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Client Ref: T. Mason  
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## Durability Appraisal of Masons Pipe Penetration Seal

### 1. Introduction

*Les Boulton & Associates Ltd (LBA)* was requested by *Masons Plastabrick Ltd (Masons)* to carry out a durability appraisal on the *Masons Pipe Penetration Seal* system. The purpose of the durability appraisal was to assess whether the materials employed for the elements of the Masons pipe penetration seal system comply with the requirements of the New Zealand Building Code (NZBC), Clause B2 *Durability*.

Masons pipe penetration seal is an air seal flashing designed for cavity construction where a pipe or service penetrates a building cladding and passes through the air seal membrane (*Figure 1*). The air seal membrane may be building wrap, flexible air barrier or rigid air barrier. Once installed the pipe penetration seal creates an air seal between the pipe or service penetration and the air barrier membrane of the cavity cladding system.

Masons range of pipe penetration seals provide an internal wall flashing system for pipes that penetrate through a drained and ventilated cladding system. The pipe penetration seal maintains the integrity of the air seal in the cladding cavity. The pipe penetration seal assists the external rain screen of a cladding system to maintain weathertightness.

Masons pipe penetration seal is provided with a flexible synthetic rubber nozzle (EPDM) that can be cut to fit a standard range of pipes. The pipe penetration seal comes in sizes to cater for pipes from 1mm to 170mm diameter. The EPDM nozzle of the pipe seal is trimmed to fit the service pipe size.

The following technical data and background information<sup>1</sup> were provided to assist with the durability appraisal of the materials employed to manufacture the pipe penetration seal system:

- 1) Masons *40 Below* flashing tape, Technical Data Sheet.
- 2) Masons *40 Below* flashing tape, Product Warranty.
- 3) Masons *40 Below* flashing tape, CertMark Australia, Evaluation Report No.CMI-ER30098, 2016.
- 4) EPDM synthetic rubber material certificate, 2019.

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<sup>1</sup> The information provided is referred to as References 1-5.

- 5) Water penetration and structural testing of Masons flexible wall underlay configurations, Report 18-16a, R. Gibbs, FacadeLab Ltd, 2018.

## **2. Principle of the pipe penetration seal system**

Designed for use in residential and commercial buildings, the Masons pipe penetration seal system incorporates a synthetic rubber (EPDM<sup>2</sup>) nozzle bonded to a carrier material comprising a flashing tape which extends out from the pipe penetration through the air seal membrane. A typical Masons pipe penetration seal is shown in *Figure 1*.

The carrier material employed with the pipe penetration sealing system is Masons *40 Below* flashing tape. The window flashing tape adheres permanently to the air seal membrane when firm pressure is applied to the flashing tape. The *40 Below* flashing tape is durable and it is compatible with all types of building underlays. The *40 Below* self-adhesive flashing tape is provided with each pipe penetration seal because it is an integral component of the Masons pipe penetration seal design.

Masons pipe penetration seals have been installed and trialled during testing of water penetration through a wall cladding system in a façade testing booth. The building underlay under trial was Masons UNI flexible air barrier. The building underlay being tested in the booth had four Masons pipe penetration seals installed (20mm to 110mm diameter). The testing booth was subjected to pressurised water penetration testing that followed Method E2/VM1 of the NZ Building Code (NZBC). The Masons pipe penetration seals subjected to water pressure during the trials in the testing booth (*FacadeLab*) gave good performance against pressurised water penetration (Reference 5).

A pipe penetration seal provides a secondary line of defence against moisture ingress into the building walls. The pipe penetration seals, when installed behind cladding systems that meet the requirements of NZBC (such as those covered by Acceptable Solutions E2/AS1) in accordance with the manufacturer's recommendations, will assist a drained and ventilated cladding system to comply with NZBC Clause E2 *External moisture*.

Masons pipe penetration seals provide a cost-effective way to deal with construction issues associated with pipe penetrations through cavity wall claddings. Installation of the pipe seal system offers a repeatable method of construction without undue reliance on the skill level of an installer.

## **3. Materials used in the pipe penetration seal system**

### **3.1 EPDM nozzle on pipe penetration seal**

The cone-shape flexible nozzle (sleeve) on the Masons pipe penetration seal is manufactured from EPDM which is an elastomer that is commonly called a synthetic rubber (Reference 4). The EPDM nozzle is light and it has rubber-like elasticity. The EPDM nozzle forms a weathertight seal around a service pipe penetration that passes through the cavity of a cladding system.

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<sup>2</sup> EPDM is ethylene propylene diene terpolymer.

EPDM synthetic rubber formulations are not affected by moisture and they have excellent chemical stability under normal operating conditions. EPDM rubber exhibits good resistance to heat, cold, ozone and weather. EPDM is formulated for application in outside installations such as service pipe penetration seals installed in a cavity cladding system. EPDM building components have been employed widely in exterior environments without any form of degradation occurring.

### **3.2 40 Below window flashing tape**

The *40 Below* window flashing tape used as the carrier for the pipe seal is a flexible self-adhesive weatherproof tape for use around framed joinery openings and cladding penetrations. *40 Below* flashing tape, when installed according to the manufacturer's recommendations, acts as a secondary weather barrier against moisture ingress in the cavity behind a cladding system rain screen.

*40 Below* window flashing tape is composed of a thin flexible self-adhesive polymeric tape with an easy release backing paper. The flexible white-faced flashing tape is strongly adherent being composed of a hot-melt pressure adhesive. The high quality *40 Below* flashing tape performs very well in all weather conditions experienced in New Zealand (References 1,2,3,7).

## **4. Assessment of the durability of the pipe penetration seal system**

The Masons range of pipe penetration seals for installation in drained and ventilated cavity cladding systems is fabricated using the following materials:

- EPDM synthetic rubber nozzles.
- *40 Below* flexible self-adhesive polymeric flashing tape.

The EPDM synthetic rubber used in the pipe penetration seal has been assessed for service performance and durability. The EPDM synthetic rubber employed in the pipe penetration seal nozzle is not affected by moisture, light, cold, heat and weather.

The *40 Below* pipe penetration flashing tape is durable. The EPDM rubber nozzle and the *40 Below* flashing tape are installed as a pipe penetration seal within the wall cavity of a cladding system. Masons pipe penetration seals are not exposed to light during service which ensures that the pipe penetration seal materials do not undergo UV degradation during service. The materials employed in the Masons pipe penetration seal system provide 90 days of exposure to UV radiation on a building site after which time the installed pipe penetration seal must be enclosed.

When a Masons pipe penetration seal is installed in conjunction with a wall underlay as part of a cavity cladding system, the pipe penetration seal will contribute to meeting code compliance with NZBC Clause E2 *External Moisture*.

The materials employed for the Masons pipe penetration seals do not emit any form of radiation nor do they emit noxious vapours. The seal surfaces are safe to handle and they do not release

any dust or hazardous substances during installation. The pipe penetration seals will not present a health hazard to people. The pipe penetration seals meet the code requirements of NZBC Clause F2 *Hazardous Building Materials*.

## **5. Durability appraisal of the pipe penetration seal system**

5.1 A durability appraisal of the materials utilised in the Masons pipe penetration seals for cavity cladding systems has been carried out. The durability assessment has shown that the pipe penetration seal system is protected against degradation and corrosion when in service due to the appropriate choice of quality durable materials.

5.2 The materials employed in the Masons pipe penetration seals are durable and will withstand exposure to all New Zealand weather conditions. The likelihood of degradation or corrosion occurring on the pipe penetration seal EPDM nozzle and *40 Below* flashing material during service inside a drained and ventilated cavity of a cladding system is very low.

5.3 To ensure that the expected durability of the Masons pipe penetration seal is achieved appropriate inspection of the cladding system should be carried out by the asset owner at intervals recommended by the manufacturer.

## **6. Conclusions for the Masons pipe penetration seal durability appraisal**

6.1 A review has been carried out of the design and materials employed for the elements of the Masons pipe penetration seal for cavity wall claddings. The durability appraisal included a technical review of the chemical and physical properties of the materials employed in the manufacture of the pipe penetration seals.

6.2 An assessment of resistance against degradation and corrosion of the materials comprising the Masons pipe penetration seal has shown that the pipe penetration seals are very durable. The pipe penetration seals will perform well when installed inside a drained and ventilated cavity cladding system in all New Zealand environments.

6.3 The Masons pipe penetration seal system meet the requirements of the NZ Building Code Clause (NZBC) Clause B2 *Durability* in order to provide a service life equal to the façade cladding which is at least 15 years and up to 50 years for a brick veneer cladding.

6.4 The Masons pipe penetration seal system when used as part of a drained and ventilated cavity wall cladding system will contribute to meeting the requirements of NZBC Clause E2 *External Moisture*.

6.5 The Masons pipe penetration seal system meets the requirements of NZBC Clause F2 *Hazardous Building Materials*.

6.6 The durability of the Masons pipe penetration seal is conditional upon the asset owner meeting the inspection recommendations of the wall cladding manufacturer.

**Durability Appraisal prepared by:**

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**Figure 1.** Example of a Masons pipe penetration seal