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Client Ref: T. Mason
LBA Ref: 191261-01

Appraisal of Masons Roof Boot Flashings

1. Introduction

Les Boulton & Associates Ltd (LBA) was requested by *Masons Plastabrick Ltd* (Masons) to carry out an appraisal on *Masons Roof Boot Flashings*. The purpose of the appraisal was to assess whether the materials employed for the roof flashings comply with the requirements of the New Zealand Building Code (NZBC), Clause B2 *Durability*, Clause E2 *External Moisture* and Clause F2 *Hazardous Materials*.

Masons roof boot flashings are designed for building applications where a pipe or building service penetrates the roof of a building. When installed the roof boot flashings create a weathertight seal between the service pipe and the building roof.

The following technical information was provided by Masons to assist with the appraisal of the materials employed to manufacture the roof boot flashings:

- 1) NZ Building Code (NZBC) Acceptable Solutions E2/AS1, Department of Building and Housing, 2014.
- 2) Testing of properties of EPDM synthetic rubber to ASTM Specifications, 2012.
- 3) Testing of properties of Silicone synthetic rubber to ASTM Specifications, 2019.
- 4) MSDS data sheet for EPDM synthetic rubber, 2012.
- 5) MSDS data sheet for Silicone synthetic rubber, 2013.

2. Principle of Masons roof boot flashings

Masons roof boot flashings comprise a flexible synthetic rubber cone made from moulded EPDM rubber, or moulded Silicone rubber, that can be cut to size to fit a range of pipe and service penetrations (*Figures 1&2*). The roof boot flashings are one piece components comprising a synthetic rubber boot moulded onto a flexible aluminium base that is fixed to the roof of a building.

Masons roof boot flashings come in various sizes to cater for service pipes (up to 170mm diameter pipes). The roof flashings are designed for use in residential and commercial buildings. The flexible aluminium base of the roof flashings is fixed to the roof with rivets or screws.

The roof boot flashings comply with NZBC E2/AS1 clause 4.3.9 for roof flashings made of a rubber. The rubber cones comply with ASTM D6134:2007 *Standard specification for vulcanised rubber sheets used in waterproofing systems*.

The moulded rubber roof flashings have been installed on buildings in New Zealand for many years and they have become an industry standard for roof pipe penetrations. The roof flashings have proven to be durable and weathertight on the roofs of buildings throughout New Zealand.

The EPDM and Silicone roof boot flashings have been given a 20 year Warranty against degradation and/or failure by the manufacturer. Masons roof boot flashings provide a cost-effective way to deal with construction issues associated with pipe penetrations through building roofs. Installation of the roof boot flashings offers a repeatable method of construction without undue reliance on the skill level of an installer.

3. Materials used for Masons roof boot flashings

3.1 EPDM and Silicone cones on roof boot flashings

The flexible rubber cones on the roof boot flashings pipe penetrations are manufactured from EPDM rubber or Silicone rubber. Both synthetic rubber materials are *elastomers*. The EPDM and Silicone flexible cones are light and have rubber-like elasticity. Thus the flexible elastomeric cone of a roof boot flashing forms a weathertight seal around a service pipe that penetrates a building roof.

The two synthetic rubber formulations are not affected by moisture and they have excellent chemical stability under normal operating conditions. Both of the synthetic rubbers exhibit good resistance to heat, cold, ozone and the weather. EPDM rubber and Silicone rubber are formulated for exterior applications such as for pipe penetrations on building roofs. EPDM and Silicone roof boot flashings have been employed in exterior environments without degradation occurring.

The assessment showed that Masons synthetic rubber boot flashings for pipe penetrations on roofs will provide a service life of at least 15 years. The roof boot flashings carry a manufacturer's warranty for 20 years.

3.2 Aluminium bases for roof boot flashings

The roof boot flashings are one-piece mouldings that connect the flexible rubber cones to an aluminium base. The aluminium base comprises a malleable metal flange that can be moulded to fit the roof profile when the roof flashing is installed. The flexible aluminium base of the roof flashing is fabricated from grade AA1060 aluminium sheet which is 99.6% pure aluminium.

3.3 Fixing the aluminium base of the roof boot flashing

The flexible aluminium base of the Masons roof boot flashings are fixed to a roof to give a weathertight seal using blind rivets (aluminium) or self-drilling screws with neoprene washers. The fasteners employed should be made of a material that is compatible in contact with the

aluminium base of the flashing. The fasteners chosen to fix a roof boot flashing to the roofing material should be selected by the installer to comply with NZBC Acceptable Solutions E2/AS1 Clause 4.4 *Fixings*.

It is acceptable to install a silicone sealant (neutral-curing silicone) under the bottom edge of the aluminium base when fixing the boot flashing to a roof. The application of silicone sealant enhances the weathertightness of the roof boot flashing aluminium base to the roofing material.

4. Assessment of Masons roof boot flashings

The Masons range of roof boot flashings is fabricated using the following materials:

- EPDM synthetic rubber cones
- Silicone synthetic rubber cones
- Aluminium bases
- Fixings for flashing to a roof

The EPDM and Silicone synthetic rubbers used for the roof boot flashings have been assessed for service performance and durability. The synthetic rubbers employed for the flashing cones are not affected by moisture, light, cold, heat or weather. The roof boot flashings will provide a service life of at least 15 years and thereby meet the requirements of NZBC Clause B2 *Durability*. In addition Masons roof boot flashings have a manufacturer's warranty of 20 years service life.

The aluminium base of the roof boot flashings is made from high purity grade AA1060 aluminium which is strong and durable. Because the roof boot flashing is rain washed the metal flange forms an aluminium oxide passive film which protects the aluminium metal from corrosion during service.

When a Masons roof boot flashing is correctly installed for a service pipe penetration as part of an approved roofing system, the roof boot flashing will contribute to meeting code compliance with NZBC Clause E2 *External Moisture*.

The materials employed for the Masons roof boot flashings do not emit any form of radiation nor do they emit noxious vapours. The flashing surfaces are safe to handle and they do not release any dust or hazardous substances during installation. The roof boot flashings will not present a health hazard to people. The roof boot flashings meet the code requirements of NZBC Clause F2 *Hazardous Building Materials*.

5. Appraisal of Masons roof boot flashings

5.1 An appraisal of the materials employed in the Masons roof boot flashings has been carried out. The assessment has shown that the roof boot flashings are protected against degradation in service by the appropriate choice of quality materials.

5.2 The materials employed to fabricate Masons roof boot flashings are durable and they will withstand exposure to all New Zealand weather conditions. The likelihood of degradation occurring on the synthetic rubber cones and on the aluminium bases during service is very low.

5.3 To ensure that the expected durability of the Masons roof boot flashings is achieved a condition inspection of the roof boot flashings should be carried out by the asset owner at intervals recommended by the supplier.

6. Conclusions from the Masons roof boot flashing appraisal

6.1 A review has been carried out of the design and materials employed for the elements of the Masons roof boot flashings. The appraisal included a technical review of the properties of the materials employed in the manufacture of the roof boot flashings.

6.2 An assessment of resistance against degradation of the materials comprising the Masons roof boot flashings has shown that the flashings are very durable. The roof boot flashings will perform well when installed on building roofs in all New Zealand environments.

6.3 Masons roof boot flashings meet the requirements of the NZ Building Code Clause (NZBC) Clause B2 *Durability* and they will provide a service life of at least 15 years. Masons roof boot flashings have a warranty for 20 years service life.

6.4 The Masons roof boot flashings when used as part of a roofing system will contribute to meeting the requirements of NZBC Clause E2 *External Moisture*.

6.5 The Masons roof boot flashings meet the requirements of NZBC Clause F2 *Hazardous Building Materials*.

6.6 The long term performance of Masons roof boot flashings is conditional upon the asset owner meeting the inspection recommendations of the roof boot flashing supplier.

Appraisal prepared by:

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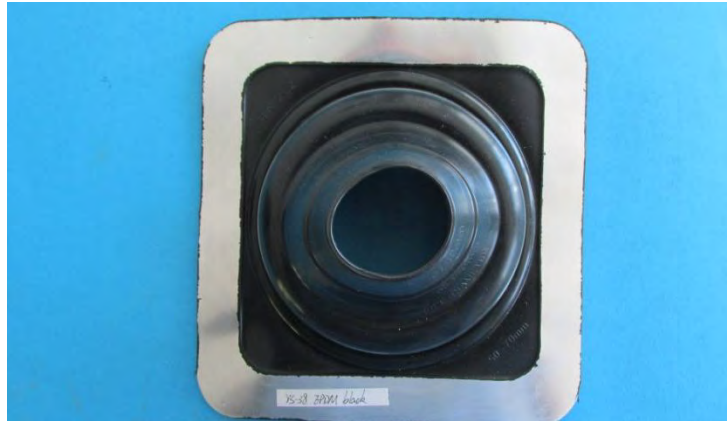


Figure 1. Masons EPDM roof boot flashing (large pipes)



Figure 2. Masons Silicone roof boot flashing (small pipes)