. Building Code Clause B2 Durability requires this element to be durable for 15 years. The applicant's consultant assessed a sample of flashings up 16 years old and found no matters that caused concern apart from some corrosion of the fixings used at the time the flashings were installed.

6.10 The applicant has confirmed that in other instances where the territorial authority has declined to accept the use of the flashing, the territorial authority required the flashing to be 'overlapped' with a flat soaker flashing of a similar dimension to that shown in Figure 54. A rigid fibreglass, or polypropylene, boot flashing is then surface-fixed to the soaker flashing and sealed with one line of closed-cell foam. The soaker flashing is back-flashed with another layer of roofing back to the ridge flashing at the apex of the roof.

6.11 The territorial authority has cited disadvantages associated with the use of surface-fixed EPDM boots. However, the flashing differs from an EPDM boot in several important respects: the flashing does not reply on sealant to achieve weathertightness nor is it lapped over the roofing to create any dam to trap either moisture or dirt.

6.12 I acknowledge that the flashing does restrict the trough profile but even if water is restricted in its movement down the roof, its temporary build-up will not lead to water ingress though any weak points in the flashing.

6.13 The flashing has been in common use for 16 years and I do not accept the territorial authority's position that after this established period of use the determination will be seen as a generic approval of the flashing.

6.14 I believe the applicant has provided sufficient evidence of proven in-service performance and has also provided independent verification of this.

The adequacy of the documentation

6.15 In my view the documentation presented with the application was not sufficient to demonstrate compliance with the Building Code. The drawings were for the installation of the flashing into a corrugated steel roof. However, the metal roofing in this instance had a trapezoidal profile. The drawings did not clearly show how the critical top, bottom, and side laps were to be constructed. How these junctions were to be made weathertight was only made clear to me when the sample flashing was provided. An expanded view of the complete flashing assembly would also assist.

Conclusion

6.16 Figure 54 of E2/AS1 describes a solution for the worst case situation for a roof of this type, pitch and exposure using standard materials and fittings. The minimum laps shown are to compensate for the use of a soaker flashing that is unable to be adequately sealed to the roof profile. Figure 54 shows the use of an EPDM boot which adds two more junctions which must be rendered weathertight.

6.17 In this case the flashings are purpose made items that are mounded to the profile of the metal roofing. They can therefore be effectively sealed around the full perimeter of the roof penetration while still providing the appropriate lap direction. The flashing does not require the installation of an EPDM boot.

6.18 There are significant differences between the situation shown Figure 54 and the flashings as installed on the house. I do not consider that the minimum laps described in Figure 54 are relevant in this instance.

6.19 The installation detail sought by the territorial authority appears to duplicate the soaker flashing shown in Table 54. However, the rigid boot is surface-fixed to the soaked flashing which is reliant on proper sealing of this junction which, in my view, cannot provide a more robust weathertight joint than that already offered by the applicant using the standard installation details for the flashing.

6.20 I accept the evidence presented by the applicant that the flashings have a proven history of performance that can be used to demonstrate compliance with Building Code. I conclude that the flashings as installed comply with Clause E2 “External moisture”.

6.21 The documentation presented by the applicant to the territorial authority was insufficient to demonstrate compliance with the Building Code and the installation drawings for the flashing did not show critical details.

6.22 I emphasise that each determination is conducted on a case-by-case basis. Accordingly, the fact that a particular product or system been established as being code compliant in a specific situation does not necessarily mean that the same product or system will be code compliant in other situations. This determination should on no account be taken as any form of product endorsement, appraisal or certification.

7. The decision

7.1 In accordance with section 188 of the Act I determine that the flashings installed in this house comply with Building Code Clause E2 “External Moisture”.

Signed for and on behalf of the Chief Executive of the Department of Building and Housing on 10 July 2008.

John Gardiner
Determinations Manager